



# 2014 New York State Hazard Mitigation Plan



New York State Division of Homeland  
Security and Emergency Services

January 2014

### Cover Photograph Credits:

**Upper Left;** Dymski, Gary. (2012). A brush fire in Melville's West Hills County Park. Retrieved from <http://www.newsday.com/long-island/suffolk/brush-fire-burns-4-acres-of-melville-park-1.3650690>

**Upper Center;** Matthews, Beбето. AP Photo. (2012). Bloomberg News: Hurricane Sandy's Waters Flood Blacked-Out New York City. Retrieved from <http://www.businessweek.com/news/2012-10-29/hurricane-sandy-s-waters-flood-blacked-out-new-york-city>

**Upper Right;** Peltza, Jennifer. (2013). AP Photo. New York flood zone map expands post-Sandy. Retrieved from <http://news.msn.com/us/new-york-flood-zone-map-expands-post-sandy>

**Center;** *New York Recovers: Hurricane Sandy Federal Recovery Support Strategy, Version One.* (2013).

**Disaster Preparedness Commission**  
**ADOPTION RESOLUTION**

**The State of New York**  
**Multi-Hazard Mitigation Plan**

The State of New York has developed and updated its Multi-Hazard Mitigation Plan for 2014 through the efforts of the State Division of Homeland Security and Emergency Services (DHSES), the State Disaster Preparedness Commission (DPC) and other state, regional and local agencies and partners.

The following resolution was passed by the New York State Disaster Preparedness Commission, 1220 Washington Avenue, Albany, New York, after full consideration of the updated plan. The Commission, being fully empowered to act on behalf of the State of New York in disaster-related matters, in accordance with New York State Executive Law, Article 2-B, as amended, adopted the following resolution.

**RESOLUTION**

WHEREAS, the State of New York, with the assistance of the State Division of Homeland Security and Emergency Services, all member agencies of the Disaster Preparedness Commission, and other interested agencies and partners, has gathered information and prepared the 2014 New York State Multi-Hazard Mitigation Plan (the Plan); and

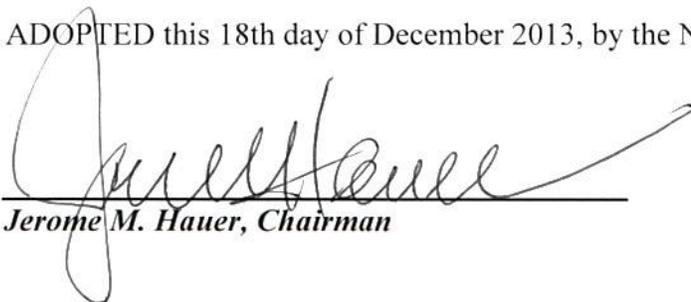
WHEREAS, the Plan has been prepared and updated in collaboration with the Federal Emergency Management Agency, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS, the State of New York has afforded state, federal and local agencies, regional groups, not-for-profit organizations, and private citizens an opportunity to comment and provide input into the Plan and the actions of the Plan; and

WHEREAS, the State of New York, through its Disaster Preparedness Commission, has reviewed the Plan and affirms that the Plan will be monitored and maintained in keeping with the specified terms and conditions of the Plan, and will be updated and current, consistent with applicable FEMA regulations and policies;

NOW, THEREFORE, BE IT RESOLVED by the Disaster Preparedness Commission that the State of New York adopts the 2014 New York State Multi-Hazard Mitigation Plan, including any minor revisions as may be required by FEMA to maintain current federal assistance levels, as the State's Natural Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this 18th day of December 2013, by the NYS Disaster Preparedness Commission.

  
\_\_\_\_\_  
*Jerome M. Hauer, Chairman*



**FEMA**

December 18, 2013

The Honorable Andrew Cuomo  
Governor, State of New York  
Office of the Governor  
State Capitol  
Albany, NY 12224

Re: Approval of the Updated New York State Hazard Mitigation Plan

Dear Governor Cuomo:

I am pleased to inform you that I have formally approved the State of New York's updated Standard Hazard Mitigation Plan (the "Plan"), pursuant to my authority under Title 44 Code of Federal Regulations (CFR) §201.3(a)(3). This Plan is approved from the date of this letter for a period of three years, through December 18, 2016.

The State's Plan has been reviewed in accordance with 44 CFR Part 201, *Mitigation Planning*, and the FEMA *Multi-Hazard Mitigation Planning Guidance*. The approval of this Plan allows the State of New York to retain its eligibility for the following types of FEMA disaster assistance:

- Public Assistance-Categories C-G
- Fire Management Assistance Grants (FMAG)
- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation Grant Program (PDM)
- Flood Mitigation Assistance (FMA)

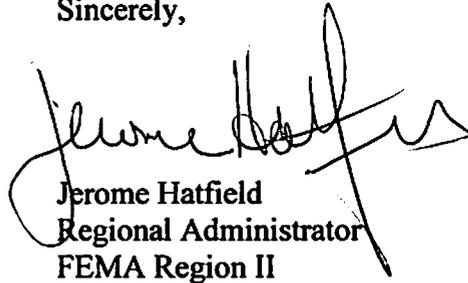
It is important to recognize that all future requests for funding under these programs will be evaluated individually according to the specific eligibility and other requirements of the particular program under which the application is submitted. For example, a specific mitigation activity or project identified in the plan may not meet the eligibility requirements for FEMA funding, and even eligible mitigation activities are not automatically approved for FEMA funding under any of the aforementioned programs.

Governor Andrew M. Cuomo  
December 18, 2013  
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We look forward to working with the New York State Division of Homeland Security and Emergency Services on continuing mitigation planning efforts and on the implementation of the State's hazard mitigation strategy.

Please contact me at (212) 680-3612 or have a member of your staff contact Tim Crowley, Mitigation Division Director at (212) 680-3627 if we can provide further information.

Sincerely,



Jerome Hatfield  
Regional Administrator  
FEMA Region II

cc: Jerome M. Hauer, Chair, NYS Disaster Preparedness Commission  
Commissioner, NYS Division of Homeland Security and Emergency Services

Andrew X. Feeney, Deputy Commissioner for Special Programs  
NYS Division of Homeland Security and Emergency Services

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## Section 1: INTRODUCTION

*“Over the past two years, New York State has been hit by some of the most destructive storms in the state's history, causing untold damage and the tragic loss of many lives. Regardless of the cause of these storms, New York State must undertake major reforms to adapt to the reality that storms such as Sandy, Irene, and Lee can hit the state at any time.”*

*-Governor Andrew M. Cuomo*

The effects of Hurricane Irene, Tropical Storm Lee and Hurricane Sandy have taken an immense toll on the citizens, businesses, and government of the State of New York. Ordinarily, the period covered by the 2014 State Hazard Mitigation Plan (SHMP) update would already have been noteworthy for several incidents, including not only Hurricane Irene and Tropical Storm Lee, with Hurricane Irene representing the most costly disaster to date in New York State at the time, but also with brush fires in April 2012 that occurred in 16 counties and New York City, affecting over 1,100 acres in four municipalities in Suffolk County and approximately 550 acres in the Harriman State Park in Rockland County; the line of severe thunderstorms in late July 2012 that caused power outages for over 100,000 New Yorkers and spawned a tornado in Chemung County, resulting in severe damage in downtown Elmira; and the industrial fire in the Town of Ghent in Columbia County, involving potentially hazardous materials and necessitating the ordered evacuation of residents living within a one-mile radius of the fire (as well as residents in neighboring Berkshire County, Massachusetts, living within 15 miles of the fire who were recommended to “shelter-in-place” due to the track of the plume from the fire).

But all of these events were eclipsed by the most catastrophic storm in the State's history: Hurricane Sandy. The storm caused once-in-a-generation flooding and catastrophic power outages, bringing down power lines, uprooting trees, and forcing the evacuation of close to half a million people in New York City and Long Island from their homes and businesses. With the impact of Hurricane Irene and Tropical Storm Lee still being felt throughout the State, Hurricane Sandy tore into the State with an unprecedented level of ferocity and fury. The amount of damage caused by Sandy was of a level never before experienced in New York State and the impact will be felt for years to come.<sup>1</sup>

*We will never be able to perfectly predict or prevent all extreme events or eventualities. Therefore, we must conserve and develop those systems that can most quickly respond to, and most effectively rebound from, severe weather events and other emergencies. Building resilience will enable us to avoid unmanageable impacts, while managing the risks that the future will no doubt present.*

*-New York State 2100 Commission Report*

<sup>1</sup> New York State Disaster Preparedness Commission 2012 Annual Report



The value of mitigation planning is increasingly evident as disasters seem to occur more frequently and the financial resources to rebuild remain scarce. Since it was approved by FEMA and adopted by the New York State Disaster Preparedness Commission (DPC) on January 4, 2011, the 2011 New York State Hazard Mitigation Plan (SHMP) has allowed eligible State agencies, local governments, and eligible private non-profits to access federal disaster assistance related to more than \$7.2 billion in damages.

**In addition to meeting planning requirements that allows New York State to access financial resources for mitigation, the SHMP serves to:**

- Document New York's progress in identifying risks and mitigating natural hazards to avoid the loss of life and injury and reduce the damage to state-owned and -managed infrastructure.
- Provide a reference document and information source for local governments as they develop local hazard mitigation plans to reduce their own levels of risk and to access the full suite of federal disaster funding.

As New York State's communities continue to grow, hazard mitigation will play an even more important role in the government's primary objective of protecting its citizens' health, safety, and welfare. In short, hazard mitigation is sound fiscal policy in good times and bad.

## 1.1 Prerequisites

The Disaster Mitigation Act of 2000 (DMA 2000) (P.L. 106-390)<sup>2</sup> provides an opportunity for states, territories, tribes, and local governments to take a new and revitalized approach to mitigation planning. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Act) by repealing the previous Mitigation Planning section (409) and replacing it with a new Mitigation Planning section (322). This new section emphasizes the need for state, territorial, tribal, and local entities to closely coordinate mitigation planning and implementation efforts. It continues the requirement for a state mitigation plan as a condition of disaster assistance, and creates incentives for increased coordination and integration of mitigation activities at the State level.

To implement the DMA 2000 planning requirements, FEMA published an Interim Final Rule (the Rule) in the Federal Register on February 26, 2002. This Rule (44 CFR Part 201) established the mitigation planning requirements for states, tribes, and local governments.

The Rule serves as the governing set of requirements for DMA 2000 planning implementation. In accordance with the Rule (44 CFR Part 201), this plan is the scheduled 2014 update to New York's Standard State Mitigation Plan, which was initiated through approval by FEMA in January 2005.<sup>3</sup>

<sup>2</sup> FEMA <http://www.fema.gov/media-library/assets/documents/4596?id=1935>

<sup>3</sup> Multi-Hazard Mitigation Planning Guidance



**Standard State Mitigation Plans (201.4 of the Rule):** To receive federal mitigation funds, states must develop and submit for approval to FEMA a Standard Hazard Mitigation Plan that includes details of the State's natural hazards risks, vulnerabilities, and mitigation goals, objectives, and priorities.

States with an approved Standard Hazard Mitigation Plan qualify for federal Hazard Mitigation Assistance (HMA),<sup>4</sup> which includes the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) program and the Flood Mitigation Assistance (FMA) program. Together, these programs provide significant opportunities to reduce or eliminate potential losses to state and local governments in New York State through hazard mitigation planning and project grant funding.<sup>5</sup>

Mitigation opportunities are also available through the FEMA Public Assistance (PA) program.<sup>6</sup> Through the PA program, FEMA provides supplemental federal disaster assistance for debris removal, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain private non-profit (PNP) organizations.

These programs are further described in **Section 4: Mitigation Strategy** of this plan.

## 1.2 Plan Adoption Process

**Requirement §201.4(c)(6):** *The plan **must** be formally adopted by the State prior to submittal to [FEMA] for final review and approval.*

The 2014 SHMP will be adopted in accordance with the 44 CFR 201.4(c)(6) and the New York State Executive Law, Article 2-B, as amended, which gives adoption authority to the DPC.<sup>7</sup>

The New York State DPC is comprised of the commissioners, directors, or chairpersons of 32 state agencies and one volunteer organization, the American Red Cross. The responsibilities of the DPC include the preparation of state disaster plans; the direction of state disaster operations and coordination of those with local government operations; and the coordination of federal, state and private recovery efforts. New York State Executive Law, Article 2-B, Section 21 enacted in 1978, shifted emphasis from civil defense to all-hazards preparedness activities and missions; created the DPC; and assigned responsibility for off-site radiological emergency preparedness for commercial nuclear power plants.

<sup>4</sup> FEMA <http://www.fema.gov/hazard-mitigation-assistance>

<sup>5</sup> Hazard Mitigation Assistance Unified Guidance

<sup>6</sup> FEMA <http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit>

<sup>7</sup> New York State 2013 Hazard Mitigation Plan approval letter



The Commissioner of the Division of Homeland Security and Emergency Services (DHSES) serves as the Chair of the DPC. As the Governor's Authorized Representative (GAR) or Alternate GAR on major disasters, the DHSES Commissioner facilitates the adoption of the mitigation plan by the members of the DPC on behalf of the State.

**The DPC member agencies are comprised of the following:**

- Department of Agriculture and Markets
- Division of Homeland Security and Emergency Services
- Office of Children and Family Services
- Office of Interoperability and Emergency Communications
- Commissioner of Division of Criminal Justice Services
- Office of Parks, Recreation and Historic Preservation
- Department of Corrections and Community Supervision
- Office of People with Developmental Disabilities
- Department of Financial Services
- Office of Information Technology Services
- Education Department
- Office of Victim Services
- Empire State Development Corporation
- Port Authority of New York and New Jersey
- Energy Research and Development Authority
- Public Service Commission
- Department of Environmental Conservation
- Department of State
- Office of Fire Prevention and Control
- Division of State Police
- Office of General Services
- Office of Temporary and Disability Assistance
- Department of Health
- Thruway Authority
- Division of Housing and Community Renewal
- American Red Cross
- Department of Labor
- Metropolitan Transportation Authority
- Office of Mental Health
- Department of Transportation
- Division of Military and Naval Affairs



In July 2010, the NYS Legislature consolidated the Offices of Counter Terrorism, Emergency Management, Fire Prevention and Control, Information Technology Services, and Interoperable & Emergency Communications into DHSES. The Division is dedicated to protecting New Yorkers, their property, and the State's economic well-being from acts of terrorism as well as natural and human-caused emergencies or disasters. Soon after Hurricane Sandy struck in 2012, the Public Assistance (PA), Individual Assistance (IA), and all-hazard mitigation planning and project grants management functions originally housed in the Office of Emergency Management (OEM) were moved under direct DHSES oversight. Thus, many hazard mitigation activities attributed to State OEM in earlier versions of the State Hazard Mitigation Plan now fall to DHSES.

Overall administration of the hazard mitigation program is the responsibility of the DHSES Mitigation Section. The Mitigation Section oversees the HMGP, PDM and FMA programs. The Mitigation Section also facilitates community mitigation planning. **Duties of the Mitigation Section include, but are not limited to, the following:**

- Implementing and updating the State Hazard Mitigation Plan
- Working with federal, state, and local agencies in the implementation of hazard mitigation plans
- Administering the Hazard Mitigation Grant Program
- Administering the Pre-Disaster Mitigation Program
- Administering the Flood Mitigation Assistance Program
- Providing technical assistance and training programs to state and local personnel
- Coordinating mitigation operations following disaster declarations
- Keeping abreast of mitigation requirements and technologies and transferring them to local governments and other interested parties
- Serving on various federal, regional, and state panels or committees for the development, implementation and promotion of hazard mitigation initiatives
- Working in conjunction with state agencies to promote state and federal programs that result in mitigation.

The Mitigation Section will review the plan annually or as needed if hazard mitigation regulations or guidelines change. The adoption of the 2008 New York State Hazard Mitigation Plan was received by FEMA on January 2, 2008. The plan was approved by FEMA on January 4, 2008. The 2011 update of the New York State Hazard Mitigation Plan was adopted by the State on January 3, 2011, and was approved by FEMA on January 4, 2011. The 2014 plan adoption process followed the same approach used in previous cycles. The plan was approved by FEMA and adopted by the DPC on December 18, 2014. The plan will be updated every three years or as required.

New York State and the DPC will comply with the actions of the plan and will maintain and update the plan in keeping with the processes specified in **Section 6: Plan Maintenance**. The official adoption documents will be included in the plan after FEMA's final review and conditional approval.



### 1.3 Planning Process

The SHMP represents the State's systematic approach to mitigating the adverse impacts of natural disasters and extent of vulnerability within its borders, and fulfilling its obligations to mitigate the risks resulting from natural hazards. It sets forth the policies, strategies, goals, and objectives that will be used to establish and implement hazard mitigation activities within the State. It will also serve as a guide to local jurisdictions in completing their local hazard mitigation plans (LHMPs). In addition, local plan development tools can be found in **Appendix 5**.

Effective and consistent implementation of this plan is crucial to the hazard mitigation program and the State's efforts to reduce or eliminate their vulnerability to future disasters. This plan incorporates all changes associated with the implementation of the federal/state hazard mitigation program, including the applicable sections of the DMA 2000. In addition, it is consistent with the appropriate standards of the Emergency Management Accreditation Program (EMAP) through identification of all natural hazards, the comprehensive risk assessment, and the mitigation program and plan (EMAP Appendix provides a review of the SHMP in relation to the EMAP standards for hazard identification, risk assessment and mitigation).

#### Organization of the Plan

The plan is organized to parallel the structure provided in the Rule. **The plan has seven sections and is followed by seven appendices that link to each section:**

- **Section 1:** Introduction and Prerequisites
- **Section 2:** Planning Process
- **Section 3:** Hazard Identification and Risk Assessment
- **Section 4:** Mitigation Strategy
- **Section 5:** Coordination of Local Planning
- **Section 6:** Plan Maintenance
- **Section 7:** Severe Repetitive Loss Strategy
- Appendices

#### Highlights of the 2014 SHMP include:

- Extended risk assessment with the addition of: avalanche, climate change, coastal erosion, and tsunami
- Ranking of the identified hazards
  - The DHSES Planning Section provides support for the use of the State's hazard analysis software (HAZNY), which has become a tool for local communities preparing DMA 2000 LHMPs. During the 2014 SHMP update process, HAZNY was used in a modified format as the hazard ranking tool. This process used the general HAZNY criteria in a manner consistent with the local hazard ranking methodology, but added a weighting factor for



mitigation potential to determine the final hazard score. (See **Section 3.2.1 – Ranking Methodology** for a description of the ranking methodology used for the 2014 SHMP).

- Modified goals that provide an updated framework that determines actions and activities
- A statewide approach to mitigation actions and activities that reduces vulnerabilities and limits losses.

The hazards profiled are limited to natural hazards as detailed in **Section 3.0: Hazard Identification and Risk Assessment**. This plan represents Volume 1 of the New York State Comprehensive Emergency Management Plan (CEMP), but individuals or jurisdictions interested in information about human-caused, technological, or biological hazards may find information in Volume 2 of the CEMP. Additional information about the CEMP and its critical annexes, such as Pandemic Influenza, Terrorism, and Hazardous Materials may be found in Volume 2 or on related State agency websites, such as the New York State Department of Health, New York State Office of Counter Terrorism, or similar federal websites.

## 1.4 Compliance with Federal and State Regulations

***Requirement §201.4(c)(7):** The plan **must** include assurances that the State will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c). The State will amend its plan whenever necessary to reflect changes in State or Federal laws and statutes as required in 44 CFR 13.11(d).*

This plan complies with the requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (as amended by the DMA 2000); all pertinent presidential directives associated with the U.S. Department of Homeland Security and FEMA; all aspects of 44 CFR pertaining to hazard mitigation planning and grants pertaining to the mitigation of adverse effects of natural disasters; interim final rules and final rules pertaining to hazard mitigation planning and grants, as described above; all planning criteria issued by FEMA; and all Office of Management and Budget circulars and other federal government documents, guidelines, and rules.

The State of New York agrees to comply with all federal statutes and regulations in effect with respect to mitigation grants it receives, in compliance with 44 CFR 13.11(c). As stated in **Section 1.2 - Plan Adoption**, the plan will be updated every three years or as required, and amendments will be made as necessary to address changes in federal or state statutes, regulations, and policies. Such amendments will be submitted to FEMA for approval. Additional information about how the plan will be reviewed and updated is in **Section 6: Plan Maintenance**.



DHSES intends to comply with all administrative requirements outlined in 44 CFR 13 and 206 in their entirety and to monitor all subgrant-supported activities to ensure compliance with 44 CFR 13 and 206 in their entirety.

## **Governing Authorities**

### **New York State**

#### **Constitution**

- New York State Constitution

#### **State Laws**

##### *Executive*

- New York State Law, Executive Article 2-B, as amended
- New York State Law, Executive Article 42 (910 – 923), Waterfront Revitalization Of Coastal Areas And Inland Waterways

##### *Consolidated Laws*

- New York State Canal Law
- New York State Defense Emergency Act (4/12/51), as amended
- New York State Finance Law
- New York State Freshwater Wetlands Act of 1973
- New York State Highway Law, Sections 10, 12, 16, 42a, 55, 64, 104, 269, 340-b and other miscellaneous provisions
- New York State Interstate Civil Defense and Disaster Compact, Chapter 674 (1951)
- New York State Parks, Recreation and Historic Preservation Law (historic properties)
- New York State Public Authorities Law
- New York State Public Service Law, Sections 65 and 66
- New York State Tidal Wetlands Act of 1973
- New York State Environmental Conservation Law (ECL), Part 53: Tree Conservation and Urban Forestry
- New York State Environmental Conservation Law (ECL), Parts 215, Open Fires
- New York State Environmental Conservation Law (ECL), Part 673: Dam Safety Regulations

##### *New York Codes, Rules and Regulation (NYCRR)*

- 6NYCRR Part 360 & 750, Environmental Conservation Law (ECL) Article 3, Title 3; Article 17, Titles 3, 5, 7, 8; Article 70, Title 1; and the Federal Water Pollution Control Act, 33 USC 1251, et seq
- 6NYCRR Part 505, Coastal Erosion Management Regulations (authority ECL Article 34)



- 6NYCRR Part 617, State Environmental Quality Review Act
- 6NYCRR Part 601 and 621, Uniform Procedures Act (authority ECL section 70-0107)
- 16NYCRR, Part 105, New York State Public Service Commission Rulemaking, Chapter II, Electric Utility Emergency Plans

## Federal

### *Laws*

- The National Security Act of 1947
- Public Law 84-99 (33 USC 701n) for flood emergencies
- Public Law 85-256, Price-Anderson Act
- Public Law 89-665 (16 USC 470 et seq.), National Historic Preservation Act
- Public Law 90-448, National Flood Insurance Act of 1968 (42 USC 4001 et seq.)
- Public Law 91-646, Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970
- (42 U.S.C. 4601 et seq.)
- Public Law 93-288, as amended by Public Law 100-707, The Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 6121 et seq.)
- Public Law 93-234, Flood Disaster Protection Act of 1973
- Public Law 95-124, as amended by Public Laws 96-472 and 99-105, Earthquake Hazards Reduction Act of 1977 (42 USC 7701 and 7704)
- Public Law 96-295, The Nuclear Regulatory Commission Appropriations Authorization Act
- Public Law 96-510, Comprehensive Environmental Response, Compensation, and Liability Act of 1980, Section 104(i),(42 USC 9604(i))
- Public Law 99-499, Superfund Amendments and Reauthorization Act of 1986
- Public Law 101-615, Hazardous Materials Transportation Uniform Safety Act
- Public Law 101-549, Clean Air Amendments of 1990
- Public Law 107-296, Homeland Security Act of 2002
- Public Law 108-264, Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004
- Public Law 113-2, Department of Housing and Urban Development Appropriations Act, 2013
- Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12)

### *Administrative Rules*

- 44 CFR Part 9, Floodplain Management and Protection of Wetlands
- 44 CFR Part 10, Environmental Considerations
- 44 CFR Part 13 (The Common Rule), Uniform Administrative Requirements for Grants and Cooperative Agreements
- 44 CFR Part 14, Audits of State and Local Governments
- 44 CFR Parts 59-76, National Flood Insurance Program and related programs
- 44 CFR Part 201, Mitigation Planning
- 44 CFR Part 206, Federal Disaster Assistance for Disasters Declared after November 23, 1988



- 49 CFR Part 24, Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs

#### *Executive Orders*

- Executive Order 11988, Floodplain Management
- Executive Order 11990, Protection of Wetlands
- Executive Order 12656, Assignment of Emergency Preparedness Responsibilities
- Executive Order 12148, Federal Emergency Management
- Executive Order 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- Homeland Security Presidential Directive 5, Management of Domestic Incidents, February 28, 2003
- Homeland Security Presidential Directive 8, National Preparedness, December 17, 2003.

#### References

- Emergency Management Accreditation Program
  - Hazard Identification and Risk Assessment Standards 4.3.1 and 4.3.2
  - Hazard Mitigation Standards 4.4.1, 4.4.2, 4.4.3, 4.4.4 and 4.4.5

## 1.5 Plan Summary and Section Update

**Section 1: Introduction** – presents and summarizes each section of the SHMP, and also includes selected background information about New York State, including topography and demographics.

**Section 2: Planning Process** - explains the process used to develop the 2014 SHMP, including the coordination efforts among state agencies, appropriate federal agencies, local jurisdictions, and other interested groups. This collaboration has been integrated to the extent possible with other ongoing state planning efforts, as well as other FEMA mitigation programs and initiatives.

**Section 3: Hazard Identification and Risk Assessment** - provides the factual basis for activities proposed in the strategy for the mitigation plan. The risk assessment characterizes and analyzes natural hazards and risks to provide a statewide overview. This overview allows the State to compare potential losses throughout the State, to determine their priorities for implementing mitigation measures under the strategy, and to prioritize jurisdictions for receiving technical and financial support in developing more detailed local risk assessment and vulnerability assessments.

Also in this risk assessment is an overview of the locations of all hazards that can affect the State, using maps where appropriate and including information on previous occurrences of



hazard events and the probability of future hazard events. This section also gives a description of vulnerabilities in terms of the jurisdictions most threatened by the identified hazards and most vulnerable in relation to people, property, environment, and economy associated with hazard events. Also in this section:

- The estimated potential losses, with an overview and analysis to the identified vulnerable structures based on estimates provided in state and local risk assessments
- The State's estimation of potential dollar losses by jurisdiction and to state-owned or -operated buildings, infrastructure, and critical facilities located in the identified hazard areas
- A description of any changes in development trends in relation to natural hazards

**Section 4: Mitigation Strategy** - provides the State's blueprint for reducing the losses identified in the risk assessment. The mitigation strategy is a description of the State goals that guide the selection of activities to mitigate and reduce potential losses. Goals selected for the 2014 SHMP include:

- Goal 1:** Promote a comprehensive state hazard mitigation policy framework for effective mitigation programs that includes coordination between federal, state, and local organizations for planning and programs.
- Goal 2:** Protect property including public, historic, private structures, and critical facilities and infrastructure.
- Goal 3:** Increase awareness and promote relationships with stakeholders, citizens, elected officials, and property owners to develop opportunities for mitigation of natural hazards.
- Goal 4:** Encourage the development and implementation of long-term, cost-effective, and resilient mitigation projects to preserve and/or restore the functions of natural systems.
- Goal 5:** Build stronger by promoting mitigation actions that emphasize sustainable construction and design measures to reduce or eliminate the impacts of natural hazards.

This section reflects progress in statewide mitigation efforts and changes in priorities, and describes the State's pre- and post-disaster hazard mitigation policies, programs, and capabilities to mitigate area hazards, including evaluation of state laws, regulations, policies and programs related to hazard mitigation; program development in hazard-prone areas; and state funding capabilities for hazard mitigation projects. The section also includes identification, evaluation, and ranking of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy. This section also provides a list of potential federal, state, local, and other funding sources.



**Section 5: Coordination of Local Mitigation Planning** - details the State's process to support and coordinate, through funding and technical assistance, the development of local mitigation plans and projects. The description of the State's process and timeframe by which the local plans will be reviewed, coordinated, and linked to the SHMP is described, as well as the criteria for prioritizing communities and local jurisdictions that would receive funding.

**Section 6: Plan Maintenance Process** - includes the established method and schedule for monitoring, evaluating, and updating the plan. This includes a system for monitoring and evaluating implementation of mitigation measures and activities. The State's system for reviewing progress on goals is included in this section as well.

**Section 7: Severe Repetitive Loss Strategy** - describes the State's repetitive loss flood mitigation strategy, identifying specific actions the State has taken to reduce the number of repetitive loss and severe repetitive loss properties, and specifies how the State intends to reduce the number of such properties in the future.

## 1.6 About New York State

New York State Facts	
State Capital	Albany
Population	19,570,261
Land Area	47,223,839 square miles
Inland Water	7,247,305 square miles
Depth (North-South)	310 miles
Length (East-West)	440 miles, including Long Island
Counties	62 (See Figure 1b)
Number of Cities	62
Number of Villages	553
Number of Towns	932
State and Local Roads	112,956.17 miles
State Roads	16,489.91 miles
Local Roads	96,466.26 miles
Number of Hospitals	259 estimated
Highest Point	Mount Marcy, 5,344 feet above sea level
Lakes, Ponds and Reservoirs	Over 6,700
Largest City	New York City, 2012 population estimate is 8,336,697 (See Table 1c for population density)
Largest Park	The Adirondack Park (larger than Yellowstone, Yosemite, Grand Canyon, Glacier, and Olympic National Parks combined)
Largest Lake (within State borders)	Oneida, 79.8 square miles
Longest River	Hudson, 315 miles, which is influenced by tidal waters as far north as Troy, 157 miles north of New York City
Longest Toll Expressway in the World	Governor Thomas E. Dewey Thruway, 559 miles
State Motto	"Excelsior", which is Latin for "Ever Upward"

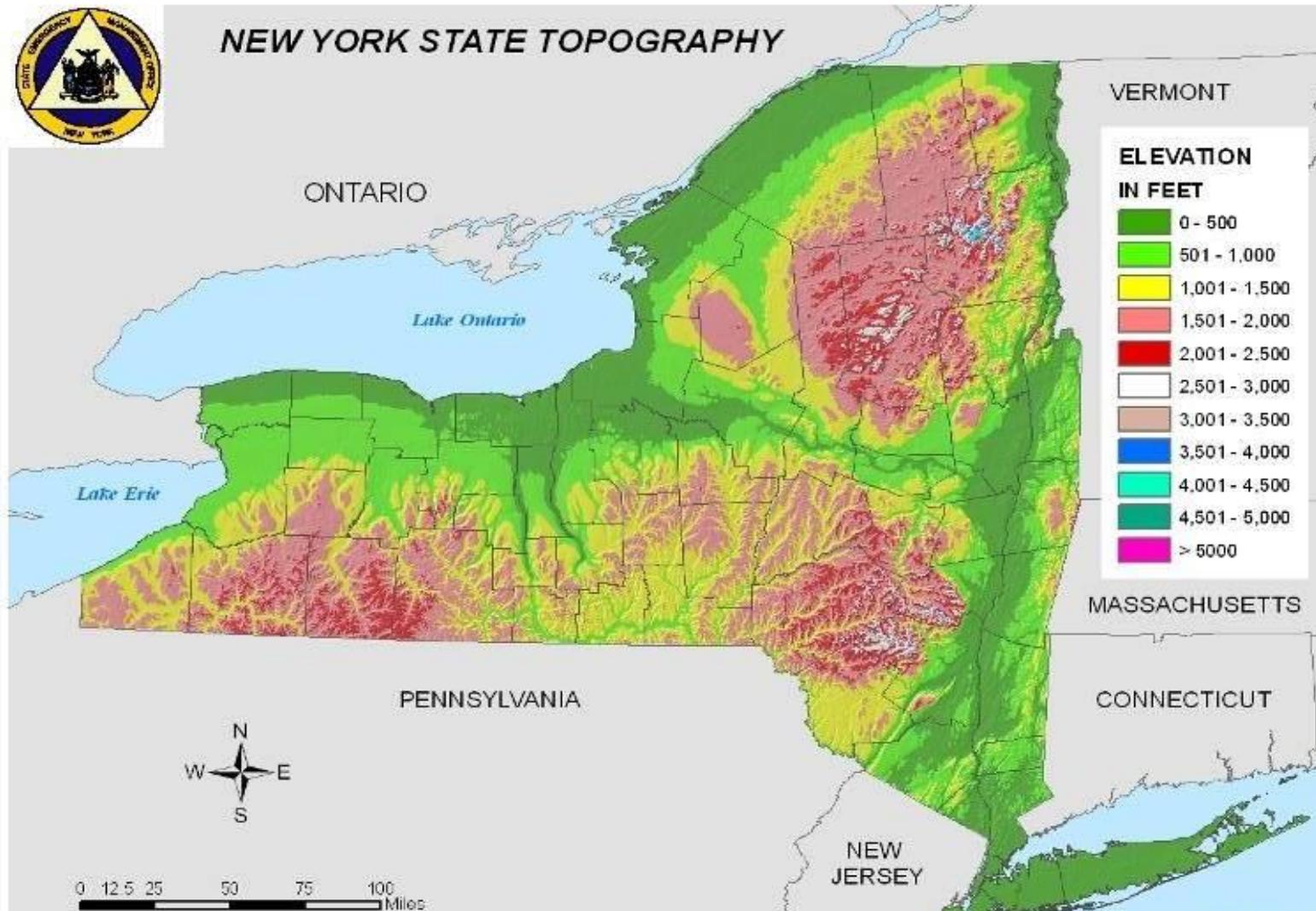


New York State Facts	
State Nickname	The Empire State

The total area of New York State is 54,471,144 square miles (47,223,839 in land and 7,247,305 in inland water). There are four mountain ranges in New York State: the Adirondacks in the North, the Catskill and Shawangunk ranges in the South Central, and the Taconic in the East. The highest point in New York State is Mount Marcy, located in the Adirondacks in Essex County, at 5,344 feet above sea level. A topographic map of New York State is shown in **Figure 1.6a**.



**Figure 1.6a: New York State Topography**



## **Bodies of Water**

There are 6,713 natural ponds, lakes, and reservoirs of one acre or more, 76 with an area of one square mile or more. There are 1,745 square miles of inland water, including some 4,000 lakes, ponds, and reservoirs.

The State has 70,000 miles of rivers and streams; 127 miles of Atlantic Ocean coastline; and 9,767 miles of total shoreline, which includes 8,778 miles of lake shoreline, 231 miles of shorefront on the Long Island Sound, 548 miles of beachfront in the Long Island area, and 83 miles of coastal barrier islands off Long Island.

Crossing the State from east to west, the New York State Barge Canal System is the longest internal waterway system in any state (800 miles), carrying over 2 million tons of cargo per year.

### **Rivers**

The State has approximately 70,000 miles of rivers and streams, with the majority of these located along the Hudson River Valley.

### **Longest River**

The Hudson River is the longest river in the State at 306 miles long and it drains an area of 13,370 square miles. Its average discharge is 21,500 cubic feet per second. The Hudson's most distant source is in Essex County, the Adirondack Mountains. Lake Tear of the Clouds is the highest lake in the State – 4,320 feet above sea level – and is considered the source of the Hudson River. The Hudson empties into the Atlantic Ocean at New York City.

### **Greatest Volume**

The Niagara River has the highest flow, spilling 40 million gallons of water 180 feet downward each minute across a ledge nearly 2/3 of a mile wide at Niagara Falls.

### **Lakes**

There are over 6,700 natural ponds, lakes and reservoirs of one acre or more in the State of New York. There are 76 lakes with an area equal to or greater than one square mile and there are 10 natural fresh-water lakes of 10 square miles or more.

- Oneida Lake, at 79.8 square miles, is the largest lake completely within the state. Other prominent lakes are the Finger Lakes, Otsego Lake, Lake George, Lake Placid, and Lake Champlain, which is 107 miles long.
- Lake Champlain, in Essex County, covers a 490-square-mile area and includes islands that total about 55 square miles.
- Lake Erie borders New York State for a linear distance of 64 miles. Its surface area in the U.S. totals 5,002 square miles.
- Lake Ontario forms the northern boundary of New York State and central Canada for a linear distance of 146 miles.



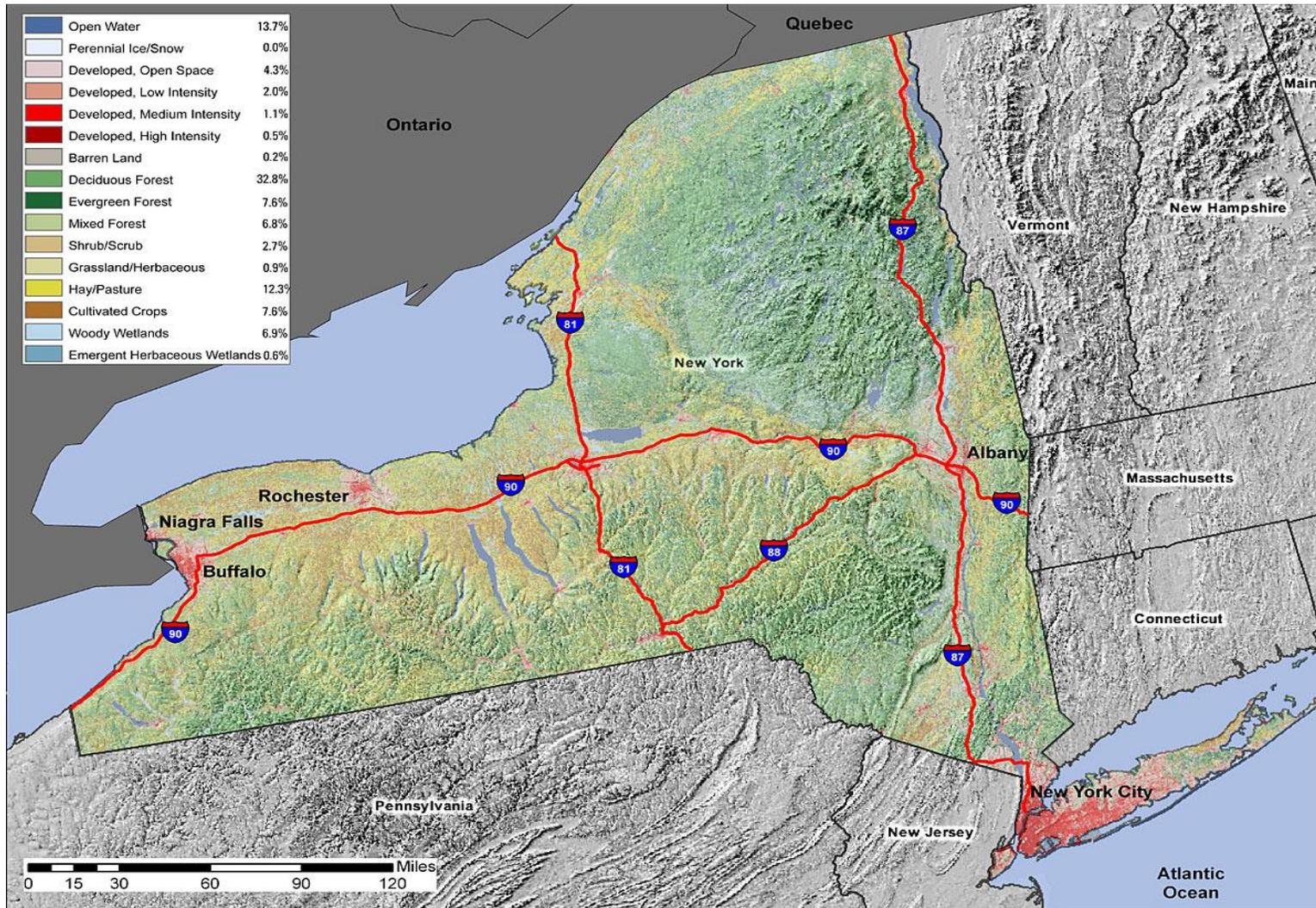
Although best known for its highly urbanized coastline, forests are the most common New York land cover type. Sugar maple, white ash, beech, and oak are some of the State's most prominent trees. A large proportion of the forests are located in the northern Adirondack Mountains, in particular, the Adirondack State Park. In addition, concentrations of forest cover are located throughout the southern Catskills Mountains and the Appalachian Uplands. New York borders two Great Lakes (Erie and Ontario) along with Lake Champlain in the northeast, the St. Lawrence River in the northwest, and the Atlantic Ocean in the southeast. The Hudson River is the primary river system in the state that includes its main tributary, the Mohawk River. The Finger Lakes in the west, a group of 11 glacially formed lakes, are among the State's primary inland bodies of water. These lakes provide drinking water for several local cities, and the area is the center of the State's wine industry. Urban development in New York City, Rochester, and Buffalo is significant. A land cover map of New York State is shown in **Figure 1.6b**.<sup>8</sup>

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<sup>8</sup> USGS Land Cover Institute (LCI) <http://landcover.usgs.gov/newyork.php>



**Figure 1.6b: New York State Land Cover**

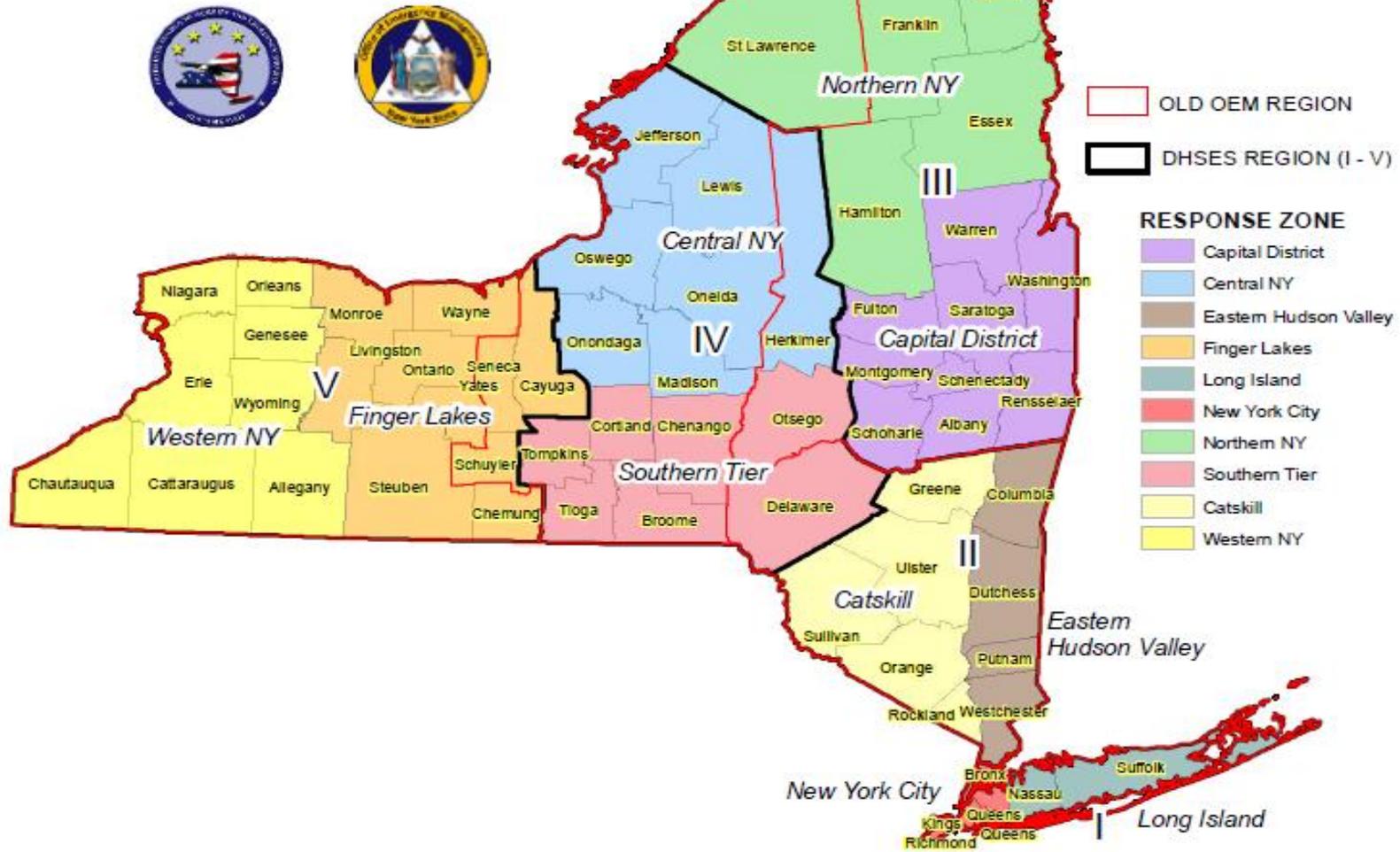


The State of New York State is comprised of 62 counties, and 62 cities, 932 towns, and 553 villages. The largest city in the state is comprised of five counties (boroughs): Bronx, New York (Manhattan), Queens, Kings (Brooklyn), and Richmond (Staten Island). The state has five DHSES regions; each region is divided into two response zones. A New York State county map is provided in **Figure 1.6c**, which illustrates the former regions in relation to the current revised DHSES regions and response zones.



Figure 1.6c: Counties in New York State

**New York State Division of Homeland Security and Emergency Services Regions**



**Table 1.6a** provides the population estimate from the 2010 Census and population change by county, from Census 2000 to Census 2010.<sup>9</sup> Population density derives from Census 2010, and housing unit estimates come from the American Census Survey 5-year estimate. The State's 19 million people are not evenly dispersed throughout its jurisdictional boundaries, neither are they equally exposed to the major hazards of the State. The majority of the population resides in the Southeastern and Western sections of the State, with significant populations residing along waterways such as the Atlantic Ocean, Long Island Sound, Lake Ontario, Lake Erie, and the numerous rivers and lakes.

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<sup>9</sup> New York 2010 Census Population and Housing Characteristics



Table 1.6a: New York 2010 Census Population and Housing Characteristics

County	Population 1990	Population 2000	Population 2010	% Change 2000-2010	Square Miles	2010 Pop Density (pop/area)	Housing Units 2010
Albany	292,594	294,565	304,204	3.3	533	571	136,810
Allegany	50,470	49,927	48,946	-2.0	1,035	47	25,908
Bronx	1,203,789	1,332,650	1,385,108	3.9	57	24,103	509,665
Broome	212,160	200,536	200,600	0.0	715	280	90,348
Cattaraugus	84,234	83,955	80,317	-4.3	1,324	61	41,032
Cayuga	82,313	81,963	80,026	-2.4	882	91	36,469
Chautauqua	141,895	139,750	134,905	-3.5	1,508	89	66,784
Chemung	95,195	91,070	88,830	-2.5	411	216	38,371
Chenango	51,768	51,401	50,477	-1.8	898	56	24,615
Clinton	85,969	79,894	82,128	2.8	1,117	74	35,523
Columbia	62,982	63,094	63,096	0.0	648	97	32,501
Cortland	48,963	48,599	49,336	1.5	501	98	20,515
Delaware	47,225	48,055	47,980	-0.2	1,467	33	30,890
Dutchess	259,462	280,150	297,488	6.2	825	361	116,946
Erie	968,532	950,265	919,040	-3.3	1,222	752	420,432
Essex	37,152	38,851	39,370	1.3	1,915	21	25,312
Franklin	46,540	51,134	51,599	0.9	1,696	30	25,149
Fulton	54,191	55,073	55,531	0.8	533	104	28,464
Genesee	60,060	60,370	60,079	-0.5	496	121	25,409
Greene	44,739	48,195	49,221	2.1	658	75	28,883
Hamilton	5,279	5,379	4,836	-10.1	1,806	3	8,555
Herkimer	65,797	64,427	64,519	0.1	1,456	44	33,219
Jefferson	110,943	111,738	116,229	4.0	1,756	66	57,168
Kings	2,300,664	2,465,326	2,504,700	1.6	97	25,783	986,482
Lewis	26,796	26,944	27,087	0.5	1,290	21	15,230
Livingston	62,372	64,328	65,393	1.7	641	102	26,774
Madison	69,120	69,441	73,442	5.8	661	111	31,243
Monroe	713,968	735,343	744,344	1.2	1,384	538	318,793



County	Population 1990	Population 2000	Population 2010	% Change 2000-2010	Square Miles	2010 Pop Density (pop/area)	Housing Units 2010
Montgomery	51,981	49,708	50,219	1.0	410	122	23,020
Nassau	1,287,348	1,334,544	1,339,532	0.4	447	2,999	466,721
New York	1,487,536	1,537,195	1,585,873	3.2	34	46,984	839,013
Niagara	220,756	219,846	216,469	-1.5	1,144	189	98,686
Oneida	250,836	235,469	234,878	-0.3	1,257	187	104,049
Onondaga	468,973	458,336	467,026	1.9	805	580	201,871
Ontario	95,101	100,224	107,931	7.7	663	163	47,290
Orange	307,647	341,367	372,813	9.2	838	445	135,562
Orleans	41,846	44,171	42,883	-2.9	814	53	18,300
Oswego	121,771	122,377	122,109	-0.2	1,401	87	53,652
Otsego	60,517	61,676	62,259	0.9	1,014	61	30,725
Putnam	83,941	95,745	99,710	4.1	246	405	37,881
Queens	1,951,598	2,229,379	2,230,722	0.1	179	12,464	832,357
Rensselaer	154,429	152,538	159,429	4.5	665	240	70,891
Richmond	378,977	443,728	468,730	5.6	102	4,582	175,907
Rockland	265,475	286,753	311,687	8.7	199	1,564	102,533
Saratoga	181,276	200,635	219,607	9.5	844	260	97,153
Schenectady	149,285	146,555	154,727	5.6	210	739	67,701
Schoharie	31,859	31,582	32,749	3.7	626	52	17,065
Schuyler	18,662	19,224	18,343	-4.6	342	54	9,424
Seneca	33,683	33,342	35,251	5.7	390	90	15,810
St Lawrence	111,974	111,931	111,944	0.0	2,819	40	51,845
Steuben	99,088	98,726	98,990	0.3	1,404	71	48,562
Suffolk	1,321,864	1,419,369	1,493,350	5.2	2,373	629	564,684
Sullivan	69,277	73,966	77,547	4.8	996	78	48,675
Tioga	52,337	51,784	51,125	-1.3	522	98	22,109
Tompkins	94,097	96,501	101,564	5.2	491	207	41,381
Ulster	165,304	177,749	182,493	2.7	1,161	157	83,007
Warren	59,209	63,303	65,707	3.8	931	71	38,343
Washington	59,330	61,042	63,216	3.6	846	75	28,626
Wayne	89,123	93,765	93,772	0.0	1,396	67	40,825



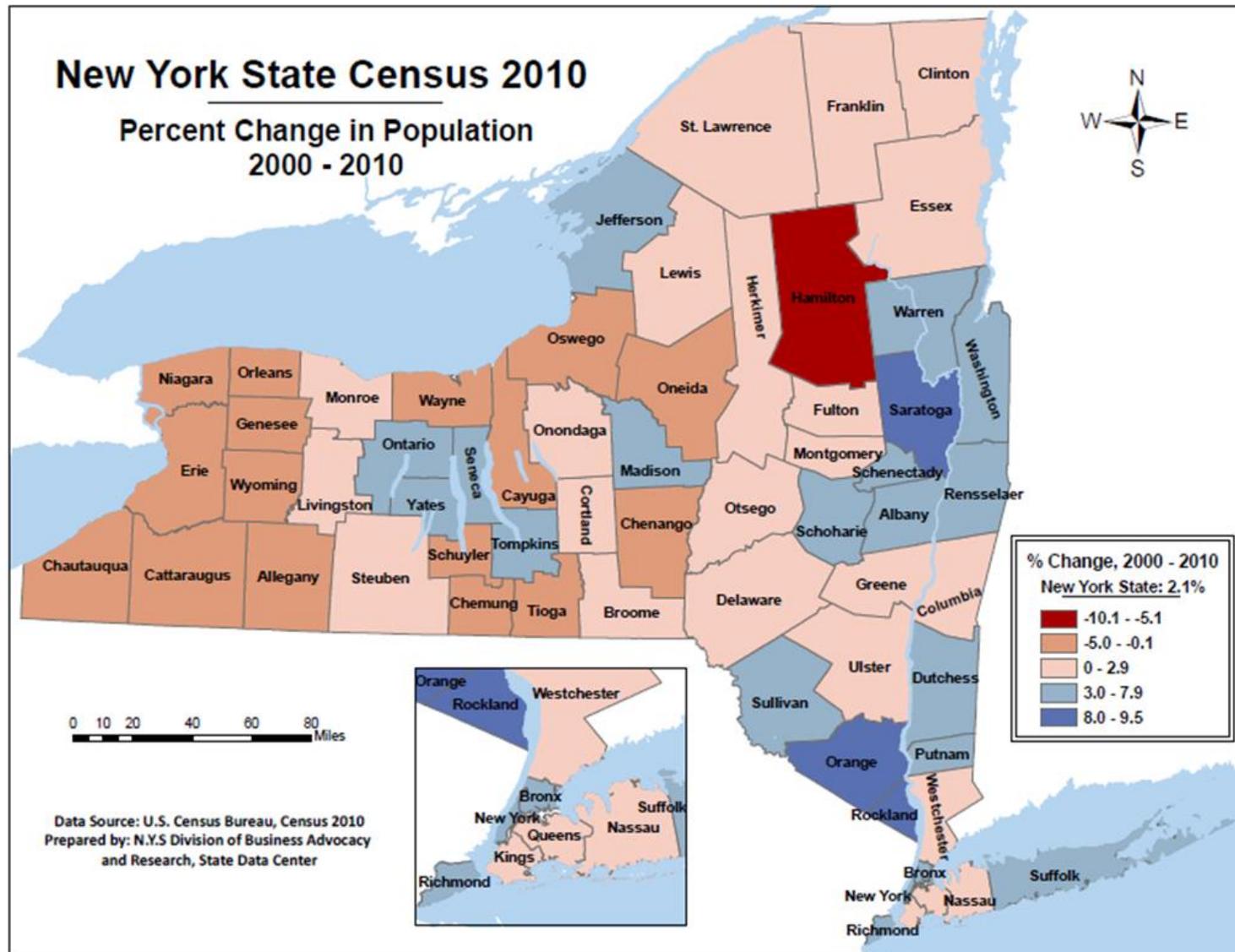
County	Population 1990	Population 2000	Population 2010	% Change 2000-2010	Square Miles	2010 Pop Density (pop/area)	Housing Units 2010
Westchester	874,866	923,459	949,113	2.8	500	1,898	368,498
Wyoming	42,507	43,424	42,155	-2.9	597	71	17,876
Yates	22,810	24,621	25,348	3.0	376	67	13,303
<b>Totals</b>	<b>17,990,455</b>	<b>18,976,457</b>	<b>19,378,102</b>	<b>96.6</b>	<b>54,574</b>	<b>129,797</b>	<b>8,085,835</b>



**Figure 1.6d** illustrates the percentage change from 2000-2010. Saratoga (9.5%), Orange (9.2%), and Rockland (8.7%) had the greatest increase in population, based on the U.S. Census data. Hamilton had the greatest loss of population at -10.1% during the same period.



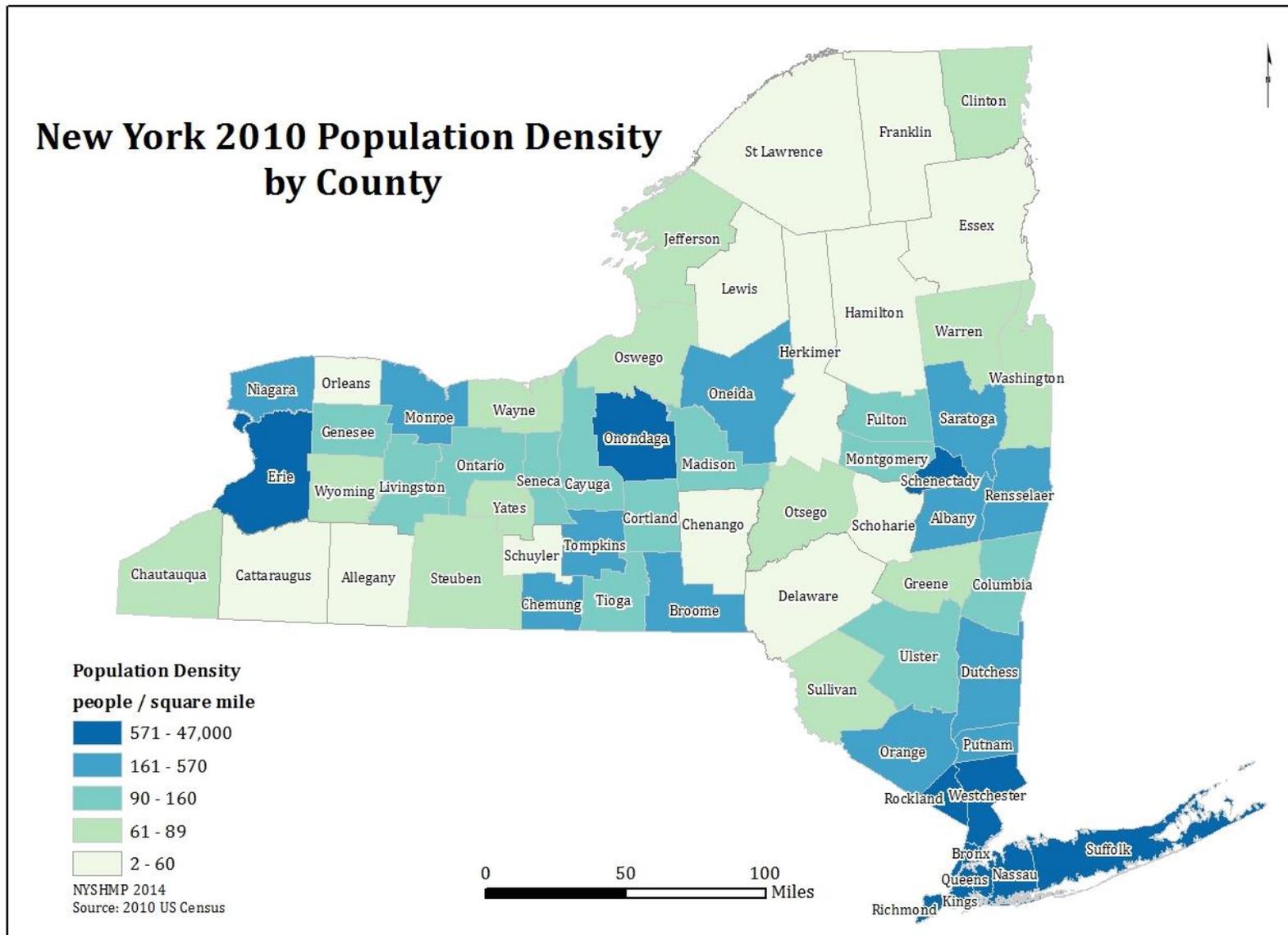
Figure 1.6d: New York State Percent Change in Population



**Figure 1.6e** shows the State's population density by county. The five New York counties (New York, Kings, Bronx, Queens, and Richmond) are located on the State's urbanized coastline. Consequently the areas of the State most likely to experience major impacts from hazards such as hurricane, high wind, and flooding are also the most vulnerable.



Figure 1.6e: New York State Population Density



## Section 2: PLANNING PROCESS

### 2014 SHMP Update

- Meets Requirements §201.4(b) and §201.4(c)(1)
- Planning Process describes the 2014 State Hazard Mitigation Plan (SHMP) Team
- Describes the development of the updated plan
- Incorporates data from 2008 and 2011 SHMPs
- Describes program integration since 2011 SHMP
- Lists the general updates for each section of the 2014 SHMP

### "Roadmap" Activity<sup>1</sup>

In addition to the long-term and ongoing multi-hazard and hazard-specific strategies identified in this section, and **Section 4**, DHSES will continue to update this section of the plan over the life cycle of the plan in key areas, such as enhancement of stakeholder participation and coordination.

***Requirement §201.4(c)(1):** The State plan **must** include a description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated.*

***Requirement §201.4(b):** The State mitigation planning process should include coordination with other State agencies, appropriate Federal agencies and interested groups.*

This Section focuses on the State's mitigation planning process, including the process followed for the 2014 update. **The following topics are addressed in the sub-sections:**

- 2.1 Documentation of the Planning Process
- 2.2 Coordination Among Agencies
- 2.3 Program Integration

### 2.1 Documentation of the Planning Process

***Requirement §201.4(c)(1):** The State plan **must** include a description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated.*

The foundation of the 2014 plan update effort was the 2008 and 2011 FEMA-approved New York State (NYS) Multi-Hazard Mitigation Plan documents. It was determined by the SHMP Team that the update process would focus on the identification and risk assessment

<sup>1</sup> Roadmap Activities are action items to be developed further during the life-cycle of the plan, through the monitoring, evaluation and update process. The comprehensive list of action items can be found in **Sections 2 and 4**.



of natural hazards, assessment of goals and objectives, and current status of mitigation actions across the State. In addition, the update process would provide multiple opportunities for stakeholders to participate in bringing the plan up to date with existing policies, practices, projects and programs.

On October 29, 2012, Hurricane Sandy devastated the State of New York causing a temporary change in focus from day-to-day operations to response and recovery. Recognizing that as a result of time and resource constraints, the process to address the SHMP update timeframe would require an expedited and efficient planning process, the New York State Division of Homeland Security and Emergency Services (DHSES) worked in close coordination with FEMA Region II to initiate a review of the current plan and begin revision for the 2014 plan update.

DHSES serves as the lead agency responsible for the maintenance and update of the SHMP under the direction of the State Hazard Mitigation Officer (SHMO). As lead, the SHMO convened an initial planning meeting on December 7, 2012, with the FEMA Region II Hazard Mitigation Planner, at which time a determination was made that due to the compressed timeframe for plan revision and the upcoming expiration date in early January 2014, the DHSES Mitigation Section would be unable to carry out the plan update internally, and a consultant team would be selected to facilitate the update process and the plan revision.

Adjusters International (AI) was selected as the contractor lead for the 2014 SHMP Team<sup>2</sup> under the direct supervision of the SHMO and DHSES Mitigation Section staff. The first meeting between the State and AI was held on August 7, 2013, when AI introduced the mitigation planning team to DHSES Mitigation Section staff. The overall goal of this meeting was to present the project work plan, which included tasks, assignments, milestones, and schedule. The work plan addressed the overall planning process, including stakeholder involvement and updates to multiple sections of the plan, such as the risk assessment, capability assessment, and mitigation strategy. Roles were defined for AI, DHSES and stakeholders, which provided the direction and guided the activities of the SHMP Team. In addition, an accelerated stakeholder outreach plan was discussed and approved, and target dates selected for implementation of the outreach plan. (Documentation of this meeting and all planning meetings is included in **Appendix 2**. In addition, **Table 2c** provides dates, attendees and a summary of topics covered at all meetings.)

Initially, the AI consultant group and DHSES Mitigation Section staff reviewed and analyzed each section of the 2011 plan with resulting consensus that each section would be revised and updated to take into consideration recent disaster events and lessons learned, and to meet FEMA requirements. **Specifically, the SHMP Team would evaluate and integrate the following areas:**

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<sup>2</sup> For the 2014 update cycle, the “SHMP Team” includes the SHMO; DHSES Mitigation Section staff; key state and local agencies, private organizations and other interested stakeholders; Disaster Preparedness Commission agency representatives; and the AI Contractor group.



1. Changes in hazard risk, vulnerabilities and losses (including data related to three major storms in 2011 and 2012)
2. Changes in laws, policies, and/or regulations at the state or local levels
3. Changes in State agencies' programs and/or procedures that may affect mitigation programs or administration of funds
4. Changes in state or local capabilities
5. Changes in funding sources
6. Progress on current mitigation actions and consideration of new mitigation actions

The planning roles and tasks exercised to update the plan are described in **Table 2.1a** below.

**Table 2.1a: Planning Roles and Tasks**

Contractor Roles and Tasks – Adjusters International
<ul style="list-style-type: none"> <li>• <b>Provide technical assistance</b> <ul style="list-style-type: none"> <li>○ Planning guidance</li> <li>○ Federal compliance</li> </ul> </li> <li>• <b>Data research, collection, and analysis</b> <ul style="list-style-type: none"> <li>○ Hazard profiles and risk assessment</li> <li>○ Capability assessment</li> <li>○ Goals, objectives and activities</li> <li>○ Summarize results/report findings</li> </ul> </li> <li>• <b>Facilitate State Hazard Mitigation Team meetings, webinars, outreach, and surveys</b></li> <li>• <b>Document the plan update process</b></li> <li>• <b>Plan preparation</b></li> </ul>
Lead Agency Roles and Tasks – DHSES
<ul style="list-style-type: none"> <li>• <b>Project management</b> <ul style="list-style-type: none"> <li>○ Central point of contact (Rick Lord, SHMO)</li> <li>○ Communication and coordination with the State Hazard Mitigation Planning (SHMP) Team and FEMA</li> </ul> </li> <li>• <b>Active participation in the planning process</b> <ul style="list-style-type: none"> <li>○ Data collection and exchange</li> <li>○ Public awareness and stakeholder involvement</li> <li>○ Attend SHMP Team meetings</li> <li>○ Mitigation strategy update</li> <li>○ Plan review and feedback</li> </ul> </li> </ul>



**Planning Team Roles and Tasks – SHMP Team (Disaster Preparedness Commission, DHSES, FEMA, State and Local agencies, Interested Stakeholders, and the AI Contractor Group)**

- **Active participation in the planning process**
  - Data collection and exchange
  - Public awareness and stakeholder involvement
  - Attend SHMP Team meetings and webinars
  - Plan review and feedback
  - Update of current activities and identification of new activities

To initiate the outreach process for the 2014 update, 61 stakeholder agency and organization representatives were first contacted through email and mail. Throughout the update process various activities, including face-to-face meetings, phone calls, webinars, and surveys, provided all entities with multiple opportunities to participate and provide input into the plan update process.

The SHMP Team participated in 35 planning meetings (face-to-face and by phone) between August 2013 and October 2013. The primary purpose of the meetings was to encourage widespread participation in the planning process, but the meetings also served as opportunities to gather information from stakeholders to ensure that the 2014 plan was current and comprehensive.

As part of the update process, two webinars were presented to stakeholder groups. The first webinar was conducted on August 28, 2013, for non-state planning partners (other state, local and regional agencies). The second webinar took place on September 5, 2013, and was targeted to representatives of key state agency planning partners (other DHSES offices, Disaster Preparedness Commission (DPC) representatives, and other state agencies and authorities). During both events, the Mitigation Section and contractor group presented an overview of the SHMP planning process and plan requirements, timeline, and opportunities for input.

To continue outreach to stakeholder agencies and organizations, the SHMP Team followed the webinars by sending email introductions to the planning process, requesting follow-up face-to-face agency meetings to discuss specific hazards, risks, vulnerabilities, and current and potential new actions and activities. In addition, the agency meetings provided an additional opportunity to identify new initiatives, programs, and activities.

A summary of key collaborative agency contacts for the 2014 planning process in comparison to the 2008 and 2011 plan is included in **Table 2.1b**.



Table 2.1b: Participating Agencies by Plan Year

Agency Participation	2008	2011	2014	DPC Member
DHSES NYS Office of Information Technology Services & Critical Infrastructure Coordination (CSCIC)	✓	✓		
DHSES NYS Office of Information and Technology Services (OITS)		✓	✓	✓
DHSES NYS Office of Fire Prevention (OFPC)		✓	✓	✓
Metropolitan Transportation Authority (MTA)	✓	✓	✓	✓
New York Department of State (DOS)	✓	✓	✓	✓
New York State Department of Health (DOH)	✓	✓	✓	✓
NYS Banking and Insurance Department <sup>3</sup>	✓	✓		
NYS Bridge Authority	✓	✓		
NYS Department of Agriculture and Markets (NYSDAM)	✓	✓		✓
NYS Department of Education	✓	✓	✓	✓
NYS Department of Environmental Conservation (DEC)	✓	✓	✓	✓
NYS Department of Homeland Security and Emergency Services (DHSES)	✓	✓	✓	✓
NYS Department of Financial Services			✓	✓
NYS Department of Labor (DOL)		✓	✓	✓
NYS Department of Transportation (DOT)	✓	✓	✓	✓
NYS Division of Criminal Justice Services	✓	✓	✓	✓
NYS Division of Housing and Community Renewal (DHCR)	✓	✓		✓
NYS Division of Military & Naval Affairs (DMNA)	✓	✓	✓	✓
NYS Division of State Police	✓	✓	✓	✓
NYS Empire State Development (EDC)	✓	✓	✓	✓
NYS Energy Research and Development Authority (NYSERDA)	✓	✓	✓	✓
NYS Office of Children and Family Services (OCFS)			✓	✓
NYS Department of Corrections and Community Supervision (DOCCS)	✓	✓	✓	✓
NYS Office for People with Developmental Disabilities (OPWDD)			✓	✓
NYS Office of General Services (OGS)	✓	✓	✓	✓
NYS Office of Information Technology Services	✓	✓		

<sup>3</sup> As of the 2014 Hazard Mitigation Plan Update the NYS Department of Banking and Insurance is now a part of the Department of Financial Services.



Agency Participation	2008	2011	2014	DPC Member
NYS Office of Mental Health (OMH)	✓	✓	✓	✓
NYS Office of Parks, Recreation and Historic Preservation (OPRHP)	✓	✓	✓	✓
NYS Office of Temporary & Disability Assistance (OTDA)	✓	✓	✓	✓
NYS Public Service Commission (PSC)	✓	✓	✓	✓
NYS Thruway Authority / Canal Corporation	✓	✓	✓	✓
Port Authority of NY and NJ	✓	✓	✓	✓
State University of NY (SUNY)	✓	✓	✓	
NYS Department of Agriculture and Markets (NYSDAM)	✓			
American Red Cross	✓	✓	✓	✓
Office of Cyber Security <sup>4</sup>		✓		✓
Office of Victim Services				✓

The accelerated outreach plan resulted in a total of thirty-seven (37) meetings, including those that took place prior to August 2013, during the 2014 plan update process. The table below offers a brief summary of these meetings. In addition, meeting minutes providing a detailed description of each meeting are provided in **Appendix 2**.

**Table 2.1c** provides a summary of key meetings held during the plan update collaboration. Summaries include dates, actions, participants and topics, illustrating how each stakeholder served a valuable role through participation in the 2014 planning process. (Meeting notes and sign-in sheets can be found in **Appendix 2**.)

**Table 2.1c: Summary of Plan Development Collaboration**

Date	Action	Participants/Topic
12/7/2012	<b>State-FEMA Update Meeting</b>	<b>Participants:</b> Mike McHale (FEMA), Rick Lord (DHSES) <b>Topics:</b> 2014 SHMP update preparation; short lead time, required changes, opportunities for improvement. M. McHale recommended that DHSES retain a consultant to conduct the process. R. Lord agreed with the advisability of hiring a contractor. M. McHale to do some research to identify high-quality State plans that may be worthy of emulation.
5/16/2013	<b>State-FEMA Update Meeting</b>	<b>Participants:</b> Mike McHale (FEMA); Rick Lord and Debra Dunbrook (DHSES) <b>Topics:</b> Wide-ranging discussions of a number of strategies, approaches and the <i>Opportunities for Improvement</i> paper, with a particular emphasis on State facilities and bona fide mitigation actions. Rick announced that Adjusters International (AI) had been retained for this engagement.
8/7/2013	<b>DHSES Plan</b>	<b>Participants:</b> DHSES: Rick Lord, Debra Dunbrook, Fred Nuffer

<sup>4</sup> Office of Cyber Security was a former member agency of the Disaster Preparedness Commission.



Date	Action	Participants/Topic
	<b>Update Meeting</b>	<p>AI: John Agostino, Nancy Freeman, Julie Lam, Princess Ousley, Kyrie Wagner, Krause Wilson, Judy Wolf</p> <p><b>Topics:</b> State Asset Inventory Project happening in parallel; approach to updating sections, involving state and non-state participants, e.g., webinars; realigning natural hazards list with FEMA list; remove power failure from list (consequence, not cause); FEMA willingness to be closely involved with and available for update process; FEMA crosswalk; State process for review and integration of local plans; State's buyout focus after Irene, want to identify top 3-5 communities for active outreach; data/information requirements and resources.</p>
8/7/2013	<b>State-FEMA Update Meeting</b>	<p><b>Participants:</b> DHSES: Rick Lord, Debra Dunbrook FEMA: Cathleen Carlisle, Mike McHale (conf. call) AI: Nancy Freeman, Judy Wolf</p> <p><b>Topics:</b> Work plan; meetings; webinars; map updates; new FEMA levee policy; FEMA fine with dropping power failure as a hazard, with explanation why; levees – good idea to add; updated plan to include new mitigation actions; clarification requested of FEMA comments in opportunities for improvement document; feedback from FEMA on example state plans M. McHale provided; climate change; FEMA will look at sections as ready throughout process; submittal dates for first and final drafts; outreach initiative; FEMA's 4085 planners may have data, also EPA.</p>
8/12/2013	<b>DHSES Plan Update Meeting</b>	<p><b>Participants:</b> DHSES: Debra Dunbrook, Fred Nuffer, Dan O'Brien AI: Nancy Freeman, Judy Wolf</p> <p><b>Topics:</b> Inventory project; stakeholder outreach, upcoming meeting of Adaptation Working Group; proactive outreach with emphasis on interviews with key agencies; hazards list, discussed new hazards (e.g., tsunami, dam/levee failure) and resources for information; gathering of local plans; reviewed weekly task list; set weekly meetings</p>
8/13/2013	<b>Interagency Adaptation Working Group Meeting</b>	<p><b>Participants:</b> Amanda Stevens, Mark Watson (NYSERDA); Barry Pendergrass (DOS); Elisabeth Lennon (DOT); Mark Lowery, Kristin Marcell (DEC); Eleanor Stein, Michale Worden (PSC); Alan Belensz (OAG); Jan Storm, Dan Luttinger (DOH) DHSES: Debra Dunbrook, Fred Nuffer AI: Nancy Freeman, Princess Ousley</p> <p><b>Topics:</b> Environmental Monitoring Evaluation and Protection Program (EMEP) Multi-Year Research Plan; ClimAID report; cost/benefit analysis tools; Guidance for Community Reconstruction Plans; Local Waterfront Revitalization Program – developing planning framework for coastal and riverfront communities; HUD planning grants; kickoff for NY-NJ Post Sandy Vulnerability Assessment with Federal Highway Administration; DOT's Statewide Flooding Vulnerability Assessment developing GIS layer that maps flood vulnerability</p>



Date	Action	Participants/Topic
		along state highways, results to be incorporated into statewide transportation plan (worked with DHSES Mitigation to locate state and FEMA mapping resources); DOT's new risk-based asset management project that will include adaptation as a risk layer; pilot for Climate Smart Resiliency Planning, a new tool for adaptation planning; Climate Smart Communities program certification program in development to track community's mitigation and adaptation progress and recognize community climate action; Scenic Hudson, the Hudson River National Estuarine Research Reserve, DOS and the Consensus Building Institute are working with the Hudson River Estuary Program to design a waterfront flooding task force process for Kingston, NY and other waterfront communities; DOH was funded again to develop climate and health adaptation plans; FN requested a draft template of guidance for local health departments; State Hazard Mitigation Plan updated process and upcoming outreach efforts, introductions to AI team members.
8/16/2013	<b>Phone Call AI-FEMA</b>	<b>Participants:</b> Mike McHale (FEMA), Judy Wolf (AI) <b>Topics:</b> Confirm format of Plan for Oct 1 deadline. M. McHale expects as close to a final draft as possible for initial review.
8/16/2013	<b>Plan Update Team Meeting</b>	<b>Participants:</b> (AI) Amanda Burnett, Nancy Freeman, Princess Ousley, Judy Wolf <b>Topics:</b> Outreach plan and deadlines; webinars; participant contact lists; publication schedule given 10/1 firm deadline for initial final draft.
8/20/2013	<b>DHSES Plan Update Meeting</b>	<b>Participants:</b> DHSES: Debra Dunbrook, Fred Nuffer, Kathy Schmocker AI: Amanda Burnett (conf. call), Nancy Freeman, Judy Wolf <b>Topics:</b> Outreach initiative, emails and requests for information sent 8/19; FN to schedule DEC meetings; hazards list feedback; climate change; approach to including links in Plan; webinars; facilities list and related databases (e.g., OGS, Cyber Security); draft review process; categorizing and prioritizing participant lists; internal tracking sheet for planning meetings.
8/20/2013	<b>DHSES Plan Update Meeting</b>	<b>Participants:</b> DHSES: Fred Nuffer AI: Nancy Freeman, Princess Ousley, Judy Wolf <b>Topics:</b> Scheduled meeting with State Floodplain Manager; discussed DEC organization, key divisions for the Plan update; non-state participants and users (e.g., soil & water districts, basin planning commissions); webinars; resources for data/information needs; hazard rankings; review/approval process for Plan sections, and tracking sheet; GIS needs, workstation; outreach forms, meetings.
8/21/2013	<b>State-FEMA Update Meeting</b>	<b>Participants:</b> DHSES: Debra Dunbrook, Fred Nuffer, Kathy Schmocker FEMA: Mike McHale AI: Amanda Burnett (conf call), Nancy Freeman, Judy Wolf <b>Topics:</b> Overview of activities; reorganization of hazard



Date	Action	Participants/Topic
		sections to reflect CFR and crosswalk; comprehensive range of actions per hazard; brick and mortar projects preferred if possible; first draft review process and schedule; deliverables for first and final drafts; outreach initiative; FEMA 4085 planner information – M. McHale to check with Region 2 unit for repetitive loss information; FEMA feedback: on the right track so far.
8/22/2013	<b>Agency Meeting Department of State</b>	<p><b>Participants:</b> DOS: Barry Pendergrass DHSES: Fred Nuffer AI: Nancy Freeman, Princess Ousley, Courtney Shorter, Tracy Smith, Kyrie Wagner, Judy Wolf</p> <p><b>Topics:</b> DOS functions; Coastal Zone management program; GIS products, data available; Guidance for NY Rising Community Reconstruction Plans and related initiative; Building Code Office, local building codes; coordination with DEC coastal programs; definition of community assets; Adaptation Working Group; EPF funding administered by DOS; development changes over past three years; mitigation projects/activities over next three years; list of waterfront revitalization plans; NYSERDA projects; drought; extreme precipitation events; university research studies.</p>
8/23/2013	<b>Agency Meeting Department of Environmental Conservation – Dam Safety &amp; Coastal Erosion</b>	<p><b>Participants:</b> DEC: Alon Dominitz, PE; Susan McCormick, PE DHSES: Fred Nuffer AI: Amanda Burnett (conf. call), Nancy Freeman, Julie Lam, Princess Ousley, Tracy Smith, Judy Wolf</p> <p><b>Topics:</b> <i><b>Dam Safety</b></i> – Community Rating System vs. Hazard Mitigation Plan; overview of divisions and authorities; flood control projects (all USACE); location data non-restricted; dam ownership; inspections, engineering standards, enforcement; NY Works funding; validation of federal inventory; emergency action plans for dams; Gilboa Dam; crest gates; GIS and map data.</p> <p><i><b>Coastal Erosion</b></i> – overview of department; Coastal Erosion Hazard Area (CEHA); map update project underway; regulations; post-Sandy permitting and projects; USACE short protection program; feasibility studies; Fire Island breaches; project timelines; overview of key projects; Sandy Relief Bill, funding; need to strengthen enforcement authority; GIS, mapping, LIDAR; studies; requested historical listing of erosion events; drought.</p>
8/27/2013	<b>Agency Meeting Department of Transportation</b>	<p><b>Participants:</b> DOT: Elisabeth Lennon, Mary Anne Mariotti, Arthur Sanderson, Lynn Weiskopf AI: Amanda Burnett, Princess Ousley, Courtney Shorter, Tracy Smith, Judy Wolf</p> <p><b>Topics:</b> Verification of 2011 Plan information as still ongoing and valid; risk assessment research; new preservation investment strategy, bridges emerging as strong focus; DOT active in NYS 2100 Commission; department inventory –</p>



Date	Action	Participants/Topic
		<p>projects underway, potential vulnerabilities; scour critical bridges project to assess and address most critical; DOT operations heavily focused on ongoing mitigation; DOT staff involved in climate change discussions at a national level, also part of national research agendas; vulnerability assessments, New York State Flooding Vulnerability Study, taking climate change into account; Long Island culverts post-Sandy; recommendation from DOT: pull projects out of 2100 Commission Report; most significant hazards: flooding (inland and coastal), hurricane &amp; coastal storm, winter storm (more response than mitigation); retrofitting bridges for earthquake; landslide vulnerability identification and monitoring; NY Rising effort and funding; tree trimming; NY-NJ-CT vulnerability assessment; NYSERDA funding; FHWA pilot – risk-based asset management plan; Herkimer flooding, requested list of 406 hazard mitigation projects; work with neighboring states: I-95 Corridor Coalition, CONEG, NASTO; GIS contact; Sea Level Rise Task Force, report.</p>
8/27/2013	<b>Agency Meeting Office of Fire Protection &amp; Control</b>	<p><b>Participants:</b> OFPC: Andrew Dickinson, Donald Fischer AI: Princess Ousley, Tracy Smith, Judy Wolf <b>Topics:</b> Firewise program (e.g., Cragmoor); wildland-urban interface; overview of agency functions – inspections, fire training; coordination with DEC on training; development of courses with wildfire component; mitigation activities past three years, next three years; vulnerable assets; Ready Set Go program; National Guard discussions regarding response to wildfires.</p>
8/28/2013	<b>Webinar Non-State Stakeholders</b>	<p><b>Participants:</b> Broome County, Cattaraugus County, USDA-NRCS, Nassau County, Monroe County, Schenectady County, Tompkins County, Warren County, Washington County, Village of North Syracuse, USGS, Orange County, Albany County, Chemung County, Dutchess County, Erie County, Niagara County, National Weather Service DHSES: Rick Lord, Debra Dunbrook, Marlene White AI: Nancy Freeman, Judy Wolf, William Wagner III <b>Topics:</b> Overview of hazard mitigation planning process, requirements, timeline, next steps, and opportunities for participation.</p>
8/28/2013	<b>Agency Meeting DEC – Hudson Estuary Program</b>	<p><b>Participants:</b> DEC: Kristin Marcell AI: Amanda Burnett, Nancy Freeman, Courtney Shorter, Tracy Smith, Kyrie Wagner <b>Topics:</b> Program overview; Kingston Waterfront Flooding Task Force; LiDAR study; Sustainable Shorelines Project; SUNY research to assess climate change impact on flood risk in Mohawk and Hudson River Basins; mapping of barriers; habitat corridor mapping in Hudson Valley; long-term water level monitoring station in Hudson Estuary; Hudson Estuary Watershed Resiliency Project; SLAMM modeling in Hudson</p>



Date	Action	Participants/Topic
		Estuary; Climate Smart Communities Certification Program.
8/30/2013	<b>Agency Meeting NYS Canal Corporation</b>	<b>Participants:</b> NYS Canal Corp: Howard Goebel, Cathy Sheridan DHSES: Fred Nuffer AI: Princess Ousley, Tracy Smith, Kyrie Wagner <b>Topics:</b> NYS Canal System and agency overview; flooding-related activities including data gathering, monitoring, development of Canal Infrastructure Management System (CIMS); flood-related issues and infrastructure damages and economic impact; dams, debris; high-hazard dams; drought and Canal Corp reservoirs; mitigation projects including movable dam improvements and flood warning systems; source of project funds; anticipate program use.
9/3/2013	<b>DHSES Plan Update Meeting</b>	<b>Participants:</b> DHSES: Debra Dunbrook, Fred Nuffer, Dan O'Brien, Kathy Schmocker AI: Amanda Burnett (conf. call), Nancy Freeman, Judy Wolf <b>Topics:</b> Overview of activities; handoff/review of sample sections by DHSES; local plan data collection efforts and findings; hazard ranking matrix; maintenance and monitoring tools in development; preparation for FEMA meeting.
9/3/2013	<b>State-FEMA Update Meeting</b>	<b>Participants:</b> DHSES: Debra Dunbrook, Fred Nuffer, Dan O'Brien, Kathy Schmocker FEMA: Mike McHale AI: Amanda Burnett (conf. call), Nancy Freeman, Judy Wolf <b>Topics:</b> Overview of activities, including stakeholder outreach; timing of hazard section rough drafts for FEMA preview; timeline through initial draft due date; review schedule for October; information on repetitive loss (roadblocks in obtaining information, alternative sources being contacted); clarified treatment of "development" in crosswalk 201.4(d); local plan collection/data gathering efforts and results; hazard ranking matrix; maintenance and monitoring tools in development, streamlined and realistic process.
9/3/2013	<b>Agency Meeting National Oceanic and Atmospheric Administration</b>	<b>Participants:</b> NOAA: Britt Westergard, Steve DiRienzo DHSES: Fred Nuffer AI: Nancy Freeman, Courtney Shorter, Tracy Smith, Kyrie Wagner <b>Topics:</b> Climate change section - impacts on extreme temperatures, drought, flooding, sea-level rise; resources including national database on precipitation records (National Climatic Data Center), NOAA Coastal Services sea-level rise mapper showing inundation based off of sea-level rise, climate report from NCDC; Drought section - National Drought Monitor; Tsunami section - Tsunami warning system in place, Wireless Emergency Alerts (WEA); storm size considerations; lake levels; seiche; avalanche; flood warning systems in development.
9/5/2013	<b>Webinar State Stakeholders</b>	<b>Participants:</b> DOS, DHSES, DMNA, NYS Canal Corporation, NYS Police, NYS Education Department, NYC OEM, NYS Department of Agriculture & Markets, NYS Department of Public Service,



Date	Action	Participants/Topic
		<p>NYS DOT, NYS DOCCS, NYS DOL, NYS OGS, NYS OMH, NYS OPWDD, NYS Thruway Authority, NYS DEC, NYS DOH, NYSERDA, Office of Children and Family Services, Port Authority of NY &amp; NJ</p> <p>DHSES: Rick Lord, Debra Dunbrook, Marlene White  FEMA: Cathleen Carlisle, Nicole Aimone  AI: Nancy Freeman, Judy Wolf, William Wagner III</p> <p><b>Topics:</b> Overview of hazard mitigation planning process, requirements, timeline, next steps, and opportunities for participation, including facilities/damage survey tool being sent to all agencies following webinar.</p>
9/5/2013	<b>Agency Meeting New York State Energy Research and Development Authority</b>	<p><b>Participants:</b> NYSERDA: Chris Reohr, Amanda Stevens, Mark Watson  AI: Nancy Freeman, Princess Ousley, Courtney Shorter, Tracy Smith, Judy Wolf</p> <p><b>Topics:</b> Adaptation Working Group (WG); verified projects on list provided at WG meeting; discussed additional sources for information; draft timelines, opportunities for review; modeling projects; Con Ed post-Sandy enhancement plan; Commercial New Construction Program; Cleaner, Greener Communities Program; Gas Station Program; NY Rising Community Reconstruction Program; ClimAID; water supply-related projects (none for NYSERDA currently); other current activity.</p>
9/5/2013	<b>Agency Meeting Susquehanna River Basin Commission</b>	<p><b>Participants:</b> SRBC: Ben Pratt, John Bala  AI: Amanda Burnett, Princess Ousley, Tracy Smith, Kyrie Wagner</p> <p><b>Topics:</b> Program overview; regulatory authority; past mitigation activities largely non-structural; flood warning system and reduction in stream gauge network funding in 2014; flooding issues; drought; past year focus no infrastructure and preserving infrastructure (flood forecast and warning system and gauge warning system); activities to promote NFIP; focus on sustaining the gauge network.</p>
9/9/2013	<b>DHSES Plan Update Meeting</b>	<p><b>Participants:</b> DHSES: Fred Nuffer  AI: Amanda Burnett, Nancy Freeman, Judy Wolf</p> <p><b>Topics:</b> Overview of activities; hazard ranking matrix; hazards; prioritize sections for review; plan maintenance and monitoring tools; draft preview protocols and schedule; adoption process.</p>
9/9/2013	<b>Agency Meeting NYS Office of Parks, Recreation &amp; Historic Preservation</b>	<p><b>Participants:</b> NYS OPRHP: Marc Talluto, John Orsini  DHSES: Fred Nuffer  AI: Joe Jones, Princess Ousley, Courtney Shorter, Tracy Smith</p> <p><b>Topics:</b> Program and agency overview; Irene, Lee and Sandy flooding impacts, locations, damage amounts; wildfire incidents; occasional landslides; upstate erosion.</p>
9/10/2013	<b>Agency Meeting DEC - Flood Control Program</b>	<p><b>Participants:</b> DEC: Alan Fuchs, Stephen Len  AI: Princess Ousley, Courtney Shorter, Tracy Smith, Kyrie Wagner</p> <p><b>Topics:</b> New project development; funding splits for various</p>



Date	Action	Participants/Topic
		project phases; oversight, maintenance and repair of completed projects; DEC permitting program; levee breaks/breaches; state facility vulnerability; infrastructure aging-related maintenance issues; inspection schedule; damage from storm events past three years.
9/18/2013	<b>DHSES Plan Update Meeting</b>	<b>Participants:</b> DHSES: Debra Dunbrook AI: Amanda Burnett, Nancy Freeman, Judy Wolf <b>Topics:</b> Overview of activities; hazard ranking matrix, stakeholder outreach, mitigation actions & activities matrix, survey monkey tool; sections ready for FEMA review, protocol, final review of flood second draft; State review session on 9/25; detailed review of sections 1, 2, 5 and 6 for D. Dunbrook feedback; local plan integration/process; Adirondack Park Agency web site for avalanche information; outreach and plan maintenance workload, process, and staffing recommendations going forward.
9/19/2013	<b>State-FEMA Update Meeting</b>	<b>Participants:</b> DHSES: Debra Dunbrook FEMA: Mike McHale AI: Amanda Burnett, Nancy Freeman, Princess Ousley, Judy Wolf <b>Topics:</b> Overview of activities, including stakeholder outreach; preliminary draft and 10/1 initial draft review and feedback, including handoff, timelines, crosswalk, feedback format, and GIS products currently missing from preliminary draft; hazard ranking matrix and treatment of different levels within Plan; mitigation actions and activities, including Region 2 preference for presenting projects to best support potential grant applications; integration of level of detail specified in Blue Book guidance; submission of crosswalk with State's 10/1 initial draft to FEMA with requirement locations identified.
9/25/2013	<b>DHSES Plan Update Meeting</b>	<b>Participants:</b> DHSES: Rick Lord, Debra Dunbrook, Fred Nuffer, Dan O'Brien, Kathy Schmocker AI: Amanda Burnett, Nancy Freeman, Juliana Lam, Princess Ousley, Courtney Shorter, Tracy Smith, Kyrie Wagner, Judy Wolf <b>Topics:</b> Timeline for adoption; detailed review and discussion of sections 1, 2, 3.0-3.2, 4, and hazard sections for Avalanche, Climate Change, Coastal Erosion, Drought, Earthquake, Extreme Temperatures, and Flood; discussed State goals and objectives, which should tie in with Governor's 2100 Report priorities.
9/26/2013	<b>DHSES Plan Update Meeting</b>	<b>Participants:</b> DHSES: Debra Dunbrook, Fred Nuffer, Dan O'Brien, Kathy Schmocker AI: Amanda Burnett, Nancy Freeman, Juliana Lam, Princess Ousley, Courtney Shorter, Tracy Smith, Kyrie Wagner, Judy Wolf <b>Topics:</b> Reviewed and approved revised State goals and objectives; detailed review and discussion of sections 5, 6, 7, and hazard sections for Hailstorm, High Wind, Hurricane, Land Subsidence & Expansive Soils, Landslide, Tsunami, Winter Storm, and Wildfire.
9/26/2013	<b>DHSES Plan</b>	<b>Participants:</b> DHSES: Rick Lord



Date	Action	Participants/Topic
	<b>Update Meeting</b>	AI: Amanda Burnett, Judy Wolf <b>Topics:</b> Reviewed and approved State goals and objectives; discussed input and information needed for Section 4; discussed public review of draft and process for posting to State web site.
10/7/2013	<b>DHSES Plan Update Meeting</b>	<b>Participants:</b> DHSES: Debra Dunbrook, Fred Nuffer AI: Nancy Freeman, Judy Wolf <b>Topics:</b> Overview of activities and Plan status; coordination with State Inventory Project; schedule for final draft State run through.
10/11/2013	<b>State-FEMA Update Meeting</b>	<b>Participants:</b> DHSES: Rick Lord FEMA: Cathleen Carlisle, Mike McHale (both via conference call) AI: Nancy Freeman, Princess Ousley, Judy Wolf <b>Topics:</b> Federal shutdown and potential impact on timeframes; FEMA bringing in additional state assets to assist with Plan review; possible change to administrative rule; FEMA sending Plan status letter to the Governor; timeframes for final draft deadline, FEMA request to push forward to allow additional time for edits (if needed) following formal crosswalk; FEMA to provide feedback by 10/18 on flood, hurricane, wind, and severe winter storm sections; local plans as a resource for data – including as a resource/link; importance of referencing NYC activities and Risk MAP program; local plan integration, including progress and approach to date; coordination with State Asset Inventory project; FEMA direction/suggestions for how to approach required edits for January Plan approval while building framework for future/ongoing improvement; HAZUS information coming from FEMA – full-out analysis can be done after January; FEMA request that changes from 10/1 draft be highlighted for final draft; input still incoming from stakeholders on hazard sections.
10/21/2013	<b>DHSES Plan Update Meeting</b>	<b>Participants:</b> DHSES: Debra Dunbrook, Fred Nuffer AI: Nancy Freeman, Judy Wolf <b>Topics:</b> Overview of activities; incorporation of edits and feedback ongoing; good response from stakeholders regarding mitigation actions and activities; 20 responses received to date regarding web draft posted in September; excellent and detailed feedback received from key agencies tasked with reviewing specific hazard sections; ongoing mitigation activities have been moved to State Capabilities section; table created for new 2014 mitigation projects with a Status Update column; table created to track funding/completion of past projects, to be kept up over time; communication with State agencies regarding ongoing maintenance process and expectations; local plan funding and review; Hazus and Risk MAP information; progress on local plan review and integration; deadlines; photos; adoption process.
10/28/2013	<b>DHSES Plan Update Meeting</b>	<b>Participants:</b> DHSES: Rick Lord, Debra Dunbrook, Fred Nuffer AI: Nancy Freeman, Princess Ousley, Judy Wolf <b>Topics:</b> Reviewed and discussed “final draft” versions of all



Date	Action	Participants/Topic
		sections except 4 and 7, which are scheduled to be reviewed on 11/4; discussion regarding critical facilities; need to publicly announce any ranking/selection criteria that are established, will also need to be approved by Attorney General & comptroller; discussion regarding NYS actions to identify and address roadblocks to buyout program success.
11/4/2013	<b>DHSES Plan Update Meeting</b>	<b>Participants:</b> DHSES: Rick Lord, Debra Dunbrook, Fred Nuffer AI: Nancy Freeman, Princess Ousley, Judy Wolf <b>Topics:</b> Reviewed and discussed Section 4 (in progress); changing wildfire and landslide to low hazards, keeping severe winter storm low hazard with additional explanation/justification; details regarding legislative task force; alert systems as mitigation activities; reviewed activities table for status updates, identified ongoing programmatic functions from 2011 plan; public posting of final plan; adoption process; funding sources.

During stakeholder meetings, the SHMP Team and contractor group gathered information related to hazards and risks, as well as any impacts to agency facilities resulting from disasters between 2011 and 2014. Each stakeholder agency was also responsible for updating the mitigation actions and activities relevant to their agency. These agencies received an Excel spreadsheet with their actions and a deadline to review and provide input regarding the actions. In addition, each agency was encouraged to create new actions to reflect the ongoing mitigation efforts in New York.

In addition, multiple requests for information were solicited by phone and email from the SHMP agencies. This information has been incorporated throughout the plan as appropriate.

### Plan Section Review and Analysis

All agencies were instrumental in providing hazard and risk assessment data and revising and updating the 2011 mitigation goals, objectives, capabilities, funding sources, and activities. Information gathered during the planning process provided guidance in assessing and ranking the hazards and redefining the goals and objectives. **Section 4 – Mitigation Strategy** further explains the revisions and resolutions of the 2011 goals and objectives. **The goals selected by the SHMP Team for 2014 are:**

- Goal 1:** Promote a comprehensive state hazard mitigation policy framework for effective mitigation programs that includes coordination between federal, state, and local organizations for planning and programs.
- Goal 2:** Protect property including public, historic, private structures, and critical facilities and infrastructure.



- Goal 3:** Increase awareness and promote relationships with stakeholders, citizens, elected officials, and property owners to develop opportunities for mitigation of natural hazards.
- Goal 4:** Encourage the development and implementation of long-term, cost-effective, and resilient mitigation projects to preserve and/or restore the functions of natural systems.
- Goal 5:** Build stronger by promoting mitigation actions that emphasize sustainable construction and design measures to reduce or eliminate the impacts of natural hazards.

Extensive research of reports, policies, websites, and publications was conducted in order to update the information presented in the 2014 plan. In some cases, existing information was determined to be valid or new material or data was not available, so the existing information was retained in the plan, if still applicable. Information from numerous local jurisdiction hazard mitigation plans was integrated throughout the development of the State plan. It was found that the hazard information and mitigation strategy information from the local plans provided critical details to supplement the hazard profiles and risk assessments, as well as the mitigation strategy section. Sample data and analysis from local plans was integrated into appropriate sections of the 2014 update as describe in **Section 5: Coordination of Local Planning**. A selection of plans was made to represent jurisdictions with significant vulnerability to specific hazards. All hazards identified in local plans were linked to the State’s hazards, as shown in **Section 5, Table 5e**.

Another outcome was the goal of trying to make the state plan a useful resource for local jurisdictions that will undertake the planning effort in the future years. It was determined that some useful maps and planning methods and tools would be provided throughout the plan as a resource.

During the course of plan development, every effort was made to use the best readily available data. Unfortunately, information that is needed or useful for certain analyses may not exist, and in some cases, the data that is available remains deficient from the standpoint of accuracy and completeness. DHSES and its partner agencies have been working on filling identified gaps in data and will continue to address these issues during subsequent planning periods.

A major data deficiency in the 2014 update is the limited information New York State maintains on its building assets, particularly the details required for risk assessment. Currently, the primary database of state buildings is the NYS Office of General Service’s “Fixed Asset Inventory,” which contains over 19,000 building records. While this database contains useful information such as building value and square footage, it does not contain basic structural information needed to make general assessments of vulnerability to earthquakes, wind and flood. In addition to the need to gather missing structural information, there is a need to refine the accuracy of the geographic coordinates to enable better GIS screening of these buildings as to their proximity to floodplains; the presence of



soils that amplify earthquake shaking; and other hazardous areas. On September 9, 2013, DHSES requested that state agencies complete an online survey to collect basic facility data to identify additional state facilities and critical infrastructure. The survey helped to identify agencies', counties', and regions' facility types that may require special consideration and a more ambitious methodology to gather critical data related to their facilities and infrastructure in order to determine potential vulnerabilities to hazards. A total of eighteen (18) agencies responded to the survey, providing an important first step to ensure that the State has a comprehensive database of all state-owned and operated facilities and infrastructure.

An additional initiative to gather State facility data was begun during the 2014 SHMP update process. The State Fixed Asset Inventory Project process will involve development of a methodology to identify facilities based on potential hazard vulnerability and eventually result in a comprehensive State fixed asset inventory/database. Phase one of the project consists of a pilot to gather information related to residential facilities<sup>5</sup>, due for completion in mid-2014.

On September 25, 2013, an initial SHMP draft was presented to the DHSES Mitigation Section for review and input. The resulting second draft was placed on the DHSES website on September 30, 2013, for stakeholder review and comment. Input and comments were received from September 30 to October 15, 2013. Feedback was received in the form of emailed comments, written comments on the draft, or documents with information relevant to the plan or the appropriate agency's section. Feedback was collected and reviewed by the contractor and DHSES and incorporated as appropriate into the plan.

**The review and evaluation process included an in-depth analysis by the contractor team to ensure the following measures were addressed:**

- Consistency with the 44 CFR 201.4 Standard State Hazard Mitigation Plan Crosswalk
- Recommendations from FEMA that were provided in the 2011 plan review
- Incorporation of stakeholder input into the appropriate sections

An initial draft was provided to FEMA on October 1, 2013, for a preliminary comprehensive plan review. All comments from FEMA were then integrated into the final plan. Table 2d provides a summary of revisions and updates in each section. **Descriptions of specific changes are listed in each section of this plan.**

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<sup>5</sup> Project priorities related to type of facilities may change as the project evolves.



**Table 2.1d: Section Updates**

<b>Section 1</b>
Updates include the New York facts and figures to reflect current population numbers, a description of the adoption process, and assurances to comply with applicable laws.
<b>Section 2</b>
The updates in Section 2 include the description of the 2014 SHMP Team, contractor group, and the plan update process. Relevant data from the 2008 and 2011 plan was incorporated. Section 2 also describes program development and integration since the 2011 SHMP.
<b>Section 3</b>
Section 3 updates include the restructuring of hazard sections to further align with the standard state hazard mitigation crosswalk. 2011 hazards were researched and redefined to include the addition of new hazard sections for Avalanche, Climate Change, Coastal Erosion and Tsunami. The listing of past federal disaster declarations in New York State was updated. Local plans were reviewed, and local vulnerability and loss data were included in the 2014 plan update. The state facility and infrastructure vulnerability and loss data were also reviewed, updated, and included in the plan.
<b>Section 4</b>
The goals and objectives were revised to reflect five specific categories. These categories were utilized in revising and addressing the 2011 SHMP goals. The projects from the 2011 SHMP were updated, and progress and capability tables have been added to map the State's progress. 2014 activities have been added by participating agencies and all projects were ranked in accordance with the new NYS Hazard Mitigation Ranking System. In addition, an updated list of current and potential funding sources is provided.
<b>Section 5</b>
Section 5 update discusses the process followed by the Mitigation Sections in providing funding and technical assistance, and includes the process for reviewing and integrating the local hazard mitigation plans (LHMPs). In addition, it provides criteria for prioritizing HMA funding for planning and non-planning grants.
<b>Section 6</b>
The updates in Section 6 include a revised timeline and criteria for monitoring and evaluation of the SHMP, and a revised approach to the update process for the 2017 SHMP. Updates also include how the goals, objectives, and activities will be monitored for achievement.
<b>Section 7</b>
Discusses the goals and objectives that were updated to support the selection of mitigation activities for repetitive loss and severe repetitive loss (SRL). The following table was added to the 2014 SRL section: Repetitive Loss. The following figures were added to the 2014 SRL section: Policy Matters, the number of NFIP policies from 2011-2012; and National Flood Insurance Program Data for the Top 10 States.



## 2.2 Coordination among Agencies

*Requirement §201.4(b): The State mitigation planning process should include coordination with other State agencies, appropriate Federal agencies [and] interested groups.*

Coordination among state and federal agencies has evolved with recent events such as Hurricanes Irene, Tropical Storm Lee, and Hurricane Sandy. These events have highlighted the importance of mitigation, which is reflected in the increased number of state mitigation initiatives and enhanced coordination with federal entities. **Ongoing programs and initiatives include, but are not limited to, the following:**

The **New York State Department of Environmental Conservation (DEC) Hudson River Estuary Program** has taken a proactive approach to mitigating coastal erosion and adaptation strategies for climate change to reduce vulnerability to losses on the Hudson River Estuary. Their efforts include a series of green shoreline demonstration projects, including the design of two ecologically enhanced (or “green”) shoreline treatments to control erosion on shorelines in Cold Spring and Nyack, NY.

The **DHSES Mitigation Section** processed the largest number of buyouts in the state’s history between 2011 and 2013. Due to multiple disasters, coordination among state and federal entities has continued to progress, resulting in increased opportunities for mitigation. For example, the State collaborated with FEMA Region II to coordinate the acquisition and elevation of severe repetitive loss properties. In this same timeframe, the Hazard Mitigation Grant Program (HMGP) has funded 1,232 acquisition buyout projects totaling \$210 million.<sup>6</sup>

The **ad-hoc interagency adaptation working group** has provided significant opportunities for program integration and mitigation activities. It has steadily grown since its inception from less than five participating agencies to gathering as many as 12 agencies in regular attendance. The original impetus for meeting was by legislative direction and was primarily for the identification of the state’s vulnerabilities to climate change and adaptation measures to address climate change, but this discussion has since extended beyond climate change concerns and into mitigation related to other natural hazards. Additional information about the adaptation working group can be found in **Section 4.2**.

The **NYSDEC and Department of State (DOS)** have worked closely with the U.S. Army Corps of Engineers through a long term planning process to address and fund coastal protection projects. Coordination among these agencies includes joint planning related to project development and implementation, funding agreements and technical assistance. Feasibility studies have been conducted on beach renourishment projects, and a number of projects have been funded to repair damage caused by the repetitive storms in 2011 and 2012, including Hurricane Sandy. For example, the Lake Montauk Harbor Storm Damage Reduction and Navigation Project to renourish the beach, build a groin, and expand the

<sup>6</sup> New York State Disaster Preparedness Commission 2012 Annual Report



navigational channel to provide heightened protection to properties was the outcome of a feasibility study. The Fire Island to Montauk Point Project supports beach and dune re-nourishment and the elevation of homes. The goal of each project is to support adaptive measures that will help address risk from shoreline erosion. Information on currently funded coastal protection projects is described in **Table 3.5c**.

These and other programs and projects have led to a greater consensus among agencies related to the importance of pre-disaster planning and actions that have the potential to reduce the state's vulnerabilities to hazards. **Table 2.2e** demonstrates the collaboration with participating agencies for the 2014 planning cycle.

**Table 2.2e: 2014 Federal, State and Local Participating Entities**

State Agency Participation	Provided Data	State Agency Webinar	Non-State Agency Webinar	Responded on Survey Monkey	Provided initial draft feedback
DHSES NYS Office of Fire Prevention (OFPC)	✓				✓
Metropolitan Transportation Authority (MTA)	✓			✓	
New York Department of State (DOS)	✓	✓			
New York State Department of Health (DOH)	✓	✓			
NYS Canal Corporation	✓	✓			✓
NYS Department of Education		✓			
NYS Geological Survey	✓				
NYS Department of Environmental Conservation (DEC)	✓	✓			✓
NYS Department of Homeland Security and Emergency Services (DHSES)	✓	✓	✓	✓	✓
NYS Department of Labor (DOL)		✓		✓	
NYS Department of Transportation (DOT)	✓	✓		✓	✓
NYS Division of Military & Naval Affairs (DMNA)	✓	✓		✓	
NYS Department of Corrections and Community Supervision	✓	✓			
NYS Division of State Police (NYSP)	✓	✓		✓	
NYS Energy Research and Development Authority (NYSERDA)	✓	✓			✓
NYS Office of Children and	✓	✓		✓	



State Agency Participation	Provided Data	State Agency Webinar	Non-State Agency Webinar	Responded on Survey Monkey	Provided initial draft feedback
<b>Family Services (OCFS)</b>					
<b>NYS Office for People with Developmental Disabilities (OPWDD)</b>	✓	✓			✓
<b>NYS Office of General Services (OGS)</b>	✓	✓			
<b>NYS Department of Financial Services</b>				✓	
<b>NYS Office of Mental Health (OMH)</b>	✓	✓		✓	
<b>NYS Office of Parks, Recreation and Historic Preservation</b>	✓				✓
<b>NYS Office of Temporary &amp; Disability Assistance (OTDA)</b>	✓				
<b>NYS Public Service Commission (PSC)</b>	✓	✓			
<b>NYS Thruway Authority</b>	✓	✓			✓
<b>Port Authority of NY and NJ</b>		✓			
<b>State University of NY (SUNY)</b>	✓			✓	
<b>NYS Department of Agriculture and Markets (NYS AG&amp;MKTS)</b>		✓		✓	
<b>NYS Office of Victim Services</b>				✓	



Local Municipalities, Local Departments, Non-Governmental Organizations, Private Sector and Federal Agencies	Provided Data	State Agency Webinar	Non-State Agency Webinar	Responded on Survey Monkey	Provided initial draft feedback
<b>Local Municipalities</b>					
Albany County			✓		
Broome County			✓		
Cattaraugus County			✓		
Nassau County			✓		
Monroe County			✓		
Orange County			✓		
Schenectady County			✓		✓
Tompkins County			✓		
Warren County			✓		
Washington County			✓		
<b>Local Departments</b>					
NYC Office of Emergency Management		✓			
Nassau Health Care Corporation					✓
<b>Non-Governmental Organizations</b>					
American Red Cross	✓				
Susquehanna River Basin Commission (SRBC)	✓				
Delaware River Basin Commission (DRBC)	✓				
<b>Private Sector</b>					
Environmental Emergency Services, Inc.	✓				
<b>Federal Agencies</b>					
Federal Emergency Management Agency (FEMA)		✓			✓
National Weather Service (NWS)	✓				✓
U.S. Army Corps of Engineers (USACE)	✓				
U.S. Geological Survey (USGS)	✓				



## 2.3 Program Integration

**Requirement §201.4(b):** *The State mitigation planning process should be integrated to the extent possible with other ongoing State planning efforts as well as other FEMA mitigation programs and initiatives.*

### Integration with State Planning Efforts

The State's hazard mitigation efforts fall under a wide variety of programs and constitute many initiatives at the local, state, and federal levels. The 2014 State Hazard Mitigation Plan acts as an umbrella document that identifies the various risks and assesses the mitigation actions that are being implemented to reduce these risks. The following sections describe some of these efforts.

### State Agencies

The following sections describe in detail ongoing mitigation activities performed by State agencies on a routine basis. **Table 2.3f** presents a matrix showing the roles the various State agencies play in the statewide mitigation efforts. The State has a substantial role in ensuring mitigation measures of various types are implemented at the local level. **The State's role can be divided into three broad functional levels of application:**

- **Indirect Influence:** Activities which are carried out exclusively by the private sector or local government. These may be promoted or encouraged by state efforts such as vulnerability reports, education activity, and similar indirect means.
- **Direct Influence:** Activities which will generally be carried out by private interests or local government, but are directly influenced by state activity. These could be local assistance funding, standard setting, preparation of model statutes, codes, and all similar activities where state authority encourages or enables local actions that support mitigation.
- **Implementation:** Activities carried out by the State as direct program functions. These would include such things as State-conducted training, State regulatory programs, design and construction of State facilities, and the creation of new or amended (state) law.

State agencies include such considerations in actions wherever they are reasonable and compatible with program purposes and goals. In some cases, these activities may be conducted as normal functions of the individual agency by direction of law, rule, or agency discretion or as part of agency budgets. As such, agencies will continue to perform the activities identified and described. **Table 2.3f** describes state agencies' roles in ongoing mitigation efforts.



Table 2.3f: State Agencies' Roles in Mitigation Efforts

Agency	Compliance/ Enforcement Programs	Mitigation Education/Public Awareness	Mitigation Plans / Planning	Mitigation Activities / Actions	Technical Assistance	Risk / Vulnerability Assessment
Department of Agriculture and Markets		✓	✓	✓	✓	✓
Office of Children & Family Services			✓	✓		
Department of Environmental Conservation	✓	✓	✓		✓	✓
Department of Labor			✓			
Office of Mental Health			✓			✓
Department of Military and Naval Affairs			✓	✓		
Public Service Commission			✓			
Thruway Authority/				✓		
Canal Corporation	✓	✓	✓	✓	✓	✓
Department of Transportation	✓	✓	✓	✓	✓	✓
Department of Homeland Security and Emergency Services	✓	✓	✓	✓	✓	✓
NYS Energy and Research Development Authority		✓	✓	✓	✓	✓



Agency	Compliance/ Enforcement Programs	Mitigation Education/Public Awareness	Mitigation Plans / Planning	Mitigation Activities / Actions	Technical Assistance	Risk / Vulnerability Assessment
Department of State	✓	✓	✓	✓	✓	✓
Metropolitan Transportation Authority		✓	✓			✓
Office General Services			✓	✓		✓
Office of Parks, Recreation and Historic Preservation			✓	✓		✓
Port of NY and NJ		✓	✓	✓		✓
State University of NY		✓	✓	✓		✓
Department of Corrections and Community Supervision			✓			✓
Empire State Development Corporation						✓
Department of Health		✓	✓	✓		✓
Division of Housing and Community Renewal			✓			
Office of Cyber Security				✓		✓
Office of Persons with Developmental Disabilities			✓	✓		✓
Division of State Police			✓			



## Review and Integration of Existing Plans and Documents

Every effort was made to review and incorporate pertinent information into the 2014 Plan from previous State mitigation planning efforts and other mitigation related plans. Plans that were reviewed as part of the planning process are listed below. These plans were reviewed and pertinent information was incorporated into the current plan.

### Federal

- *FEMA Plan Development Toolkit*
- *FEMA Multi-Hazard Mitigation Planning Guidance (Disaster Mitigation Act of 2000)*
- *FEMA Hazard Mitigation Grant Program*
- *FEMA Understanding Your Risks* how-to-guide
- *FEMA Developing the Mitigation Plan* how-to-guide
- *FEMA Bringing the Plan to Life* how-to-guide
- *FEMA Guidance on Benefit-Cost Analysis of Hazard Mitigation Projects*
- FEMA Risk Map Program

### State

- The NYS DPC 2012 Annual Report
- The NYS 2100 Commissioner's Report
- The NYS Consolidated Edison Co. Post Sandy Enhancement Plan
- The NYS Climate Smart Resiliency Planning: A Planning Evaluation Tool for NYS Communities
- The NYS 2007 DEC Wildfire Management Plan
- The NYS Drought Management Plan
- The NY NJ Regional Catastrophic Planning Team
- The NYS Emergency Action Plan for Dams
- The NYS Comprehensive Emergency Management Plan, which is supported by a host of functional, hazard-specific, and support annexes

Many of the agencies that comprise the DPC also maintain their own agency-specific emergency operations plans.

### Local

- Fifty-six (56) local hazard mitigation plans were reviewed and referenced in the 2014 plan update. A list of the 56 plans can be found in **Section 5: Coordination of Local Planning**.

## Integration into FEMA Mitigation Grant Programs

DHSES administers and oversees federal mitigation grant programs for New York State that are related to hazard mitigation, emergency management, and disaster relief, and serves as the lead agency for the State in disaster mitigation efforts. Due in part to the agency's comprehensive role, DHSES has the opportunity to integrate the dissemination of mitigation information with the FEMA grant application process for the following programs:



- Hazard Mitigation Grant Program (HMGP);
- Pre-Disaster Mitigation (PDM) Grant Program;
- Public Assistance (PA) Grant Program;
- Individual Assistance (IA) Grant Program
- Flood Mitigation Assistance (FMA) Program;
- Community Development Block Grant (CDBG) – Department of Housing and Urban Development
- Federal Highway Administration – Emergency Response Program

DEC administers the **National Flood Insurance Program (NFIP)** within the State of New York, with responsibilities assigned to the State NFIP Coordinator and support staff. The primary responsibilities of the office of the State NFIP Coordinator include facilitating participation in the NFIP among New York communities, providing technical support and training to local administrators, and encouraging participation in the Community Rating System (CRS) program.

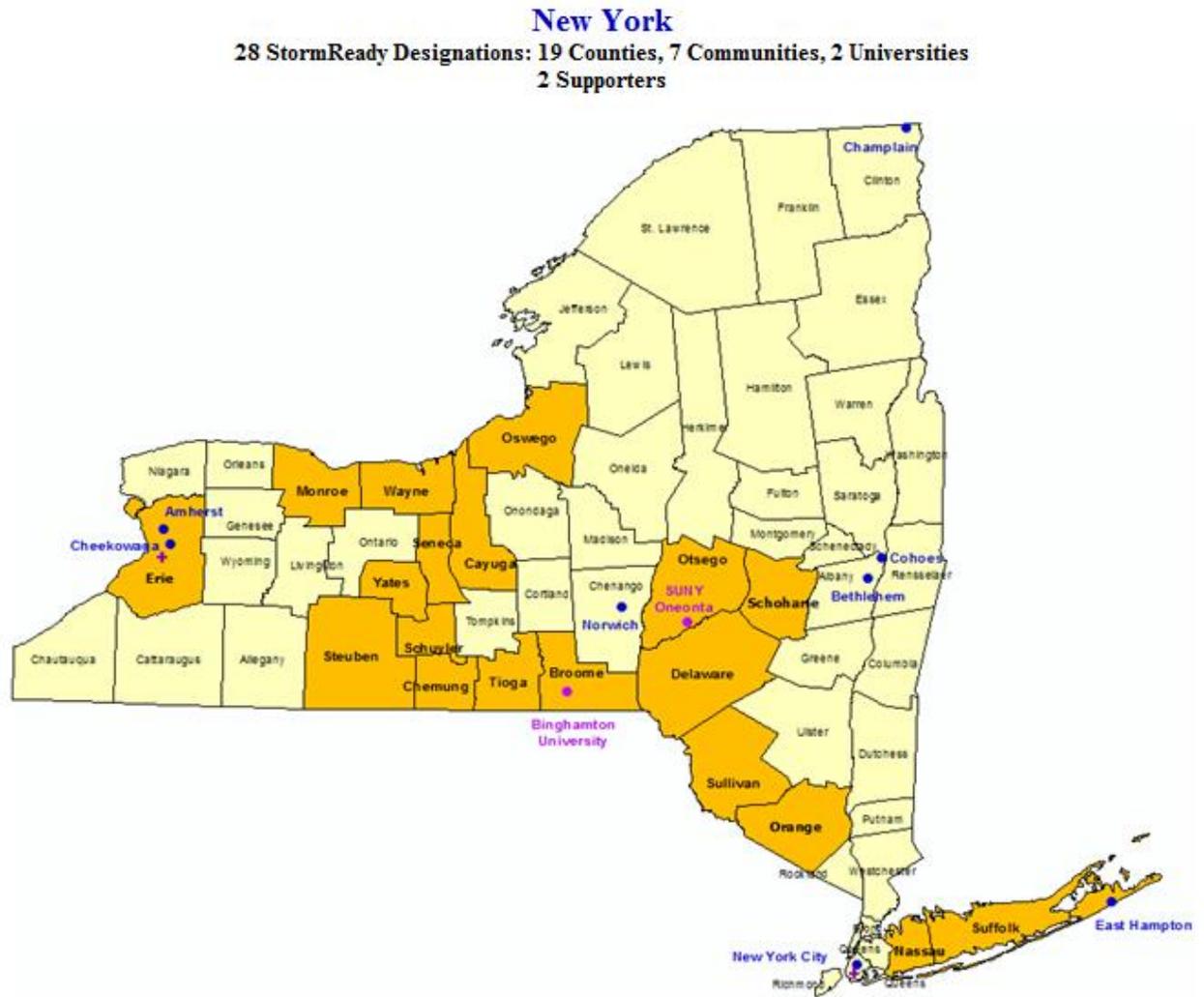
### Integration into FEMA Mitigation Programs and Initiatives

Integration of federal programs into the state mitigation program has been an ongoing process that has highlighted the importance of mitigation. This process has resulted in the implementation of federal programs and initiatives, as well as the review and integration of current state plans, programs and policies that promote mitigation initiatives throughout the State. Ongoing programs and initiatives include, but are not limited to, the following:

**National Weather Service StormReady Program:** StormReady is a nationwide community preparedness program that uses a grassroots approach to help communities develop plans to handle all types of severe weather from tornadoes to tsunamis. The program encourages communities to take a proactive approach to improving local hazardous weather operations by providing emergency managers with clear-cut guidelines on how to improve their hazardous weather operations. To be officially StormReady, a community must: 1) establish a 24-hour warning point and emergency operations center; 2) have more than one way to receive severe weather warnings and forecasts and to alert the public; 3) create a system that monitors weather conditions locally; 4) promote the importance of public readiness through community seminars; and 5) develop a formal hazardous weather plan that includes training severe weather spotters and holding emergency exercises. StormReady communities in New York State have undertaken extra efforts in preparedness measures in order to mitigate hazardous weather events in their communities. Currently New York State has 28 StormReady designations, as illustrated in **Figure 2.3a**.



Figure 2.3a: New York State StormReady Designations



<b>Gold Shading: StormReady County</b>		<b>Blue Dot: StormReady Community</b>	<b>Purple Dot: StormReady University</b>
<ul style="list-style-type: none"> <li>• Broome</li> <li>• Cayuga</li> <li>• Chemung</li> <li>• Delaware</li> <li>• Erie</li> <li>• Monroe</li> <li>• Nassau</li> <li>• Orange</li> <li>• Oswego</li> <li>• Otsego</li> </ul>	<ul style="list-style-type: none"> <li>• Schoharie</li> <li>• Schuyler</li> <li>• Seneca</li> <li>• Steuben</li> <li>• Suffolk</li> <li>• Sullivan</li> <li>• Tioga</li> <li>• Wayne</li> <li>• Yates</li> </ul>	<ul style="list-style-type: none"> <li>• Amherst</li> <li>• Bethlehem</li> <li>• Champlain</li> <li>• Cheektowaga</li> <li>• Cohoes</li> <li>• East Hampton</li> <li>• New York City</li> <li>• Norwich</li> </ul>	<ul style="list-style-type: none"> <li>• Binghamton University</li> <li>• State University of New York at Oneonta</li> </ul>
<b>Purple Plus: StormReady Supporter</b>			
<ul style="list-style-type: none"> <li>• Buffalo Bills at Ralph Wilson Stadium</li> <li>• WABC-TV 7</li> </ul>			

Source: <http://www.stormready.noaa.gov/com-maps/ny-com.htm>



**National Flood Insurance Program's (NFIP) Community Rating System (CRS):** The NFIP CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premium rates are discounted to reflect the reduced flood risk resulting from community actions meeting the three goals of the CRS: (1) Reduce flood losses; (2) Facilitate accurate insurance rating; and (3) Promote the awareness of flood insurance. Each community has prepared a flood mitigation plan and has received funding for flood mitigation projects. Details are presented in the flood hazard section. (See **Section 3.9: Flood** for additional information related to NFIP and the CRS.)

**FEMA's National Mitigation Strategy:** In response to the unacceptable loss of life and property from recent disasters, and the prospect of even greater catastrophic loss in the future, the National Mitigation Strategy has been developed to provide a conceptual framework to reduce these losses. The strategy is intended to engender a fundamental change in the general public's perception about hazard risk and mitigation of that risk, and to demonstrate that mitigation is often the most cost-effective and environmentally sound approach to reducing losses. The overall long-term goal of the strategy is to substantially increase public awareness of natural hazard risk and to significantly reduce the risk of loss of life, injuries, economic costs, and the disruption of families and communities caused by natural hazards. The foundation of the strategy is the development of partnerships that empower all Americans to fulfill their responsibility for ensuring safer communities. This strategy must be implemented in partnership with state and local governments and private sector constituents, including, and most especially, the general public.

**Emergency Management Accreditation Program:** The Emergency Management Accreditation Program (EMAP) is the voluntary assessment and accreditation process for state and local government programs responsible for coordinating prevention, mitigation, preparedness, response, and recovery activities for disasters, whether natural or human-caused. Accreditation is based on compliance with collaboratively developed national standards for emergency preparedness, the EMAP Standard. EMAP, as an independent, non-profit organization, fosters excellence and accountability in emergency management and homeland security programs by establishing credible standards applied in a peer review accreditation process. New York State is EMAP-accredited.



**National Incident Management System (NIMS):** The Federal Department of Homeland Security has developed the NIMS system as the integrated standard for emergency planning. New York State has officially adopted the NIMS system and continually implements this program within state agencies and local jurisdictions. The State integrates emergency management and homeland security resources to comply with this federal initiative.

**Risk Mapping, Assessment, and Planning (Risk MAP):** Risk Mapping, Assessment, and Planning (Risk MAP) is a new FEMA program that provides communities with flood information and tools they can use to enhance their mitigation plans and better protect their citizens. Through more accurate flood maps, risk assessment tools, and outreach



support, Risk MAP builds on Map Modernization and strengthens local ability to make informed decisions about reducing risk. Risk MAP's ultimate goal is saving lives and dollars. Through collaboration with state, local and tribal entities, Risk MAP focuses on products and services beyond the traditional DFIRM, which is primarily used to set flood insurance rates and communicate 1-percent-annual-chance flood risk. **(See Section 3.9.2 for additional information related to NYS Risk MAP.)**

### **Other Interested Groups, Including Private Non-Profits and Non-Governmental Organizations**

Early in the planning process, the SHMP Team and DHSES identified a list of entities that should be involved in the plan development process, including federal and state agencies, interested groups, private non-profits, and non-governmental organizations. In the first stages of the process, these groups were identified and points of contact defined.

Non-State Agency planning partners and interested groups were invited to participate in a webinar on August 28, 2013. The presentation slides from these webinars and a list of registered participants have been included in **Appendix 2**. All contacts were sent information packets prior to the webinar; **Appendix 2** contains the "Non-State Agency Planning Partners Information Packet" (also referred to as "Participant Guidance"). These packets were utilized as tools to encourage participation in the planning process. The packets facilitated the identification and update of new and current mitigation actions and activities for inclusion in the plan.

Throughout development of the plan, these organizations were asked to provide information and were invited to review and comment on draft sections of the plan.

Several non-governmental organizations and interested groups provided assistance and support throughout development of this plan. **Table 2.2e** provides the list of participating entities for the 2014 SHMP update.



## Section 3.0: HAZARD IDENTIFICATION AND RISK ASSESSMENT

The following requirement(s) are met throughout this section:

**Requirement §201.4(c)(2):** *[The State plan **must** include a risk assessment] that provides the factual basis for activities proposed in the strategy portion of the mitigation plan. Statewide risk assessments must characterize and analyze natural hazards and risks to provide a statewide overview. This overview will allow the State to compare potential losses throughout the State and to determine their priorities for implementing mitigation measures under the strategy, and to prioritize jurisdictions for receiving technical and financial support in developing more detailed local risk and vulnerability assessments.*

**Requirement §201.4(c)(2)(i):** *[The State risk assessment **shall** include an overview of the] location of all natural hazards that can affect the State, including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate ... .*

**Requirement §201.4(c)(2)(ii):** *[The State risk assessment **shall** include an] overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments as well as the State risk assessment. The State **shall** describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events. State owned critical or operated facilities located in the identified hazard areas shall also be addressed ....*

**Requirement §201.4(c)(2)(iii):** *[The State risk assessment **shall** include an] overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State **shall** estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas.*

### INTENT OF SECTION 3:

This Hazard Analysis assesses various risks facing New York State and its communities in order to evaluate and rank them. This process is then used to characterize hazards and their risks for planning purposes. It estimates the probability of occurrence and the severity of consequences for each hazard and provides a method of comparison. The assessment involves many inter-related variables (topography, demographics, development trends, etc.) and should be used by state and local officials in developing a mitigation strategy, goals, objectives and activities that address the natural hazards that



provide the greatest opportunity for loss reduction. In addition, the hazard risk assessment serves as guidance for general preparedness and response planning, including identifying, prioritizing and allocating resources. The information provided in this section identifies and focuses on those hazards with the highest potential for loss.

**This section provides significant background information and guidance on natural hazards in New York State, which will assist in the development of Local Hazard Mitigation Plans (LHMPs) including:**

- List of hazards to be considered by all jurisdictions for mitigation planning
- Methodology for assessing risk and estimating potential losses

### **"Roadmap" Activity<sup>1</sup>**

In addition to the long-term and ongoing multi-hazard and hazard-specific strategies identified in **Section 4**, DHSES will continue to develop this section in key areas, such as integration of over the life cycle of the plan:

- Vulnerability and estimation of losses from local hazard mitigation plans
- Trends in development that potentially impact vulnerability to hazards
- Vulnerability and estimation of losses related to State facilities and critical infrastructure

### **2014 SHMP Update**

This section of the plan uses information from the 2011 State Hazard Mitigation Plan (SHMP) as a foundation for the 2014 update, but is revised and restructured to be consistent with the Standard State Mitigation Plan crosswalk defined by 44 CFR §201.4(c)(2). **All hazards identified within the crosswalk were reviewed based on the following considerations:**

- Applicability to New York State and local jurisdictions
- Opportunity to identify new hazards data and information related to probability, frequency, vulnerability, and loss
- Methodology for a uniform risk assessment process for all-hazards planning

Based on this review, the hazards list was modified as described in **Table 3.1b**. Each hazard was thoroughly researched and updated with the most readily available information, including historical and scientific data. Hazard profiles show expanded information and offer enhanced examples of GIS data to characterize vulnerability. The format for the individual hazard sections was realigned to be consistent with 44CFR, §201.4 crosswalk. In addition, attempts were made throughout the hazard sections to

<sup>1</sup> Roadmap Activities are action items to be developed further during the life-cycle of the plan, through the monitoring, evaluation and update process. The comprehensive list of action items can be found in **Sections 2 and 4**.



streamline information and clarify data to enhance usability of the plan. Data was updated where available, and data limitations and key references are described at the end of Section 3.0 as well as each individual hazard section.

The 2011 plan featured updates of the hazards identified in the 2008 plan. As a result of the 2014 analysis, several hazards included in the 2011 plan as sub-types of other hazards were extracted and placed as stand-alone sections in the 2014 update. In addition, other hazard categories were restructured based on recommendations from FEMA's 2011 plan review, and input from the SHMP Planning Team and other stakeholders. The Flood profile was expanded to include all types of flooding events, including ice jams, and dam- and levee-break flooding. Coastal Erosion was extracted from the 2011 Flood section and developed as a stand-alone hazard section. In addition, Climate Change was identified as a significant hazard and discussion in Section 3.3.1 of the 2011 SHMP is now addressed in Section 3.4 of the 2014 update. This section includes the most recent validated data from multiple sources including scientific climate reports and studies, and provides guidance for the local planning and decision-making processes.

**Summary of changes to the hazards sections includes:**

- The list of 13 hazards identified and assessed in the 2011 Plan is restructured into 15 separate hazards, and one hazard omitted, in order to align more closely with the 44 CFR 201.4 criteria and recommendations from FEMA, State mitigation staff and stakeholder review of the 2011 Plan.
- Climate Change discussion was removed from Section 3.3.1 (2011 Plan) and developed as a new hazard profile and risk assessment.
- Coastal Erosion was removed from the Flood Hazard section and developed as a new hazard profile and risk assessment.
- Avalanche and Tsunami were profiled as new hazards and assessed for probability, vulnerability and potential losses.
- Power Failure was removed as a natural hazard, as it is primarily an impact or consequence of various types of natural and human-caused hazards, and has been integrated into the appropriate hazard sections.
- Updated listing of past Federal Disaster Declarations in New York State
- Updated state vulnerability and loss data
- Referenced *New York State Local Hazard Mitigation Planning Standards (2012)* as a planning tool and resource for developing local Plans
- Review of 56 LHMPs and integration of vulnerability and loss data in the SHMP.



### 3.1 OVERVIEW AND METHODOLOGY

This section describes the general approach used to identify and profile hazards, assess their impacts and vulnerabilities to the state and local communities, and rank the hazards by greatest opportunity for loss reduction.

#### 3.1.1 Identifying Hazards

New York State's large size, varying climate, and substantial population make hazard mitigation essential for sustained quality of life for the citizens of the State. Hazard mitigation begins with *hazard identification*.

A hazard is an act or phenomenon that has the potential to produce harm or other undesirable consequences to a person or thing. Natural hazards can exist with or without the presence of people and land development. However, hazards can be exacerbated by societal behavior and practice, such as building in a floodplain, along a shoreline, or on an earthquake fault. Natural disasters are inevitable, but many impacts of natural hazards can, at a minimum, be mitigated or, in some instances, prevented entirely.

The 2014 hazard review and identification process began with a list of **sixteen** potential hazards to be considered.

**Table 3.1a: Hazards Initially Considered for the 2014 New York State Hazard Mitigation Plan**

Hazard Type	Definitions and Key Terms
<b>Avalanche</b>	A downhill fall of snow: a rapid downhill flow of a large mass of something dislodged from a mountainside or the top of a precipice, especially snow or ice.
<b>Climate Change</b>	An emerging scientific consensus recognizing that the increasing concentration of carbon dioxide in the atmosphere, along with other heat-trapping greenhouse gasses, resulting from the combustion of fossil fuels and other human sources, is warming the planet and changing the climate. Increased impacts and consequences of climate change may include increased severe storms (including flooding and coastal erosion), excessive heat, sea level rise, and heavy demand on energy resources. These and other impacts may be addressed through initiatives related to adaptation and mitigation.
<b>Coastal Erosion (including seiche)</b>	A process whereby large storms, flooding, strong wave action, sea level rise, and human activities, such as inappropriate land use, alterations, and shore protection structures wear away the beaches and bluffs along the U.S. ocean and Great Lakes coastlines. Erosion



Hazard Type	Definitions and Key Terms
	undermines and often destroys homes, businesses, and public infrastructure, and can have long-term economic and social consequences. Similar in motion to a seesaw, a <i>seiche</i> is a standing wave in which the largest vertical oscillations are at each end of a body of water with very small oscillations at the "node," or center point, of the wave. Seiches can form in any enclosed or semi-enclosed body of water, from a massive lake to a small pond and can cause flooding and erosion along the adjacent shorelines.
<b>Drought</b>	A prolonged period with no rain, particularly during the planting and growing season in agricultural areas. Limited winter precipitation accompanied by moderately long periods during the Spring and Summer months can also lead to drought conditions.
<b>Earthquake</b>	The sudden motion or trembling of the ground produced by abrupt displacement of rock material, usually within the upper 10-20 miles of the earth's surface.
<b>Extreme Temperatures (Heat and Cold)</b>	<p><u>Extreme Heat</u>-temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks are defined as extreme heat.</p> <p><u>Extreme Cold</u>-Although no specific definition exists for extreme cold, the following are characteristics of an extreme cold event in New York State: temperatures at or below zero degrees for an extended period of time. Note that extreme cold events are usually part of Winter Storm events, but can occur during anytime of the year and have devastating effects on New York State agricultural production.</p>
<b>Flood</b>	<p>A general and temporary condition of partial or complete inundation on normally dry land from the following:</p> <ul style="list-style-type: none"> <li>• Riverine flooding, including overflow from a river channel, flash floods, alluvial fan floods, mud flows or debris floods;</li> <li>• Ice-jam floods</li> <li>• Dam- and levee break floods</li> <li>• Local drainage or high groundwater levels</li> <li>• Fluctuating lake levels</li> <li>• Coastal flooding</li> </ul>
<b>Hail Storm</b>	Showery precipitation in the form of irregular pellets or balls of ice more than 5 mm in diameter, falling from a cumulonimbus cloud.
<b>High Wind Events (Tornado and Straight Line Winds)</b>	<u>Tornado</u> - is a local atmospheric storm, generally of short duration, formed by winds rotating at very high speeds, usually in a counterclockwise direction in the Northern hemisphere. The vortex, up to several hundred yards wide, is visible to the observer as a



Hazard Type	Definitions and Key Terms
	<p>whirlpool-like column of winds rotating about a hollow cavity or funnel. Top winds have been estimated to be in excess of 300 miles per hour.</p> <p><u>Straight-line wind</u>- is wind that comes out of a thunderstorm. If these winds meet or exceed 58 miles per hours then the storm is classified as severe by the National Weather Service. These winds are produced by the downward momentum in the downdraft region of a thunderstorm. An environment conducive to strong straight-line wind is one in which the updrafts (and downdrafts) are strong, the air is dry in the middle troposphere and the storm has a fast forward motion. Straight-line wind intensity can be as powerful as a tornado. The National Weather Service distinguishes between straight-line wind and wind produced from a tornado when conducting surveys of wind damage.</p>
<p><b>Hurricane (Tropical Cyclones, Coastal Storms, and Nor'easters)</b></p>	<p><u>Tropical Cyclones</u>- form in the atmosphere over warm ocean areas, in which wind speeds reach 74 miles per hour or more and blow in a large spiral around a relatively calm center or "eye". Circulation is counterclockwise in the Northern Hemisphere.</p> <p><u>Coastal Storms</u>- are a disturbance of the stable conditions of the atmosphere with wind (sustained and high gusts) and heavy rain as the dominant meteorological element. Thunder and lightning may also be present. Types of storms include extra-tropical cyclones, in which there is a low central pressure relative to the surrounding pressure that may occur along with the high winds and heavy rains. Impacts can include wind damage, coastal flooding, high tides, coastal and inland erosion, impact to ecosystems, and power failure. Consequences from coastal storms are similar to those experienced in tropical cyclones and may include immediate threats to life, property, environment, and the coastal economy.</p> <p><u>Nor'easters</u>- are coastal storms that occur along the east coast, and are most frequent and strongest between September and April. They typically account for more cumulative damage than hurricanes because they occur more frequently and may last for several days. Although Nor'easters are typically winter storms, they are addressed in this section due to the wind and wave actions similar to other coastal storms. <i>(See also Severe Winter Storms)</i></p>
<p><b>Land Subsidence and Expansive Soils</b></p>	<p><u>Land Subsidence</u>- is depressions, cracks, and sinkholes in the earth's surface which can threaten people and property. Subsidence depressions, which normally occur over many days to a few years,</p>



Hazard Type	Definitions and Key Terms
	<p>may damage structures with low strain tolerances such as dams, factories, nuclear reactors, and utility lines. The sudden collapse of the ground surface to form sinkholes, many yards wide and deep, within the span of a few minutes to a few hours poses immediate threat to life and property.</p> <p><u>Expansive Soils</u>- is any soil that expands when wet and shrinks when dry. Soils are tested using an accepted standard of measurement to determine swell potential. Expansive soils can exert pressures up to 15,000 lbs. per foot causing the breakdown of building foundations and structural integrity. Roadbeds may also be affected, and could lead to avalanche and collapse when cutting into mountains and hillsides.</p>
<b>Landslide</b>	<p>The downward and outward movement of slope-forming materials reacting to the force of gravity. Slide materials may be composed of natural rock, soil, artificial fill, or combinations of these materials. The term landslide is generalized and includes rockfalls, rockslides, block glide, debris slide, earth flow, mud flow, slump, and other such terms that describe mass wasting.</p>
<b>Severe Winter Storm (Snow and Ice)</b>	<p>Includes ice storms and blizzards and can be accompanied by extreme cold. The National Weather Service characterizes blizzards as being combinations of winds in excess of 35 miles per hour with considerable falling or blowing snow, which frequently reduces visibility.</p>
<b>Tsunami</b>	<p>A series of ocean waves generated by a rapid large-scale disturbance of the sea water, tsunamis do not have a season and do not occur regularly or frequently on the east coast. Most tsunamis are generated by earthquakes, but may also be caused by volcanic eruptions, landslides, undersea slumps, or meteor impacts. Tsunami waves radiate outward in all directions from the disturbance and can move across entire ocean basins. A tsunami typically causes the most severe damage and casualties close to its source, where local populations may have little time to react before the waves arrive.</p>
<b>Wildfire</b>	<p>A wildfire is an uncontrolled fire in an area of combustible vegetation that occurs in the countryside or a wilderness area, sometimes in close proximity to development. A wildfire differs from other fires by its extensive size, the speed at which it can spread out from its original source, its potential to change direction unexpectedly, and its ability to jump gaps such as roads, rivers and fire breaks. Wildfires are characterized in terms of the cause of ignition, their physical properties such as speed of propagation, the combustible material present, and the effect of weather on the fire.</p>



Hazard Type	Definitions and Key Terms
<p><b>Volcano</b></p>	<p>A volcano is an opening, or rupture, in the surface or crust of the Earth which allows hot lava, volcanic ash and gases to escape from the magma chamber below the surface. <i>(Volcano was eliminated from any further consideration in the SHMP because there are no historical records of occurrence in the State and the probability is extremely low.)</i></p>

### 3.1.2 Profiling Hazards

In its role as the coordinating agency for the State's Disaster Preparedness Commission (DPC) and for Federal Emergency Management Agency (FEMA) Programs in the State, New York State Department of Homeland Security and Emergency Services (DHSES) has identified multiple natural, technological, and human-caused hazards which have impacted, or have the potential to impact, New York State. However, given the scope of this plan, only natural hazards are addressed in the 2014 SHMP update.

**The process to identify hazards that are relevant to New York State's mitigation planning involved the 2014 SHMP Planning Team and key stakeholders, and included consideration of the following elements:**

- Recent disaster events and incidents for all natural hazards
- Profiles and assessments of the identified hazards by stakeholders
- Other New York State plans and programs that address hazards identified and/or managed by state agencies and authorities
- Hazards identified in current FEMA-approved county mitigation plans
- New data and information that determines hazard probabilities and risk

As new hazards are identified in future updates, they can be added to the hazard list, profiled, assessed for risk, and considered for mitigation potential.

As a result of the extensive research and analysis for the 2014 SHMP update, **fifteen** hazards were identified as relevant for State and Local mitigation planning. Volcano was eliminated for any further consideration because there are no historical records of occurrence in New York State and the probability of volcanic eruption or impact in the state from volcanic eruption in another jurisdiction is extremely low. **Table 3.1b** shows the **fifteen** natural hazards that were addressed in the 2014 SHMP and how and why they were identified. The level of detail provided in each hazard section correlates to the relative level of risk of the hazard and is limited by the type and level of data available.



**Table 3.1b: Natural Hazards Considered for the 2014 SHMP**

<b>Hazard Profile</b>	<b>How Identified</b>	<b>Why Identified</b>
<b>Avalanche</b>	<ul style="list-style-type: none"> <li>▪ NYS Department of Homeland Security and Emergency Services (DHSES)</li> <li>▪ New York State Department of Environmental Conservation (DEC), Division of Forest Protection</li> <li>▪ National Avalanche Center</li> </ul>	<ul style="list-style-type: none"> <li>▪ History of previous localized occurrences</li> <li>▪ Related loss of life from previous occurrences</li> <li>▪ Potential damage to property and/or infrastructure</li> </ul>
<b>Climate Change</b>	<ul style="list-style-type: none"> <li>▪ New York State Department of Environmental Conservation (DEC)</li> <li>▪ New York Energy Research and Development Authority (NYSERDA)</li> <li>▪ New York State Department of State (DOS)</li> <li>▪ DHSES</li> <li>▪ State ad hoc adaptation interagency working group</li> <li>▪ National Oceanic and Atmospheric Administration (NOAA)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential link to occurrences of coastal flooding, erosion, and temperature change</li> <li>▪ Potential impact to health and safety</li> <li>▪ Potential impact to critical energy resources</li> <li>▪ Identified research and planning priority for State agencies (and LHMPs)</li> </ul>
<b>Coastal Erosion</b>	<ul style="list-style-type: none"> <li>▪ DEC Coastal Management Program</li> <li>▪ DOS Coastal Management Program</li> <li>▪ DHSES</li> <li>▪ United States Army Corps of Engineers (USACE)</li> <li>▪ LHMPs</li> </ul>	<ul style="list-style-type: none"> <li>▪ History of previous occurrences</li> <li>▪ Related loss of life</li> <li>▪ Documented damage to natural and built infrastructure</li> <li>▪ High potential loss of critical infrastructure</li> <li>▪ High potential impact to State and local economies</li> <li>▪ Link to climate change indicators</li> </ul>
<b>Drought</b>	<ul style="list-style-type: none"> <li>▪ Drought studies</li> <li>▪ Farm Service Agency</li> <li>▪ National Climatic Data Center (NCDC)</li> <li>▪ National Drought Monitoring Center (NDMC)</li> <li>▪ NYSDEC</li> <li>▪ US Department of Agriculture (USDA)</li> </ul>	<ul style="list-style-type: none"> <li>▪ History of previous occurrences</li> <li>▪ Importance of large water users and agriculture to the state's economy</li> <li>▪ Numerous USDA disaster declarations and state declared disasters and emergencies</li> </ul>



<b>Hazard Profile</b>	<b>How Identified</b>	<b>Why Identified</b>
<b>Earthquake</b>	<ul style="list-style-type: none"> <li>▪ DHSES</li> <li>▪ National Earthquake Hazards Reduction Program (NEHRP)</li> <li>▪ New York State Geological Survey (NYSGS)</li> <li>▪ US Geological Survey (USGS)</li> </ul>	<ul style="list-style-type: none"> <li>▪ History of previous occurrences</li> <li>▪ Potential for significant earthquake losses</li> </ul>
<b>Extreme Temperatures</b>	<ul style="list-style-type: none"> <li>▪ NCDC</li> <li>▪ National Severe Storms Laboratory</li> <li>▪ National Weather Service (NWS), National Oceanic and Atmospheric Administration (NOAA)</li> <li>▪ DHSES</li> <li>▪ Storm Prediction Center, NOAA</li> </ul>	<ul style="list-style-type: none"> <li>▪ History of previous occurrences</li> <li>▪ Potential health and safety issues</li> <li>▪ Link to climate change indicators</li> <li>▪ Potential impact to critical energy infrastructure</li> </ul>
<b>Flood</b>	<ul style="list-style-type: none"> <li>▪ FEMA</li> <li>▪ NCDC</li> <li>▪ DHSES</li> <li>▪ DEC</li> <li>▪ New York State (NYS) Thruway Authority and NYS Canal Corporation</li> <li>▪ USACE</li> <li>▪ USGS</li> </ul>	<ul style="list-style-type: none"> <li>▪ Extensive history of severe riverine flooding</li> <li>▪ High losses from previous floods</li> <li>▪ History of damaging ice jam and flash floods</li> <li>▪ Ongoing, persistent closed basin flooding</li> <li>▪ Numerous dams throughout the state, including 384 high hazard dams</li> <li>▪ Dam maintenance problems and extreme weather events could cause failures</li> <li>▪ History of coastal flooding</li> <li>▪ Numerous Presidential disaster declarations for flooding</li> </ul>
<b>Hailstorm</b>	<ul style="list-style-type: none"> <li>▪ NWS, NOAA</li> <li>▪ NCDC</li> </ul>	<ul style="list-style-type: none"> <li>▪ History of previous localized occurrences</li> <li>▪ Potential health and safety issue</li> <li>▪ Potential for significant damage to property</li> </ul>
<b>High Wind Events</b>	<ul style="list-style-type: none"> <li>▪ NWS, NOAA</li> <li>▪ NCDC</li> </ul>	<ul style="list-style-type: none"> <li>▪ Extensive history of damaging tornadoes, hail, downbursts, lightning, and strong winds throughout the state</li> <li>▪ Numerous Presidential Disaster Declarations for severe storms</li> </ul>



Hazard Profile	How Identified	Why Identified
<b>Hurricane</b>	<ul style="list-style-type: none"> <li>▪ National Hurricane Center, NOAA</li> <li>▪ NWS, NOAA</li> <li>▪ FEMA Disaster Declarations</li> <li>▪ DHSES</li> </ul>	<ul style="list-style-type: none"> <li>▪ Significant history of previous occurrences</li> <li>▪ High potential for loss of life</li> <li>▪ High potential for property damage and loss</li> <li>▪ High potential for infrastructure damage and loss</li> <li>▪ High potential for environmental impacts</li> <li>▪ High potential for economic damage and loss</li> </ul>
<b>Land Subsidence/ Expansive Soils</b>	<ul style="list-style-type: none"> <li>▪ NEHRP</li> <li>▪ NYSGS</li> <li>▪ USGS</li> </ul>	<ul style="list-style-type: none"> <li>▪ History of previous localized occurrences</li> <li>▪ Potential for property damage</li> </ul>
<b>Landslides</b>	<ul style="list-style-type: none"> <li>▪ NYSGS</li> <li>▪ USGS</li> <li>▪ NYSDHSES</li> </ul>	<ul style="list-style-type: none"> <li>▪ History of previous localized occurrences</li> <li>▪ Potential for property damage</li> </ul>
<b>Severe Winter Storms</b>	<ul style="list-style-type: none"> <li>▪ NCDC</li> <li>▪ National Severe Storms Laboratory</li> <li>▪ NWS, NOAA</li> <li>▪ DHSES</li> <li>▪ Storm Prediction Center, NOAA</li> </ul>	<ul style="list-style-type: none"> <li>▪ Significant history of previous occurrences</li> <li>▪ Potential for loss of life</li> <li>▪ Significant impacts to critical infrastructure</li> </ul>
<b>Tsunami</b>	<ul style="list-style-type: none"> <li>▪ 44 Code of Federal Regulations (CFR) §201.4, Standard State Hazard Mitigation Planning Criteria</li> <li>▪ DHSES</li> </ul>	<ul style="list-style-type: none"> <li>▪ Low potential for occurrence based on lack of previous events</li> <li>▪ Potential for loss of life</li> <li>▪ Potential for significant environmental and economic losses</li> </ul>
<b>Wildfire</b>	<ul style="list-style-type: none"> <li>▪ DHSES</li> <li>▪ DEC, Division of Forest Protection</li> </ul>	<ul style="list-style-type: none"> <li>▪ History of previous occurrences</li> <li>▪ Potential for loss of life</li> <li>▪ Potential for environmental impacts</li> </ul>

Although the hazards described in **Table 3.1b** (above) were determined to be relevant to the state as a whole, some may not necessarily pose a significant threat to all areas, regions, counties or local jurisdictions within the state. DHSES recommends that all 15 hazards identified in **Table 3.1b** be initially considered during the local hazard mitigation planning process, but accepts that some hazards relevant at the state level may not need to be fully profiled and assessed for risk in local plans, if it is determined that they present a low probability or risk to the local jurisdiction. Conversely, some hazards considered to be significant by local jurisdictions may be more relevant for preparedness and response actions, and may not present cost effective opportunities for mitigation at the state level.



**Table 3.1c** illustrates the relationship of the **fifteen** hazards identified and addressed in the 2011 SHMP to the realigned hazards in the 2014 update (changes are noted in **Red** font).

2011 HMP (12 hazards)	2014 HMP (15 hazards)
Flood	Flood (sub-types - riverine overbank flooding, flash floods, alluvial fan floods, mudflows or debris floods, ice-jam floods, dam- and levee-break floods, local drainage or high groundwater levels, fluctuating lake levels, and coastal flooding)
Hurricane, Tropical Storm, and Coastal Storm	Hurricane (including Tropical Storm, Coastal Storm, and Nor'easter)
Tornado	High Wind Events (Tornado and Straight-line Winds)
Winter Storm (Severe)	Severe Winter Storm (including Snow and Ice)
Hailstorm	Hailstorm
Wildfire	Wildfire
Drought	Drought
Extreme Temperatures	Extreme Temperatures
Earthquake	Earthquake
Landslide	Landslide
Land Subsidence	Land Subsidence and Expansive Soils
Power Failure (removed with justification)	Coastal Erosion
*Climate Change	Climate Change
	Avalanche
<i>*The 2011 SHMP included a discussion of issues and activities related to this hazard.</i>	Tsunami



### 3.1.3 Previous Occurrences and Probability of Future Events

This section provides a discussion of previous hazard events. This data serves to define historic hazard trends and provides a reference point for understanding the potential impacts from future predicted events. **Reviewing historic data assists in evaluating hazard event profiles, which focus on answering the following questions:**

- How often might a particular disaster occur?
- Where is New York State most likely to be affected?
- What is the potential loss/damage?

The 2014 update provides a percentage for probability/frequency calculated from the Spatial Hazard Events and Losses Database United States (SHELDUS™) for each hazard, where available. This information is included as a means to identify those jurisdictions that have the highest number of previous occurrences as a basis for calculating future probability. In some cases, other accepted methodology has been used to quantify probability for select hazards.

#### Past Major Disaster and Emergency Events

From February 2011 through September 2013, New York State had ten major disasters or emergency declarations related to weather events - hurricanes, tropical storms, severe storms, flooding, tornadoes, and straight-line winds. Between 1956 through 2013, all but five of the disasters or events that were declared major disasters or emergencies have been the result of damages from severe floods, hurricanes, coastal storms, and severe winter storms. The five disaster declarations that do not fall into those categories are: the Love Canal, the World Trade Center Bombing in 1993, the Long Island Wildfires in 1995, the September 11, 2001 Terrorist Attacks, and the April 2002 Earthquake.

Hurricane Sandy struck New York State on October 29, 2012, causing major impacts to the population, property, infrastructure and environment of the state. Specific information related to the impacts, consequences and outcomes from the storm, where available, is included throughout the hazard sections of this plan; however, quantitative information related to total costs and detailed losses have not yet been fully compiled into national databases. Additional information describing impacts from Hurricane Sandy are described in the featured box below.



### Hurricane Sandy Summary<sup>2</sup>

On October 29, 2012, Hurricane Sandy made landfall in the New York City metropolitan area producing record storm surge, flooding, and wind damage. Tragically, 60 New Yorkers lost their lives as a result of the storm. Millions in the region were also impacted by flooded streets, water systems, and subways; loss of power to more than 2 million homes; and thousands of housing units were damaged and hundreds of homes destroyed.

On coastal Long Island, flood waters downed trees and inundated entire neighborhoods, creating 6 million cubic yards of debris. In Breezy Point, Queens, several explosions and fires erupted, destroying more than 80 homes in a small neighborhood.

In advance of the storm, the State, New York City, and numerous local Emergency Operations Centers (EOCs) were activated to prepare for this event and to pre-position critical supplies and assets. Over 400,000 New Yorkers were also evacuated pre-storm, before the mass transit system was shut down and several key bridges were closed.

Thousands of emergency personnel were deployed to the impacted area, including National Guard Troops, State Police, DHSES personnel, and over 1,200 citizen volunteers. In response to Sandy, more than 147 shelters were operating at the peak of the response and over 2 million meals were served or delivered. 63 Disaster Assistance Centers were opened, registering over 260,000 claims totaling over \$800 million in damages. Disaster unemployment claims totaled over \$1.7 million.

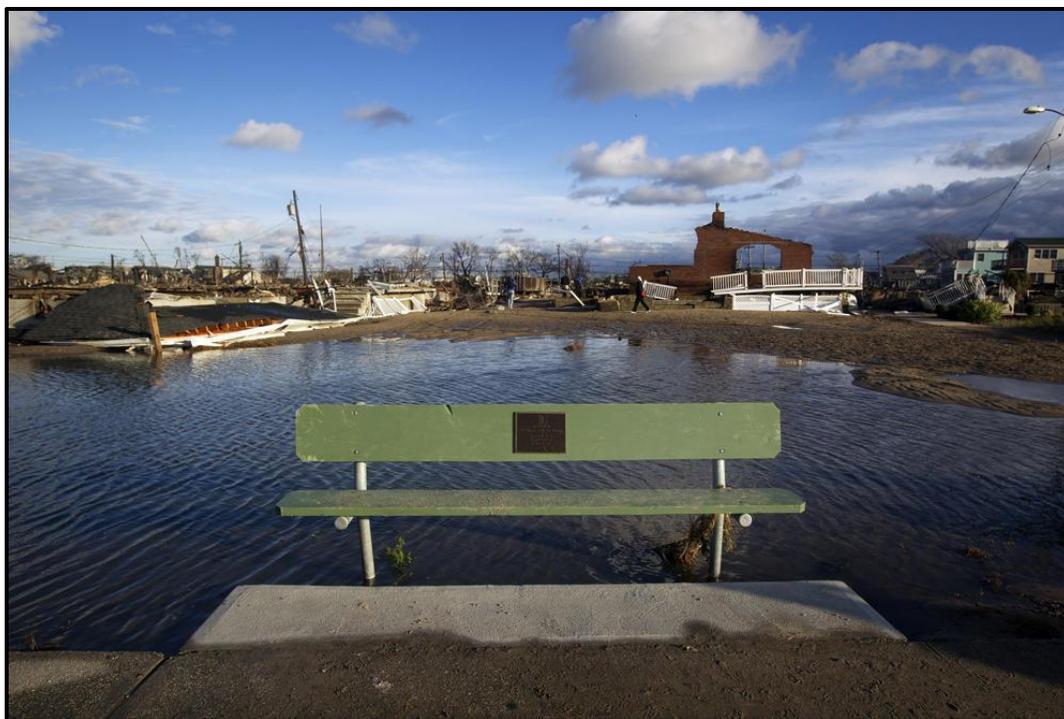
Hurricane Sandy damaged critical infrastructure such as hospitals, wastewater treatment facilities, mass transit (subways/tunnels), and roads and bridges in its path across New York City, Long Island, and multiple other counties. Overall, 14 counties were included in New York's Presidential Disaster Declaration for Public Assistance totaling over 1,600 applicants and costs of over \$3 billion dollars. *[NOTE: The number of applicants and total costs are not yet fully documented.]*

The effects of Hurricane Sandy will affect New York State for years to come; in particular, long-term housing and other recovery efforts will be a particularly challenging issue. In order to prepare for future catastrophic events, Governor Cuomo convened three task forces: The NYS Ready Commission, NYS Respond Commission, and the Moreland Commission (to review and make recommendations on utilities' preparations for and response to Sandy). The initial reports of these Commissions have been released and the State is beginning to take actions to address the recommendations put forth by the Commissions.

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<sup>2</sup> New York State Threat/Hazard Identification and Risk Assessment (THIRA)





*A bench sits in front of the wreckage of homes devastated by fire and the effects of Hurricane Sandy in Breezy Point, Queens, NY. October 31, 2012 (Reuters/Shannon Stapleton)*



*A bench sits in front of homes under construction in Breezy Point, Queens, NY a year after Hurricane Sandy devastated the area. October 10, 2013 (Gordon Donovan /Yahoo News)*



**Table 3.1d** and **Figure 3.1a** provide a listing and map of New York's major disaster and emergency declarations. The disaster history demonstrates the wide variety of disaster types and locations where disasters have occurred in the State. Following many of these disasters, especially since 1996, post-disaster strategy reports were prepared. These reports, among other things, identify the hazards which caused the disasters or emergencies, assess the severity of the events and the factors contributing to the severity, and make recommendations for the implementation of mitigation and other emergency management actions. As appropriate, elements of these reports were used in the development of the State's Hazard Mitigation Plan. The losses attributed to the listed events range from minor property damage such as stream bank erosion and basement flooding, to catastrophic and devastating losses, such as loss of human life and destruction of many homes and businesses, resulting in severe regional and statewide economic impact.

**Table 3.1d: Previous Occurrences – Federally Declared Disasters (1954-2013)**

Disaster Number	Date Declared	Year	Incident Description	Declaration Type
4129	7/12/2013	2013	Severe Storms and Flooding	Major Disaster Declaration
4111	4/23/2013	2013	Severe Winter Storm and Snowstorm	Major Disaster Declaration
4085	10/30/2012	2012	Hurricane Sandy	Major Disaster Declaration
3351	10/28/2012	2012	Hurricane Sandy	Emergency Declaration
4031	9/13/2011	2011	Remnants of Tropical Storm Lee	Major Disaster Declaration
3341	9/8/2011	2011	Remnants of Tropical Storm Lee	Emergency Declaration
4020	8/31/2011	2011	Hurricane Irene	Major Disaster Declaration
3328	8/26/2011	2011	Hurricane Irene	Emergency Declaration
1993	6/10/2011	2011	Severe Storms, Flooding, Tornadoes, and Straight-line Winds	Major Disaster Declaration
1957	2/18/2011	2011	Severe Winter Storm and Snowstorm	Major Disaster Declaration
1943	10/14/2010	2010	Severe Storms, Tornadoes, and Straight-line Winds	Major Disaster Declaration



<b>Disaster Number</b>	<b>Date Declared</b>	<b>Year</b>	<b>Incident Description</b>	<b>Declaration Type</b>
1899	4/16/2010	2010	Severe Storms and Flooding	Major Disaster Declaration
1869	12/31/2009	2009	Severe Storms and Flooding Associated with Tropical Depression Ida and a Nor'easter	Major Disaster Declaration
1857	9/1/2009	2009	Severe Storms and Flooding	Major Disaster Declaration
1827	3/4/2009	2009	Severe Winter Storm	Major Disaster Declaration
3299	12/18/2008	2008	Severe Winter Storm	Emergency Declaration
1724	8/31/2007	2007	Severe Storms, Flooding, and Tornado	Major Disaster Declaration
1710	7/2/2007	2007	Severe Storms and Flooding	Major Disaster Declaration
1692	4/24/2007	2007	Severe Storms and Inland and Coastal Flooding	Major Disaster Declaration
3273	2/23/2007	2007	Snow	Emergency Declaration
1670	12/12/2006	2006	Severe Storms and Flooding	Major Disaster Declaration
1665	10/24/2006	2006	Severe Storms and Flooding	Major Disaster Declaration
3268	10/15/2006	2006	Snowstorm	Emergency Declaration
1650	7/1/2006	2006	Severe Storms and Flooding	Major Disaster Declaration
3262	9/30/2005	2005	Hurricane Katrina Evacuation	Emergency Declaration
1589	4/19/2005	2005	Severe Storms and Flooding	Major Disaster Declaration
1564	10/1/2004	2004	Severe Storms and Flooding	Major Disaster Declaration
1565	10/1/2004	2004	Tropical Depression Ivan	Major Disaster Declaration
1534	8/3/2004	2004	Severe Storms and Flooding	Major Disaster Declaration
3195	3/3/2004	2004	Snow	Emergency Declaration



<b>Disaster Number</b>	<b>Date Declared</b>	<b>Year</b>	<b>Incident Description</b>	<b>Declaration Type</b>
1486	8/29/2003	2003	Severe Storms, Tornadoes and Flooding	Major Disaster Declaration
3186	8/23/2003	2003	Power Outage	Emergency Declaration
1467	5/12/2003	2003	Ice Storm	Major Disaster Declaration
3184	3/27/2003	2003	Snowstorm	Emergency Declaration
3173	2/25/2003	2003	Snowstorm	Emergency Declaration
1415	5/16/2002	2002	Earthquake	Major Disaster Declaration
1404	3/1/2002	2002	Snowstorm	Major Disaster Declaration
3170	12/31/2001	2001	Snowstorm	Emergency Declaration
1391	9/11/2001	2001	Terrorist Attack	Major Disaster Declaration
3157	12/4/2000	2000	Snow Storm	Emergency Declaration
3155	10/11/2000	2000	Virus Threat	Emergency Declaration
1335	7/21/2000	2000	Severe Storms	Major Disaster Declaration
1296	9/19/1999	1999	Hurricane Floyd	Major Disaster Declaration
3149	9/18/1999	1999	Hurricane Floyd	Emergency Declaration
2269	8/9/1999	1999	West Point Fire Complex	Fire Management Assistance Declaration
3138	3/10/1999	1999	Winter Storm	Emergency Declaration
3136	1/15/1999	1999	Winter Storm	Emergency Declaration
1244	9/11/1998	1998	Severe Storms	Major Disaster Declaration
1233	7/7/1998	1998	Severe Storms and Flooding	Major Disaster Declaration
1222	6/16/1998	1998	New York Severe Thunderstorms and Tornadoes	Major Disaster Declaration



<b>Disaster Number</b>	<b>Date Declared</b>	<b>Year</b>	<b>Incident Description</b>	<b>Declaration Type</b>
<b>1196</b>	1/6/1998	1998	Severe Winter Storms	Major Disaster Declaration
<b>1148</b>	12/9/1996	1996	Severe Storms/Flooding	Major Disaster Declaration
<b>1146</b>	11/19/1996	1996	Severe Storms/Flooding	Major Disaster Declaration
<b>1095</b>	1/24/1996	1996	Severe Storms/Flooding	Major Disaster Declaration
<b>1083</b>	1/12/1996	1996	Blizzard	Major Disaster Declaration
<b>2115</b>	8/25/1995	1995	Sunrise Complex	Fire Management Assistance Declaration
<b>984</b>	4/2/1993	1993	World Trade Center Explosion	Major Disaster Declaration
<b>3107</b>	3/17/1993	1993	Severe Blizzard	Emergency Declaration
<b>974</b>	12/21/1992	1992	Coastal Storm, High Tides, Heavy Rain, Flooding	Major Disaster Declaration
<b>918</b>	9/16/1991	1991	Hurricane Bob	Major Disaster Declaration
<b>898</b>	3/21/1991	1991	Severe Storm, Winter Storm	Major Disaster Declaration
<b>801</b>	11/10/1987	1987	Severe Winter Storm	Major Disaster Declaration
<b>792</b>	5/15/1987	1987	Flooding	Major Disaster Declaration
<b>750</b>	10/18/1985	1985	Hurricane Gloria	Major Disaster Declaration
<b>734</b>	3/22/1985	1985	Snow Melt, Ice Jams	Major Disaster Declaration
<b>733</b>	3/20/1985	1985	Flooding	Major Disaster Declaration
<b>725</b>	9/25/1984	1984	Severe Storms, Flooding	Major Disaster Declaration
<b>702</b>	4/17/1984	1984	Coastal Storm, Flooding	Major Disaster Declaration
<b>3080</b>	5/21/1980	1980	Chemical Waste, Love Canal	Emergency Declaration



<b>Disaster Number</b>	<b>Date Declared</b>	<b>Year</b>	<b>Incident Description</b>	<b>Declaration Type</b>
3066	8/7/1978	1978	Chemical Waste, Love Canal	Emergency Declaration
527	2/5/1977	1977	Snowstorms	Major Disaster Declaration
3027	1/29/1977	1977	Snowstorms	Emergency Declaration
520	9/3/1976	1976	Hurricane Belle	Major Disaster Declaration
515	7/21/1976	1976	Severe Storms, Flooding	Major Disaster Declaration
512	6/29/1976	1976	Flash Flooding	Major Disaster Declaration
494	3/19/1976	1976	Ice Storm, Severe Storms, Flooding	Major Disaster Declaration
487	10/2/1975	1975	Severe Storms, Heavy Rain, Landslides, Flooding	Major Disaster Declaration
3004	11/2/1974	1974	Flooding (NYS Barge Canal)	Emergency Declaration
447	7/23/1974	1974	Severe Storms, Flooding	Major Disaster Declaration
401	7/20/1973	1973	Severe Storms, Flooding	Major Disaster Declaration
367	3/21/1973	1973	High Winds, Wave Action, Flooding	Major Disaster Declaration
338	6/23/1972	1972	Tropical Storm Agnes	Major Disaster Declaration
311	9/13/1971	1971	Severe Storms, Flooding	Major Disaster Declaration
290	7/22/1970	1970	Heavy Rains, Flooding	Major Disaster Declaration
275	8/26/1969	1969	Heavy Rains, Flooding	Major Disaster Declaration
233	10/30/1967	1967	Severe Storms, Flooding	Major Disaster Declaration
204	8/18/1965	1965	Water Shortage	Major Disaster Declaration
158	8/23/1963	1963	Heavy Rains, Flooding	Major Disaster Declaration



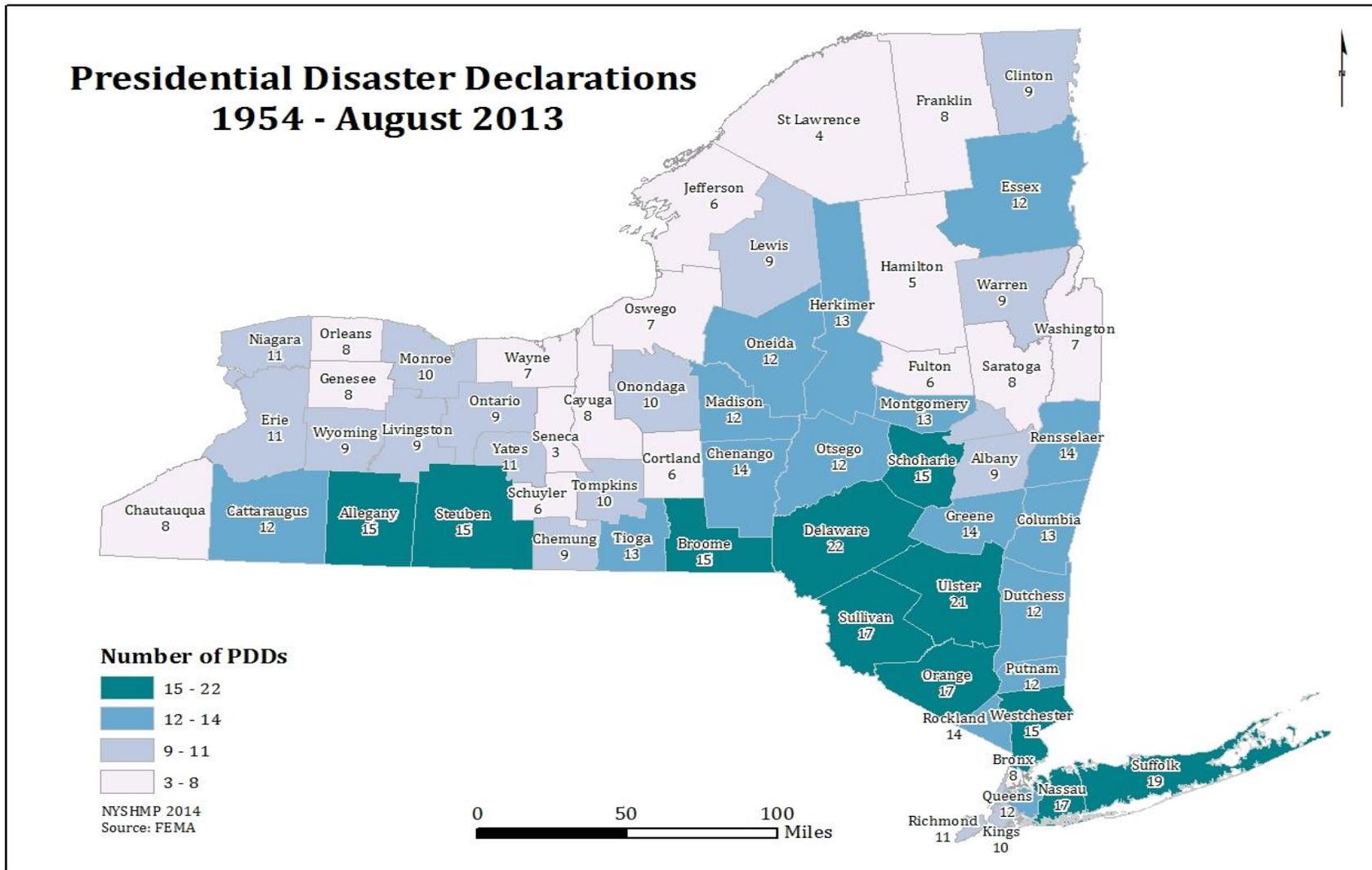
Disaster Number	Date Declared	Year	Incident Description	Declaration Type
129	3/16/1962	1962	Severe Storm, High Tides, Flooding	Major Disaster Declaration
52	3/29/1956	1956	Flood	Major Disaster Declaration
45	8/22/1955	1955	Hurricane, Floods	Major Disaster Declaration
26	10/7/1954	1954	Hurricane	Major Disaster Declaration

Source: FEMA

**Figure 3.1a** shows the number of PDDs by county for the period of 1954 through August 2013. Counties in the southern part of New York show the highest totals, with Delaware, Ulster, and Suffolk Counties having the greatest number of PDDs for the State.



**Figure 3.1a: Number of Presidential Disaster Declarations, By County (1954-2013)**



**Table 3.1e** provides a summary of the number of all hazard events, by county, for the period 1960 to 2012.<sup>3</sup> This information can be used in development of local plans to help prioritize hazards.

**Table 3.1e: Summary of Hazard Events, By County (1960 - 2012)**

County	Total Events	Coastal	Drought	Earth-quake	Extreme Temps	Flood	Hail	High Wind	Hurricane	Winter Storm
Albany	516	0	3	41	8	64	42	159	4	195
Allegany	425	0	0	0	1	57	32	183	1	151
Bronx	225	3	0	0	13	37	26	72	9	65
Broome	601	0	3	0	7	126	37	252	2	174
Cattaraugus	684	0	0	0	17	77	54	255	1	280
Cayuga	567	0	2	0	3	36	40	207	2	277
Chautauqua	765	4	0	0	1	75	58	324	1	302
Chemung	363	0	2	0	3	52	34	140	2	130
Chenango	592	0	2	0	6	91	36	235	2	220
Clinton	702	0	1	15	22	87	42	217	1	317
Columbia	430	0	3	0	3	54	45	168	4	153
Cortland	522	0	3	0	6	62	29	185	2	235
Delaware	536	0	4	0	6	90	36	216	2	182
Dutchess	480	0	3	6	6	56	46	201	5	157
Erie	823	7	0	6	1	104	78	328	1	298
Essex	707	0	1	19	21	116	29	194	1	326
Franklin	645	0	1	13	24	45	34	203	1	324
Fulton	464	0	3	4	8	42	33	150	2	222

<sup>3</sup> Source: SHEL DUS. Hurricane Sandy data is not yet included in SHEL DUS data.



County	Total Events	Coastal	Drought	Earth-quake	Extreme Temps	Flood	Hail	High Wind	Hurricane	Winter Storm
Genesee	424	0	0	0	2	43	37	158	1	183
Greene	423	0	3	0	4	69	40	125	4	178
Hamilton	421	0	3	7	7	29	28	106	2	239
Herkimer	583	0	3	1	15	85	34	167	3	275
Jefferson	560	0	2	1	2	34	34	211	2	274
Kings	235	4	0	0	15	34	26	83	9	64
Lewis	615	0	2	4	2	49	37	188	2	331
Livingston	392	0	0	6	1	41	33	156	1	154
Madison	497	0	3	0	4	36	31	160	2	261
Monroe	515	0	0	0	1	63	57	204	1	189
Montgomery	496	0	3	0	9	65	38	156	3	222
Nassau	296	13	0	0	6	42	26	134	10	65
New York	251	5	0	2	20	36	26	94	7	61
Niagara	541	1	0	4	1	42	66	246	1	180
Oneida	745	0	4	0	4	70	46	302	2	317
Onondaga	499	0	2	0	7	37	36	202	2	213
Ontario	396	0	0	0	1	44	40	155	2	154
Orange	408	1	2	12	6	43	32	171	6	135
Orleans	379	0	0	0	2	32	39	139	1	166
Oswego	704	0	2	0	4	36	49	239	2	372
Otsego	616	0	4	2	7	62	31	255	2	253
Putnam	293	1	2	4	6	34	27	87	8	124
Queens	284	13	0	0	18	40	28	112	8	65
Rensselaer	467	0	3	0	7	62	55	190	4	146



County	Total Events	Coastal	Drought	Earth-quake	Extreme Temps	Flood	Hail	High Wind	Hurricane	Winter Storm
Richmond	193	2	0	0	7	30	24	63	7	60
Rockland	231	1	1	2	5	32	25	74	8	83
Saratoga	558	0	2	1	10	58	53	227	4	203
Schenectady	421	0	2	2	7	49	42	121	3	195
Schoharie	474	0	3	2	8	60	38	134	2	227
Schuyler	305	0	2	0	4	32	29	103	2	133
Seneca	321	0	2	0	3	26	27	112	2	149
St Lawrence	717	0	3	6	22	41	32	237	2	374
Steuben	408	0	1	2	3	65	33	185	2	117
Suffolk	317	14	0	1	5	39	26	151	11	70
Sullivan	434	0	4	0	6	69	31	179	3	142
Tioga	451	0	3	0	6	74	31	151	2	184
Tompkins	364	0	2	0	4	34	33	146	2	143
Ulster	505	0	3	0	5	87	41	189	5	175
Warren	437	0	2	4	10	55	38	135	3	190
Washington	423	0	2	2	7	52	41	164	2	153
Wayne	508	0	1	0	2	40	56	179	2	228
Westchester	336	2	1	13	7	41	26	150	7	89
Wyoming	464	0	0	7	1	43	37	156	1	219
Yates	275	0	1	0	1	25	30	103	2	113
<b>Total</b>	<b>29,229</b>	<b>71</b>	<b>104</b>	<b>189</b>	<b>430</b>	<b>3,351</b>	<b>2,320</b>	<b>10,688</b>	<b>200</b>	<b>11,876</b>

Source: SHELUS



**Probability of Future Hazard Events**

The hazards covered in the analysis are listed in **Table 3.1f**, along with the probability/frequency ratings, which have been validated by DHSES. The hazards listed are those that have been experienced by, or pose a potential threat to, New York State. However, local or isolated incidents that constitute potential disasters should not be overlooked. The ratings are situationally dependent.

**The following criteria describe the probability/frequency ratings for each hazard:**

- Rare Event (less than once every 50 years)
- Infrequent (once every 8-50 years)
- Regular (once every 1-7 years)
- Frequent (more than once a year)

For the 2014 SHMP update, probabilities are based on the typical period of record (52 years, or 1960 - 2012) for hazard occurrences. It is acknowledged that a much longer period of record is required for more accurate statistical reporting; however, this time frame is the most consistent currently available for the majority of hazards. Pre-1960 data is also often considered to be less reliable or accurate due to quality of record-keeping.

**Table 3.1f: Natural Hazards Profiled in the All-Hazards Mitigation Plan**

<b>Natural Hazards</b>	<b>Probability/Frequency</b>
<b>Avalanche</b>	Infrequent
<b>Climate Change</b>	Regular
<b>Coastal Erosion</b>	Regular
<b>Drought</b>	Infrequent
<b>Earthquake</b>	Infrequent
<b>Extreme Temperatures</b>	Regular
<b>Flood</b>	Regular
<b>Hailstorm</b>	Regular
<b>High Winds</b>	Regular
<b>Hurricane</b>	Regular
<b>Land Subsidence/Expansive Soils</b>	Rare event
<b>Landslide</b>	Rare event
<b>Severe Winter Weather</b>	Regular
<b>Tsunami</b>	Rare Event
<b>Wildfire</b>	Infrequent



### 3.1.4 Assessing Vulnerability – Overview

Vulnerability is discussed within each hazard section that is fully assessed for risk and potential losses, and will provide an overview and analysis of the State’s vulnerability to the hazards. This will serve to describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events. The overview of the vulnerability analysis was completed using a variety of methods, including, Hazus-MH, other GIS-based risk modeling, and statistical analysis of exposure, census data, and past historic losses of state facilities and information from local FEMA-approved hazard mitigation plans.

The 2014 update provided the opportunity for additional research related to the locations of jurisdictions most threatened and vulnerable to hazard occurrences. A significant omission of data available during the 2014 update planning period was that related to Hurricane Sandy. Because New York State is still in the recovery phase from this significant event, a full summary of the impacts, losses and mitigation opportunities from Hurricane Sandy will be added with the next update.

#### Methodology

Individual hazard profiles within this section include information related to general characteristics, location, previous occurrences, probability for future events, and severity based on impact and consequences to people, property, critical infrastructure, environment, and economy.

Each hazard profile section is followed by an analysis of probability/frequency in order to quantify the potential impact and consequences of the hazard. Based on the outcome of the hazard ranking process, “HAZNY-Mitigation”, some hazards were determined to be of low probability and severity and further assessment of vulnerability and losses was not conducted. (See **Section 3.1.11** for a complete description of the HAZNY-Mitigation ranking process.)

For this update, three primary methodologies were chosen to ensure that a comprehensive compilation of probability, vulnerability and loss data was achieved. In addition, other information sources were reviewed and incorporated, as appropriate. The New York State Threat/Hazard Identification and Risk Assessment (THIRA), June 2013, was analyzed for additional information that could inform the hazards analysis process; however, the THIRA document focuses primarily on human-caused hazards. One capability target identified in the THIRA related to natural hazard mitigation. This was the “Threat and Hazard Identification” capability that noted that a threat/hazard identification should be conducted annually at the state level and every three to five years at the local level, which is consistent with the hazard mitigation planning and maintenance cycle.



Extensive GIS data derived from national state, regional, and local sources were utilized. Updated data sets from all FEMA-approved county-level and multi-jurisdictional mitigation plans were incorporated with existing statewide data sets, where available. Hazus-MH was used for specific hazards such as hurricane and earthquake to quantify potential loss estimates. In addition to geographic data, information for this update was compiled by the SHMP Planning Team from stakeholder agencies, including federal, state, regional and local entities, to ensure the most current and accurate information was obtained. In some instances, comprehensive data sets that were included in the 2011 plan were moved to **Appendix 3: Data Supplement** and were updated and summarized in tables or maps in the 2014 SHMP to enhance clarity related to hazard risk, vulnerability and estimated losses. Additional information is available in the appendices of this plan.

### *Methodology 1 – GIS Baseline Datasets*

Geographic Information Systems (GIS) has become an accepted method of conducting spatial analysis of relationships between data. New York State agencies and key stakeholder groups have widely adopted GIS as the primary system to manage, analyze, and visualize spatial information. GIS enables the ability to see or visualize data in the form of a map, providing an effective way to comprehend information in a way that tabular or text based information alone cannot provide.

The New York State GIS Coordination Program provides access to an extensive repository of useful GIS data as well as a host of technical resources, references, and training opportunities that can facilitate the hazard mitigation planning. Counties and local governments can access the NYS GIS Clearinghouse by enrolling in the New York State GIS Data Sharing Cooperative. Many of the datasets used in this plan are accessible through this site. These include, among other datasets, the NYS Office of Real Property property parcels and the FEMA Q3 digital floodplain data used in the 100-year floodplain property exposure analysis.

Like many activities of government, successful hazard mitigation requires an understanding of geography, including knowledge of the spatial relationships between hazards and the population and property at risk. GIS can be used to help define the location and extent of hazardous areas, which is a requirement of the hazard mitigation plan (§201.4(c)(2)(i)). An example of using GIS for hazard identification is demonstrated by the “Landslide Susceptibility Pilot Study of Schenectady County, NY” found in Section 3.13 of this document. The technology can be used to identify and estimate potential damages to the property and populations exposed in these hazardous areas. An example of the use of GIS for natural hazard vulnerability analysis is demonstrated in this plan’s “100-Year Floodplain Property Exposure Analysis” in the risk analysis of the Section 3.9 – Flood.

The role of GIS in the hazard mitigation plan is primarily for risk assessment in each hazard section. In addition to the landslide hazard identification and 100-year floodplain property



vulnerability analysis examples, GIS is used extensively in the risk assessment sections for earthquakes, hurricanes, winter storms, coastal erosion, and extreme heat.

DHSES GIS office has assisted in compiling data from multiple levels of government. Identification of GIS resources in local mitigation plans will assist in continuing to identify, validate, and map hazard data at the State level.

**Three critical GIS resources that assisted in developing and updating the SHMP include:**

- 1) New York State GIS Coordination Program and the associated New York State GIS Clearinghouse: <http://www.nysgis.state.ny.us/>
- 2) Hazus-MH, FEMA's GIS based software program for estimating potential losses to earthquakes, wind and floods:  
<http://www.fema.gov/plan/prevent/hazus/index.shtm>  
<http://www.hazus.org/>
- 3) Data obtained from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™). SHELDUS is a county-level hazard data set for the U.S. for 18 different natural hazard event types such as thunderstorms, hurricanes, floods, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data derives from the national data source, National Climatic Data Center's monthly Storm Data publications. Using the latest release of SHELDUS™ 12.0, the database includes every loss causing and/or deadly event between 1960 through 1992 and from 1995 onward. Between 1993 and 1995, SHELDUS™ reflects only events that caused at least one fatality or more than \$50,000 in property or crop damages.

***Methodology 2 – Hazus-MH2***

FEMA has developed Hazus-MH as its primary, nationally standardized tool for hazard mitigation risk assessment. At this time Hazus-MH can be used for earthquake, hurricane winds, or flooding scenarios. Hazus-MH is a loss-estimation software program built upon an integrated GIS platform. The software enables both deterministic (e.g. user determines location for various scenarios) and probabilistic modeling (e.g. calculates annualized potential losses for earthquake (seismic), hurricane wind, or flooding hazards within a community).

Hazards such as dam and levee failure, landslides and expansive soils, geographic locations of areas at risk to the hazard are known. However, these hazards are outside the scope of Hazus-MH. For these hazards, the known locations of areas at risk are mapped utilizing GIS to show areas of the State at greatest risk.



### **Methodology 3 – Local Plan Integration**

The process to update the SHMP for 2014 included a full review and assessment of FEMA-approved county mitigation plans, including the multi-jurisdictional plan for New York City. This assessment included identifying hazards consistent with the SHMP, significant vulnerabilities to specific hazards, and potential loss estimates, if available, by county. In addition, county plans were reviewed to determine specific threats related to changes in development.

Review of 56 FEMA-approved plans noted that no single method of analysis was used throughout all LHMPs to identify hazards by priority based on previous occurrences, probability, and severity. While some plans used the state’s HAZNY methodology to rank hazards in a quantifiable manner, and categorize them as high, moderate, or low, some jurisdictions did not perform an analysis for the purpose of ranking each hazard. **Consequently, vulnerability of jurisdictions was determined for the 2014 update by the considering the following points:**

1. Which hazards did the jurisdiction address?
2. Was the county included in previous Federal Disaster Declarations (for Public Assistance) for this hazard? If so, how many, and for which hazards?
3. Did the jurisdiction identify specific vulnerabilities that were quantified, such as total number of population at risk, total value of property at risk, total value of potential economic loss, and/or critical infrastructure at risk?

The method used to incorporate this information in the 2014 SHMP update began with identifying the hazards identified and/or ranked in each county plan. Then the total number of disaster declarations by county was identified. Based on the hazards ranked as “high” or “moderately high” in each county plan, and the counties with the highest number of declarations for that hazard, specific county plans were reviewed to identify vulnerabilities or losses presented in the plans. It should be noted that the information provided in the individual county plans has not been verified beyond review of the most current and available FEMA-approved plans. As hazard mitigation planning matures as a practice and the local plans are updated and enhanced over time, the risk assessment methodologies and results are expected to continually improve.

Local jurisdictions should, at a minimum, include a full profile for all state-identified hazards in the local plan to the extent of their vulnerability to such hazards. If a hazard is omitted from a local plan, a justification should be written into the local plan explaining the reason why it was omitted. **For local mitigation plans, it is recommended that when determining the overall vulnerability related to a hazard, the jurisdiction should conduct a risk assessment evaluating the:**

1. Likelihood and frequency of an event occurring



2. Impact on the population
3. Impact on property within the jurisdiction
4. Impact on the environment
5. Potential economic losses

This methodology is consistent with the state's HAZNY ranking assessment and the modified HAZNY-Mitigation ranking process used for the 2014 SHMP update.

### **Consideration of Exposure of Cultural and Historic Sites**

Historical and cultural sites are significant to the history and identity of the state and its residents. Many of these sites are in areas vulnerable to impact from specific hazards such as flooding, hurricanes, and earthquakes. Although these sites are not addressed from a site-specific perspective within each hazard profile or vulnerability assessment in the 2014 SHMP update, they should be considered in state and local mitigation planning, especially in the context of pre- and post-disaster plans, actions, and activities. Plans should focus on protecting these unique sites and objects from destruction by hazards and from subsequent cascading effects of the hazards after the events. Although the New York State Department of Parks, Recreation and Historic Preservation (DPRHP) is the lead state agency responsible for designation and protection of these sites, regulatory policies that address appropriate protection and mitigation measures are generally the responsibility of local governments working in coordination with the state. Numerous resources are available to guide integration of cultural and historic sites and issues into mitigation planning.

### **Impacts and Consequences Summary**

Many natural hazards create conditions and consequences that result in cascading or secondary effects from additional hazards. The matrix illustrated in Table 3.1g shows the relationship between identified hazards and possible cascading or secondary effects from the primary hazards.



**Table 3.1g: Primary Hazards and Consequences/Cascading Effects\***

Primary Hazards	Structural Damage	Utility Outage	Chemical Release/Spill	Commodity Shortage	Emergency Comm. Failure	Erosion	Structural Fire	Environmental Impact	Economic -Direct or Indirect	Disease/Public Health	Impact to Responders and/or Program Operation	Flooding	Landslide	Dam/Levee Failure	Storm Surge	Tornado	Wildfire	Hail	Tsunami	
Hurricane/TS/Nor'Easter	X	X	X	X	X	X	X	X	X	X	X	X			X	X				
Climate Change	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X		
Flooding - Coastal	X	X	X			X	X	X	X	X	X	X	X							
Flooding - Inland	X	X	X			X		X		X	X		X	X						
Flooding - Ice Jam	X							X				X		X						
High Winds/Tornado	X	X	X																	
Earthquake	X	X	X	X	X		X		X	X	X		X	X						X
Coastal Erosion	X					X		X	X			X	X							
Extreme Temperatures								X	X	X										
Drought				X				X	X	X										
Severe Winter Storm	X	X		X	X		X													
Wildfire	X						X	X					X							
Tsunami	X	X	X	X		X				X		X								
Hailstorm								X												
Avalanche	X																			
Landslide	X					X														
Land Subsidence/Expansive Soils	X																			

\*Hazard Ranking colors: red = high; orange = moderate; yellow = low

### 3.1.5 Assessing Vulnerability by Jurisdiction

This section discusses the impacts and consequent vulnerabilities from each hazard and how it may affect the State’s population, property and infrastructure, environment, and economy.

**Information addressed in each section includes:**

- State’s vulnerability based on estimates provided in local and state risk assessments
- State’s vulnerability in terms of jurisdictions most threatened and most vulnerable to damage and loss associated with the hazard
- Information from relevant local risk assessments
- Changes in development for jurisdictions in hazard prone areas

An example of data sources for county-level information related to vulnerability is displayed in **Table 3.1h**, which provides a comprehensive listing of Disaster Declaration between 2010-2013, all counties included in the declaration, and the total Public Assistance costs, by county.



**Table 3.1h: Counties Included in Major Disaster Declarations and Total Public Assistance Costs (2010 - 2013)**

Disaster Number	Date Declared	Year	Incident Description	Declaration Type	Counties Designated for Public Assistance	Total Public Assistance
4129	7/12/2013	2013	Severe Storms and Flooding	Major Disaster Declaration	Allegany, Broome , Chautauqua, Chenango, Clinton, Cortland, Delaware, Essex, Franklin, Herkimer, Madison, Montgomery, Niagara, Oneida, Otsego and Warren	\$3,842
4111	4/23/2013	2013	Severe Winter Storm and Snowstorm	Major Disaster Declaration	Suffolk	\$7,866,804
4085	10/30/2012	2012	Hurricane Sandy	Major Disaster Declaration	Bronx , Green , Kings, Nassau, New York, Orange , Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster and Westchester	\$1,815,377,514
3351	10/28/2012	2012	Hurricane Sandy	Emergency Declaration	Albany , Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saint Lawrence, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, and Yates	N/A



Disaster Number	Date Declared	Year	Incident Description	Declaration Type	Counties Designated for Public Assistance	Total Public Assistance
4031	9/13/2011	2011	Remnants of Tropical Storm Lee	Major Disaster Declaration	Broome, Chemung, Chenango, Delaware, Herkimer, Montgomery, Oneida, Orange, Otsego, Schenectady, Schoharie, Tioga, Tompkins and Ulster	\$213,234,221
3341	9/8/2011	2011	Remnants of Tropical Storm Lee	Emergency Declaration	Albany, Broome, Chemung, Chenango, Delaware, Greene, Herkimer, Montgomery, Oneida, Otsego, Rensselaer, Schenectady, Schoharie, Sullivan and Tioga	\$3,194
4020	8/31/2011	2011	Hurricane Irene	Major Disaster Declaration	Albany, Bronx, Clinton, Columbia, Delaware, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Kings, Montgomery, Nassau, New York, Orange, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington and Westchester	\$486,310,293
3328	8/26/2011	2011	Hurricane Irene	Emergency Declaration	Bronx, Columbia, Delaware, Greene, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Schoharie, Suffolk Sullivan, Ulster, and Westchester Counties.	\$1,312,446
1993	6/10/2011	2011	Severe Storms, Flooding, Tornadoes, and Straight-line Winds	Major Disaster Declaration	Allegany, Broome, Chemung, Chenango, Clinton, Delaware, Essex, Franklin, Hamilton, Herkimer, Lewis, Livingston, Madison, Niagara, Oneida, Onondaga, Ontario, Steuben, Tioga, Ulster, Warren, Wyoming and Yates	\$29,691,847
1957	2/18/2011	2011	Severe Winter Storm and Snowstorm	Major Disaster Declaration	Nassau and Suffolk	\$37,732,272



Disaster Number	Date Declared	Year	Incident Description	Declaration Type	Counties Designated for Public Assistance	Total Public Assistance
1943	10/14/2010	2010	Severe Storms, Tornadoes, and Straight-line Winds	Major Disaster Declaration	Kings, Queens and Richmond	\$17,923,129
1899	4/16/2010	2010	Severe Storms and Flooding	Major Disaster Declaration	Nassau, Orange, Otsego, Richmond, Rockland, Schoharie, Suffolk, Warren and Westchester	\$81,486,959

**\*NOTE:** Data related to Hurricane Sandy is limited to that which was available during the plan update. Disaster costs from Sandy were still being calculated at the time this plan was published (December 2013).



Summaries of local risk assessment findings included in the 2014 Plan are extracted from FEMA-approved county multi-jurisdictional mitigation plans. Data presented in this state-level plan is summarized from LHMP examples to demonstrate consistency with data or information related to the hazard.

One limitation is that the information obtained from the individual county plans is summarized from plans available during the preparation of this update and may not represent plans approved after October 2013. In addition, local mitigation plans are revised and updated on a five-year schedule which precludes data from more recent events being included in the plans, in some cases.

The **New York State Local Hazard Mitigation Planning Standards (October 2012)** provides additional guidance to local jurisdictions to assist in accurately identifying, profiling and assessing the risks for these hazards.

## Vulnerability Categories

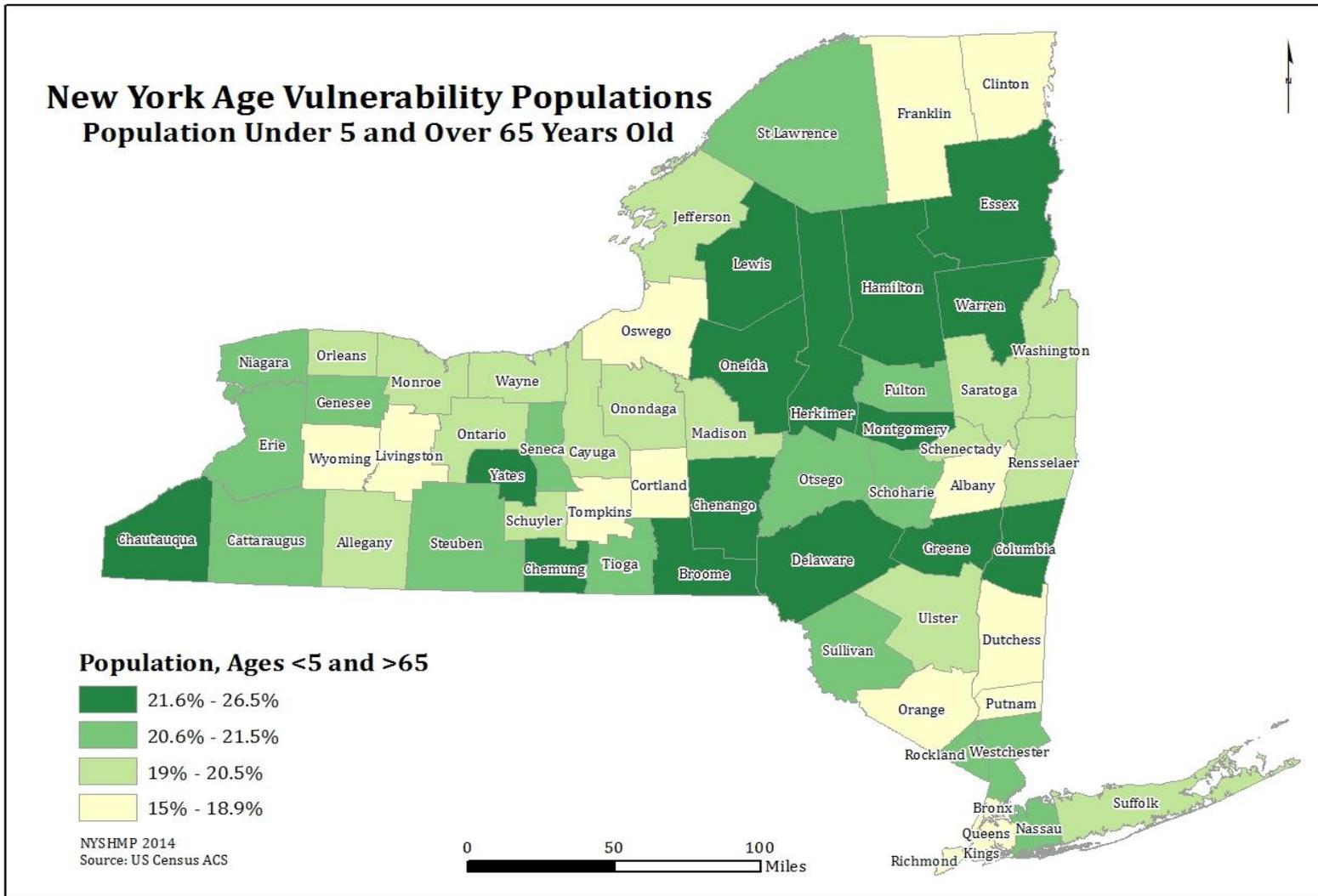
### *Population*

Each hazard section identifies and quantifies, where data is available, the potential population that may be vulnerable to the hazard. As an example, counties along the Atlantic coastline are the most densely populated, and therefore, have the highest number of people who might be impacted from a hurricane or coastal storm.

**Figure 3.1b** shows an example of vulnerable population data using the spatial distribution of age-vulnerable populations. Populations under 5 years old and over 65 are considered more vulnerable in disasters because of dependency, mobility, physicality, and other characteristics that require support and assistance for such services as sheltering, evacuation, health and medical care, transportation and community social services. Hamilton, Delaware, and Yates Counties are the top three counties with the highest percentage of age-vulnerable populations in the state, and the over-65 population is the fastest growing population demographic. Other vulnerable populations are defined and addressed in local plans.



**Figure 3.1b: Vulnerable Populations, by Age**



### ***Property***

Vulnerability of property is considered for each hazard, specific to the characteristics of that hazard. As an example, impacts from hurricanes, coastal erosion, and high winds could have significant or even catastrophic impacts on property and critical infrastructure. Extreme temperatures and drought have low to little impact on property.

### ***Environment***

The environment has some level of vulnerability to almost every natural hazard. The extent of vulnerability is dependent on the conditions related to the hazard, magnitude of impact, location of impact, and potential cascading effects that compound the impacts. Each hazard section describes specific environmental impacts related to that hazard, as applicable.

### ***Economy***

Natural hazards have both direct and indirect impacts on a jurisdiction's economy. Events such as hurricanes and floods can cause immediate significant monetary loss due to damaged and destroyed structures and infrastructure. The magnitude of the event can also result in a more long-term indirect impact on state and local economies due to failure of businesses, redevelopment costs, and supply chain impacts. Some level of economic return may occur after a significant disaster; however, depending on other conditions and issues related to the impacted community, the economy may experience a slow, long-term recovery, or, in a catastrophic disaster, local economic loss may be permanent.

Data from one disaster assistance program (Small Business Administration (SBA) loans) for businesses related to the economic impacts of the repetitive storms in 2011 and 2012 illustrates the challenges for businesses as a result of natural disasters. ***The State of New York Action Plan for Community Development Block Grant Program (CDBG) Disaster Recovery<sup>4</sup> (New York State Homes and Community Renewal Office of Community Renewal April, 2013) provides a summary of the number of affected New York businesses after Hurricane Sandy in 2012, and justification for the low response when assistance was available through low interest loans:***

- 17,468 New York businesses (outside of New York City) requested applications from the SBA after Sandy. While this number was believed to be indicative of the extent of damage to businesses across the State, and their different levels of underlying need, it was noted that many would ultimately not be eligible for NYS programs.

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<sup>4</sup> *State of New York Action Plan for Community Development Block Grant Program (CDBG) Disaster Recovery*, Supplemental funding under the Department of Housing and Urban Development Appropriations Act, 2013 (Public Law 113-2); New York State Homes and Community Renewal Office of Community Renewal April, 2013, p. 30.



- Of the 17,468 requests for applications, only 1,141 businesses ultimately submitted applications.
- Of the 1,141 applications received, only 205 were ultimately approved for assistance by the SBA. Many of these applicants had true unmet needs, but lacked necessary collateral or credit needed to qualify for loans.
- New York State believes there are many other businesses in need of assistance. In addition to the 17,468 SBA application requests, estimates suggest as many as 37,282 businesses were in the Sandy surge areas.

**Business development interests determined that the low application rate was attributable to four primary factors:**

- (1) Businesses perceive SBA interest rates to be high
- (2) SBA loans require a large amount of documentation, often not readily available, for processing
- (3) Many businesses are reluctant to accept SBA loan terms, for example requirements that business owners post personal residential property as collateral to qualify for loans
- (4) Many impacted firms acquired incremental debt during the recession and are reluctant to take on additional debt for recovery.

The analysis in the CDBG plan provides significant insight into the challenges to restoring local economies following a major disaster.

### **3.1.6 Assessing Vulnerability of State Facilities**

New York State has a specific interest in protecting facilities, property and infrastructure owned and managed by the state. Disasters can damage not only private property, but government property as well, placing a financial and operational burden on the state. Losses can extend from structures and contents to the interruption of services and the general economy.

The State owns and operates more than 19,000 building facilities statewide representing more than 210 million gross square feet of space. State-owned buildings are located in every county of the state and all of New York's major cities. Albany, New York's State Capital, is located on the Hudson River, approximately 150 miles north of New York City. The largest, single concentration of State-owned and operated facilities is located in the City of Albany and its environs.

A major data deficiency for the 2014 update is the limited information New York State maintains on its fixed assets necessary to conduct a comprehensive risk assessment. Currently, the primary database of state buildings is the New York State Office of General Service's (OGS) "Fixed Assets Inventory", which contains more than 16,000 building records. While this database contains some useful information such as building value and



square footage, it does not contain basic structural information needed to make general assessments of vulnerability to earthquakes, wind, flooding and other hazards. Additional information about the State's Fixed Assets Inventory Project is described below.

### ***State Facilities and Fixed Assets Inventory Project***

The State of New York is taking steps to inventory its facilities and built assets to evaluate its risk from natural hazards. Initial efforts to inventory facilities under a FEMA Earthquake grant, employing State Fire Inspectors utilizing FEMA-developed software, were unsuccessful. After regrouping, and evaluating what we know about our risk from discussions with State agencies during Irene, Lee and Sandy response (and during the 2014 update of the State Hazard Mitigation Plan), DHSES coordinated with FEMA and decided on a two-prong approach:

- We would begin our survey at facilities that house children and adults with mental and/or physical challenges because:
  - A March 2009 fire in Wells, Herkimer County killed four residents of a group home who could not evacuate themselves, and injured a fifth resident and two staffers (see [www.nytimes.com/2009/03/22/nyregion/22fire.html? r=0](http://www.nytimes.com/2009/03/22/nyregion/22fire.html? r=0));
  - Such facilities are overseen by a small universe of State agencies, easing coordination on our first survey effort;
  - These facilities occur both as stand-alone buildings (residences) or campuses with several buildings; the latter will help inform subsequent survey efforts at various other campuses and complexes across the State.
- Having experienced Irene, Lee and Sandy, and traditionally citing water in its various forms as our most prevalent natural disaster, DHSES will poll State agencies in February 2014 to see if lives were lost, injuries occurred, or structures were damaged or destroyed in any of these three events;
  - From that we will ascertain whether there are inordinately high positive responses:
    - In specific counties or regions of the State;
    - Correlating to certain facility types or uses;
    - From certain agencies who may not have capacity to address mitigation deficits.
  - This will allow us to target assistance such as site visits (with other agencies if needed), webinars, etc., to provide technical assistance and develop short- and long-term strategies and flesh out activities in anticipation of future funding opportunities.
- The State will analyze risk from wind, flood and earthquake at all buildings surveyed, using hand-held software applications and FEMA's "Integrated Rapid Visual Screening of Buildings" to guide the process. Before teams conduct site visits, they will research available DFIRMs, State agency records (Office of General Services, the responsible agency's Main office and Regional Office capital facilities archives, etc.) and various online resources to gather relevant information regarding floodplain locations and



relationships, construction type, etc., then fill the gaps with onsite visits and interviews. Data will be collated and analyzed in an initial screening, which will then determine which structures and facilities get a more in-depth analysis and possible assistance in developing mitigation strategies.

These activities will run on parallel but independent tracks, and in close coordination with FEMA. (In fact, the survey effort was initiated with FEMA-sponsored training of the first architects and engineers occurring in Albany the week of December 9, 2013.) Once the initial group home survey has been completed we will analyze the results with FEMA to determine our ongoing survey strategy (e.g., by agency, region, facility type, year of construction, recent damage in declared disasters), and decide what tweaking, if any, is necessary moving forward to streamline the process and capture and collate all needed data.

DHSES will also decide with FEMA whether the results of the initial group home survey warrant revisions to the State Plan's description of hazards, analysis of risk, or the strategies and activities for key agencies. As noted above, subsequent survey strategies will be developed with FEMA's concurrence, and after each survey round we will revisit the Plan as noted above to see if changes are warranted, or if State agencies need targeted assistance.

The current Fixed Assets Inventory dataset was used for a partial assessment of all state-owned and operated in the 2008 and 2011 SHMPs; however, in addition to gathering information on more facilities, there is a need to gather missing structural information and refine the accuracy of the geographic coordinates to better enable GIS screening of these buildings as to their proximity to floodplains, the presence of soils that amplify earthquake shaking and other hazardous areas.

**Table 3.1i** provides a list of various State agencies that utilize State-owned and leased space throughout the State of New York, based on information currently available in the Fixed Asset Inventory. Agencies in **bold** directly manage State owned and leased properties.

**Table 3.1i: NY State Entities that Utilize State-Owned and Leased Space**

New York State Entities
<b>Adirondack Park Agency</b>
Aging, Office for the
<b>Agriculture and Markets, Department of</b>
Alcoholism and Substance Abuse Services, Office of
Attorney General, Office of the



New York State Entities
Banking, Department of
Budget, Division of the
Children and Family Services, Office of
City University of New York
Civil Service, Department of
Community Renewal, Office of
<b>Correctional Services, Department of</b>
<b>Correctional Services, Division of Industries (Corcraft), Department of</b>
Court Administration Office of
Criminal Justice Services, Division of
<b>Dormitory Authority</b>
Education, Department of
Empire State Development
Energy Research and Development Authority
<b>Environmental Conservation, Department of</b>
Family Assistance, Department of
<b>General Services, Office of</b>
<b>Health, Department of</b>
Homeland Security and Emergency Services, Division of (formerly New York State Office of Emergency Management)
Housing and Community Renewal, Division of
Human Rights, Division of
Insurance, Department of
<b>Labor, Department of</b>
Mental Health, Department of
<b>Metropolitan Transportation Authority</b>
Military and Naval Affairs, Division of
Motor Vehicles, Department of
<b>New York Power Authority</b>



<b>New York State Entities</b>
<b>New York State Bridge Authority</b>
New York State Division of Parole
New York State Division of Probation and Correctional Alternatives
New York State Office for the Prevention of Domestic Violence
New York State Environmental Facilities Corporation
<b>New York State Housing Finance Agency</b>
New York State Racing and Wagering Board
<b>Office of Mental Health</b>
<b>Office for People with Developmental Disabilities</b>
<b>Olympic Regional Development Authority</b>
<b>Parks, Recreation and Historic Preservation, Office of</b>
<b>Port Authority of New York and New Jersey</b>
<b>Power Authority</b>
<b>Public Service Commission</b>
<b>Real Property Services, Office of</b>
State, Department of
State Comptroller, Office of
State Police, Division of
<b>State University Construction Fund</b>
<b>State University of New York</b>
Tax Appeals, Division of
Taxation and Finance, Department of
Technology, Office for
Temporary and Disability Assistance, Office of
<b>Thruway Authority New York State (including Canal Corporation)</b>
<b>Transportation, Department of</b>

For the 2014 SHMP update, the planning team utilized the OGS dataset and solicited information from other state departments and agencies related to the types of facilities New York State owns and operates; however, other priorities have prevented adding additional information, as suggested in the 2011 SHMP, to this database. Coincidentally, a

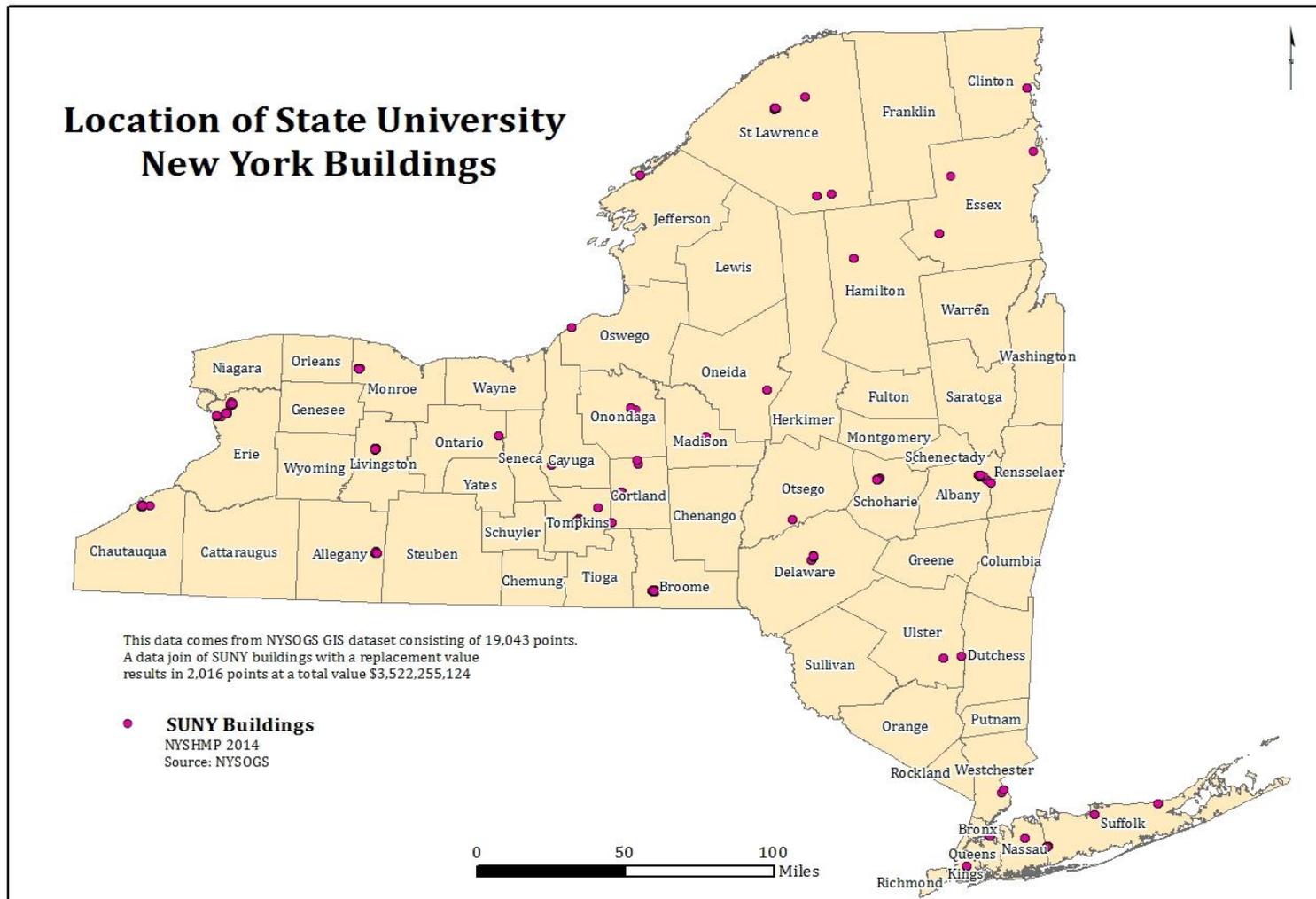


project to enhance the statewide inventory of facilities was initiated in August 2013, with a projected completion date for the initial phase in mid-2014

**Figure 3.1c** illustrates new data that was provided by the State University of New York (SUNY) during the 2014 plan update process. While the information provided for the update was not comprehensive, it provided addresses and building value information that allowed GIS mapping of 2,016 points that have a total building value of \$3,522,255,124. Future assessment of these points in relation to flood zones, storm surge zones, seismic zones and other geographic hazards will assist in expanding the State's awareness of vulnerable state-owned and operated facilities.



**Figure 3.1c: Sample GIS Mapping Update - Locations of State University of New York (SUNY) Buildings and Total Building Values**



As additional data developed during the first phase of the statewide facilities inventory project becomes available, it will be incorporated into the future updates. For the purpose of the 2014 update, consideration of vulnerable state facilities in relation to most hazards was based on the theory that they have the potential for more localized impact which could damage a state-owned or –operated facility, and cause loss of individual sites or structures. More widespread hazards, such as hurricanes and coastal storms, were considered separately with available data. For example, **Table 3.1i (Section 3.1.8)** provides the number of buildings and total replacement costs, by agency, of state-owned and operated facilities based on the current state database.

### 3.1.7 Estimating Potential Losses by Jurisdiction

All jurisdictions in the state have hazard-prone areas related to a particular natural hazard; the most common is flooding. Those jurisdictions that are experiencing growth and development may also have an increase in their vulnerability to and impact from associated hazards. This is addressed in Local Hazard Mitigation Plans as well as in the County descriptions in this update of the State Plan in specific hazard sections.

When developing the potential loss estimates by jurisdiction, the SHMP planning team examined population, and critical facilities and infrastructure at risk as identified by jurisdictions. Generally, the local plans contain more specific data related to facilities; therefore, critical facilities listed in LHMPs were considered and included, where available. A significant issue was identified in reviewing local plans in that the methodology used to assess and estimate losses related to population, property, and critical facilities was not uniform. By generalizing the data to the county level using publically available sources, this allowed for a more consistent statewide approach and also provided some measure of protection for those with security concerns.

**Table 3.1j** provides a summary of the total losses resulting from all hazard events, by county. This information will assist all counties in estimating potential losses by hazard when developing local hazard mitigation plans and identifying the highest opportunity for loss reduction. As an example, Broome County has the highest dollar loss from flood in the state. This information can guide both state and local planning, technical assistance and project funding priorities, based on previous occurrences and losses.



**Table 3.1j: Summary of Total Losses for All Hazard Events, By County (1960-2012)**

County	Total Losses	Coastal	Drought	Extreme Temps	Flood	Hail	High Wind	Hurricane	Winter Storm
Albany	\$116,153,322	\$0	\$2,701,852	\$2,890	\$56,205,507	\$1,187,866	\$7,326,638	\$197,749	\$48,530,821
Allegany	\$36,725,567	\$0	\$0	\$806	\$17,229,794	\$157,499	\$4,694,811	\$8,065	\$14,634,591
Bronx	\$35,406,271	\$714,286	\$0	\$36,521	\$20,321,483	\$66,851	\$1,551,555	\$9,528,242	\$3,187,333
Broome	\$847,823,740	\$0	\$4,863,640	\$2,890	\$813,832,702	\$917,102	\$4,834,071	\$137,552	\$23,235,784
Cattaraugus	\$125,952,945	\$0	\$0	\$1,289	\$62,895,262	\$427,181	\$43,650,878	\$8,065	\$18,970,271
Cayuga	\$59,392,985	\$0	\$3,180,307	\$2,890	\$4,632,700	\$1,366,317	\$31,908,989	\$137,552	\$18,164,230
Chautauqua	\$74,371,528	\$40,000	\$0	\$806	\$35,130,262	\$541,181	\$18,503,241	\$8,065	\$20,147,974
Chemung	\$53,471,047	\$0	\$3,180,307	\$806	\$33,580,154	\$433,094	\$12,521,816	\$137,552	\$3,617,318
Chenango	\$168,335,379	\$0	\$4,624,510	\$2,890	\$133,039,252	\$430,578	\$4,925,276	\$137,552	\$25,175,322
Clinton	\$102,474,663	\$0	\$1,683,333	\$500,806	\$67,465,101	\$599,158	\$6,826,050	\$8,065	\$25,392,150
Columbia	\$137,274,159	\$0	\$2,701,852	\$806	\$57,343,337	\$6,706,536	\$19,607,467	\$197,749	\$50,716,411
Cortland	\$66,727,624	\$0	\$4,863,640	\$2,890	\$33,069,835	\$397,407	\$3,685,485	\$137,552	\$24,570,815
Delaware	\$402,136,680	\$0	\$5,048,825	\$2,890	\$341,181,541	\$430,116	\$4,380,768	\$137,552	\$50,954,988
Dutchess	\$127,311,580	\$0	\$2,701,852	\$37,021	\$59,716,164	\$1,288,358	\$13,222,158	\$197,749	\$50,148,278
Erie	\$121,498,228	\$65,000	\$0	\$806	\$25,706,818	\$3,161,481	\$35,274,978	\$8,065	\$57,281,080
Essex	\$113,292,743	\$0	\$1,683,333	\$500,806	\$79,377,212	\$90,974	\$6,261,962	\$8,065	\$25,370,390
Franklin	\$45,365,599	\$0	\$1,683,333	\$450,806	\$13,944,187	\$410,446	\$3,319,633	\$8,065	\$25,549,129
Fulton	\$43,066,704	\$0	\$2,107,649	\$2,890	\$11,538,457	\$166,237	\$5,457,662	\$137,552	\$23,656,258
Genesee	\$80,755,875	\$0	\$0	\$806	\$6,327,679	\$10,877,814	\$7,441,332	\$8,065	\$56,100,179
Greene	\$132,727,771	\$0	\$2,701,852	\$806	\$63,829,382	\$830,336	\$16,267,243	\$197,749	\$48,900,403
Hamilton	\$116,144,557	\$0	\$2,107,649	\$2,890	\$9,636,854	\$416,775	\$78,302,474	\$137,552	\$25,540,364



County	Total Losses	Coastal	Drought	Extreme Temps	Flood	Hail	High Wind	Hurricane	Winter Storm
Herkimer	\$96,766,819	\$0	\$2,107,649	\$2,890	\$25,767,786	\$568,678	\$13,866,897	\$168,802	\$54,284,118
Jefferson	\$73,724,264	\$0	\$424,316	\$2,890	\$3,548,036	\$437,995	\$45,194,971	\$137,552	\$23,978,504
Kings	\$38,571,913	\$714,286	\$0	\$36,521	\$14,877,252	\$42,688	\$10,225,424	\$9,496,992	\$3,178,749
Lewis	\$44,716,971	\$0	\$424,316	\$2,890	\$3,886,786	\$392,049	\$19,502,907	\$137,552	\$20,370,472
Livingston	\$46,185,532	\$0	\$0	\$806	\$13,948,529	\$165,249	\$4,543,112	\$8,065	\$27,519,770
Madison	\$76,569,725	\$0	\$4,863,640	\$2,890	\$36,249,293	\$416,031	\$7,264,349	\$137,552	\$27,635,971
Monroe	\$97,404,613	\$0	\$0	\$806	\$5,107,307	\$1,447,915	\$30,792,879	\$8,065	\$60,047,641
Montgomery	\$81,208,191	\$0	\$2,107,649	\$2,890	\$20,336,013	\$180,978	\$6,392,107	\$168,802	\$52,019,752
Nassau	\$61,118,806	\$721,786	\$0	\$36,521	\$35,349,175	\$184,173	\$7,151,409	\$14,496,992	\$3,178,749
New York	\$26,595,276	\$714,286	\$0	\$36,521	\$19,780,169	\$45,624	\$2,716,132	\$124,295	\$3,178,250
Niagara	\$74,482,150	\$0	\$0	\$806	\$6,104,929	\$4,193,481	\$10,789,494	\$8,065	\$53,385,375
Oneida	\$193,413,630	\$0	\$5,048,825	\$2,890	\$68,748,230	\$6,534,883	\$84,965,518	\$137,552	\$27,975,732
Onondaga	\$133,649,387	\$0	\$3,180,307	\$2,890	\$23,615,034	\$969,178	\$96,450,985	\$137,552	\$9,293,442
Ontario	\$41,640,445	\$0	\$0	\$806	\$14,255,613	\$1,607,325	\$6,486,765	\$137,552	\$19,152,384
Orange	\$131,397,063	\$0	\$1,868,519	\$36,521	\$56,646,212	\$5,889,633	\$14,480,775	\$204,158	\$52,271,246
Orleans	\$80,590,392	\$0	\$0	\$806	\$4,945,512	\$9,782,014	\$16,022,965	\$8,065	\$49,831,030
Oswego	\$32,567,248	\$0	\$424,316	\$2,890	\$2,177,989	\$440,781	\$7,788,678	\$137,552	\$21,595,043
Otsego	\$169,723,377	\$0	\$5,048,825	\$2,890	\$131,694,754	\$351,508	\$4,799,199	\$137,552	\$27,688,649
Putnam	\$119,579,050	\$0	\$1,868,519	\$36,521	\$52,118,664	\$66,966	\$5,802,987	\$9,829,158	\$49,856,235
Queens	\$53,751,855	\$714,286	\$0	\$36,521	\$19,828,483	\$48,688	\$20,448,136	\$9,496,992	\$3,178,749
Rensselaer	\$128,557,226	\$0	\$2,701,852	\$806	\$60,273,076	\$2,836,466	\$14,452,154	\$197,749	\$48,095,123
Richmond	\$12,772,028	\$714,286	\$0	\$36,521	\$4,643,979	\$35,423	\$4,046,573	\$121,992	\$3,173,254
Rockland	\$70,855,121	\$0	\$185,185	\$36,521	\$28,532,367	\$44,866	\$1,090,610	\$9,699,671	\$31,265,901



County	Total Losses	Coastal	Drought	Extreme Temps	Flood	Hail	High Wind	Hurricane	Winter Storm
Saratoga	\$180,832,727	\$0	\$1,868,519	\$806	\$58,720,426	\$1,099,484	\$69,597,518	\$197,749	\$49,348,226
Schenectady	\$88,851,621	\$0	\$1,868,519	\$806	\$27,624,989	\$2,774,622	\$7,840,637	\$168,802	\$48,573,247
Schoharie	\$56,785,643	\$0	\$2,107,649	\$2,890	\$24,745,121	\$727,664	\$4,339,348	\$137,552	\$24,725,419
Schuyler	\$21,036,068	\$0	\$3,180,307	\$2,890	\$7,547,975	\$366,829	\$1,378,513	\$137,552	\$8,422,003
Seneca	\$16,503,475	\$0	\$3,180,307	\$2,890	\$2,712,071	\$71,408	\$2,067,724	\$137,552	\$8,331,524
St Lawrence	\$75,801,868	\$0	\$2,107,649	\$702,890	\$5,386,004	\$413,177	\$39,216,734	\$137,552	\$27,837,862
Steuben	\$61,925,061	\$0	\$2,941,176	\$806	\$43,916,683	\$491,593	\$3,245,207	\$137,552	\$11,192,043
Suffolk	\$109,843,299	\$49,322,786	\$0	\$36,521	\$35,094,104	\$71,188	\$7,586,176	\$14,496,992	\$3,235,532
Sullivan	\$287,529,761	\$0	\$5,009,695	\$36,521	\$223,177,217	\$212,933	\$10,171,744	\$137,552	\$48,784,100
Tioga	\$634,850,510	\$0	\$4,863,640	\$2,890	\$600,080,588	\$448,125	\$3,908,688	\$137,552	\$25,409,027
Tompkins	\$36,128,893	\$0	\$3,180,307	\$2,890	\$23,457,315	\$1,409,425	\$2,223,898	\$137,552	\$5,717,507
Ulster	\$645,404,114	\$0	\$2,701,852	\$36,521	\$70,127,560	\$17,239,874	\$505,713,981	\$197,749	\$49,386,576
Warren	\$134,555,426	\$0	\$1,868,519	\$806	\$70,718,314	\$176,472	\$13,731,825	\$166,499	\$47,892,991
Washington	\$113,703,197	\$0	\$1,868,519	\$806	\$53,633,792	\$1,829,205	\$8,820,904	\$37,012	\$47,512,959
Wayne	\$74,374,100	\$0	\$239,130	\$2,890	\$6,930,182	\$25,493,992	\$15,235,765	\$137,552	\$26,334,590
Westchester	\$156,249,932	\$0	\$185,185	\$36,521	\$100,347,596	\$45,366	\$14,822,656	\$9,449,671	\$31,362,937
Wyoming	\$62,689,846	\$0	\$0	\$806	\$11,514,282	\$235,181	\$31,243,174	\$8,065	\$19,688,339
Yates	\$32,132,801	\$0	\$2,941,176	\$806	\$10,856,613	\$405,713	\$1,595,880	\$137,552	\$16,195,061
<b>Total</b>	<b>\$7,681,397,909</b>	<b>\$53,721,000</b>	<b>\$116,200,000</b>	<b>\$2,700,500</b>	<b>\$3,975,029,707</b>	<b>\$121,098,150</b>	<b>\$1,507,979,884</b>	<b>\$92,720,500</b>	<b>\$1,811,948,167</b>

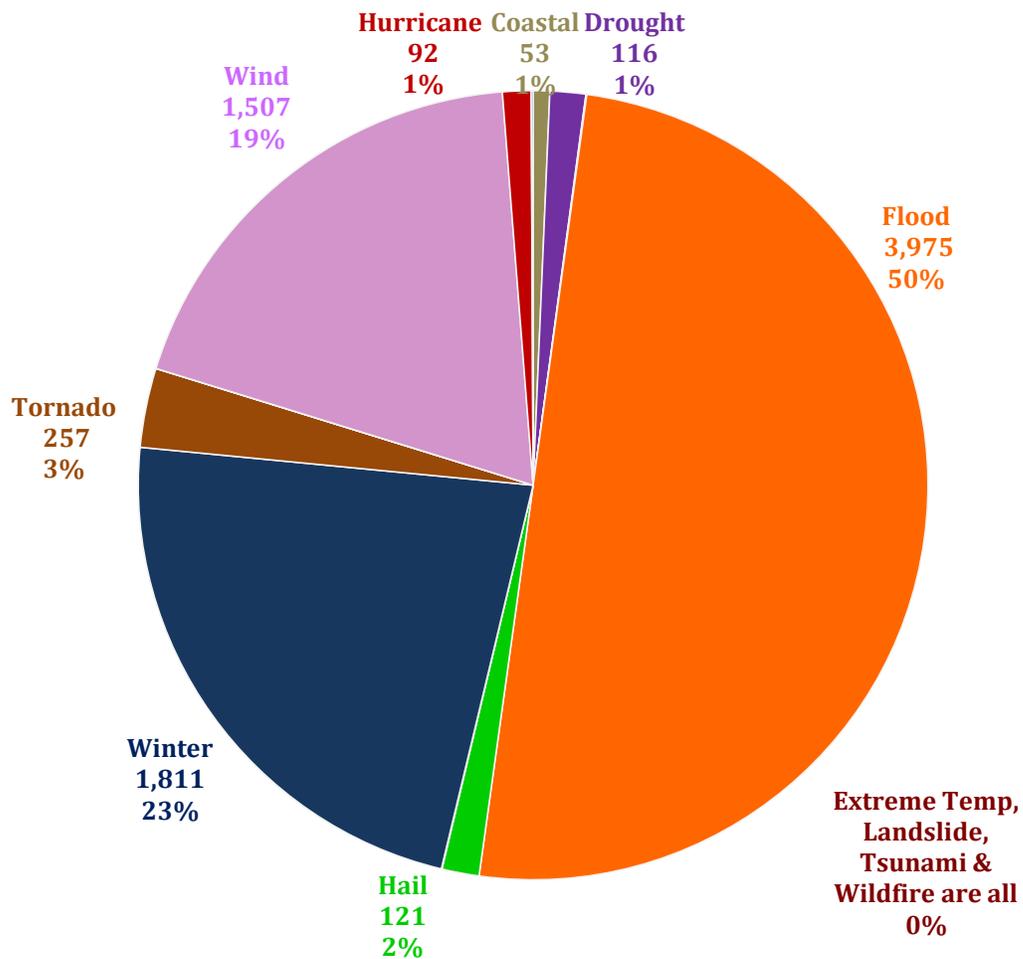
Source: SHELVDUS



**Figure 3.1d** represents the distribution of economic losses by hazard type for the period of 1960 through 2012. Dollar values are in millions and come from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™). It is important to note that fire data may not be as accurate or detailed as records kept at the local or state level, because SHELDUS™ is a national database. The New York State Department of Environmental Conservation (DEC) has a more comprehensive count of wildfire events and losses, but for the purposes of data source consistency, the DEC dataset was not used in the following chart.

While this serves as a method to compare distribution of events, it does not necessarily reflect the hazards prioritized in the 2014 plan update or those that provide the highest opportunity for mitigation, as it does not take severity and other conditions, vulnerabilities and consequences of hazard events into account. However, this information may assist all-hazards preparedness, response, and recovery planning, as well as resource allocation.

**Figure 3.1d: Distribution of Economic Losses by Hazard Type (1960 - 2012)**



Source: SHELDUS



**Table 3.1k** describes the annualized losses tab takes the total economic losses divided by the number of years of record, so that it becomes losses per year. Information from SHEL DUS provided the data for most hazards, except hurricane and earthquake which was calculated in Hazus. Annualized losses for hurricane and earthquake are provided within those hazard sections. *(Please note: Hurricane Sandy data has not yet been incorporated into SHEL DUS.)*

**Table 3.1k: Summary of Annualized Losses from Hazards, by County (1960 - 2012<sup>5</sup>)**

County	Total Losses	Coastal	Drought	Earthquake	Extreme Temps	Flood	Hail	High Wind	Hurricane	Winter Storm
Albany	\$2,231,766	\$0	\$51,959	\$1,186	\$56	\$1,080,875	\$22,844	\$140,897	\$666	\$933,285
Allegany	\$706,171	\$0	\$0	\$58	\$16	\$331,342	\$3,029	\$90,285	\$7	\$281,434
Bronx	\$532,824	\$13,736	\$0	\$4,718	\$702	\$390,798	\$1,286	\$29,838	\$30,451	\$61,295
Broome	\$16,302,018	\$0	\$93,532	\$285	\$56	\$15,650,629	\$17,637	\$92,963	\$76	\$446,842
Cattaraugus	\$2,422,138	\$0	\$0	\$114	\$25	\$1,209,524	\$8,215	\$839,440	\$8	\$364,813
Cayuga	\$1,139,653	\$0	\$61,160	\$116	\$56	\$89,090	\$26,275	\$613,634	\$10	\$349,312
Chautauqua	\$1,430,273	\$769	\$0	\$200	\$16	\$675,582	\$10,407	\$355,832	\$6	\$387,461
Chemung	\$1,025,765	\$0	\$61,160	\$103	\$16	\$645,772	\$8,329	\$240,804	\$18	\$69,564
Chenango	\$3,234,673	\$0	\$88,933	\$79	\$56	\$2,558,447	\$8,280	\$94,717	\$21	\$484,141
Clinton	\$1,971,740	\$0	\$32,372	\$1,205	\$9,631	\$1,297,406	\$11,522	\$131,270	\$24	\$488,311
Columbia	\$2,636,634	\$0	\$51,959	\$173	\$16	\$1,102,756	\$128,972	\$377,067	\$376	\$975,316
Cortland	\$1,280,655	\$0	\$93,532	\$70	\$56	\$635,958	\$7,642	\$70,875	\$7	\$472,516
Delaware	\$7,730,885	\$0	\$97,093	\$96	\$56	\$6,561,183	\$8,271	\$84,246	\$36	\$979,904
Dutchess	\$2,447,395	\$0	\$51,959	\$806	\$712	\$1,148,388	\$24,776	\$254,272	\$2,092	\$964,390
Erie	\$2,339,130	\$1,250	\$0	\$2,734	\$16	\$494,362	\$60,798	\$678,365	\$47	\$1,101,559

<sup>5</sup> Hurricane Sandy data has not yet been incorporated into SHEL DUS.



County	Total Losses	Coastal	Drought	Earthquake	Extreme Temps	Flood	Hail	High Wind	Hurricane	Winter Storm
Essex	\$2,179,059	\$0	\$32,372	\$470	\$9,631	\$1,526,485	\$1,750	\$120,422	\$38	\$487,892
Franklin	\$873,065	\$0	\$32,372	\$795	\$8,669	\$268,157	\$7,893	\$63,839	\$9	\$491,329
Fulton	\$825,819	\$0	\$40,532	\$197	\$56	\$221,893	\$3,197	\$104,955	\$61	\$454,928
Genesee	\$1,553,012	\$0	\$0	\$165	\$16	\$121,686	\$209,189	\$143,103	\$5	\$1,078,850
Greene	\$2,548,929	\$0	\$51,959	\$123	\$16	\$1,227,488	\$15,968	\$312,832	\$151	\$940,392
Hamilton	\$2,230,988	\$0	\$40,532	\$76	\$56	\$185,324	\$8,015	\$1,505,817	\$8	\$491,161
Herkimer	\$1,857,870	\$0	\$40,532	\$196	\$56	\$495,534	\$10,936	\$266,671	\$20	\$1,043,925
Jefferson	\$1,415,594	\$0	\$8,160	\$460	\$56	\$68,231	\$8,423	\$869,134	\$4	\$461,125
Kings	\$635,014	\$13,736	\$0	\$9,143	\$702	\$286,101	\$821	\$196,643	\$66,738	\$61,130
Lewis	\$857,407	\$0	\$8,160	\$108	\$56	\$74,746	\$7,539	\$375,056	\$3	\$391,740
Livingston	\$888,153	\$0	\$0	\$117	\$16	\$268,241	\$3,178	\$87,368	\$7	\$529,226
Madison	\$1,469,992	\$0	\$93,532	\$131	\$56	\$697,102	\$8,001	\$139,699	\$11	\$531,461
Monroe	\$1,874,615	\$0	\$0	\$1,551	\$16	\$98,217	\$27,845	\$592,171	\$54	\$1,154,762
Montgomery	\$1,558,656	\$0	\$40,532	\$160	\$56	\$391,077	\$3,480	\$122,925	\$46	\$1,000,380
Nassau	\$976,594	\$13,880	\$0	\$6,276	\$702	\$679,792	\$3,542	\$137,527	\$73,745	\$61,130
New York	\$563,092	\$13,736	\$0	\$12,958	\$702	\$380,388	\$877	\$52,233	\$41,076	\$61,120
Niagara	\$1,432,778	\$0	\$0	\$577	\$16	\$117,402	\$80,644	\$207,490	\$8	\$1,026,642
Oneida	\$3,717,522	\$0	\$97,093	\$634	\$56	\$1,322,081	\$125,671	\$1,633,952	\$40	\$537,995
Onondaga	\$2,568,567	\$0	\$61,160	\$985	\$56	\$454,135	\$18,638	\$1,854,827	\$46	\$178,720
Ontario	\$798,331	\$0	\$0	\$187	\$16	\$274,146	\$30,910	\$124,745	\$11	\$368,315
Orange	\$2,526,528	\$0	\$35,933	\$1,165	\$702	\$1,089,350	\$113,262	\$278,476	\$2,422	\$1,005,216
Orleans	\$1,549,749	\$0	\$0	\$87	\$16	\$95,106	\$188,116	\$308,134	\$2	\$958,289
Oswego	\$623,880	\$0	\$8,160	\$221	\$56	\$41,884	\$8,477	\$149,782	\$11	\$415,289
Otsego	\$3,261,433	\$0	\$97,093	\$127	\$56	\$2,532,591	\$6,760	\$92,292	\$40	\$532,474
Putnam	\$2,112,252	\$0	\$35,933	\$329	\$702	\$1,002,282	\$1,288	\$111,596	\$1,348	\$958,774



County	Total Losses	Coastal	Drought	Earthquake	Extreme Temps	Flood	Hail	High Wind	Hurricane	Winter Storm
Queens	\$925,813	\$13,736	\$0	\$7,910	\$702	\$381,317	\$936	\$393,233	\$66,848	\$61,130
Rensselaer	\$2,469,351	\$0	\$51,959	\$446	\$16	\$1,159,098	\$54,547	\$277,926	\$454	\$924,906
Richmond	\$255,816	\$13,736	\$0	\$1,847	\$702	\$89,307	\$681	\$77,819	\$10,699	\$61,024
Rockland	\$1,181,771	\$0	\$3,561	\$1,400	\$702	\$548,699	\$863	\$20,973	\$4,305	\$601,267
Saratoga	\$3,474,476	\$0	\$35,933	\$722	\$16	\$1,129,239	\$21,144	\$1,338,414	\$4	\$949,004
Schenectady	\$1,706,538	\$0	\$35,933	\$651	\$16	\$531,250	\$53,358	\$150,781	\$448	\$934,101
Schoharie	\$1,089,761	\$0	\$40,532	\$76	\$56	\$475,868	\$13,994	\$83,449	\$298	\$475,489
Schuyler	\$401,968	\$0	\$61,160	\$23	\$56	\$145,153	\$7,054	\$26,510	\$50	\$161,962
Seneca	\$314,779	\$0	\$61,160	\$46	\$56	\$52,155	\$1,373	\$39,764	\$4	\$160,222
St Lawrence	\$1,456,363	\$0	\$40,532	\$1,276	\$13,517	\$103,577	\$7,946	\$754,168	\$5	\$535,344
Steuben	\$1,188,362	\$0	\$56,561	\$123	\$16	\$844,552	\$9,454	\$62,408	\$18	\$215,232
Suffolk	\$1,991,633	\$948,515	\$0	\$4,512	\$702	\$674,887	\$1,369	\$145,888	\$153,539	\$62,222
Sullivan	\$5,527,237	\$0	\$96,340	\$203	\$702	\$4,291,870	\$4,095	\$195,610	\$260	\$938,156
Tioga	\$12,206,085	\$0	\$93,532	\$51	\$56	\$11,540,011	\$8,618	\$75,167	\$16	\$488,635
Tompkins	\$692,288	\$0	\$61,160	\$131	\$56	\$451,102	\$27,104	\$42,767	\$16	\$109,952
Ulster	\$12,409,154	\$0	\$51,959	\$489	\$702	\$1,348,607	\$331,536	\$9,725,269	\$850	\$949,742
Warren	\$2,584,972	\$0	\$35,933	\$452	\$16	\$1,359,968	\$3,394	\$264,074	\$117	\$921,019
Washington	\$2,186,241	\$0	\$35,933	\$216	\$16	\$1,031,419	\$35,177	\$169,633	\$137	\$913,711
Wayne	\$1,427,795	\$0	\$4,599	\$161	\$56	\$133,273	\$490,269	\$292,995	\$8	\$506,434
Westchester	\$2,850,238	\$0	\$3,561	\$4,807	\$702	\$1,929,761	\$872	\$285,051	\$22,350	\$603,133
Wyoming	\$1,205,514	\$0	\$0	\$91	\$16	\$221,428	\$4,523	\$600,830	\$4	\$378,622
Yates	\$615,335	\$0	\$56,561	\$38	\$16	\$208,781	\$7,802	\$30,690	\$4	\$311,443
<b>Total</b>	<b>\$146,491,137</b>	<b>\$1,033,096</b>	<b>\$2,234,615</b>	<b>\$74,854</b>	<b>\$51,933</b>	<b>\$76,442,879</b>	<b>\$2,328,811</b>	<b>\$28,999,613</b>	<b>\$480,180</b>	<b>\$34,845,157</b>

Source: SHEL DUS



**3.1.8 Estimating Potential Losses of State Facilities**

New York State government entities are responsible to provide affordable building insurance coverage for the facilities under their responsibility. Through this coverage, each department maintains a separate list of state-owned facilities and their replacement values. State-operated facilities are typically not included in this list, as building insurance is a responsibility of the property owner.

The current database contains the addresses and/or latitudes and longitudes of some state-owned and -operated properties, and, where available, this information has been integrated in the DHSES Geographic Information System (GIS) data for state-owned facilities; however, because a comprehensive inventory has not yet been conducted, the value of the state-owned buildings and property were assessed for this update with available information only.

**Table 3.11** shows the values of state-owned buildings and property, based on currently available data. (Departments, agencies, transportation infrastructure)

**Table3.11: State- Owned Building Replacement Value**

State Agency	No. of Buildings & Properties	Replacement Cost
Office of General Services (OGS)	2,046	\$7,269,621,781
Department of Health (DOH)	468	\$494,168,461
Department of Corrections and Community Services (DOCCS)	19,972	\$9,111,425,045
Office of Parks, Recreation and Historic Preservation (OPRHP)	10,325	\$2,073,612,475
Department of Environmental Conservation (DEC)	3,144	\$270,643,840
Office of Mental Health (OMH)	4,497	\$6,287,808,931
Office of Persons with Developmental Disabilities (OPWDD)	7,438	\$2,755,709,522
Division of State Police (DSP)	267	\$164,142,582
Department of Military and Naval Affairs (DMNA)	1,186	\$735,644,622
Department of Transportation (DOT)	4,242	\$691,748,381
Office of Children and Family Services (OCFS)	1,800	\$424,633,865
Other Agencies	22	\$9,809,970
Dormitory Authority (DASAS)	46	\$33,880,238
NYS Unified Court System (COURTS)	42	\$31,856,013
Department of Labor (DOL)	81	\$146,468,249



State Agency	No. of Buildings & Properties	Replacement Cost
New York State Education Department (NYSED)	408	\$530,134,651
Adirondack Park Agency (APA)	20	\$4,026,713
Department of Agriculture and Markets (AG&MKTS)	634	\$179,474,412
Department of State (DOS)	69	\$22,851,819
<b>Total</b>	<b>56,707</b>	<b>*\$31,237,661,570</b>

Source: OGS; \*This value accounts for 50,110 buildings, which are part of the 56,707 properties

### 3.1.9 Estimating Potential Losses – Critical Infrastructure

Facilities that support key emergency and disaster functions are important in protecting the safety of the population, the continuity of government, and the continued delivery of essential community services. These “critical” or “essential” functions are defined by the types of services they provide or support and include, but are not limited to, public safety, communications, transportation, healthcare, electric power, water, and sewer. Continuity of these functions relies on established infrastructure that, if lost, could directly threaten lives and increase the need for resources and services to vulnerable populations. The providers of these services use a variety of systems to ensure consistent service throughout the state. Each of these services is important to daily life in New York, and in some cases, is critical to the protection of life and property.

The definition of critical facilities and infrastructure used in this plan is based on the U.S. Department of Homeland Security definition of “critical infrastructure” as “systems and assets, whether physical or virtual, so vital that the incapacity or destruction of such may have a debilitating impact on the security, economy, public health or safety, environment, or any combination of these matters, across any Federal, State, regional, territorial, or local jurisdiction.” (U.S. Department of Homeland Security, 2009) **Similarly, the state has its own set of criteria that is more specific to the State’s resources, as identified in the New York State Local Hazard Mitigation Planning Standards:**

- Any government facility that has sustained flooding in past events, regardless if it is located in the 100-year floodplain, as identified by FEMA
- Essential community services (Police, fire protection/emergency services, health and medical care/hospitals, education, libraries, utilities and administrative and support facilities essential to their operation (as defined by FEMA))
- Major communication centers
- Facilities designed for bulk storage of chemicals, petrochemicals, hazardous or toxic substances or floatable materials (as defined by DEC)
- Critical private non-profit facilities (fire protection/emergency services, health and medical care/hospitals, education, utilities, child care facilities, alcohol and drug



rehabilitation facilities, custodial care, homeless shelters, libraries and other facilities that provide health and safety services of a governmental nature

- Recommend consideration of major employers and other entities that could have an economic impact with prolonged down-time due to disasters

As a public document, this plan limits the amount of detail it provides related to critical facilities and infrastructure. For the most part, publicly available data sources have been used to describe and quantify the critical facilities and infrastructure in the state. Since much of the States critical infrastructure is owned and managed by private entities, information related to this infrastructure is typically proprietary and is not readily available for inclusion in this plan.

One source of information related to critical infrastructure vulnerability and losses that was researched for the 2014 SHMP update is *Responding to Climate Change in New York State* (ClimAID). The ClimAID report was funded by the New York State Energy Research and Development Authority (NYSERDA), and focused on eight critical sectors of the state (agriculture, coastal zones, ecosystems, energy, public health, telecommunications, transportation, water resources). The report looks at vulnerability, and potential challenges to these critical sectors caused by multiple conditions related to climate change, as well as potential adaptation strategies. Although the focus was on adaptive strategies to address potential impacts of climate change, the scope of this report provides the best picture of the State's vulnerable infrastructure and the comprehensive approach to identifying potential measures to protect it from multiple hazards.

**Figure 3.1e** illustrates the integrating sectors and themes linked to climate change, which describe eight categories of critical infrastructure vulnerable to multiple natural hazards. Additional detail related to vulnerabilities and losses to the climate change hazard are included in **Section 3.4**.



**Figure 3.1e: Integrated Sectors and Themes Linked to Climate Change**

Several data sources were used to analyze potential impacts to critical facilities, including previous versions of the New York State Hazard Mitigation Plan, the ClimAID report, and internet research. Using these sources, the critical facilities and infrastructure can be assessed by sector in a general sense with several limitations. Losses estimated in the ClimAID report focus on impacts to the eight sectors related to climate change. First, although the general sectors defined in ClimAID relate to the State's services and support to population, environment and economy, the definitions of these sectors are not directly aligned with FEMA's definition of critical facilities, or the categories of critical facilities described in DHSES' *Hazard Mitigation Planning Standards*. In addition, the projected costs of impacts are based on various scenarios of probability. Costs of impacts are described in the ClimAID tables.

Losses related to sector impacts from climate change described in the ClimAID report are illustrated in the following example for water resources. Losses related to the various elements of climate change were identified as annual incremental costs at mid-century without adaptation, compared to annual incremental adaptation costs and benefits at mid-century.

**Table 3.1m: Example of Vulnerability of Critical Infrastructure - Climate and Economic Sensitivity Matrix: Water Resources Sector (Values in \$2010 US.)**

Element	Main climate variables				Economic risks and opportunities: – is Risk + is Opportunity	Annual incremental impact costs of climate change at mid-century, without adaptation	Annual incremental adaptation costs and benefits of climate change at mid-century
	Temperature	Precipitation	Extreme events: heat	Sea level rise & storm surge			
Coastal flooding		•		•	– Damage to wastewater treatment plants – Blockage from SLR of system outfalls – Salt water intrusion into aquifers	Coastal flooding of WWTPs \$116-203M	Costs: \$47M Benefits: \$186M
Inland flooding	•	•			– Increased runoff leading to water quality problems – Damage in inland infrastructure	High direct costs Statewide estimated \$237M in 2010.  Violation of standards	Restore natural flood area; decrease permeable surfaces; possible use of levees; control turbidity
Urban flooding		•			– Drainage system capacity exceeded; CSOs – Damage to infrastructure		Very high costs of restructuring drainage systems
Droughts	•	•			– Reduction in available supplies to consumers – Loss of hydroelectric generation – Impacts on agricultural productivity	1960s drought in NYC system reduced surface safe yield from 1800 mgd to 1290 mgd	Increased redundancy and interconnectedness costs for irrigation equipment
Power outages	•	•	•		– Loss of functionality of wastewater treatment plants and other facilities	Violation of standards	Flood walls
Total estimated costs of key elements						\$353-440M	Costs: \$47M Benefits: \$186M

See **Section 3.4 Climate Change** for additional ClimAID vulnerability tables.

### 3.1.10 Changes in Development Trends

As part of the plan update process for 2014, the State looked at changes in growth and development. Also reviewed were notable and important trends identified in the review of the local hazard mitigation plans. Development trends are also addressed in each hazard section.

Development indicators such as population change and building permits demonstrate that there was relatively little change in both areas between 2000 and 2010, based on the most current available U.S. Census data.



Census information indicates that Orange (9.2%), Rockland (8.7%), and Saratoga (9.5%) Counties had the greatest increase in population, based on U.S. Census data, 2000-2010. Hamilton County had the greatest loss of population (10.1%) during the same period. The coastal area in and around New York City is the most densely populated area of the state, which could potentially be under significant pressure for development in sensitive coastal areas; however, population increase in New York City between 2000 to 2010 was only 3.9%. Information from the Orange, Rockland and Saratoga hazard mitigation plans provide this information related to changes in development trends:

- The Orange County plan<sup>6</sup> includes a history of land development patterns in the county, which provides a historical reference for assessment of changing trends. Also, a questionnaire was used to gather information related to current land uses and development trends occurring within the county, such as the predominant types of development occurring, location, expected intensity, and pace by land use; and regulations/ordinances/codes to protect new development from the effects of natural hazards. The plan includes tables that describe the acreages and percentages of all land uses in the County and its municipalities, including vacant land which could potentially be developed. In addition, the tables indicate the percentage of vacant land that lies within geographically delineated hazard zones. Municipalities could offer some level of protection from hazard events by minimizing future development in hazard prone areas, or by imposing certain development restrictions which would offer some protection from hazard events.
- The Rockland County plan<sup>7</sup> provides a summary of land cover uses by acreage and percentage, which illustrates that more than one third of the county (35.3%) is protected undeveloped land in the form of public parkland under various jurisdictions (state, county, town, etc.) and private recreational land.
- The Saratoga County plan<sup>8</sup> includes statements within Section 4 and each community's annex related to areas targeted for future growth and development that have been identified across the county. As an example, the section of the plan that addresses earthquakes notes that the entire county is identified as the hazard area, and, "It is anticipated that the human exposure and vulnerability to earthquake impacts in newly developed areas will be similar to those that currently exist within the County. Current building codes require seismic provisions that should render new construction less vulnerable to seismic impacts than older, existing construction that may have been built to lower construction standards." In addition, the plan includes hazard maps that illustrate where potential new development is located in relation to the county's hazard areas.

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<sup>6</sup> Orange County Single Jurisdiction Hazard Mitigation Plan, DRAFT 2010

<sup>7</sup> Rockland County Multi-Jurisdictional Hazard Mitigation Plan, FINAL, October 2010

<sup>8</sup> Saratoga County Multi-Jurisdictional Hazard Mitigation Plan, 2009, p. 5.4.5-50

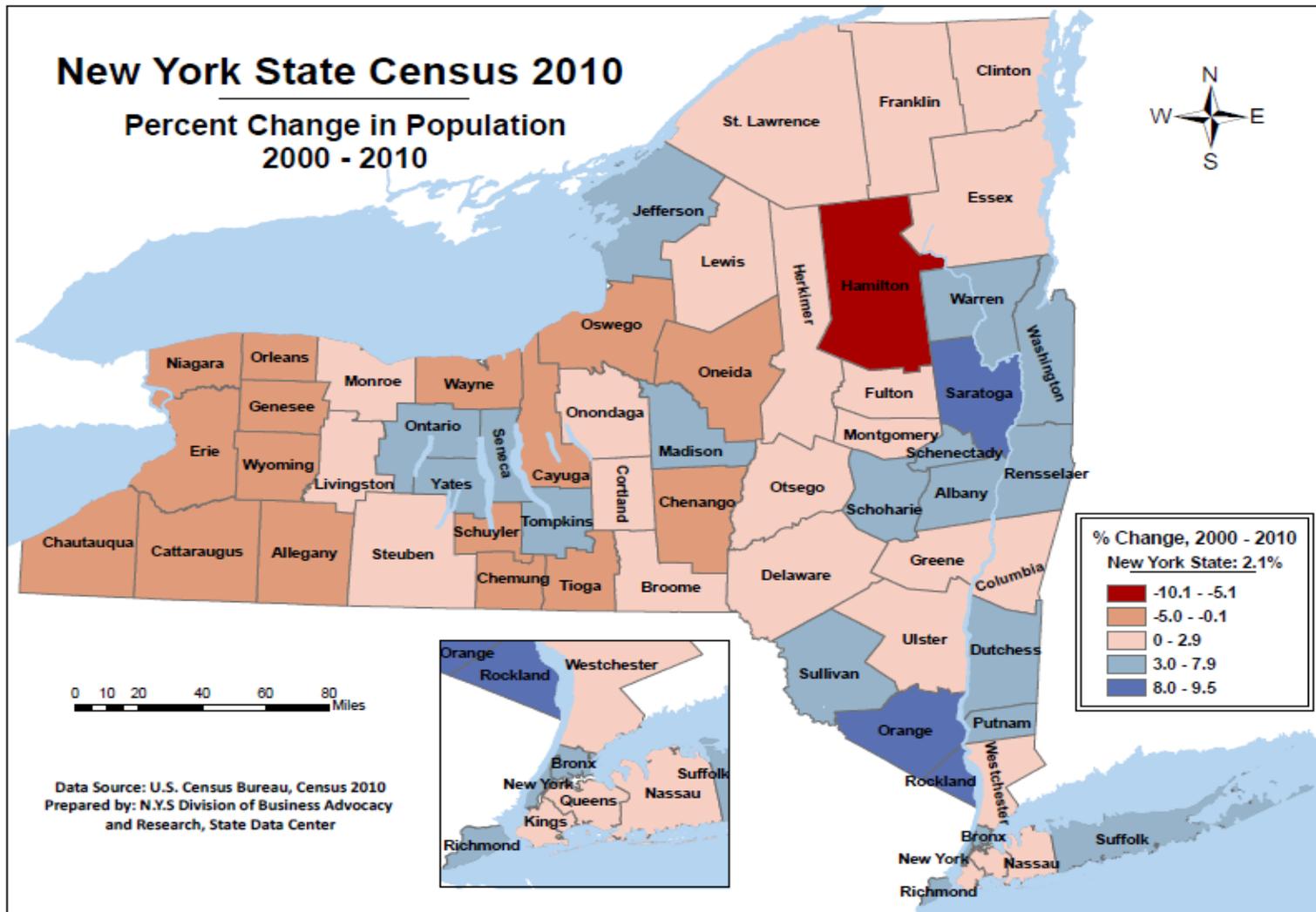


Another indicator of development that may impact hazard-prone areas is tracking authorized building permits. Based on the number of permits issued (by month), the percent change in permits issued December 2012 and January 2013 was an 8% increase. However, there was a 32% increase in permits issued between January 2012 and January 2013. The wide variation between these percentages undoubtedly takes into account the increased volume of property repairs and reconstruction due to damages from Hurricane Sandy in October 2012, and does not reflect a significant amount of growth in new development.

Although New York State has various land use planning and building construction measures, such as the New York State Building Code, and Coastal Erosion Hazard Area regulations, that regulate or limit development in hazard-prone areas, it is primarily the local jurisdictions (counties and municipalities) that develop and enforce regulatory policies, codes, and/or practices that provide levels of protection for people and property from hazards related to development. The best source for detailed local-level development data and trends is the LHMPs.



Figure 3.1f: Illustrates the Percent Change in Population, 2000-2010



## 3.2 SUMMARY OF HAZARDS ASSESSED FOR RISK AND POTENTIAL LOSSES

In order to determine the hazards that present the greatest opportunity for mitigation of exposure and loss, a ranking process was developed based on probability of future events and severity/ extent of impact.

### 3.2.1 Ranking Methodology

The hazard mitigation ranking system was developed based on the state's HAZNY risk analysis methodology, described in **Section 1**. **The ranking process consisted of analysis in eight areas related to natural hazards:**

- Scope
- Cascade effects
- Frequency (relative probability of occurrence based on rating noted in Table 3.1e, Section 3.1.3, above.)
- Impact-People
- Impact – Private Property
- Impact-Community Infrastructure
- Onset
- Duration (time hazard is active)

Each category listed above included a series of questions that were used as the basis for the point system developed for ranking. Although HAZNY has a pre-defined numerical ranking system, it is predominantly focused on factors that impact preparedness and response capabilities. For the purpose of mitigation, an additional category, "Mitigation Potential" was added as a weighting factor to ensure that all hazards were considered for appropriate mitigation measures, based on cost benefit potential and technical feasibility. For the purpose of mitigation planning and activities, a point scale ranging from 9 (minimum) to 34 (maximum) was developed and applied to identify the hazards with the highest potential for mitigation. A score of 20 was selected as the appropriate cut-off point to separate high/moderate hazards from low hazards that required no further consideration for risk assessment due to low probability, limited impact or severity, or mitigation potential.



The ranking process, approved by the 2014 SHMP Planning Team in September 2013, resulted in the identification of **six** of the fifteen hazards ranked as high, which required further analysis to conduct the comprehensive risk assessment.

**The following criteria specifically applied to those hazards ranked as high hazards:**

1. **History** – High rating indicates that the hazard has affected the state often in the past and that the hazard has occurred often and/or with widespread or severe consequences.
2. **Presence of susceptible areas** – High rating indicates that the state has numerous facilities, operations, or populations that may be subjected to impact or damage from the hazard.
3. **Data availability** – High rating indicates that sufficient quality data is available to permit an accurate and comprehensive risk assessment.
4. **Federal disaster declarations** – High rating indicates that the state has received numerous disaster declarations for the particular hazard.
5. **Potential for Mitigation** – High rating indicates that there are ways to address the hazard, and that the methods are technically feasible and have the potential to be cost-effective.

**Two** additional hazards (wildfire and landslide), although they were ranked as low hazards, were determined to have to some potential for mitigation. Because the overall scores of these two hazards were below the cut-off point of 20 for a high hazard, a full risk assessment was not required; however, the probability of identifying cost-effective and feasible mitigation activities was determined to be substantial enough to include mitigation activities for both hazards.



**Table 3.2a: Ranking of Hazards Identified in the 2014 SHMP, based on HAZNY-Mitigation scale**

	Points	Hurricane	Climate Change	Flood	High Winds	Earthquake	Coastal Erosion	Extreme Temp	Drought	Severe Winter Storm	Wildfire	Tsunami	Hailstorm	Avalanche	Landslide	Land Sub/Expan
<b>Scope</b>																
Single location	1									1			1	1	1	
Several individual locations	2					2					2					
Small region	3		3									3				
Large region	4	4	4	4	4	4	4	4	4							
<b>Cascade Effects</b>																
None	1															
Highly unlikely	2									2		2		2	2	
Some potential	3						3	3	3		3		3			
Highly likely	4	4	4	4	4	4										
<b>Frequency</b>																
Rare event (<once every 50yr)	1										1				1	1
Infrequent (once every 8-50yr)	2					2		2		2			2			
Regular (once every 1-7 yr)	3	3	3		3	3	3	3				3				
Frequent (>once a year)	4		4													
<b>Impact - People</b>																
Serious injury/death likely, not large numbers	1		1	1	1	1	1	1	1	1		1	1	1	1	1
Serious injury/death likely, large numbers	2										2					
Serious injury/death likely, extreme numbers	3	3														
<b>Impact - Private Property</b>																
Little or no damage	1						1	1	1	1		1	1	1	1	1
Moderate damage	2		2	2	2	2					2					
Severe damage	3	3														
<b>Impact - Community Infrastructure</b>																
Little or no structural damage	1						1	1	1	1		1	1	1	1	1
Moderal structural damage	2		2	2	2	2					2					
Severe structural damage	3	3														
<b>Onset</b>																
Up to one week warning	1	1	1				1	1	1							
One day warning	2			2	2	2										
Several hours warning	3										3	3				3
No warning	4				4					4			4	4		
<b>Duration - Time Hazard is Active</b>																
Less than one day	1					1					1	1	1	1	1	1
One day warning	2					2										
Two-three days	3	3				3			3	3						
Four days - week	4			4			4									
More than one week	5		5					5								
<b>Mitigation Potential</b>																
Largely preparedness & response based	1						1	1	1		1	1	1			1
Unlikely cost-benefit & technical feasibility	2															
Possible cost-benefit & technical feasibility	3					3	3			3				3		
Likely cost-benefit & technical feasibility	4	4	4	4	4											
<b>SCORE</b>		<b>28</b>	<b>26</b>	<b>26</b>	<b>24</b>	<b>23</b>	<b>22</b>	<b>19</b>	<b>19</b>	<b>18</b>	<b>18</b>	<b>17</b>	<b>16</b>	<b>15</b>	<b>15</b>	<b>12</b>
Minimum = 9																
Maximum = 34																

\*\*Although hazard scores were in the “low” range, these hazards have the potential for cost-effective mitigation activities.



Six hazards were ranked as high in the 2014 ranking process, based on probability/frequency, severity/impact and mitigation potential, as described in **Table 3.2b**.

**Table 3.2b: Summary of Hazards Profiled and Assessed for Risk and Potential Loss\***

Natural Hazards	Ranking (Score)	Final Disposition in Plan
<b>Hurricane</b>	High (28)	Profiled and full risk assessment conducted
<b>Climate Change</b>	High (26)	Profiled and full risk assessment conducted
<b>Flood</b>	High (26)	Profiled and full risk assessment conducted
<b>High Winds</b>	High (24)	Profiled and full risk assessment conducted
<b>Earthquake</b>	High (23)	Profiled and full risk assessment conducted
<b>Coastal Erosion</b>	High (22)	Profiled and full risk assessment conducted

\*Minimum score is 9; maximum score is 34.

**Nine** of the fifteen hazards identified in **Table 3.2a** were addressed within hazard profiles; however, as a result of the information assessed in the profiles they were eventually excluded in the full risk assessment for the 2014 update. **Table 3.2c** lists the **nine** hazards that were excluded or minimally addressed in this plan along with justification for this determination.

**Table 3.2c: Hazards Excluded or Minimally Addressed in the 2014 SHMP**

Hazard Profile	Why Hazard was not Assessed for Risk and Loss	Final Disposition in Plan
<b>Avalanche</b>	<ul style="list-style-type: none"> <li>▪ New York is not covered by a National Avalanche Center.</li> <li>▪ New York does not have a history of any declared state or federal avalanche disasters.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Profiled, but detailed risk assessment not required</li> </ul>
<b>Drought</b>	<ul style="list-style-type: none"> <li>▪ New York experiences some occurrences and has some potential for loss, but projected impacts to people, property and infrastructure are low.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Profiled, but detailed risk assessment not required</li> </ul>
<b>Extreme Temperatures</b>	<ul style="list-style-type: none"> <li>▪ New York does experience high summertime and low winter temperatures, but the impacts generally do not exceed local capabilities.</li> <li>▪ New York does not have a history of any</li> </ul>	<ul style="list-style-type: none"> <li>▪ Profiled, but detailed risk assessment not required</li> </ul>



<b>Hazard Profile</b>	<b>Why Hazard was not Assessed for Risk and Loss</b>	<b>Final Disposition in Plan</b>
	<p>declared state or federal extreme heat/cold disasters.</p> <ul style="list-style-type: none"> <li>▪ Some elements of the extreme heat hazard are included in the drought hazard profile and mitigation strategy</li> </ul>	
<b>Hailstorm</b>	<ul style="list-style-type: none"> <li>▪ New York experiences some occurrences and has some potential for loss, but projected impacts to people, property and infrastructure are low.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Profiled, but detailed risk assessment not required</li> </ul>
<b>Land Subsidence and Expansive Soils</b>	<ul style="list-style-type: none"> <li>▪ New York does have a land subsidence and expansive soils hazard, but the hazard areas, history, impacts, and mitigation strategies are addressed through levee safety programs in the DEC and the USACE.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Profiled, but detailed risk assessment not required</li> </ul>
<b>Landslide</b>	<ul style="list-style-type: none"> <li>▪ New York has experienced some occurrences; however, most are localized and losses are typically low. There is some opportunity for mitigation related to transportation infrastructure.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Profiled, but detailed risk assessment not required</li> </ul>
<b>Severe Winter Storm</b>	<ul style="list-style-type: none"> <li>▪ New York has occurrences and some potential for losses; however, losses are typically low and are related to preparedness and emergency protective measures (response), providing little opportunity for cost-effective mitigation at the state level.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Profiled, but detailed risk assessment not required</li> </ul>
<b>Tsunami</b>	<ul style="list-style-type: none"> <li>▪ There have been no past occurrences and the projected impacts to people, property and infrastructure are localized.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Profiled, but detailed risk assessment not required</li> </ul>
<b>Wildfire</b>	<ul style="list-style-type: none"> <li>▪ Most wildfires are small, localized events that have little potential for broad impact.</li> <li>▪ New York has had a minimal number of declared wildfire disasters, but there is some opportunity for mitigation</li> </ul>	<ul style="list-style-type: none"> <li>▪ Profiled, but detailed risk assessment not required</li> </ul>



### 3.2.2 Data Sources and Limitations

- Code of Federal Regulations (CFR) at Title 44, Chapter 1, Part 201.4 - Standard State Mitigation Planning
- Code of Federal Regulations (CFR) at Title 44, Chapter 1, Part 201.6 - Local Mitigation Planning
- FEMA Mitigation Planning “Tool Kit”, Mitigation Planning Series
  - FEMA “How to Guide: Understanding Your Risks” (FEMA 386-2)
  - FEMA, “Integrating Historic Property and Cultural Resources Considerations in Hazard Mitigation Planning” (FEMA 386-6)
- New York State Local Hazard Mitigation Planning Standards, NYSDHSES (October 2012)
- *Disaster Planning for Historic Sites*, Florida Department of State and Florida Division of Emergency Management (2005)
- *Disaster Mitigation for Historic Properties*, Florida Department of State and Florida Division of Emergency Management (2008)
- Hurricane Sandy recovery is still in progress and final data related to impacts and costs are not yet available. Data will be collected and added during the next phase of annual maintenance of the plan.
- A project to produce a statewide inventory of facilities was initiated in August 2013, with a projected completion date of the initial pilot for mid-2014. The pilot will identify and assess one category of state critical infrastructure, residential facilities, and develop the methodology for what is anticipated to be a multi-year project. The methodology will include analysis of hazard vulnerability and estimated potential losses to state facilities from future hazard events which will be added to future SHMP updates for GIS analysis to capture a more detailed picture of state facility vulnerabilities and potential losses for natural hazards.



## Section 3.3 AVALANCHE

### 2014 SHMP Update

Avalanche is addressed in the 2014 update as a new hazard section, to ensure consistency with the mitigation planning requirements detailed in 44 CFR §201.4(c)(2)(i). Research included:

- Identification of characteristics, locations and previous occurrences
- Research for probability, vulnerability, and losses
- Review of local hazard mitigation plans for hazard ranking, vulnerability and loss

### 3.3.1 Avalanche Profile

Hazard	Definition and Key Terms
<b>Avalanche</b>	A downhill fall of snow: a rapid downhill flow of a large mass of snow or ice dislodged from a mountainside or the top of a precipice.

#### Characteristics

An avalanche is a mass of snow sliding down a mountainside, normally occurring on terrain where snow is deposited on slopes of 20 degrees or more. Avalanches are also called “snowslides”; however, there is no difference in these terms<sup>1</sup>. Snow accumulates to sufficient depths on high mount peaks and slopes to create conditions conducive to avalanches. While avalanche danger increases during and immediately after major snowfalls, as well as during thaws, avalanches can occur in any situation where snow, slope and weather conditions combine to create the proper conditions.

While avalanche danger increases during and immediately after major snowfalls, as well as during thaws, avalanches can occur in any situation where snow, slope and weather conditions combine to create the proper conditions.

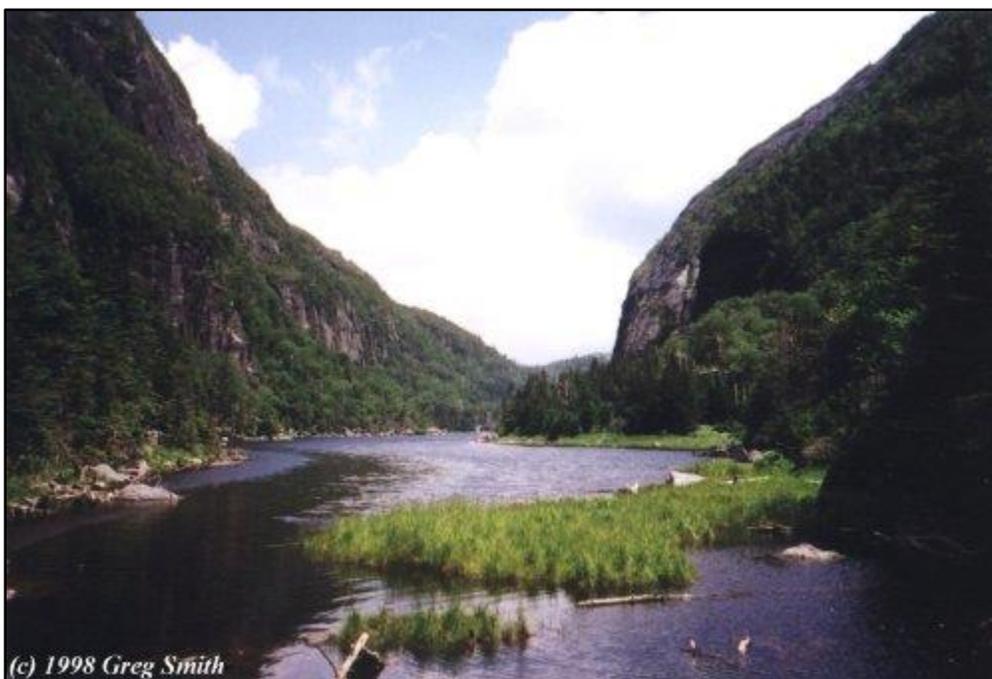
#### Location

Avalanches have occurred typically in the back country of the Adirondack Mountains. Avalanche Lake, which sits between the vertical cliffs of Avalanche Mountain and Mount Colden, has been the site of at least two previous avalanches which caused elevation of the bed of Avalanche Lake<sup>2</sup>.

<sup>1</sup> Avalanche Preparedness Brochure, New York State Department of Environment and Conservation (NYSDEC).

<sup>2</sup> NYS DEC





(c) 1998 Greg Smith

Source: <http://www.adirondack-park.net/lakes/avalanche.lake.html>; **Avalanche Lake, Adirondack Mountains, New York**

## Previous Occurrences

Rare, localized avalanches have occurred in some mountainous regions of the state. A large avalanche occurred on August 20, 1869, creating a number of landslides on Mount Colden, the rubble from which substantially raised the level of Avalanche Lake. Another avalanche in 1942 caused further slides that raised the lake level by 10 feet<sup>3</sup>.

One avalanche incident has been reported between 1996 and 2013 (National Climatic Data Center, NOAA). An avalanche in Western Essex County on February 19, 2000 took one life and caused 5 injuries; however, no property damage was reported.

Additional unconfirmed occurrences from one source<sup>4</sup> reported a total of 14 avalanche incidents, some involving fatalities or injuries, attributing the avalanches to skiers, snowshoers, or ice climbers, usually on steep, open terrain such as a cliff or a slide. Unofficial reports<sup>5</sup> of some incidents include:

- March 8, 1975 - Three ice climbers suffered severe injuries when they were caught in an avalanche on a cliff near Chapel Pond.

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<sup>3</sup> McMartin, Barbara and Bill Ingersoll. (2004) *Discover the Adirondack High Peaks*. (3rd Ed.) Discover the Adirondack series, Canada Lake, NY: Lake View Press.

<sup>4</sup> "A Short History of Adirondack Avalanches", Phil Brown, The Adirondack Almanac, February 1, 2010

<sup>5</sup> Ibid.



- March 15, 1975 - A snowshoer was on a slide path on Macomb Mountain when an avalanche swept him five hundred feet. He was partially buried but managed to escape injury.
- April 1990 - A veteran ice climber was standing at the bottom of the North Face of Gothics when an avalanche occurred. He was able to dig himself out and climb the slope.
- March 1997 - An avalanche swept two backcountry skiers down a steep slide on Mount Colden. Although the skiers were bruised, trees prevented their descent and they were able to ski out.
- An avalanche occurred on “Angel Slide”, Wright Peak on February 27, 2010, catching two skiers in the incident.

Because avalanches occur in back-country areas of the Adirondack Mountains, the New York State Department of Environmental Conservation (DEC) has developed an Avalanche Preparedness brochure, targeted to people who pursue winter sports in the area, about the potential for avalanches and how to be better prepared. The DEC brochure<sup>6</sup> provides these suggestions for basic avalanche awareness:

- Know basic avalanche rescue techniques
- Check the snow depth
- Check how much new snow has fallen
- Practice safe route finding
- Check the degree of the slope
- Check the terrain
- Carry basic avalanche rescue equipment
- Never travel alone
- Let someone know where you are going
- Do not be afraid to turn around
- Use common sense

### Probability of Future Occurrences

- Based on the history of one previous occurrence, avalanches are likely to occur in the same area that was previously impacted by the hazard, but are infrequent (occurrence expected once every 8-50 years).

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<sup>6</sup> *Avalanche Preparedness in the Adirondacks*, NYSDEC, [www.dec.ny.gov/docs/lands\\_forests\\_pdf/avalanche.pdf](http://www.dec.ny.gov/docs/lands_forests_pdf/avalanche.pdf)



### Justification for Not Performing Vulnerability/Loss Assessment

Avalanche occurrences are typically local in scale; and, while past occurrences have resulted in loss of life, the magnitude of an event is not considered likely to cause a life safety threat to large populations. The HAZNY-Mitigation ranking process identified Avalanche as a “low” hazard with a score of 15. (See **Section 3.2.1.**) Consequently, it is determined that there is not sufficient evidence that Avalanche has a high level of overall risk to justify further analysis for the 2014 SHMP update.

The additional information provided in the Risk Assessment sections below serves as guidance for impact and consequence analysis for local hazard mitigation and operational planning.

### 3.3.2 Assessment of Vulnerability by Jurisdiction

Avalanches have occurred only in the Adirondack Mountains, most often on slopes between 30 and 50 degrees. Based on review of the 56 FEMA-approved local hazard mitigation plans (LHMP), Essex and Yates Counties identify avalanche as a hazard; however, Essex County’s Hazard Mitigation Plan (2011) ranks the hazard as moderately low and Yates County ranks it as low. The Yates County LHMP (2011) notes that, “The steeply sloped areas of Yates County are heavily treed and vegetated, which along with climatic factors associated with the Finger Lakes and local topography, tend to minimize the kind of snow pack and risk associated with an avalanche”.

Although Essex County identifies avalanche as a moderately low hazard, the County’s Hazard Mitigation Plan provided the following information related to avalanche:

“Avalanche: In February of 2002 a backcountry avalanche in the high peak region of the county took the life of a cross-country skier. The area was known to be prone to avalanche but it is rare that the quantity of snow exists at one time.”

### 3.3.3 Assessment of Vulnerability of State Facilities

State buildings and facilities are typically not vulnerable to avalanches, as they generally occur in undeveloped areas. There is a very low possibility that state park facilities could be damaged, but there is no historical incidence of this occurring and the probability for future events in areas where state-owned facilities are located is low.

### 3.3.4 Estimate of Potential Losses by Jurisdiction

There is no recorded incidence of property loss associated with the one documented event in Essex County. Because avalanches tend to occur in undeveloped back-country areas, no future losses are anticipated.



### 3.3.5 Estimate of Potential Losses of State Facilities

While state park and preservation lands could potentially be impacted by avalanche, they have previously occurred in state-owned undeveloped areas and there is little potential for losses associated with state facilities.

### 3.3.6 Data Limitations and Key Documents

- Only two of the FEMA-approved local hazard mitigation plans in New York State identify avalanche as a hazard. One county plan (Essex) provides information on a previous occurrence that resulted in one fatality, but does not indicate that there were any property losses resulting from the event.
- New York State Adirondack Park Agency (avalanche history)
- National Climatic Data Center (NCDC)(avalanche history)
- New York State Department of Environmental Conservation (avalanche characteristics and preparedness measures)



## Section 3.4: CLIMATE CHANGE

### 2014 SHMP Update

Climate Change was included in the 2011 plan (**Section 3.3.1**) as a discussion; however, it is expanded in this 2014 update as a separate section to highlight current initiatives by New York State, and to report on adaptation strategies being developed by the state. This section includes the climate change information from the 2011 plan.

This section is not intended to provide a comprehensive review of current scientific evidence and data on climate change, on either a global or jurisdictional scale. In addition, it is not intended to propose or advocate for specific policy-making or regulatory initiatives related to climate change. It is intended to serve as a guide for identifying potential mitigation activities for New York State agencies and local jurisdictions, and to link these activities to strategies, goals and objectives that address mitigation to the impacts and consequences of climate change.

For the purpose of profiling climate change for the 2014 plan update, hazards affected by climate change or its consequences are addressed in this section. Additional data and information related to specific hazards can be found within the respective hazard sections of this plan.

While this plan carefully outlines all natural hazards that threaten our communities, it is recommended that elected officials, planners, and the emergency response/mitigation community recognize the potential for the changing nature of climate and its impacts.

New information and data related to climate change included in the 2014 SHMP update:

- Characteristics
- Location
- Previous events, vulnerabilities and estimated losses
- Climate change adaptation initiatives
- Local plan information related to potential impacts, vulnerabilities and losses
- Changes in development in hazard-prone areas

Specific data sources and key documents are listed at the end of this section.



## Characteristics

Climate change is a worldwide concern because of its potential to significantly impact people, natural resources, and economic conditions around the globe. While the magnitude of these changes is difficult to predict, there is broad agreement that they will continue to occur and will dramatically affect many aspects of peoples' daily lives.

Climate change, in and of itself, is not an individual hazard, and is not required to be addressed by Federal mitigation planning criteria, but analysis of the conditions brought on by climate change can provide a better understanding of how risk and vulnerabilities of population, property, environment and the economy may be affected in the future. In addition, changing climatic conditions may exacerbate the impacts of the other hazards that currently affect New York State. Since the 2011 plan, there has been increased confidence that certain changes in multiple atmospheric conditions can be attributed to climate change.

The effects of climate change are already impacting New York State and are projected to increase in the coming years. At the same time, this presents the opportunity to research, identify, and initiate appropriate adaptive strategies and activities that can lessen the effects of climate change on the environment and future populations.

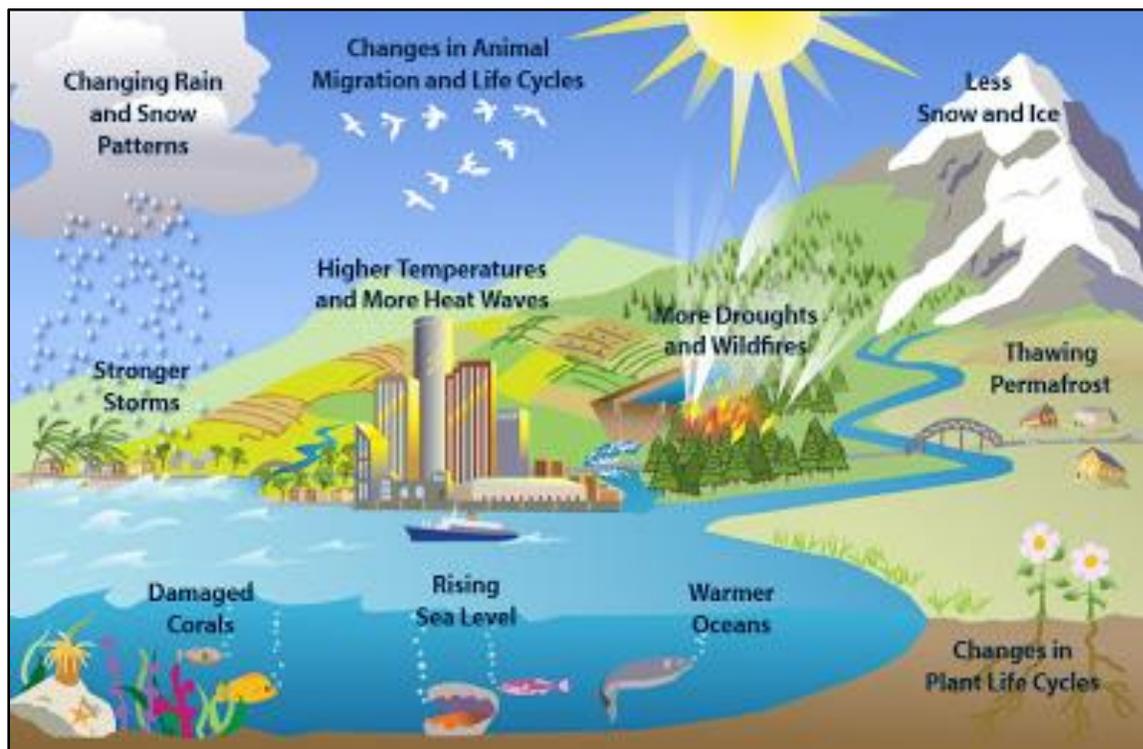
Hazard	Definition and Key Terms
<p><b>Climate Change</b></p>	<p>New York State Department of Environmental Conservation Policy CP-49 identifies types of environmental variables vulnerable to climate change as:</p> <ul style="list-style-type: none"> <li>• Temperature (air, water and ground)</li> <li>• Precipitation</li> <li>• Water quantity/quality</li> <li>• Snow/ice</li> <li>• Sea level rise</li> <li>• Storm frequency and intensity</li> <li>• Humidity</li> <li>• Evaporation</li> <li>• Wind speed and direction</li> </ul> <p>These environmental factors also link to other natural hazards and their impacts that area outlined in this plan, which include coastal erosion, flooding, drought, and wildfire.</p>

Climate change is a shift in long-term weather patterns: temperature, precipitation, wind, and more. While the body of scientific evidence that the climate is changing has been universally accepted, the complexities within this field of study make it difficult to precisely define the full scope and magnitude of its consequences. However, climate change experts



are in agreement that one of the greatest threats posed by global warming is sea level rise, which is expected to increase coastal flood frequency and severity from tropical cyclones, extra tropical cyclones and other severe coastal storms.

**Figure 3.4a** illustrates the widespread impacts of climate change on the natural environment.



Source: <http://3.bp.blogspot.com>

While climate change may be due in part to natural processes and forces, it is extremely likely (i.e., with 99-100% certainty) that a significant portion of climate change is due to the influence of human beings on nature. In addition to reducing greenhouse gas emissions to lessen the degree of climate change, the state's approach to addressing climate change and its potential impacts is also through adaptation strategies, which are adjustments in natural or human systems to better prepare for the impacts of a changing environment.

### 3.4.1 Climate Change Profile

Conditions related to climate change are expected to alter both average climate and the frequency and intensity of extreme weather events in New York State<sup>1</sup>, which will, in turn, exacerbate what in the past were considered to be "expected" impacts and consequences of

<sup>1</sup> *Responding to Climate Change in New York State* (ClimAID), November 2011, p. 259. The ClimAID report was funded by the New York State Energy Research and Development Authority (NYSERDA), provides the best available scientific information specific to the effects of climate change on energy systems in New York State. p. 259



weather events. These conditions will significantly increase the risk to people, property, environment, and the economy. In addition, indirect impacts on infrastructure may be greater than the direct impacts. One of the most comprehensive studies on climate change in New York State, *Assessment for Effective Climate Change Adaptation Strategies in New York State* (ClimAID), (November 2011), was funded by the New York State Energy Research and Development Authority (NYSERDA) and focused on eight critical sectors within the state - agriculture, coastal zones, ecosystems, energy, public health, telecommunications, transportation, water resources. Each sector was analyzed for risks, vulnerability, and potential challenges caused by conditions related to climate change, as well as potential adaptation strategies. For example, specific risks to the supply, distribution, demand and consumption of energy were identified, linked to principal climate variables, defined, and assigned to locations and “crosscutting links” such as public

*“Climate change is a reality,  
extreme weather is a reality,  
and it is a reality that we are  
vulnerable.”*

*-Governor Andrew Cuomo  
October 2012*

health, water resources, agriculture or communications. As an additional example, conditions linked to prolonged high temperatures and extreme weather events may temporarily or permanently change energy demand patterns.<sup>2</sup> The ClimAID Report also proposes potential adaptive strategies to mitigate significant effects of climate change on the state’s power generation systems.

These following issues highlighted in the ClimAID reports<sup>3</sup> are also identified in the soon-to-be-released National Climate Assessment Report (draft, September 2013).

- Heat waves, coastal flooding due to sea level rise, and river flooding due to more extreme precipitation events will pose a growing challenge to the region’s environmental, social, and economic systems. This will increase the vulnerability of the region’s residents, especially populations that are already most disadvantaged.
- Infrastructure will be increasingly compromised by climate-related hazards including sea level rise and coastal flooding, and intense precipitation events.
- Agriculture and ecosystems will be increasingly stressed by climate-related hazards, including higher temperatures, sea level rise and coastal flooding, and more extreme precipitation events. A longer growing season may allow farmers to explore new crop options, but this and other adaptations will not be cost or risk-free, and inequities exist in the capacity for adaptation.
- While a majority of states and several municipalities have begun to incorporate the risk of climate change into their planning activities, implementation of adaptation measures is still at early stages.

<sup>2</sup> ClimAID, p. 260

<sup>3</sup> ClimAID, p. 3 (These issues are also identified in the soon-to-be-released National Climate Assessment Report (draft, September 2013)).



## Coastal and Inland Erosion

New York's coastline is subject to a variety of hazards, including coastal storms, long-term sea level rise, erosion, and saltwater intrusion. Development and human settlement puts lives and properties at risk to these coastal hazards.

An area's potential for erosion is determined by four factors: soil characteristics, vegetative cover, climate/rainfall, and topography. The two major erosion mechanisms are wind and water. Wind that blows across sparsely vegetated or disturbed lands can cause erosion by picking up soil, carrying it through the air, and displacing it in another site. Water erosion occurs over land, and in streams and channels. Major storms can cause coastal erosion from the combination of high winds and heavy surf and storm surge. Climate change could exacerbate conditions that lead to both coastal and inland erosion.

Based on various assessments of shoreline changes since the mid-1800s, New York's beaches appear to be experiencing net erosion in general, but beach renourishment has been used in a number of areas as a method to stabilize this underlying trend. Long-term shoreline change rates vary from marginally accretional along some standard beaches, to highly erosional (as much as 20 feet per year) in some highly dynamic inlet areas. Beginning with Hurricane Irene in 2011 and again with Hurricane Sandy in 2012, Fire Island in Suffolk County has experienced above average erosion rates and is considered one of the most vulnerable beaches in New York State. (Additional information related to the USGS Fire Island Survey is provided in **Section 3.5: Coastal Erosion.**)

Coastal erosion and other climate change hazards are also discussed in the following hazard sections:

- Section 3.5** Coastal Erosion
- Section 3.8** Extreme Temperatures
- Section 3.9** Flood
- Section 3.12** Hurricane
- Section 3.17** Wildfire

## Drought

Rising summer temperatures, along with little change in summer rainfall are projected to increase the frequency of short-term (one to three month) droughts. This scenario will lead to impacts on the natural and managed ecosystems across the state. Water management and hydrology are also affected. In addition, drought has been directly linked to an increasing number of land subsidence incidents in other parts of the world. In France, for example, subsidence-related insurance claims have risen by over 50 percent in the last 20 years, costing the affected regions an average \$425 million a year<sup>4</sup>.

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<sup>4</sup>Lloyd's Insurance conference on agricultural issues



Additional information related to the characteristics, vulnerabilities and losses for Drought is provided in **Section 3.6**.

### Extreme Temperatures

Temperatures in the Northeast are projected to increase an additional 4.0 to 9.0 degrees Fahrenheit in New York State by the year 2080<sup>5</sup>. Consequences of this change will lead to increased energy usage with direct impact on energy demand and supply. Within 40 years and beyond, the choices made for emissions could make a dramatic difference in the projected impacts of extreme temperatures on energy use.

Since 1970, the annual average temperature in the Northeast has increased by 1.5°F, with winter temperatures rising twice as much. Warming has resulted in many other climate-related changes, including:

- More frequent days with temperatures above 90°F
- A longer growing season
- Increased heavy precipitation

It is unclear whether the frequency or severity of ice storms will change across the state over the next few decades. Some sources predict less winter precipitation falling as snow and more as rain with reduced snowpack. Shorter snow seasons and earlier spring snowmelts are also predicted. However, it is possible that by later this century, changes in the winter snow patterns will impact the southern and northern parts of the state differently, with fewer ice storms in the south. The impact on frequency or severity of ice storms in northern New York later in the century is less uncertain<sup>6</sup>.

The Northeast is projected to face continued warming and more extensive climate-related changes, some of which could dramatically alter the region's economy, landscape, character, and quality of life. Also as more northerly areas warm up, insects and pathogens thrive, which may lead to an increasing use of pesticides as the number of affected areas grows. Earlier springs and warmer winters will also lead to growing insect populations.

In addition, changing temperatures will encourage weed-growth to move farther northward, competing with and sometimes overcoming agricultural crops and significantly increasing the costs to produce food.

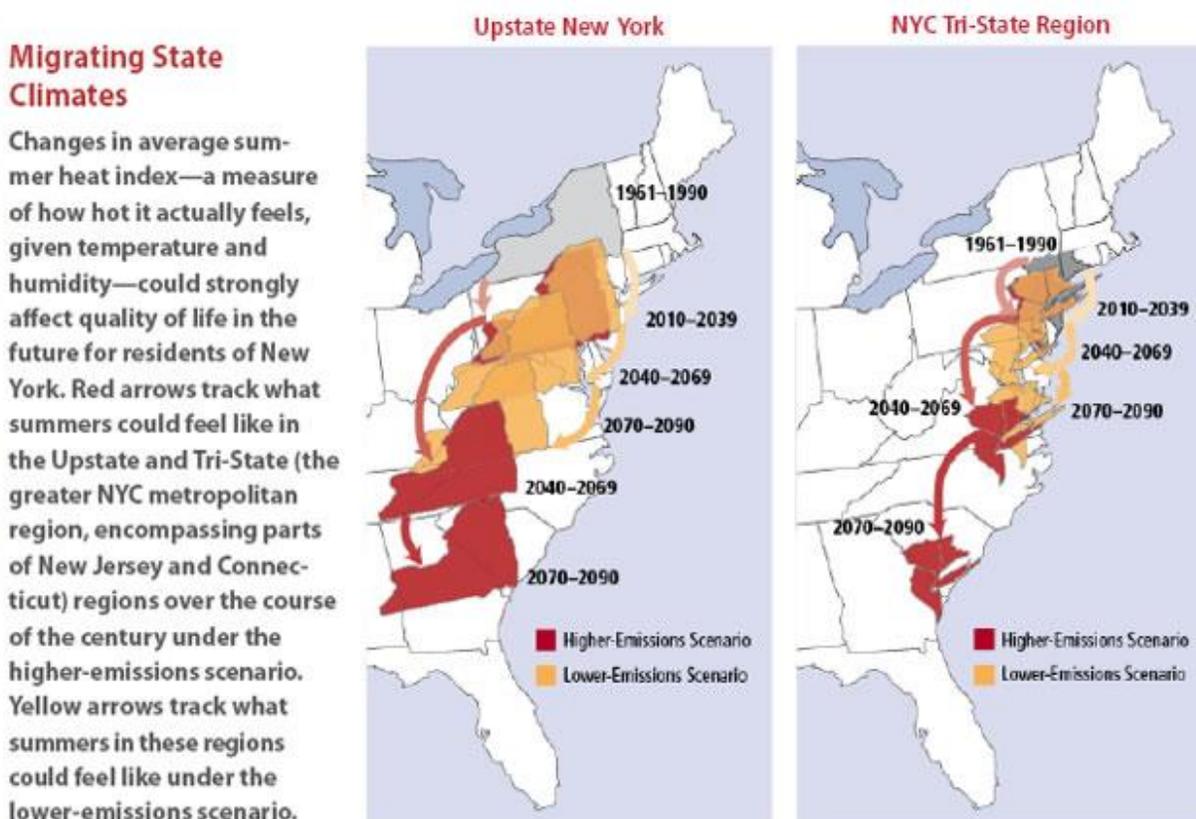
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<sup>5</sup> ClimAID, p. 29

<sup>6</sup> *Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions*, Northeast Climate Impacts Assessment (2007), Union of Concerned Scientists



**Figure 3.4b** illustrates the potential impact of changes in the average summer heat index by the end of the 21<sup>st</sup> Century.



Source: *Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions*, Northeast Climate Impacts Assessment (2007), Union of Concerned Scientists.

Adaptive strategies to lower emissions could reduce the impact of extreme temperatures to the energy sector. Higher emissions are projected to worsen impacts, which would include the following.

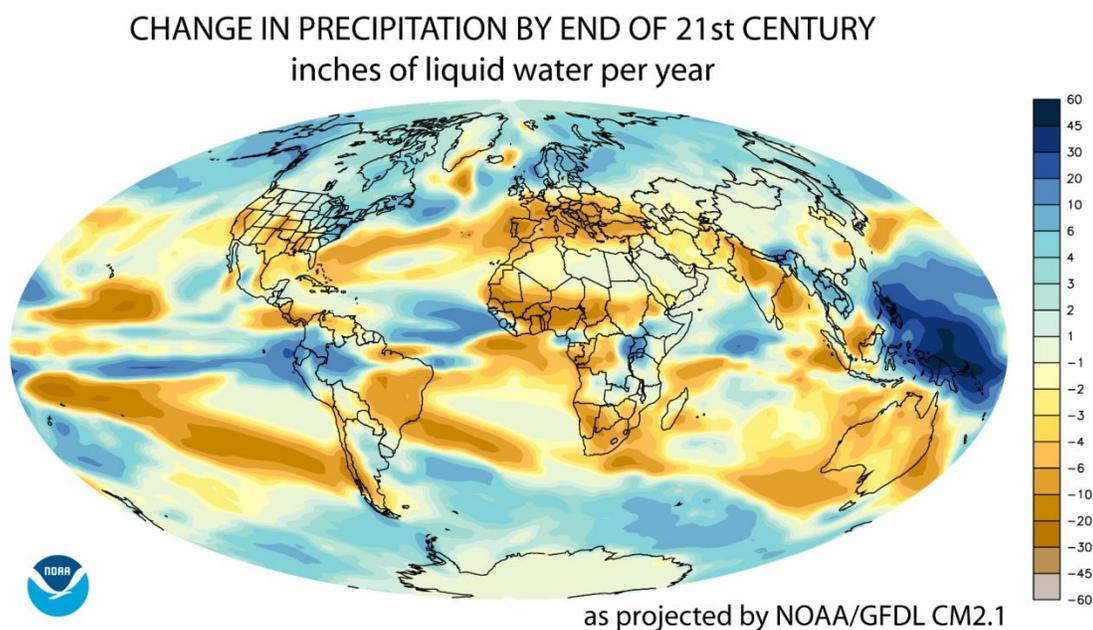
- Winters in the Northeast would be much shorter with fewer cold days and more precipitation.
- The length of the winter snow season would be cut in half across northern New York, and reduced to a week or two in southern parts of the region.
- Cities that today experience few days above 100°F each summer would average 20 such days per summer.
- Short-term (one- to three-month) droughts are projected to occur as frequently as once each summer in the Catskill and Adirondack Mountains, and across the New England states.
- Hot summer conditions would arrive three weeks earlier and last three weeks longer into the fall.
- Sea level in this region is projected to rise more than the global average

Additional information related to the characteristics, vulnerabilities and potential losses due to extreme temperatures is provided in **Section 3.8**.

### Precipitation, Flooding and Landslides

Precipitation patterns related to climate change are expected to shift in the coming decades. **Figure 3.4c** illustrates the potential increase in precipitation that could impact New York State by the end of the century. Based on this projection, areas of New York State could see an increase of 3 to 6 inches of rainfall per year. Additionally, this precipitation is projected to occur more often as heavy downpours. Increased precipitation and downpours will lead to more flooding, impacting people, property, and the environment. It can also potentially increase landslides due to higher moisture levels in soils. In addition, changes in precipitation will impact crop production and other segments of the agricultural economy.

**Figure 3.4c: Change in Precipitation by the End of 21<sup>st</sup> Century**



Source: NOAA

The Northeast region is also projected to see an increase of approximately 20 to 30% in winter precipitation<sup>7</sup>. Projections are based on lower- or higher-emissions scenarios, which also identify the potential number of “snow-days” across the state. In a high-emission scenario, the Adirondack region could see the snow season cut in half; a low-emission scenario would retain about three-quarters of its snow season, or two to three

<sup>7</sup> Confronting Climate Change



weeks of snow cover per winter month) which would carry over to an impact on the winter tourist economy.

Additional information related to the characteristics, vulnerabilities and potential losses due to precipitation is provided in **Section 3.9: Flooding**.

### Severe Storms

Although climatologists are unsure whether the increasing cycle of tropical storm events since 1995 is part of a multi-decadal cycle that will eventually decline, or whether it will be influenced by increasing conditions due to climate change, projections indicate that the severity of all storms and their impacts are increasing and will continue to do so.

Studies link increased tropical storm energy and duration to warmer ocean temperatures<sup>8</sup>. Return intervals of severe storms may also be shortened, resulting in high tide peaks, for example, that occur once every ten years rather than once every hundred years.

Additional information related to the characteristics, vulnerabilities and potential losses due to severe storms is provided in **Section 3.10: Hailstorm, Section 3.11: High Winds, 3.12: Hurricane** and **Section 3.15: Severe Winter Storm**.

### Sea Level Rise

Sea level rise associated with climate change will have significant effects on coastal areas. Rising seas will increase coastal erosion, flood wetlands and low-lying lands and worsen coastal flooding. Increased salinity will also impact estuaries and aquifers. Heavy precipitation associated with coastal storms causes increased runoff and river surges that intensify the effects of storm surges from the sea. Levees and seawalls currently protect many coastal areas, but these structures have been designed for current sea level and may be overtopped in the future or undermined by increased erosion.

Various projections of the extent and costs of sea level rise in the next century have been made:

- Residential structures in the 100-year floodplain of New York City and Nassau, Suffolk and Westchester counties have a total estimated value of over \$125 billion. While this figure includes riverine as well as coastal flood plains, it reflects the scale of flood exposure in the region. The wide range of options available to address protection of these structures, in addition to the extent and timing will influence the ultimate costs.
- Adaptation measures for coastal areas such as the construction of bulkheads, dikes, and pumping systems can protect property, but these measures are likely to result

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<sup>8</sup> Atlantic Hurricanes and Natural Variability in 2005, Trenberth and Shea, Geophysical Research Letters, 2006. 2. Increasing Destructiveness of Tropical Cyclones over the past 30 years, Kerry Emanuel, Nature, V.436, Aug 2005



in further loss of wetlands and beaches with detrimental effects on fish and wildlife, recreation, and tourism. Elevation of structures and land surfaces, and land-use policies that allow shorelines to retreat naturally are less disruptive response strategies but are challenging to implement in areas already highly developed. Land elevation and beach nourishment are attractive options in many ways; yet they are not feasible in all locations, and they require extraordinary financial and political commitments into the indefinite future.

- The ClimAID report<sup>9</sup> projects a sea-level rise of 8 to 23 inches by the 2080s, or a range of 37 to 55 inches with a rapid ice melt scenario. The International Panel on Climate Change (IPCC) predicts, “a sea-level rise of at least one to two feet can be expected by the end of the century, though a wide range of sea-level rise scenarios exist. The growing urban footprint and increasing population density in coastal areas has also amplified the financial and societal impacts of such events<sup>10</sup>.” Either scenario will cause a significant impact to coastal assets.

In addition to these sources, the State Sea Level Rise Task Force, charged by the New York State Legislature in 2007 with developing recommendations for adapting to sea level rise, adopted the sea level rise projections in the table below for two regions of the state. Although these projections have not been officially adopted by the Legislature or any New York State agency for regulatory purposes, the New York State Department of Environmental Conservation (DEC) considers them the best available projections for planning purposes<sup>11</sup>.

**Table 3.4a: Projected Sea Level Rise in Two Regions of New York (ClimAID Integrated Assessment, 2011)**

Lower Hudson Valley & Long Island	2020s	2050s	2080s
Sea level rise	2 to 5 in	7 to 12 in	12 to 23 in
Sea level rise with rapid ice-melt scenario	5 to 10 in	19 - 29 in	41 to 55 in

<sup>9</sup> ClimAID, p. 33

<sup>10</sup> “Rising Sea Levels Ranked as Greatest Climate Change Threat”, Insurance Journal, 9/4/13

<sup>11</sup> NYSDEC Sea Level Rise Website



Mid-Hudson Valley & Capital Region	2020s	2050s	2080s
Sea level rise	1 to 4 in	5 to 9 in	8 to 18 in
Sea level rise with rapid ice-melt scenario	4 to 9 in	17 to 26 in	37 to 50 in

Sea level rise is expected to permanently inundate already low-lying areas and dramatically accelerate erosion – already a severe problem along New York’s heavily developed coast. Sea level rise will continue to threaten already-vulnerable homes, businesses and infrastructure as well as environmentally-sensitive salt marshes and estuaries. These areas are critical habitats for large numbers of coastal bird and fish species, and provide ecosystem services such as pollution filtration, sediment trapping, erosion mitigation, and flood control. Wetlands in most areas have been able to keep pace with historic sea-level rise by accreting sediment and growing vertically and by moving inland with the encroaching sea. But the accelerated rates projected for the next 100 years may be too fast for natural accretion and migration to keep up; additionally, coastal development may impede the inland movement of these wetlands. Sea level rise will also likely have an impact on salt water intrusion into coastal freshwater aquifers – impacting drinking water supplies and crop irrigation. Long Island and parts of New York City rely heavily on ground water aquifers for drinking water and agriculture.

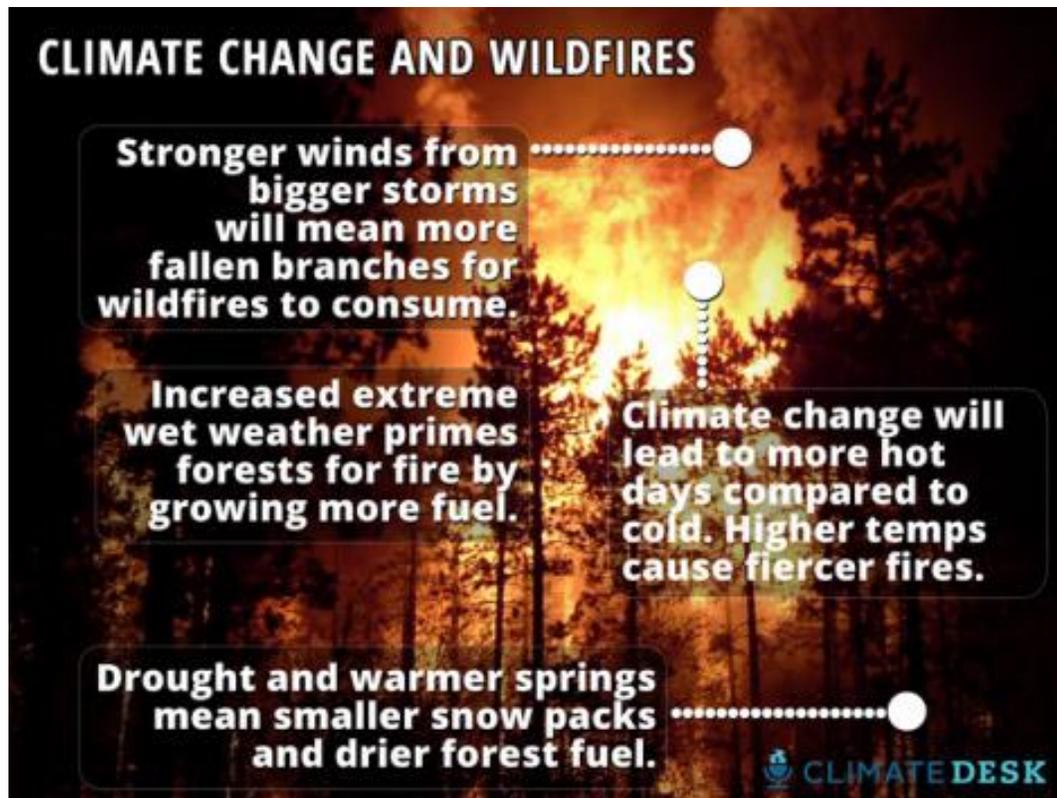
### **Wildfire**

Climate changes directly and indirectly affect the growth and productivity of forests: directly due to changes in atmospheric carbon dioxide and climate, and indirectly through complex interactions in forest ecosystems. Climate also affects the frequency and severity of many forest disturbances, such as insect outbreaks, invasive species, wildfires, and storms.

Forests cover approximately 60% of the state’s total land area. As temperatures increase, the suitability of a habitat for specific types of trees changes. In addition, there is growing evidence that prolonged heat waves are likely to lead to a greater incidence of wildfires.



**Figure 3.4d** illustrates the relationship between conditions related to climate change, including extreme temperatures and drought, to wildfires, which can subsequently lead to impacts to the population, environment, and agriculture.



Source: [www.grist.org](http://www.grist.org)

Additional information related to the characteristics, vulnerabilities and potential losses due to wildfires is provided in **Section 3.17: Wildfire**.

### Location (geographic area affected by hazard)

The entire state is potentially vulnerable to the overall effects of climate change related to extreme temperatures and precipitation. In addition, coastal areas and inland waterways are especially susceptible to sea level rise, increasing flooding and coastal erosion. The state's ecosystem is at risk for significant changes that could impact food and water supplies, energy, and the economy.

Sea level rise has the potential to impact 17 counties in New York State that adjoin to tidal bodies of water:

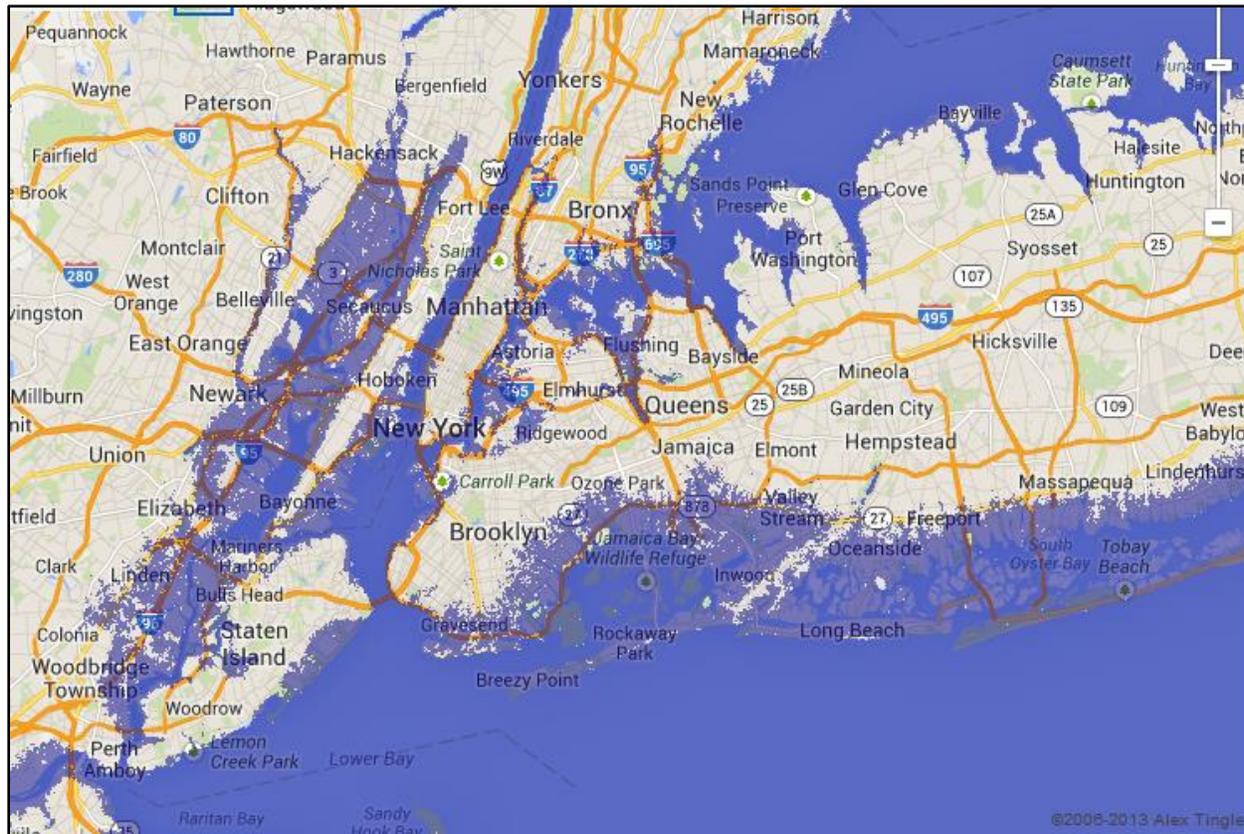
- Albany
- Bronx
- Columbia
- Dutchess
- Greene
- Kings (Brooklyn)
- Nassau
- New York (Manhattan)
- Orange
- Putnam
- Queens
- Rensselaer
- Richmond (Staten Island)
- Rockland
- Suffolk
- Ulster
- Westchester

Two of the 62 counties in New York and the five counties that make up New York City are located along the Atlantic coast, and Long Island Sound, making them especially vulnerable to hurricanes, sea level rise, erosion, salt water intrusion, and other coastal events.

Coastal events can also have inland-reaching impacts; in particular, the inland counties of Westchester, Rockland, Albany, Columbia, Dutchess, Greene, Orange, Putnam, Rensselaer, Rockland, Ulster and Westchester Counties are susceptible to tidal flooding, saltwater intrusion, and erosion caused by hurricanes and coastal storms. In addition, Erie and Chautauqua Counties have experienced erosion from storms, and other counties along the Great Lakes shorelines could become more susceptible to erosion and seiche. **Figure 3.4e** depicts coastal areas along the Atlantic Ocean, bays, tidal rivers and the Great Lakes with potential impact from sea level rise.



Figure 3.4e: Sea level Rise Projections for Coastal Areas of New York State



Source: [www.geology.com](http://www.geology.com) (Google, NASA)

### Previous Occurrences

Because of the difficulty in attributing the scope and severity of any particular event to climate change, it has not been identified as a specific hazard in relation to Federal Disaster Declarations, nor is it likely to be in the next several years. Climate change involves interrelated complexities of multiple hazards and conditions, as well as impacts and consequences. Although some industries (such as insurance companies) have started developing methodologies for taking climate change into account, tracking occurrences of climate change over time from a disaster impact probability and severity analysis will be difficult. Future studies and research may result in an accepted methodology for measurement.

Previous occurrences linked to specific hazards are addressed in other hazard profiles and risk assessments:

**Section 3.5:** Coastal Erosion  
**Section 3.8:** Extreme Temperatures  
**Section 3.9:** Flood

**Section 3.12:** Hurricane  
**Section 3.17:** Wildfire



## Probability of Future Events

There is little disagreement within government, academic, and scientific circles that changes occurring in the atmosphere over multiple decades are impacting the earth's climate. Based on research studies, reports, records of historical events over long periods of time, and predictive models, it is highly likely that climatic changes that New Yorker's have been experiencing will occur much faster in the coming years. Although the extent and magnitude of its impact is not fully determined, ongoing research may further refine predictions for probability and severity.

Despite the recent impacts from Tropical Storm Lee and Hurricane Irene in 2011, and Hurricane Sandy and Winter Storm Nemo in October 2012, there is not unanimous agreement in the scientific community about whether increased Atlantic hurricane activity since 1995 is due to the effects of climate change or a multi-decadal hurricane cycle. There is little or no information available on the frequency and distribution of extra-tropical storms (nor'easters) or on the distribution of their impacts over the landscape. Other than the historical record, there is also little information available on the frequency of Great Lakes storms or the distribution of their impacts over the landscape.

Future sea level rise depends on a number of factors. The amount of carbon dioxide (CO<sub>2</sub>) emitted will determine how much global warming takes place. The amount of ice that melts will vary according to the amount of global warming, and the same is true of thermal expansion.

## Potential Impacts and Consequences of Climate Change

The ClimAID Report identifies both near-term and longer-term climate vulnerabilities for New York State<sup>12</sup>. Vulnerability plays an essential role in determining the severity of climate change impacts. It is important to conduct a comprehensive assessment of vulnerability in order to improve the capacity of a society to adjust its functioning in response to actual and projected climate changes. For the purpose of this hazard, statements were developed to address vulnerabilities for the following sectors:

- Population
- Property
- Critical Infrastructure
- Environment
- Economy
- Continuity of services/Program operations
- Public confidence in the state's governance

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<sup>12</sup> ClimAID, p 6



The ClimAID Report suggests the following key criteria related to climate impacts in New York be considered for vulnerability:

- Magnitude
- Timing (e.g., seasonality)
- Persistence and reversibility
- Likelihood (based on estimates of uncertainty)
- Distributional aspects within a region or among socioeconomic groups
- Importance of the at-risk systems
- Thresholds or trigger points that could exacerbate the change

Figure 3.4f is an example of vulnerability analyzed in the ClimAID Report for impacts to Coastal Zones. [Table will be recreated] (Additional vulnerability tables for other critical sectors can be found in ClimAID.)

Coastal Zones							
Main Climate Variable	Specific Climate Variable	Probability of Specific Climate Variable	Climate Variable Note	Impact on Resource	Likelihood of Impact	Consequence without Adaptation	Magnitude of Consequence
Infrastructure and Coastal Property							
Sea level rise	Permanent inundation of coastal areas	N/A	By 2050, only a small increase in the area permanently inundated is expected	Entrances to bridges, tunnels, segments of highways, wastewater treatment plans, and sewer outfall systems permanently under sea water	High	Failure of systems	High
				Coastal properties permanently under sea water	High	Abandonment	Medium
				Increase salinity of influent into wastewater pollution control plants	Medium	Corrosion of materials and equipment, failure of systems	High
	Increased frequency, intensity, and duration of storm surge and coastal flooding	Likely/ very likely	Will depend both on sea level rise and on uncertain changes in tropical cyclones and nor'easters	Coastal property damage	High	Potential loss of life	High
				Increased wear and tear on equipment not designed for salt-water exposure	Medium	Economic impact Failure of systems Complications to evacuation routes	High
Ecosystems							
temperature				Heightened disease, harmful algae	High	Ecosystem vulnerability	Medium



Precipitation	Warmer coastal sea surface temperatures	Likely	N/A	blooms, and increased competition over resources Northward shift in range of habitat for many commercial important fish and shellfish species	High	Decline in fishing industry	High
	Increased mean precipitation	More likely than not	N/A	Affect rates of groundwater recharge lake levels Increased or reduced stream flow	Medium	Potential shortages of drinking water availability Affect the delivery of nutrients and pollutants to coastal waters potentially leading to poorer water quality	High Medium
Sea level rise	Permanent inundation of coastal areas	N/A	By 2050, only a small increase in the area permanently inundate by expected	Permanent inundation of wetlands	High	Loss of critical wetland habitat	High
	Increased wave action	Likely/ Very Likely	Will depend both on sea level rise and on uncertain changes in tropical cyclones and nor'easters	Increased beach erosion	High	Barrier migrations and loss of barrier islands resulting in exposure of the bay and mainland shoreline to more oceanic conditions	High
	Increased wave action	Likely	Will depend both on sea level rise and on uncertain changes in tropical cyclones and nor'easters	Erosion and reshaping of shorelines	Medium	Affect the location and extent of storm surge inundation	High

### Population

Hazards linked to climate change have the potential to instigate both direct and indirect consequences that affect the health and well-being of the population, including:

- Contaminated water
- Decreased water quantity
- Failure of sanitation systems
- Infectious disease outbreak
- Loss of health and medical services, including behavioral health
- Separation from social, and/or community cultural systems
- Job loss
- Economic decline

Additional indirect impacts could result in long-term consequences that prohibit or delay the onset of conditions leading to public health issues. Extreme weather events encourage outbreaks of disease and infestation; flooding leads to an increase in fungal growth and



nematodes while drought leads to increases in locust and white fly populations. Changes in ecosystems, agriculture, and water supplies will have extreme impacts on human health.

Globally, heat was a leading weather-related cause of death. Between 2003 and 2012, extreme heat was already the top cause of weather-related deaths in the United States, killing an average of 117 people per year. A recent study<sup>13</sup> found that heat-related mortality around the world due to the effects of climate change may rise 20 percent by the 2020s, and in some worst-case scenarios, it could increase by 90 percent or more by the 2080s, and the net temperature-related mortality, which includes the drop in deaths related to cold weather, could jump by a third compared to current levels.

In addition to more intense heat, related deterioration of air quality could increase the risk of many health problems, especially cardiovascular and respiratory problems. Other populations which may be considered vulnerable in relation to health and medical systems and services include:

- Physically and mentally disabled
- Visually impaired
- Electric-dependent (oxygen, ventilators and other medical equipment required for life-support)
- Elderly
- Lower socio-economic
- Homeless

Projections for warmer winters and hotter summers also increase the opportunity for vector-borne disease outbreaks such as West Nile Virus and Lyme-disease from mosquitos and ticks (respectively). Seasonal pollen production will also accelerate, extending allergy season and increasing risks for asthma.

Emergency responders may also be affected by impacts from climate change, such as increased service demands, and stress and other personal vulnerabilities.

Multiple projects and initiatives address health and safety of the population in relation to climate change conditions. Examples include:

- **2013-2017 State Health Improvement Plan** (New York State Department of Health)
  - The "Promote a Healthy and Safe Environment" plan for New York State focuses on four core areas that impact health, which include: water quality, air quality, built environments, and injuries and occupational health. 'Environment,' as used in the plan, incorporates all dimensions of the

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<sup>13</sup> Study produced by the Chinese Center for Disease Control and Prevention, and Radley Horton and Patrick Kinney of Columbia University, reported in the Huffington Post, May 2013.



physical environment that impact health and safety. The impact of and adaptation to climate change was included as a cross-cutting issue within this plan.

### Property

The various climate change hazards will impact properties differently. Severe weather events (hurricanes, storm-induced wave action coastal erosion, high winds, etc.) will be more likely to damage or destroy residences, businesses and critical infrastructure. Coastal areas and properties will be especially vulnerable to sea level rise. Although numerous studies and plans have been or are being developed, there is no conclusive decision on the optimal approach to reduce the coastal threats to property. There are three general approaches that could be considered. Some approaches and potential benefits to shoreline protection are described in **Table 3.4b**. Depending on the approach and conditions of the site being addressed, there could be potential for unintended consequences of armoring which ignores the surge-reducing benefits of things like wetlands. For example, protecting one area could increase flood impacts in another. Also, there are many options that have been proposed that are a mix of the three approaches described below that could have a multitude of benefits.

**Table 3.4b: Approaches and Benefits of Shoreline Protection to Address Sea Level Rise**

Approach	Potential Benefits
Armor the shore with seawalls, dikes, revetments, bulkheads, and other structures	Preserves existing land uses, but wetlands and beaches are squeezed between development and the rising sea
Elevate the land, and possibly wetlands and beaches, as well	Preserves the natural shores and existing land uses, but often costs more than shoreline armoring
Retreat by allowing the wetlands and beaches to take over land that is dry today	Preserves natural shores, but existing land uses are lost

Source: J. Tanski. 2010. "New York". In *The Likelihood of Shore Protection along the Atlantic Coast of the United States*, ed. Titus and Hudgens: Report to the U.S. Environmental Protection Agency

### Critical Infrastructure

Much of the critical infrastructure in coastal areas, such as electric, water, sanitary, communications, and transportation systems could be negatively impacted by multiple hazards related to climate change, such as rising sea levels, extreme temperatures, drought, and flood.

As an example, power failures have occurred on numerous occasions in various locations throughout the State, due to various causes. Since a power failure has the potential of



being a result of conditions caused by climate change, the probability of failure of the energy system increases as the intensity of extreme events increases. This type of incident, depending on severity, could pose significant health and safety risks and would normally require the involvement of local emergency management organizations to coordinate provisions for food, shelter, water, heating, etc<sup>14</sup>.

The New York City Panel on Climate Change has studied the potential impacts to the City for several years and has identified the following specific consequences for critical infrastructure<sup>15</sup>:

**Temperature-related** impacts may include:

- Increased summertime strain on materials
- Increased peak electricity loads in summer & reduced heating requirements in winter

**Precipitation-related** impacts may include:

- Increased street, basement & sewer flooding
- Reduction of water quality

**Sea level rise-related** impacts may include:

- Inundation of low-lying areas & wetlands
- Increased structural damage & impaired operations of critical infrastructure such as power, water, sewer, drainage, transportation, communication, health and medical

The ClimAID report provides a comprehensive analysis of the state's infrastructure, its vulnerabilities, and adaptive strategies that could reduce the potential for loss of services as the result of impacts from climate change<sup>16</sup>.

## Environment

The environment within New York State is one of the sectors most susceptible to impacts from climate change conditions. Extreme temperatures, drought, and sea level rise will impact ecosystems, crops, livestock and, ultimately, food supplies.

Water supplies and quality will also be impacted by extreme heat and drought. Rising sea levels and intensive flooding will affect sensitive natural protective barriers in coastal areas as well as inland waterways. Ultimately, changes in the environment will lead to a higher incidence of public health issues.

## Economy

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<sup>14</sup> 2011 NYS HMP: Power Failure section

<sup>15</sup> Climate Risk Information (2009), NYC Panel on Climate Change

<sup>16</sup> *Responding to Climate Change in New York State* (Final Technical Report) (November 2011), New York State Energy Research and Development Authority.



Economic costs of climate change impacts have the potential for being extraordinary. Impacts from all the impacts linked to climate change will affect the state's economy in relation to jobs, the prices of goods and services, and costs of development and construction.

Especially vulnerable to economic impacts are the coastal areas, including the Atlantic and the Great Lakes shorelines. As New York Offshore Atlantic Ocean Study (DOS, July 2013) notes, "New Yorkers rely on the ocean for a wide range of economic activities. Over two-thirds of all New Yorkers live in counties that are located within the State's ocean and estuarine regions, accounting for over 275,000 ocean and coastal-related jobs and nearly \$7.5 billion in wages in 2009<sup>17</sup>." Dependence on the coastal economy encompasses infrastructure such as transportation (marine, air, land, rail), as well as industry and tourism. Impacts to the coastal environment and property will carry over to impact the state's economy. Loss of homes and businesses in vulnerable coastal areas will cause relocation and possible economic failure.

In addition to the coastal areas, the agricultural economy is especially vulnerable to impacts from climate change. Almost 36,350 farms cover about 25% of the state's land area and generated more than \$4.4 billion in 2007. Fruit and vegetable crops alone produce about \$500 million annually. Rising air and ocean temperatures will present new opportunities and challenges to agriculture and fishing. For example, increased irrigation and pest control, and declining crop yields will increase costs. Heat also reduces milk production in cows, leading to rising costs. In addition, large temperature-driven die-offs of specific commercial fish, such as lobster, may occur by mid-century.

One of the few positive effects caused by climate change could be the potential for longer growing seasons, which could offset other economic effects related to agriculture.

### **Continuity of services/Program operations**

Emergency operations have the potential to be disrupted by the impacts and consequences of hazards related to climate change. Extreme temperatures may increase the demand for emergency medical calls and cooling centers for a larger population. Flooding and severe storms may impact government facilities and resources. In addition, consequences of events that impact a greater population will strain the capabilities and capacities of multiple sectors of government operations and services.

### **Public Confidence in the State's Governance**

Research studies have supported the close causal link between the efficiency with which governments deliver services, and the degree of trust citizens have in those governments.<sup>18</sup>

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<sup>17</sup> National Oceanic and Atmospheric Administration (NOAA), Coastal Services Center [Internet]. 2012. Coastal county snapshots [cited 2012 July 24]. Available from <http://www.csc.noaa.gov/snapshots/>.

<sup>18</sup> *Public Confidence in Government, and Government Service Delivery*, Harvey Sims; Canadian Centre for Management Development; March 2001; and *Crisis of Confidence in Government Widens: Majority of Public*



This link is exhibited through citizens' acceptance of and timely response to messages related to preparedness and protective actions in the face of an impending disaster, as well as educational initiatives for topics such as adaptation strategies for climate change. Individuals interpret messages and act upon them differently depending upon the confidence they have in the source of the message.

In recent years, New York State has taken a leading role in identifying threats, hazards and vulnerabilities related to climate change and adaptive strategies and actions that can lessen its impacts. Hurricane Sandy, well as Hurricane Irene and Tropical Storm Lee, served as an alert to the public about the potential for increased storms and their severity in the future, and the timely and appropriate response by state and local government to these concerns will assist in promoting confidence in key officials' actions and messages related to climate change and adaptive strategies.

### 3.4.2 Assessing Climate Change Vulnerability by Jurisdiction

All counties in New York State have vulnerabilities to extreme temperature, increased precipitation, and/or drought. In addition, many counties are prone to flooding which could worsen with influences of climate change. Coastal counties of New York State, already susceptible to impacts from storms, flooding and erosion, will likely experience increased events in the future, both by frequency and by severity.

#### Local Plan Integration/Risk Assessments

The methodology used to analyze and integrate information related to risk and vulnerability from LHMPs is described in **Section 3.1 and Section 5.**

Fifty-six county hazard mitigation plans were reviewed for the 2014 update, and risk assessment data related to climate change was integrated into this plan. No county plans identified climate change as a single hazard, but addressed it through discussion in relation to other hazards. Table 3.4d describes the level of risk, vulnerability and/or loss identified in four county plans that addressed climate change as a risk or vulnerability.



**Table 3.4c: Climate Change Risks/Vulnerability Addressed in Local Hazard Mitigation Plans**

County	Description of Risk/Vulnerability to Climate Change
<b>Clinton</b>	Climate change is exceedingly likely to bring warmer temperatures to NYS, with extreme heat events increasing in number, intensity and length. An escalation in total annual precipitation is likely with brief, intense rainstorms increasing. Rural areas, agriculture and natural resource dependent riverine communities face challenges in developing adaptation strategies focusing on responding to a changing climate.
<b>Franklin</b>	Climate change is exceedingly likely to bring warmer temperatures to NYS, with extreme heat events increasing in number, intensity and length. An escalation in total annual precipitation is likely with brief, intense rainstorms increasing. Rural areas, and agriculture and natural resource dependent riverine communities face challenges in developing adaptation strategies focusing on responding to a changing climate.
<b>Rockland</b>	Rockland County will continue to experience periodic drought conditions in the foreseeable future, possibly with greater frequency if some of the current predictions regarding climate change prove to be accurate.
<b>Tompkins</b>	According to the climate projections noted in NYSEERDA's ClimAID technical report, annual average precipitation is projected to increase by up to 5 percent by the 2020s, up to 10 percent by the 2050s, and up to 15 percent by the 2080s. (2) Because Tompkins County is located at the southern end of Cayuga Lake and has numerous freshwater streams within its boundaries, the County will become increasingly vulnerable to potential impacts from flash flooding events as precipitation increases in amount and frequency. Adverse flood impacts in the City of Ithaca in the area mentioned in the Army Corps of Engineers' report will continue if dredging of the Inlet does not occur.

Source: Excerpts are taken from local plans available at the time of the SHMP update. Some plans may be in the revision process for 2013 and 2014.

The DHSES Local Hazard Mitigation Planning Standards recommend including climate change as a hazard and take into account the effects that climatic change may have on vulnerabilities to specific hazards. A number of statewide and regional panels and task forces have been established to begin to address the issue of adaptation and community resiliency to climate change, and some have produced guidance documents and climate adaptation assistance tools that hazard mitigation planners and elected officials may find useful in developing or updating local plans.



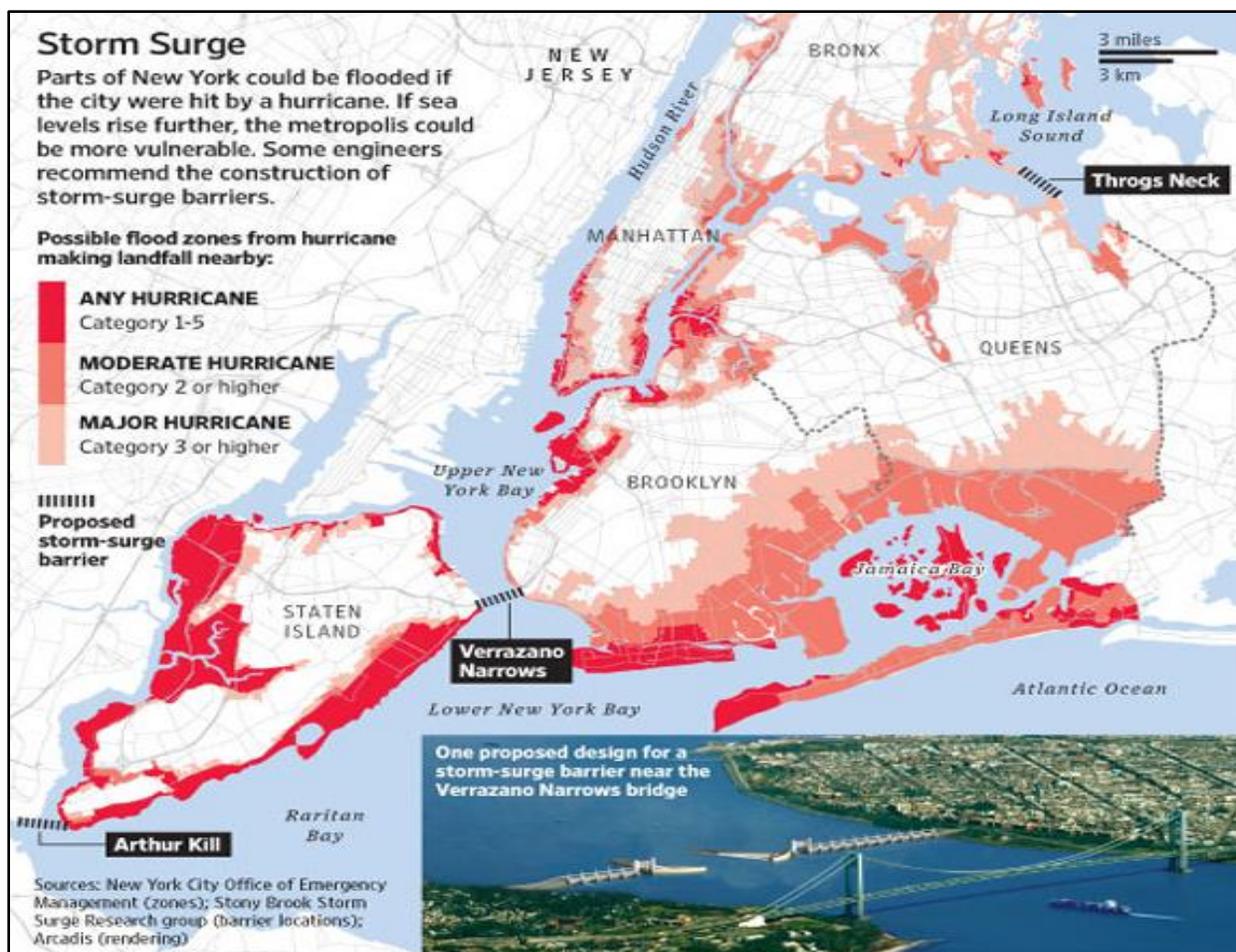
The ClimAID report provides significant information related to multiple sectors across the state, including critical infrastructure, and vulnerabilities to the hazards and conditions related to climate change. This document also includes as an appendix a *Climate Adaptation Guidebook for New York State* that can be used as a comprehensive guide for county mitigation planning to assess the vulnerability of multiple sectors and identify potential adaptive strategies. (See [www.nyserda.ny.gov/climaid](http://www.nyserda.ny.gov/climaid); Annex II: NYS Adaptation Guidebook.)

### Development in hazard prone areas

It is expected that coastal communities and habitats will be increasingly stressed by climate change impacts interacting with development and pollution during the 21<sup>st</sup> century. Population growth and the rising value of infrastructure in coastal areas increases vulnerability to climate variability, with losses projected to rise even more if the intensity of tropical storms and related conditions increase. Currently, there is no consistent methodology in local hazard mitigation plans to assess the impact of development in relation to climate change, primarily due to the multiple complex hazard conditions linked to climate change. Readiness for increased exposure will be low without implementation of measures for adaptation. Storm surge and flood zone mapping can provide one tool to assess potential vulnerabilities in development-prone coastal and waterfront areas. Some modeling has been done to indicate potential impacts from flood inundation for New York City which can help guide future development. (See **Figure 3.9: Flood section**) In addition, some areas of the city potentially vulnerable to sea level rise would require limitation of future development (building and infrastructure).

**Figure 3.4g** illustrates storm surge areas of New York and proposed locations for construction of barriers as a potential mitigation measure to protect the coastline from future surge and sea level rise.





Source: [www.coastalcare.org](http://www.coastalcare.org)

Construction of shoreline protection structures in vulnerable coastal areas may serve to encourage development in high-risk areas. The New York State Sea Level Rise Task Force: Report to the State Legislature (2010) states, “Policy changes needed to reduce vulnerability include limitations on the siting of new development or infrastructure (including transportation corridors) in high-risk areas. Also needed are changes to permit requirements for setbacks and design elevations and modifications to building codes for structural elements and corrosion-resistant equipment.

**Figure 3.4h** depicts a protective structure susceptible to overwash in future coastal storms and high tides.





Source: New York Sea Level Rise Task Force: Report to the Legislature (2010)

New York State has a number of programs, projects, and initiatives that are underway or pending at the time of this update to address the impacts of climate change on development and critical infrastructure by promoting adaptive measures:

- **Climate Smart Communities Program (NYS DEC)**

Climate Smart Communities is a state-local partnership to reduce greenhouse gas emissions, save taxpayer dollars and advance community goals for health and safety, economic vitality, energy independence and quality of life. Communities that enroll in the program are asked to do several key activities such as: identifying sources of greenhouse gases in the community; setting goals for emission reduction; and developing a climate action plan. They are also expected to implement their plans and encourage “go green” activities with businesses, institutions and individuals. The Climate Smart Community Program released “Climate Smart Resiliency Planning: A Planning Evaluation Tool for New York State Communities” in September 2013. This document, based on a similar program initiated in New Jersey, is a comprehensive self-assessment tool to address climate change effects and risks in future community-level plans, and to help local decision-makers identify planning and adaptation opportunities to reduce their community’s vulnerability to climate hazards.



Table 3.4d: List of Climate Smart Communities (DEC Climate Smart website)

County	Member Counties, Cities, Towns, and Villages
<b>Albany</b>	City of Albany; County of Albany, City of Cohoes; City of Watervliet; Town of Bethlehem
<b>Broome</b>	City of Binghamton
<b>Cattaraugus</b>	Town of Lyndon
<b>Cayuga</b>	City of Auburn
<b>Columbia</b>	Town of Copake
<b>Cortland</b>	City of Cortland, Town of Preble
<b>Dutchess</b>	City of Beacon; Town of Red Hook; Town of Rhinebeck
<b>Erie</b>	Town of Amherst, Town of Brant; Town of Evans, Village of East Aurora
<b>Essex</b>	County of Essex, Town of Lewis, Town of Schroon
<b>Greene</b>	Town of Cairo; Town of Hunter; Town of Jewett
<b>Hamilton</b>	County of Hamilton
<b>Jefferson</b>	Village of West Carthage
<b>Lewis</b>	Town of Diana, Village of Harrisville
<b>Madison</b>	County of Madison, Town of Cazenovia
<b>Monroe</b>	City of Rochester, Town of Irondequoit
<b>Nassau</b>	City of Long Beach, Town of North Hempstead; Village of East Rockaway; Village of Great Neck Plaza, Village of Woodsburgh
<b>Niagara</b>	Town of Lewiston; Town of Porter; Town of Royalton; Town of Somerset
<b>Onondaga</b>	City of Syracuse; County of Onondaga; Town of DeWitt; Town of Skaneateles; Village of Skaneateles; Village of Fayetteville
<b>Ontario</b>	Village of Victor
<b>Orange</b>	County of Orange, Town of Woodbury
<b>Oswego</b>	City of Oswego; County of Oswego
<b>Rensselaer</b>	City of Rensselaer, City of Troy, Town of East Greenbush
<b>Rockland</b>	County of Rockland, Town of Clarkstown, Town of Orangetown, Village of Montebello
<b>Saint Lawrence</b>	City of Ogdensburg; Village of Norwood



County	Member Counties, Cities, Towns, and Villages
<b>Saratoga</b>	City of Saratoga Springs, Town of Clifton Park
<b>Schenectady</b>	City of Schenectady; County of Schenectady, Town of Niskayuna
<b>Steuben</b>	Town of Campbell
<b>Suffolk</b>	County of Suffolk; Town of Babylon; Town of Brookhaven; Town of East Hampton, Town of Huntington, Town of Islip; Village of Port Jefferson; Town of Smithtown; Town of Southampton
<b>Sullivan</b>	County of Sullivan; Town of Delaware, Town of Tusten, Village of Greenport
<b>Tompkins</b>	City of Ithaca; County of Tompkins; Town of Caroline; Town of Ithaca
<b>Ulster</b>	County of Ulster; City of Kingston; Town of New Paltz; Town of Rosendale; Town of Saugerties; Village of New Paltz
<b>Westchester</b>	City of New Rochelle; City of Peekskill; City of Yonkers; Town of Bedford; Town of Cortland; Town of Greenburgh; Town of Lewisboro; Town of Mamaroneck; Town of New Castle; Town of North Castle; Town of North Salem; Town of Ossining; Town of Pound Ridge; Town of Somers; Town of Yorktown; Village of Ardsley; Village of Dobbs Ferry; Village of Croton-on-Hudson; Village of Hastings-on-Hudson, Village of Irvington, Village of Larchmont; Village of Mamaroneck, Village of Mount Kisco; Village of Ossining; Village of Port Chester; Village of Tarrytown



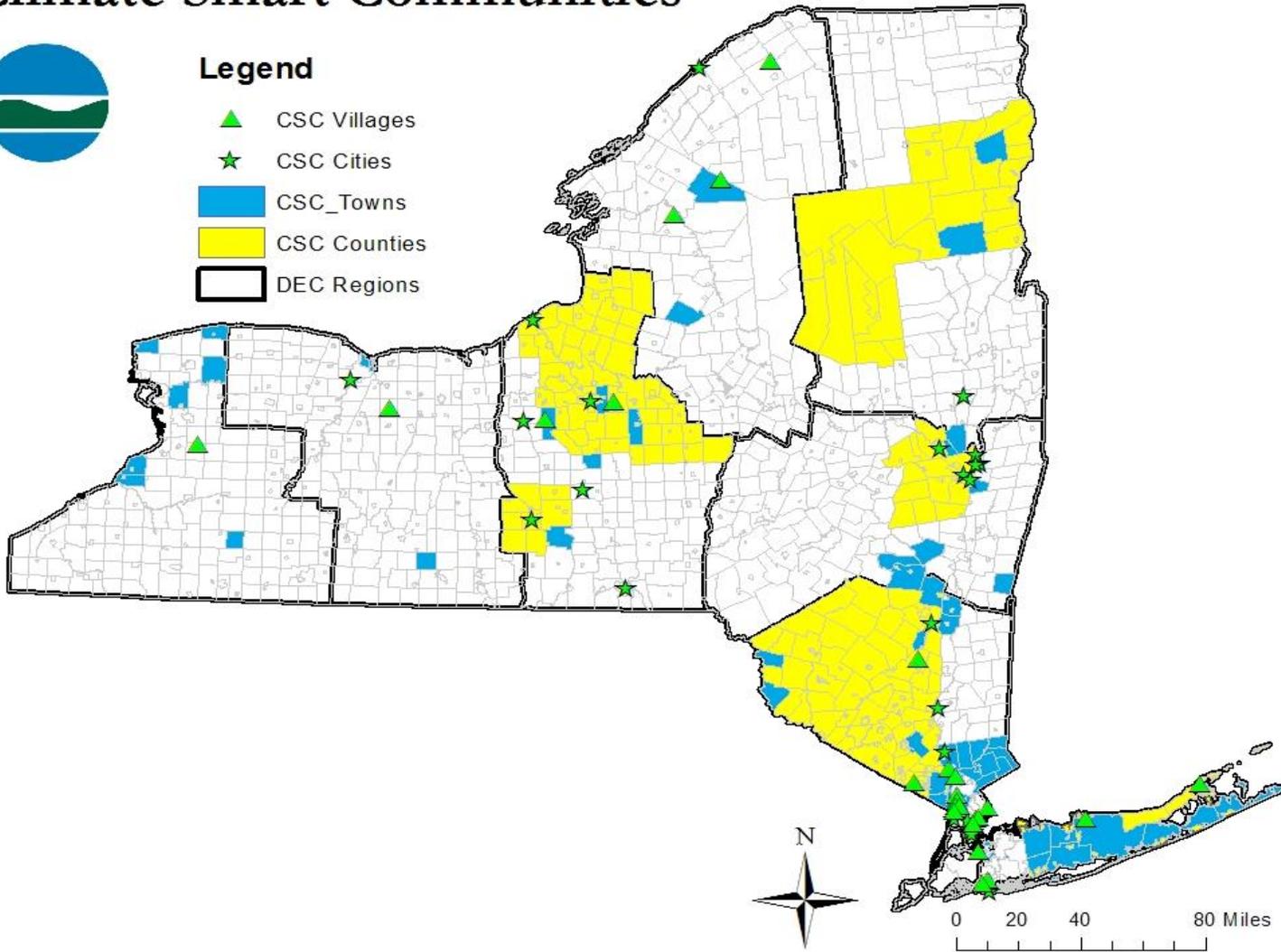
Figure 3.4i: Map of Climate Smart Communities

# Climate Smart Communities



## Legend

-  CSC Villages
-  CSC Cities
-  CSC\_Towns
-  CSC Counties
-  DEC Regions



Source: NYS DEC (NYSDEC Climate Smart website)



- **Guidance for New York Rising Community Reconstruction Plans (NY Rising Community Reconstruction Program)**

New York State is assisting communities to rebuild better and safer based on community-driven plans that consider current damage, future threats to community assets, and the community's economic future. In keeping with the National Disaster Recovery Framework, Community Reconstruction Zone (CRZ) Plans consider the needs, risks, and opportunities related to assets in the following categories of recovery support functions: Community Planning and Capacity Building, Economic Development, Health and Social Services, Housing, Infrastructure, and Natural and Cultural Resources.

- **Integrated Assessment for Effective Climate Change Adaptation in New York State (ClimAID), (NYSERDA) (November 2011)**

This project was undertaken beginning in 2008, by the New York State Environmental Research and Development Authority (NYSERDA) and funded as part of its Environmental Monitoring, Evaluation, and Protection Program (EMEP). As noted in the final report, "The goals of the Integrated Assessment for Effective Climate Change Adaptation Strategies in New York State (ClimAID) are to provide New York State decision-makers with cutting-edge information on its vulnerability to, as well as its ability to derive benefits from, climate change and to facilitate the development of adaptation strategies informed by both local experience and scientific knowledge." Additionally, the ClimAID report highlighted areas related to climate change and New York State that warranted additional research, and identified data gaps and monitoring needs in order to help guide future efforts. The ClimAID report covered climate risks, vulnerability, adaptation, equity, and economics in the following areas:

- Water Resources
- Coastal zones
- Ecosystems
- Agriculture
- Energy
- Transportation
- Telecommunications
- Public Health

Additional development-related initiatives are described in **Section 3.5: Coastal Erosion**.



### 3.4.3 Assessing Climate Change Vulnerability of State Facilities

State owned and operated facilities could be vulnerable to multiple impacts and consequences of hazards related to climate change. **Table 3.4e** describes some of these vulnerabilities, which can potentially affect state facilities. Information in this table can serve as a guide to continuity planning for state agencies.

**Table 3.4e: Potential Impacts and Consequences to State Facilities from Hazards Associated with Climate Change**

Hazard	Potential Impacts and Consequences to State Facilities
<b>Coastal Erosion</b>	<ul style="list-style-type: none"> <li>• Damage/destruction of facility from loss of dunes and protective measures</li> <li>• Loss of critical infrastructure (communications, mechanical systems, power, water supply, technology)</li> </ul>
<b>Drought</b>	<ul style="list-style-type: none"> <li>• Possible contamination or loss of water supply</li> </ul>
<b>Extreme Temperatures</b>	<ul style="list-style-type: none"> <li>• Power Failure - due to line sag and overheating)</li> <li>• Long-term conditions - rotating closures or full shut-down</li> </ul>
<b>Heavy rainfall/Flooding (inland and coastal)</b>	<ul style="list-style-type: none"> <li>• Inundation from flood waters</li> <li>• Loss of critical infrastructure (communications, mechanical systems, power, water supply, technology)</li> <li>• Loss of use of facility (temporary or permanent)</li> </ul>
<b>Disease Outbreak</b>	<ul style="list-style-type: none"> <li>• Little or no impact expected to facilities</li> <li>• Impact to personnel resources which could affect ability to continue essential services</li> </ul>
<b>Sea Level Rise (facilities in vulnerable coastal or tidal areas)</b>	<ul style="list-style-type: none"> <li>• Inundation from sea water, flooding</li> <li>• Loss of critical infrastructure (communications, mechanical systems, power, water supply, technology)</li> <li>• Loss of use of facility (temporary or permanent)</li> </ul>
<b>Severe Storms</b>	<ul style="list-style-type: none"> <li>• Damage/destruction from wind</li> <li>• Loss of critical infrastructure (communications, mechanical systems, power, water supply, technology)</li> <li>• Loss of use of facility (temporary or permanent)</li> </ul>

A project to produce a statewide inventory of facilities was initiated in August 2013, with a projected completion date for the pilot phase of mid-2014. The pilot will identify and assess one category of state critical infrastructure, developing the methodology for what is anticipated to be a multi-year project. The methodology will include analysis of vulnerability and estimated potential losses to state facilities from future hazard events. **Section 3.1.8** provides a comprehensive description of the status of the statewide facilities inventory project.



In the past few years, New York State has implemented a number of initiatives, some of which are applicable to state-owned and operated facilities, intended to address climate change through policy, research, and adaptive measures. The following table describes some of the initiatives and projects that are completed, currently underway, or planned.

**Table 3.4f: Climate Change Initiatives in New York State**

Type of Initiative	Measure	Date Implemented (or planned)
<b>Policy</b>		
<b>Executive Order No. 2</b>	Established a State Energy Planning Board and authorized the creation and implementation of a State Energy Plan.	2008
<b>Executive Order No. 4</b>	Established a State Green Procurement and Agency Sustainability Program.	2009
<b>Executive Order No. 24</b>	Established a goal to reduce greenhouse gas emissions 80% by the year 2050 and prepare a Climate Action Plan.	2009
<b>DEC Policy CP-49/Climate Change and DEC Action</b>	Established goal of the State to reduce greenhouse gas emissions; created the Climate Action Council; required a draft Climate Action Plan by September 2010.	10/22/2010
<b>Research, Studies and Reports</b>		
<b>Technical Report</b>	“Responding to Climate Change in New York State”, (ClimAID), Final Report 11-18, NYSERDA: provided a framework to develop and implement a program to reduce greenhouse gasses and dependence on energy.	November 2011
<b>Projects and Initiatives</b>		
<b>Flood Protection (New York City, Mayor’s Office)</b>	\$20 billion project to build removable floodwalls, levees, gates and other flood defenses for New York City.	[Proposed June 2013]
<b>Climate Smart Communities Certification Program (DEC)</b>	Project to build community support for and commitment to “green” activities. A roadmap for community climate action will be designed. Four pilot communities in 2013.	2013 – on-going
<b>Governor’s NY Rising Community</b>	Established to provide additional rebuilding and revitalization assistance to	2013 – on-going



Type of Initiative	Measure	Date Implemented (or planned)
<b>Reconstruction Program</b>	communities severely damaged by Hurricanes Sandy, Irene and Lee. To facilitate community redevelopment planning and the resilience of communities, \$25 million is allocated for planning in the most affected communities. Future allocations of funds will support implementation of projects and activities identified in the plans that the communities produce.	
<b>Plans and Procedures</b>		
<b>Extreme Weather Planning and Response Guide (DOH)</b>	Consistent with climate change and health priorities of the Centers for Disease Control and Prevention (CDC), the New York State Department of Health (DOH) is updating its preparedness plan for extreme weather emergencies. The Guide serves as a basis for the coordination, preparation, response, and recovery activities.	2013 – on-going
<b>Hudson River Sustainable Shorelines Project (DEC)</b>	Developing guidance for communities on management options for controlling shoreline erosion, including relative costs, impacts on habitat functions and resilience to storms and sea level rise.	Current - 2013
<b>SLAMM Modeling in the Hudson Estuary (DEC)</b>	SLAMM (Sea Level Rise Affecting Marshes Model) is being used to model potential marsh migration in the estuary to develop shoreline conservation priorities and assess the need for barrier removal to facilitate the landward migration of tidal wetlands as sea levels rise. Loss of wetlands can impact water quality, especially in drought or heat extremes.	Current - 2013



Type of Initiative	Measure	Date Implemented (or planned)
<b>Post Sandy Enhancement Plan – Consolidated Edison Co. of New York</b>	Identifies issues and makes recommendations related to hardening Consolidated Edison systems, improving information provided to customers, and strengthening partnerships. The plan considers changing weather patterns that could damage systems vulnerable to flooding and high winds/tree damage in more intense future storms. Specific mitigation projects that will mitigate power loss to more than 200,000 customers are detailed (p. 43-44)	June 2013

### 3.4.4 Estimating Climate Change Potential Losses by Jurisdiction

The methodology used to analyze and integrate information related to estimating potential losses from LHMPs is described in **Section 3.1 and Section 5**.

According to scientific projections, sea level rise associated with climate change will have significant effects on coastal areas in coming years. A study supported by Lloyd's insurance estimated the effects of climate change on storm impacts for undefended Atlantic coastal areas. The summary of finding stated, "If no action is taken by the 2030s, sea level rise could increase future average losses by more than 80% from present levels, meaning that more extensive damage will be experienced more often. An increase of 5% in the number of powerful hurricanes would raise future average flood damage losses to more than 90% above present levels. Even with a decrease in the number of storms, future average losses would be around 70% above present levels." While this study is not specific to New York, the general trend of increasing impacts associated with sea level rise, coupled with increasing coastal development indicates the increasing risk exposure for coastal areas<sup>19</sup>.

No FEMA-approved county hazard mitigation plans identify climate change as a hazard; however any loss data available in local plans is referenced in the specific hazard sections of this plan (coastal erosion, extreme temperatures, flood, hurricane and wildfire).

#### Effects of Changes in development on loss estimates

Although the hazards linked to climate change have the potential to increase losses from future events, the state is taking significant steps to address these issues through adaptive

<sup>19</sup> Lloyd's Insurance



planning. This approach is identifying measures that could lessen the impact of climate change hazards and their resulting losses.

Coastal areas are highly susceptible to loss from the impacts of sea level rise and severe storms, as well as flooding; however, various programs for coastal planning, development, and construction are regulating and providing guidance for appropriate mitigation measures. Other impacts such as drought and extreme temperatures will have little impact on loss estimates related to changes in development.

A \$2 million study and mapping project conducted by New York Sea Grants studied the likelihood of shore protection as sea level rises. **Figure 3.4j** depicts the likelihood of various types of protection for Southern Queens. Maps such as these can assist local land use planners in identifying appropriate and acceptable methods for protecting existing development and planning for future development along the New York shoreline which will reduce losses from future events<sup>20</sup>.

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<sup>20</sup> Tanski, The Likelihood of Shore Protection along the Atlantic Coast of the United States. (2010)



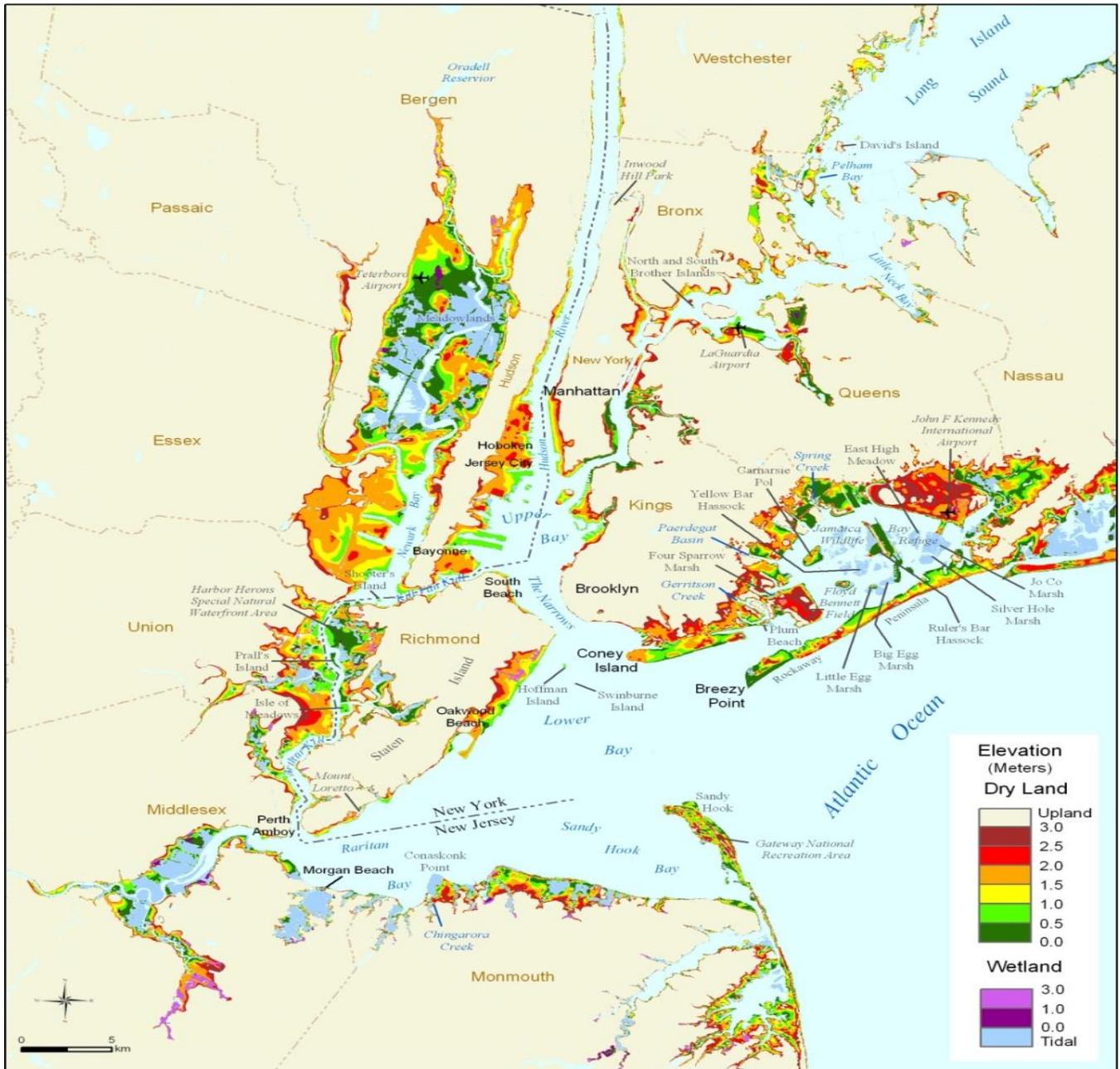
**Figure 3.4j: New York Sea level Rise Planning Map – Southern Queens**



Source: [http://plan.risingsea.net/view/S8\\_Greater\\_NYC.html](http://plan.risingsea.net/view/S8_Greater_NYC.html)



Figure 3.4k is a graphical representation of the lands near the Atlantic Ocean that are close to sea level. Areas depicted in this map could be more susceptible to losses from high tides, sea level rise, and the increased impacts from wind-driven waves due to climate change.



**Elevations of Land Close to Sea Level**

Elevations are above spring high water, which is the average high tide during new and full moons, and approximately the inland boundary of tidal wetlands. This map is a general graphical representation of elevations in the area depicted, not designed to estimate the precise elevations at specific locations. Actual elevations at specific locations may be 150 cm above or below the elevation shown.

Source: J.G. Titus and J Wang. 2008. "Maps of Lands Close to Sea Level along the Mid-Atlantic Coast". US Environmental Protection Agency.

Source: Titus and Wang, 2008, Maps of Lands Close to Sea Level along the Mid-Atlantic Coast, U.S. Environmental Protection Agency



### 3.4.5 Estimating Potential Losses of State Facilities

One method of determining potential losses of state facilities related to climate change is to analyze those buildings located within 100-year flood zones—keeping in mind that the FEMA current 100-year flood zones do not take climate change into account. While not all buildings within these zones are likely to flood, some level of vulnerability to future flooding and sea level rise may be linked to these zones. **Figure 3.4I** shows state-owned buildings that lie within the 100-year flood zone. A few data gaps exist that render this a working analysis. First, the New York State Office of General Services (OGS) manages over roughly 56,000 buildings. Secondly, a GIS file exists that has a record of just over 19,000 buildings; this GIS layer is currently in the process of being updated. Finally, not all buildings on record have an associated replacement value. After accounting for these gaps, the flood hazard analysis derived 1,101 buildings in the 100-year flood zone, with 925 buildings having an associated replacement value, to arrive at the total of \$364,974,721. Emphasis is placed on the fact that these datasets are part of an on-going state inventory and risk assessment project.

Because of the scope of hazards that are associated with climate change, there is no single reliable dataset that can be used to estimate losses for state facilities. For the estimated losses for state buildings in 100-year flood zones best illustrate vulnerabilities related to increases in precipitation and flooding. This data includes buildings only and does not consider other state-owned and -operated infrastructure at risk, such as roads, bridges, culverts and others.



Table 3.4g: State-Owned Buildings in 100-Year Flood Zone

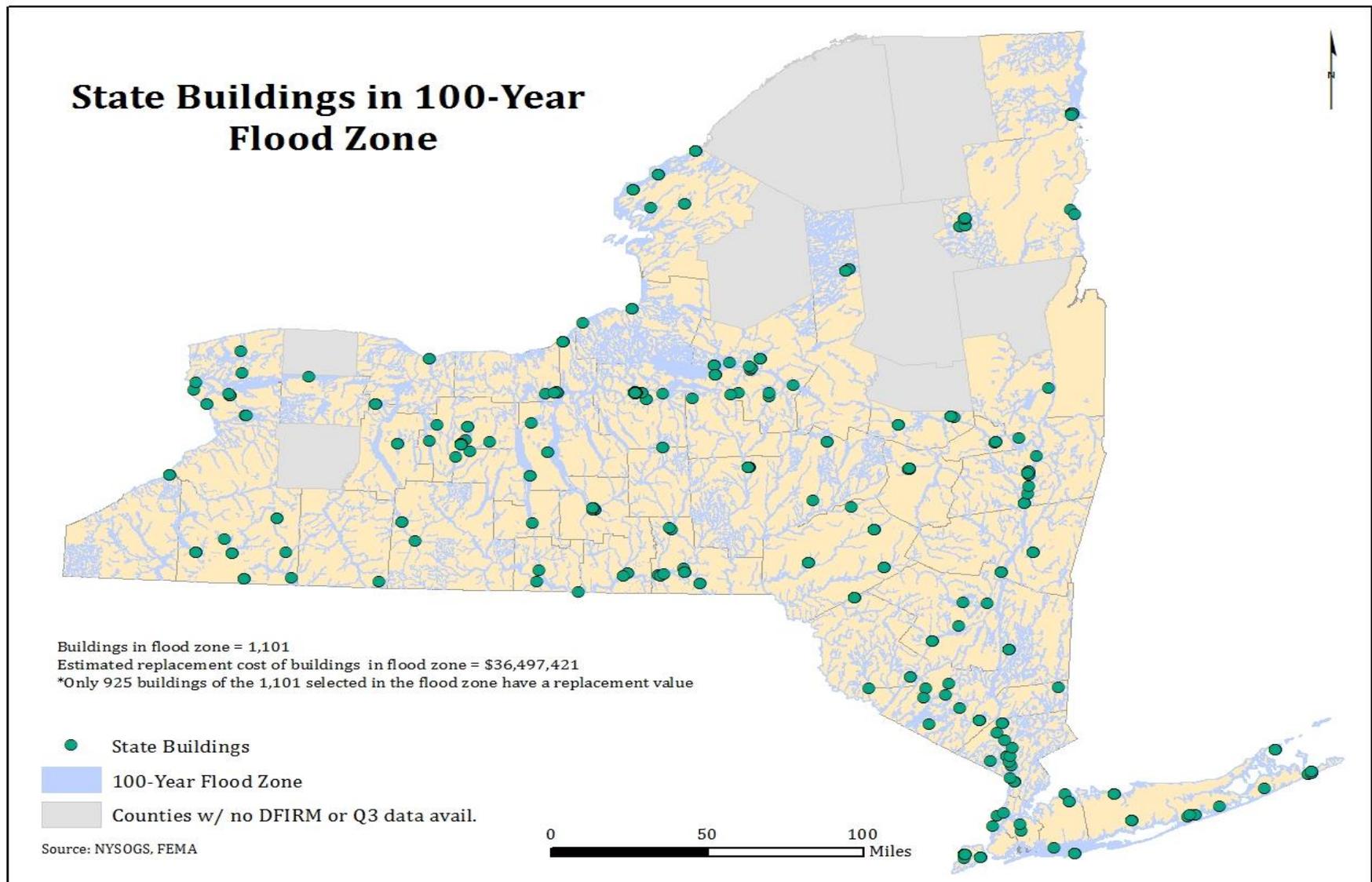
Agency	Number of Buildings	Replacement Cost
Office of General Services (OGS)	5	\$52,955,119
Department of Cyber Security (DOCS)	1	\$10,167,770
Office of Parks, Recreation and Historic Preservation (OPRHP)	542	\$95,357,356
Department Environmental Conservation (DEC)	140	\$12,041,616
Office of Mental Health (OMH)	18	\$36,440,505
Office of People with Developmental Disabilities (OPWDD)	89	\$90,525,608
Department of Military and Naval Affairs (DMNA)	1	\$11,627,475
Department of Transportation (DOT)	49	\$23,936,201
Office of Children and Family Services (OCFS)	11	\$2,431,631
Department of Agriculture and Markets (AG&MKTS)	69	\$29,491,440
<b>Total</b>	<b>925</b>	<b>\$364,974,721</b>

Source: FEMA, OGS

For estimated losses of state facilities related to specific Hazards, see also **Sections 3.4, 3.9, 3.12 and 3.17.**



Figure 3.4I: State Buildings in 100-Year Flood Zone



### 3.4.6 Data Sources and Limitations

It is recommended that Jurisdictions that are developing or updating their local Hazard Mitigation Plans take into account the effects that climatic change may have on their vulnerability to specific hazards. A number of statewide and regional panels and task forces have been established to begin to address the issue of adaptation and community resiliency to climate change. Representatives from the NYC Mayor's Office, NYS DHSES, NYS DEC, NYS DOS and other agencies have participated on these panels and task forces. Some of these panels and task forces have produced guidance documents and climate adaptation assistance tools that Hazard Mitigation Planners and elected officials may find of use in developing or updating local Hazard Mitigation Plans, including the following:

- New York Governor's Office, Executive Order 2 (2008) - established a State Energy Planning Board and authorized the creation and implementation of a State Energy Plan
- New York Governor's Office, Executive Order 4 (2009) - established a State Green Procurement and Agency Sustainability Program
- New York Governor's Office, Executive Order 24 (2009) - established a goal to reduce greenhouse gas emissions 80% by the year 2050 and prepare a Climate Action Plan
- New York State Department of Environmental Conservation, CP-49/Climate Change and DEC Action;
  - <http://www.dec.ny.gov/energy/50399.html>
- NYS Legislative Sea Level Rise Task Force
  - <http://www.dec.ny.gov/energy/45202.html>
- *Climate Risk Information*, New York City Panel on Climate Change 2010 Report (February 2009)
- *Climate Change Adaptation in New York City: Building a Risk Management Response*: New York City Panel on Climate Change 2010 Report (Nov 2011); Volume 1196
- New York State Sea Level Rise Task Force Report to the Legislature, December 31, 2010
- Third National Climate Assessment Report (DRAFT), "National Climate Assessment and Development Advisory Committee" or NCADAC
- *Responding to Climate Change in New York State* (ClimAID), funded by the New York State Energy Research and Development Authority (NYSERDA), provides the best available scientific information specific to the effects of climate change on energy systems in New York State.
  - [www.nyserda.ny.gov/climaid](http://www.nyserda.ny.gov/climaid)
- Intergovernmental Panel on Climate Change (United Nations). Assessment Report scheduled for release 9/27/13 IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.



- IPCC, 2007: Summary for Policymakers. In: Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 7-22.
- Post Sandy Enhancement Plan: Consolidated Edison Co. of New York, Orange and Rockland Utilities. June 20, 2013
- National Assessment of Coastal Vulnerability to Sea-Level Rise: Preliminary Results for the U.S. Atlantic Coast, U.S. Geological Survey Open-File Report 99-593. E. Robert Thieler and Erika S. Hammar-Klose; Woods Hole, Massachusetts 1999



## Section 3.5: COASTAL EROSION

### 2014 SHMP Update

Coastal erosion was considered within the Flood Profile and Risk Assessment in the 2011 plan. For the 2014 update, the information related to the hazard was extracted from the 2011 plan and enhanced to be a stand-alone hazard section. Related hazards addressed in separate profile and risk assessment sections include: hurricane, flooding, climate change and high wind.

#### **New information and data included in this update:**

- Characteristics
- Location
- Previous coastal erosion events and estimated losses
- Maps illustrating critically eroding shorelines
- Coastal management initiatives
- Local plan impact and vulnerability information

Specific data sources and key documents are listed at the end of this section.

### 3.5.1 Coastal Erosion Profile

Coastal erosion topples 1,500 American waterfront homes a year at a cost of \$530 million, and it's only going to get worse, according to FEMA's first nationwide erosion study (June 2000). Beaches along the Atlantic and Pacific Oceans, Gulf Coast and Great Lakes are disappearing at rates that range from 1 to 6 feet a year.

Erosion and flooding are the primary coastal hazards that lead to the loss of lives or damage to property and infrastructure in developed coastal areas. In New York State, approximately 85% of the State's population lives in highly urbanized areas within 12% of the total land mass. Certain sections of New York's coastline are especially vulnerable to coastal erosion through natural actions as well as human activities. In vulnerable areas, coastal erosion causes extensive damage to public and private property and to natural resources. This has resulted in significant economic losses to individuals, private businesses and the state's economy. Coastal erosion damage has necessitated large public expenditures to remove debris and ruined structures, renourish beaches and dunes and to replace essential public facilities and services.



Hazard	Definition and Key Terms
<p><b>Coastal Erosion</b> (including seiche)</p>	<p><i>Coastal erosion</i>- is a process whereby large storms; flooding; strong wave action; <i>seiche</i>; sea level rise; and human activities, such as inappropriate land use, alterations, and shore protection structures wear away the beaches, dunes and bluffs along the U.S. ocean and Great Lakes coastlines. Erosion undermines and often destroys homes, businesses, and public infrastructure and can have long-term economic and social consequences. Similar in motion to a seesaw, a <i>seiche</i> is a standing wave in which the largest vertical oscillations are at each end of a body of water with very small oscillations at the "node," or center point, of the wave. Standing waves can form in any enclosed or semi-enclosed body of water, from a massive lake to a small pond and can cause flooding and erosion along the adjacent shorelines.</p>

## Characteristics

Erosion is the loss or displacement of land along the coastline due to the action of waves, currents, tides, wind-driven water, waterborne ice, or other impacts of storms or human-caused actions. Erosion can also be caused by the loss or displacement of land due to the runoff of surface waters or groundwater seepage and is often exacerbated by human-caused actions.

The dynamic cycle that can lead to erosion is a natural phenomenon that occurs over time. At the same time that wind and water are wearing away a shoreline, the process of accretion (the deposition of sediments) works to build it back up. When erosion rates exceed accretion rates, a landward retreat of the shoreline occurs. Conversely, when erosion rates and accretion rates are equal, the shoreline is said to be 'stable.'

Although natural events play an important role in shaping the present-day shoreline as a consequence of the resulting erosion and movement of sand, human-caused actions can also impact the coastline as a result of increased development (buildings and infrastructure), and unpermitted coastal erosion control measures. Because the focus of this plan is on natural hazards, threats to coastal erosion from human-caused events will not be further profiled or analyzed.

Coastal erosion can occur along any type of shoreline and is primarily concerned with two forces of erosion. Along most ocean front locations, wind and water can combine to break down rocky shorelines into sand and then move the beach sand from one location to another. Erosion, caused by high winds, heavy surf and tidal conditions can occur during a coastal storm, resulting in an often detrimental impact on the surrounding coastline. In addition, decreased sediment supplies and sea level rise can contribute to coastal erosion.

The management of coastal erosion hazard areas helps to protect coastal and inland habitat areas, natural resources, infrastructure, homes, businesses, and communities from wind and water erosion and storm-induced high water.



## **Impacts from Hurricanes and other Coastal Storms**

Beaches, dunes and bluffs are a natural barrier between the ocean and inland communities, ecosystems and resources. During a powerful hurricane, changes to beaches, dunes and bluffs can be significant, and the results are sometimes catastrophic. Lives are lost, communities are destroyed, and millions of dollars are spent on rebuilding. The U.S. Geological Survey (USGS) provides scientific support for mitigation planning through observations of beach, dune and bluff change and models of waves and storm surge in order to identify areas vulnerable to extreme coastal changes. By identifying areas of the New York State coastline that are likely to experience extreme and devastating erosion during a hurricane, it is possible to determine risk levels associated with development in areas where the land shifts and moves with each land-falling storm.

## **Decreased Sediment Supplies**

Coastal landforms such as bluffs are essential to maintaining a supply of sediment to beaches and dunes. Where engineered structures are used to stabilize shorelines, the natural process of erosion is interrupted, decreasing the amount of sediment available and causing erosion to adjacent areas. Under conditions of reduced sediment supply, the ability of natural protective features such as dunes and beaches to provide storm damage prevention and flood control benefits is continually reduced. A major challenge is to ensure that regional sediment supplies are managed effectively in ways that allow the beneficial storm damage prevention and flood control functions of natural protective features to continue— both for future projects and, where possible, existing coastal development.

## **Storm-Induced High Water**

A coastal storm can occur any time of the year and at varying levels of severity. Natural protective features, such as beaches, dunes and bluffs within coastal erosion hazard areas, provide buffering and protection to shorelands from erosion by absorbing the wave energy of open water. Dunes and bluffs are especially effective against storm-induced high water and related wave action as a result of coastal storms, including hurricanes and nor'easters. (See Section 3.12 Hurricane (including Nor'easters) and Section 3.15 Severe Winter Storms for additional information.)

## **Wave Action on Inland Waters/Seiche**

Erosion and property damage can occur as a result of wave action causing a surge of water to impact shorelines with great force on inland bodies of water as well. This is generally due to a storm system with high winds occurring on a lake, called a "seiche", which causes shoreline erosion and property damage.



## Sea Level Rise

Sea level rise has been identified as a direct result of climate change (addressed in the 2014 plan update as a separate section); however, scientific evidence also substantiates the negative impact of sea level rise on the dynamic process that leads to coastal erosion. The long-term effects of climate change and sea level rise have been extensively studied; and it is clear that increased sea levels attributed to climate change speed up the natural coastal processes that remove sand and vegetation from protective beaches, dunes and bluffs. The erosion that results from sea level rise in turn leads to more intensive coastal impacts in future storm events.

Sea level rise directly impacts the costs related to increasing coastal erosion. Melting land ice and ocean heating makes water expand, which in turn causes the oceans to rise. It rose about eight inches in the past century, requiring billions of dollars to fight damage-inducing erosion. The recent rate of increase appears to have jumped to about one foot per century, and climate scientists believe the rate of increase will continue to increase. Currently the conservative prediction is for a rise of about two or three feet by 2100, and possibly even six feet<sup>1</sup>.

Additional information related to sea level rise is included in **Section 3.4** Climate Change Hazard Section.

## Measuring Coastal Erosion

Coastal erosion is measured as a rate of either linear retreat (feet of shoreline recession per year) or volumetric loss (cubic yards of eroded sediment per linear foot of shoreline frontage per year). It is estimated that the average annual erosion rate (short-term) in the New England area is 0.3 meters per year. Uncertainties for these rates range from 0.06 to 0.1 meters per year depending on the data sources used<sup>2</sup>.

## Location

Erosion can impact all of New York's coastal counties along the following bodies of water:

- Lake Erie and the Niagara River
- Lake Ontario and the St. Lawrence River
- Atlantic Ocean and Long Island Sound
- Hudson River south of the Federal dam in Troy
- East River
- Harlem River
- Kill van Kull and Arthur Kill

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<sup>1</sup> United Nations, International Panel on Climate Change (IPCC) Report; August 2013

<sup>2</sup> National Assessment of Shoreline Change: Historical Shoreline Change in New England and the Mid-Atlantic Coast; Cheryl J. Hapke, Emily A. Himmelstoss, Meredith G. Kratzmann, Jeffrey H. List, and E. Robert Thieler, revised, April 2012.



- All connecting water bodies, bays, harbors, shallows and wetlands

The coastlines along Lake Erie and Lake Ontario, Long Island Sound, and the Atlantic Ocean coastline of New York City and Long Island are at risk of coastal erosion from natural and human activities and are regulated. These are the only areas currently mapped as Coastal Erosion Hazard Areas (CEHA) that require a permit under the Environmental Conservation Law, Article 34 for any regulated activity. These areas are regulated pursuant to 6 NYCRR Part 505. The CEHA program seeks to conserve natural protective features such as beaches, dunes and bluffs, and to reduce development in the most vulnerable areas or areas that comprise these features. Where long term average annual erosion rates have been calculated to equal or exceed one foot per year, special Structural Hazard Areas have been defined and mapped that include restrictions on construction within a set-back zone equal to 40 times the average annual erosion rate landward of the natural protective feature area.

### **Atlantic Coastline**

Multiple local jurisdictions along the Atlantic Coast are highly susceptible to coastal erosion, including New York City, where three distinct Coastal Erosion Hazard Areas (CEHA) are identified by the New York State Department of Environmental Conservation (DEC):

- Brooklyn from the Verrazano Bridge south to the Queens borough line, including Coney Island
- Queens from the Brooklyn borough line to the Nassau County line, including the Rockaways
- The South Shore of Staten Island from the Verrazano Bridge south to Tottenville

Long Island is especially vulnerable to erosion due to its surficial geology of unconsolidated sand and gravel and its location facing the ocean in direct opposition to the prevailing wind and water currents moving along the Atlantic Coast and Long Island Sound. The DEC has mapped all of Long Island coastline as erosion hazard areas.

The following counties along the Atlantic Ocean shoreline have been identified as CEHAs:

- Portions of Kings, Queens and Richmond Counties in New York City
- Nassau County
- Suffolk County

### **Great Lakes Shorelines**

Storm-induced shore erosion is also a major problem along the Great Lakes shorelines. Caused primarily by storm-induced wave action and associated long shore currents, the problem becomes critical when high lake levels submerge the beaches which protect adjoining upland areas that are highly erosion-prone. Wave forces can then work directly on bluffs and dunes, resulting in rapid erosion. New York State has more than 1000 miles of coastline bordering the Great Lakes and its connecting rivers. Of these, some 200 miles

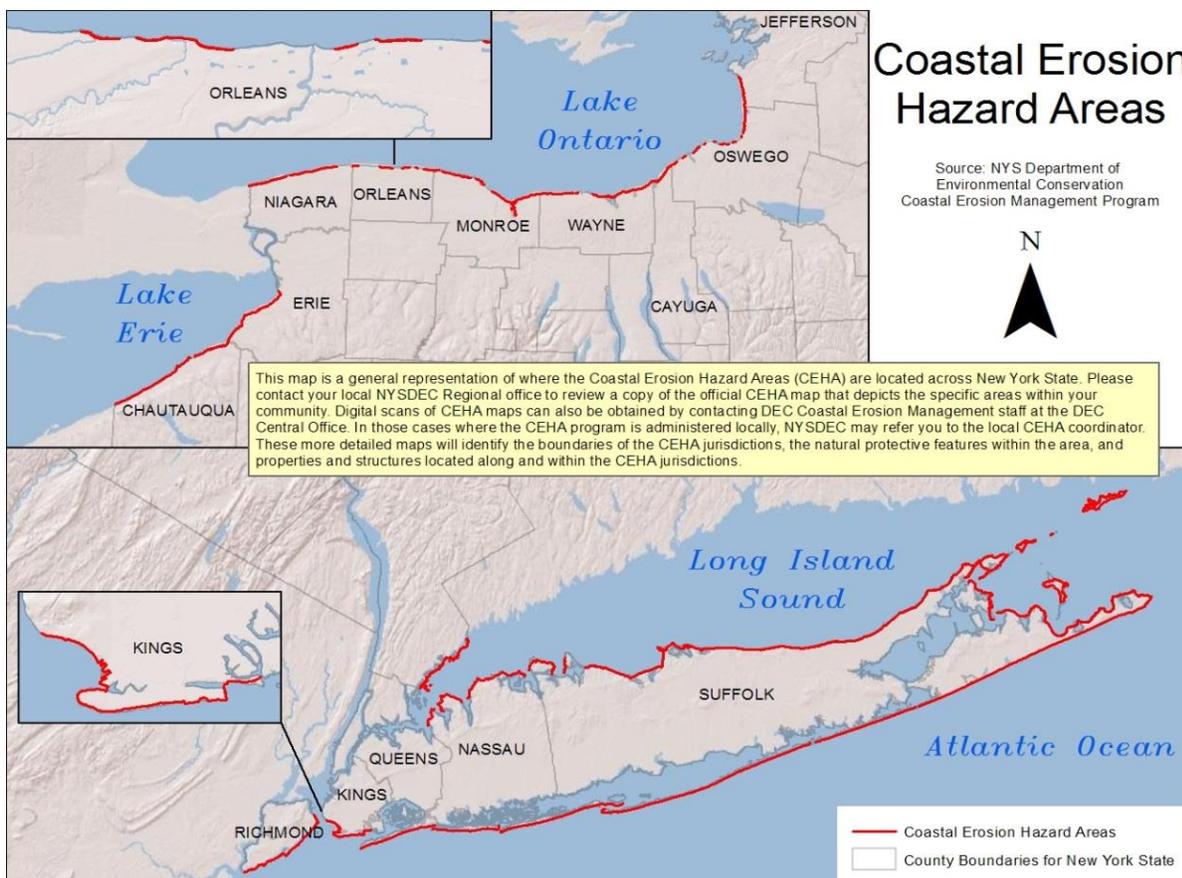


along the south shore of Lake Ontario are subject to significant erosion and are therefore mapped as CEHAs. Property damage caused by erosion of Great Lakes' shoreline during high water periods has been estimated in the millions of dollars. Lake Erie's historical high water levels were reached in the mid-1980's, a period which saw significant erosion and damage.

The following counties along the Lake Erie and Lake Ontario shorelines have been identified as CEHAs:

- Erie County
- Chautauqua County
- Niagara County
- Orleans County
- Monroe County
- Wayne County
- Cayuga County
- Oswego County
- Portions of Jefferson County

**Figure 3.5a** illustrates the **Coastal Erosion Hazard Areas (CEHAs)**, coastal areas of New York State at greatest risk of erosion.<sup>3</sup>



Source: NYS Department of Environmental Conservation (DEC), September 2014

<sup>3</sup> CEHA map provided by NYS DEC.

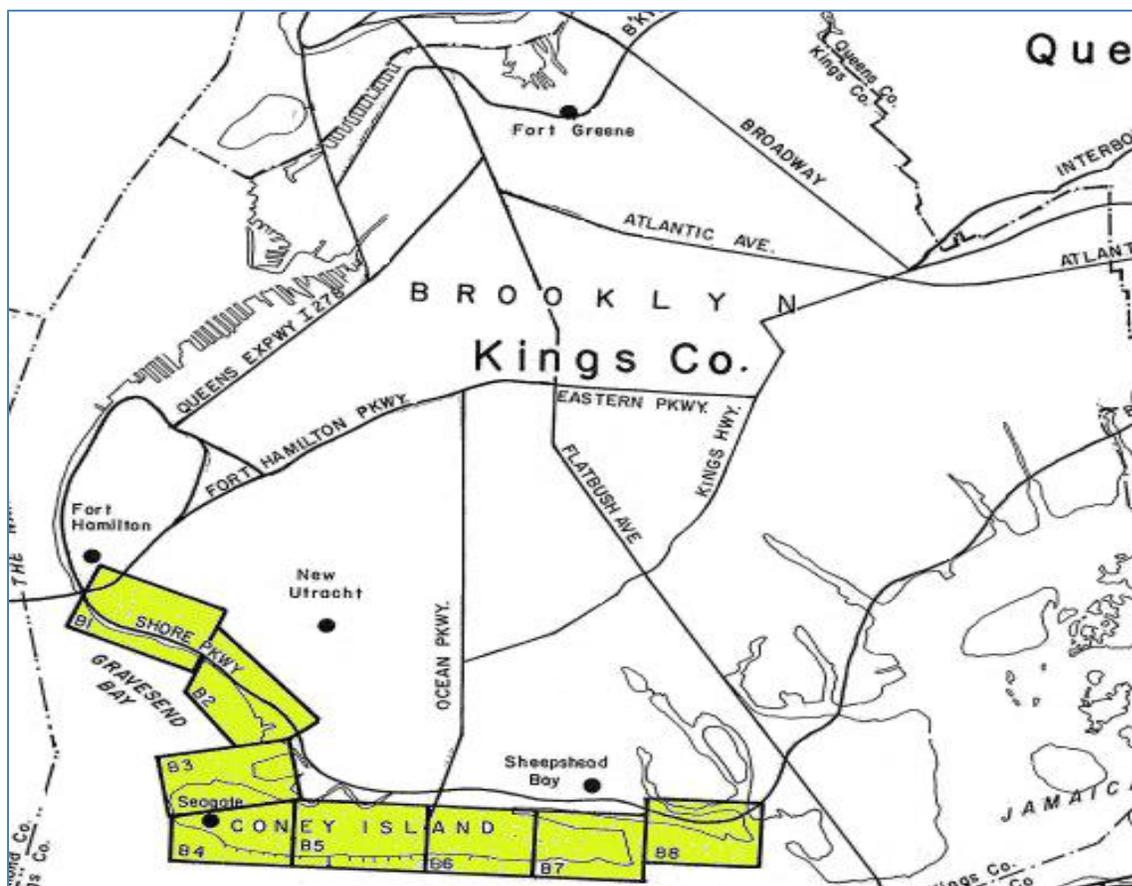


Within the CEHAs, DEC manages and regulates the following:

- **Natural Protective Features (NPF)**, such as the near shore, beaches, bluffs, primary dunes, and secondary dunes
- **Structural Hazard Areas (SHA)**, which include areas landward of the NPFs that have demonstrated a long-term average annual recession rate of one foot per year or greater

CEHA maps depict both of the regulated areas which include the landward limit of the NPFs and SHAs, and indicate the recession rate in feet per year, where applicable. NYS DEC, Division of Water, Coastal Erosion Management Section maintains CEHA maps for New York's coastal areas. Maps are to be updated every ten years, but are currently available only in hard-copy format. For New York City, the CEHA boundary was drawn at the landward limit of the NPFs; there are no SHAs currently mapped in NYC. An update of the CEHA maps is underway to generate maps in an electronic format at the time of the 2014 update of this plan. The maps will be released prior to and included in the 2017 plan update. **Figure 3.5b** is an example of current CEHA maps within a local jurisdiction's plan.

**Figure 3.5b: Example of CEHA Mapping, New York City Hazard Mitigation Plan**



Source: New York City Hazard Mitigation Plan, March 2009

## Previous Occurrences

Because coastal erosion can be caused by multiple hazards, including coastal storms, hurricanes and nor'easters, previous occurrences of coastal erosion events are often included in disaster declarations for multi-hazard events. **Table 3.5a** provides a listing of Presidential Disaster Declarations that include coastal erosion, and was developed for the 2014 plan update using validated data from FEMA and the National Climatic Data Center.

**Table 3.5a** displays historical and recent loss information for coastal erosion for the time frame of 1960 to 2012. Data is derived primarily from the Spatial Hazard Events and Loss Database for the United States (SHELDUS).



Table 3.5a: Historical and Recent Coastal Events and Losses by Jurisdiction\*

County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Albany	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Allegany	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Bronx	6	17	3	0	0	\$714,286	\$0	1	0	0	\$0	\$0
Broome	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Cattaraugus	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Cayuga	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Chautauqua	8	13	4	0	0	\$40,000	\$0	3	0	0	\$40,000	\$0
Chemung	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Chenango	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Clinton	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Columbia	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Cortland	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Delaware	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Dutchess	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Erie	13	7	7	0	0	\$65,000	\$0	6	0	0	\$65,000	\$0
Essex	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Franklin	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Fulton	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Genesee	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Greene	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Hamilton	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0



County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Herkimer	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Jefferson	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Kings	8	13	4	2	2	\$714,286	\$0	1	0	0	\$0	\$0
Lewis	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Livingston	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Madison	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Monroe	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Montgomery	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Nassau	25	4	13	14	6	\$721,786	\$0	3	3	0	\$0	\$0
New York	10	10	5	0	0	\$714,286	\$0	3	0	0	\$0	\$0
Niagara	2	52	1	0	0	\$0	\$0	0	0	0	\$0	\$0
Oneida	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Onondaga	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Ontario	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Orange	2	52	1	0	0	\$0	\$0	0	0	0	\$0	\$0
Orleans	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Oswego	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Otsego	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Putnam	2	52	1	0	0	\$0	\$0	0	0	0	\$0	\$0
Queens	25	4	13	10	0	\$714,286	\$0	3	0	0	\$0	\$0
Rensselaer	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Richmond	4	26	2	0	0	\$714,286	\$0	0	0	0	\$0	\$0

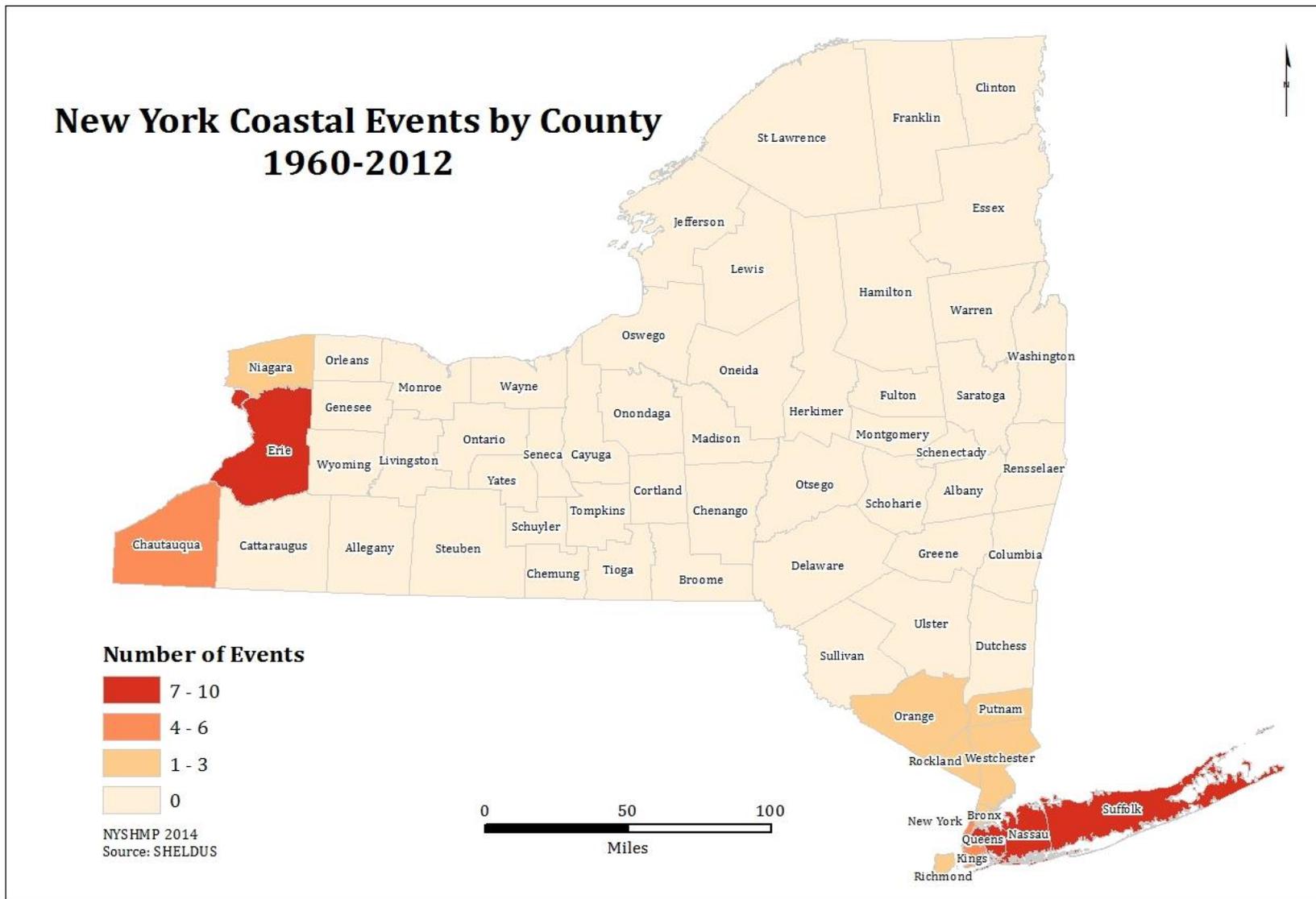


County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Rockland	2	52	1	0	0	\$0	\$0	0	0	0	\$0	\$0
Saratoga	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Schenectady	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Schoharie	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Schuyler	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Seneca	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
St Lawrence	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Steuben	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Suffolk	27	4	14	11	1	\$49,322,786	\$0	4	3	1	\$31,000,000	\$0
Sullivan	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Tioga	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Tompkins	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Ulster	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Warren	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Washington	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Wayne	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Westchester	4	26	2	2	0	\$0	\$0	0	0	0	\$0	\$0
Wyoming	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
Yates	0	0	0	0	0	\$0	\$0	0	0	0	\$0	\$0
<b>Total</b>			<b>71</b>	<b>40</b>	<b>11</b>	<b>\$53,721,000</b>	<b>\$0</b>	<b>24</b>	<b>6</b>	<b>1</b>	<b>\$31,105,000</b>	<b>\$0</b>

Source: SHEL DUS (\*Costs related to Hurricane Sandy are distributed in comparative tables in the High Winds and Flood sections and are not included in the costs represented in this table.)



Figure 3.5c: Illustrates Historical and Recent Coastal Events and Losses, by County (coastal erosion and seiche)



## Major Erosion Events – Coastal and Inland

In the last 30 years there have been many storms that have caused breaching of the barrier islands on Long Island's south shore. In January 1980, a breach was formed about 1,000 feet east of Moriches Inlet. In six months it grew to a width of 2,500 feet. It was mechanically closed in October 1980.

A string of storms starting with Hurricane Bob in 1991, the Halloween Nor'easter of 1991, the December 1992 Nor'easter and the March 1993 Nor'easter caused erosion to beach berms and dunes at various locations along the barrier islands and reduced their capacity to withstand future storms at critical locations. The most severe case involved the creation of two breaches east of Moriches Inlet in the vicinity of Pikes Beach during the December 1992 Nor'easter. One of these breaches was repaired within one month from breach occurrence, but the other was not filled immediately. It remained open for 10 months and in that time grew from 200-300 feet wide and 2-5 feet deep to 2,500 feet wide and 12- 20 feet deep. The growth of the breach led to the loss of numerous structures (over 100 homes) and allowed for increased water levels (tidal and storm) in Moriches Bay, causing back-bay damage to the towns of East Moriches, Remsenburg and Mastic Beach. During the March 1993 Nor'easter, residents along the mainland shoreline opposite the breach reported flood depths two feet greater than those caused by the December 1992 storm, which resulted in a Federal Disaster Declaration. Additionally, the breach resulted in loss of navigation in the Intracoastal waterway and harm to the shellfish industry. This breach was closed in October 1993 at a cost of \$7,000,000 (1993 dollars).

In 1993, there were at least two well-documented severe storm events occurring in the southeastern and central parts of the State causing severe erosion, heavy debris, and power failure. The event that occurred in January 1993 primarily impacted Westchester and Suffolk Counties and caused erosion damage estimated at close to \$4 million. The Central New York event resulted in a less severe financial impact, almost \$300,000, but given the rural nature of the area, the event was considered severe.

Within recent years, there have been two seiche incidents on Lake Erie, the first occurring on December 20, 2000 when high winds at the eastern end of the lake caused the water to rise above five feet in a few hours. High water levels, along with 10 to 14 foot waves caused shoreline erosion and local flooding. Evacuations were ordered at Hoover Beach, as the lake remained above flood stage for a few hours. There were no injuries or fatalities caused by the event. The second seiche on Lake Erie occurred on March 9, 2002. Winds above 50 knots on the lake caused wave levels to rise at the eastern end of the lake. The lake exceeded flood stage and peaked at over nine feet. No injuries or fatalities occurred and evacuations were not ordered. Damages from both events were more than \$100,000.

Major impacts to communities along the shorelines of Long Island, Staten Island and other locations of the New York City area have been the result of a number of storms with impacts that included coastal erosion between 2011 and 2013:



## Hurricane Irene

Hurricane Irene made landfall in North Carolina as a category 1 hurricane and caused widespread damage across a large portion of the eastern United States as it moved north-northeastward, bringing significant effects from the Mid-Atlantic States through New England. The most severe impact of Irene in the northeastern United States was catastrophic inland flooding in New Jersey, Massachusetts and Vermont; however, the center of Irene moved over Coney Island, Brooklyn, New York and then over Manhattan, New York City on August 28, 2011. Atlantic beaches in Nassau County were also hard-hit by the storm. Although the strongest winds at the time of Irene's landfall occurred primarily well east of the center, twenty New York counties and New York City's five boroughs were included in the Presidential Disaster Declaration for Public Assistance and Individuals Assistance due to the storms impacts.

## Hurricane<sup>4</sup> Sandy

Hurricane Sandy made landfall as a post-tropical cyclone near Brigantine, New Jersey on October 29, 2012, impacting areas of New York State with storm surge, high waves, and wind. Sandy caused water levels to rise along the entire east coast of the United States with the highest storm surges and greatest inundation on land occurring in New Jersey, New York, and Connecticut, especially in and around the New York City metropolitan area. In many of these locations, especially along the coast of Staten Island and southward-facing shores of Brooklyn, Queens and Long Island, the surge was accompanied by powerful damaging waves.

The highest measured storm surge in New York was 12.65 ft. above normal tide levels at Kings Point on the western end of Long Island Sound. A storm surge of 9.56 ft. above normal tide levels was reported on the northern side of Staten Island at Bergen Point West Reach, and 9.40 ft. was reported at the Battery on the southern tip of Manhattan<sup>5</sup>. State parks and recreational facilities and associated infrastructure in vulnerable coastal areas suffered more than \$320<sup>6</sup> million in damages from Hurricane Sandy.

Following Hurricane Sandy, DEC issued a General Permit for the coastal areas of Long Island, New York City, and the lower Hudson Valley to facilitate rebuilding. Approved projects included stabilizing existing functional dwellings, decks and walkways with temporary bracing and pilings; installing sandbags or sand cubes at the toe of damaged structures or eroded escarpments; re-grading eroded dunes; reconstruction existing functional of stairways; in-kind/in-place reconstruction of existing bulkheads and shoreline erosion structures that were functional before Hurricane Sandy; and repair or

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<sup>4</sup> "Hurricane" is the official type of storm, as noted in Blake, Kimberlain, Berg, Cangialosi and Beven. *Tropical Cyclone Report: Hurricane Sandy*, National Hurricane Center, National Oceanic and Atmospheric Agency (NOAA), 2/12/13

<sup>5</sup>Ibid

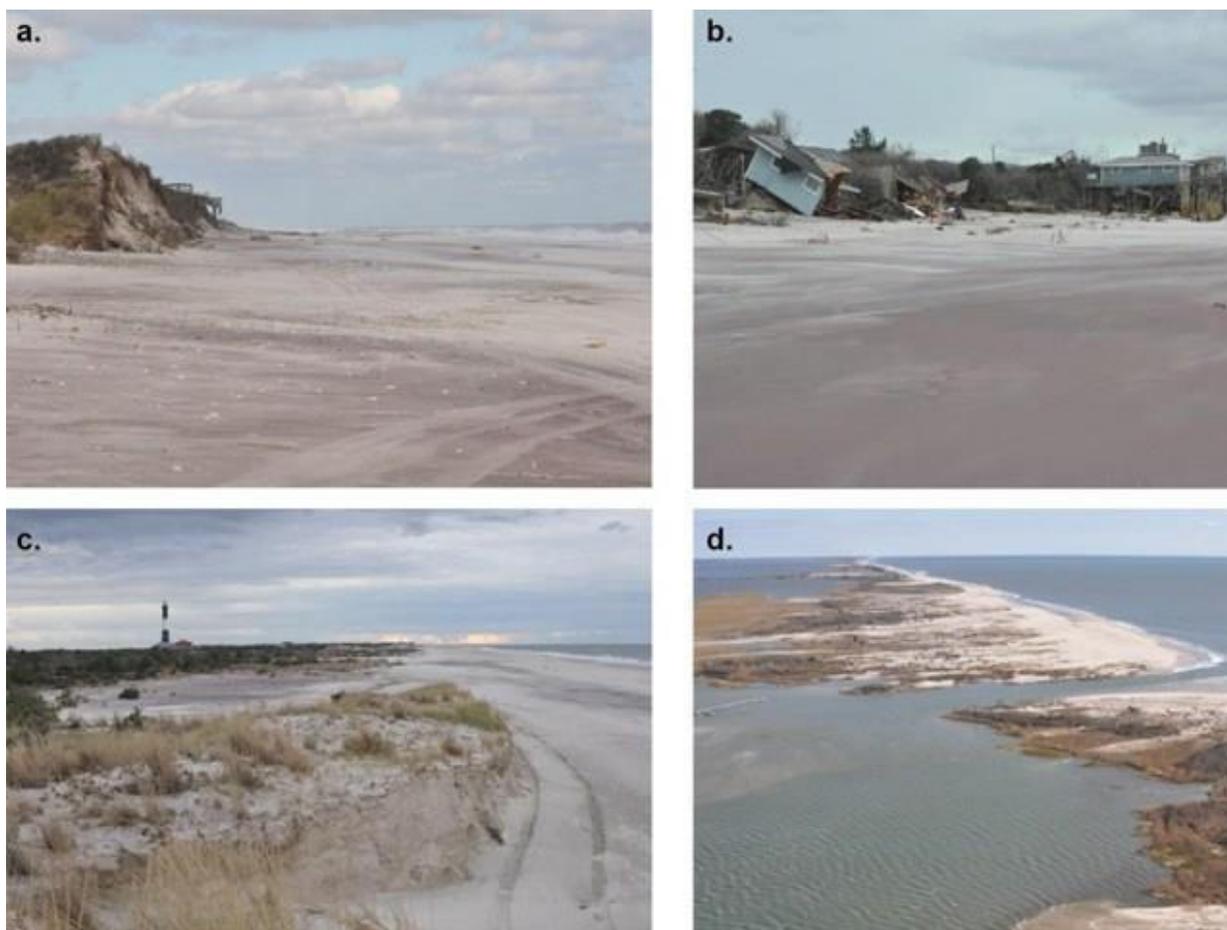
<sup>6</sup> Ibid. [The total amount of damages resulting from Hurricane Sandy in New York State are still being calculated.]



reconstruction of existing public roads, bridges, utilities and other public infrastructure. Total damage costs, which include coastal erosion, from Sandy were estimated at \$75 billion dollars<sup>7</sup>.

Some of the most significant coastal erosion that resulted from Hurricane Sandy was found on Fire Island. **Figure 3.5d** provides a visual record of coastal damage on the island.

**Figure 3.5d FIRE ISLAND Coastal Erosion Survey (USGS):** A) Levelled beaches, scarped dunes; B) damaged homes in Davis Park; C) leveled dunes, overwash sheets by the lighthouse; D) breach at Old Inlet.



Source: USGS

The repetitive storms have taken a significant toll on the coastal areas of the state and have resulted in multiple renourishment projects. One such project area is on Long Beach Island, Nassau County, located on the south shore of Long Island and consisting of approximately 7 of the 9 miles of oceanfront from Jones Inlet to East Rockaway Inlet. The area has been subject to direct wave attack and flooding during major storms and hurricanes, causing damage to structures located along the barrier island. The historical

<sup>7</sup> National Weather Service (NWS), NOAA



low height and narrow width of the beach front has increased the potential for storm damage. Nine storms have damaged the area between 1938 and 2012. Hurricane Sandy, in October 2012, was credited with over \$250 million dollars of damage to the area<sup>8</sup>. The proposed project would provide coastal storm damage risk reduction to the highly developed communities in this area, based on recommended measures from the 1995 Feasibility Study. The project will consist of construction of a combination of protective measures including, a beach berm, dune system, groins and periodic re-nourishment of the restored beaches for 50 years<sup>9</sup>. One hundred percent Federal funds are being used to analyze the sand borrow area and storm beach model effects, and update economic and environmental data to determine a final recommended plan of improvement, in cooperation with the DEC, City of Long Beach, Town of Hempstead and Nassau County.

Between 1960 and 2012, coastal events led to three Major Disaster Declarations:

- **New York Coastal Storm, High Tides, Heavy Rain and Flooding (DR-794)** – December 21, 1992
  - Counties: Nassau, New York, Rockland, Suffolk, Westchester
- **New York High Wind, Wave Action and Flooding ( DR-367)** – March 21, 1973
  - Counties: Cayuga, Genesee, Jefferson, Monroe, Niagara, Orleans, Oswego, Wayne
- **New York Severe Storm, High Tides, Flood (DR-129)** – March 16, 1962
  - Counties: [Not available]

### Probability of Future Events

The ability to predict coastal impacts from hurricanes and other coastal storms is essential in successful mitigation planning. Long-term coastal erosion is a continuous and dynamic process and is highly probable to occur in the future, impacting all coastal counties on the Atlantic Ocean as well as those with shorelines along the Great Lakes.

Based on historical frequency, the counties with the highest probability for future occurrences are noted in **Table 3.5b**.

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<sup>8</sup> This is an estimate only; additional costs may be identified as projects are developed and implemented.

<sup>9</sup> "Jones Inlet to East Rockaway Inlet (Long Beach)", USACE Project Fact Sheet, Feb 2013



**Table 3.5b: Percentage Probability\* of Future Occurrences (in any given year), by County**

County	Future Probability (%)
Suffolk	27
Nassau	25
Queens	25
Erie	13
New York	10
Chautauqua	8
Bronx	6
Richmond	4
Westchester	4
Niagara	2
Orange	2
Putnam	2
Rockland	2
Kings	0

Source: *SHELDUS* (\* Future Probability equals the number of events divided by the number of years of record [52], expressed as a percentage.)

Nassau County's LHMP discusses the probability of occurrence in relation to the greatly varying long-term and short-term erosion rates.<sup>10</sup> The plan states that, "There are no known, systematic attempts to monitor erosion rates along New York's marine shoreline including Nassau County, except for the incorporation of accepted rates greater than one foot per year into the CEHA mapping." In addition, the plan states that long-term erosion is "on-going", and is therefore 100% probable for specific locations within the CEHAs.

Based on records of previous occurrences of coastal erosion related to hazard events (described in Table 3.5a), the counties with the lowest probability of future occurrences are Niagara (2%), Orange (2%), Putnam (2%), and Rockland (2%).

There has been a dramatic increase in coastal erosion over the last two decades and this is expected to continue with the predicted increases in sea level rise and storm frequency and severity increase related to climate change. Rather than occurring over the same time scale with sea level rise, erosion of beaches and coastal bluffs is expected to occur in large bursts during storm events as a result of increased wave height and storm intensity.

Suffolk County, one of the hardest hit counties in New York State in terms of coastal erosion includes a detailed account of the history, frequency, and probability for future events. The Suffolk County LHMP describes the difficulty in accurately determining return periods:

<sup>10</sup> Nassau County Multi-Jurisdictional Hazard Mitigation Plan (February 2007), p. 39-41



*Detailed methods of determining return periods and frequencies of occurrence of coastal erosion are very difficult to determine due to limited information and the relatively short period of recorded data in most areas. The long-term patterns of coastal erosion are also difficult to detect because of substantial and rapid changes in coastlines in the short-term (that is, over days or weeks from storms and natural tidal processes). It is usually severe short-term erosion events, occurring either singly or cumulatively over a few years, that cause concern and lead to attempts to influence the natural processes. Analysis of both long- and short-term shoreline changes are required to determine which is more reflective of the potential future shoreline configuration<sup>11</sup>.*

Because of these large events, scientific models predict that shoreline erosion may outpace sea level rise by 50 to 200 fold by the year 2100<sup>12</sup>.

Just prior to the landfall of Hurricane Sandy, the United States Geological Survey developed a predictive model of the Long Island coastline very likely to experience coastal change during Hurricane Sandy. In the model, 93% of Long Island was projected to be impacted by dune erosion (collision), 12% overwash and 4% inundation.

Building coastal erosion protection structures, either by private or public funds, are extremely costly projects. These structures often are only partially effective over time and may increase the erosion potential to adjacent or nearby properties.

### **Challenges in Predicting Frequency of Coastal Erosion**

Storms are often categorized by return frequencies (e.g. 100 year storm, etc.). There are several shortcomings related to trying to categorize erosion by return frequencies. First, the historical record of storms is relatively short to accurately assess the true long-term frequency of long period events. Second, it is difficult to make an equitable comparison of events involving coastal erosion. Sea level rise changes the vulnerability such that storms of an average 100-year frequency may occur considerably more often, causing more effects including erosion. Third, coastal erosion impacts can vary significantly from one locality to another depending upon such factors as the effects of onshore wind component and incidence of wave activity to structural protective features such as jetties, groins and bulkheads. In addition, the impact of a storm can be compounded if it has multiple severe dimensions (e.g. major coastal flooding in addition to high tides, such as in Hurricane Sandy; very heavy snow; and extreme winds). Finally, development along the coastline or in other vulnerable areas can significantly increase the impact of a storm, increasing the level of erosion. Consequently, the same storm in 1993 might not have caused as much damage then as it would now with the increased coastal development and sea level rise.

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<sup>11</sup> Suffolk County DMA 2000 Hazard Mitigation Plan (2008), p. 55.

<sup>12</sup> Center for Ocean Solutions



### 3.5.2 Assessing Vulnerability by Jurisdiction

Each area of the coast of New York State is impacted differently by each type of coastal hazard and has varying vulnerabilities. Many coastal areas of New York State are highly vulnerable to erosion due to the lack of storm protection and the erosion of supportive and protective natural features such as beaches, dunes and bluffs.

The methodology used to analyze information from local plan risk assessments is described in **Sections 3.1.4** and **3.1.5** of this plan.

Review of 56 FEMA-approved Local Mitigation Plans reveals that two counties (Nassau and Suffolk) addressed coastal erosion as a hazard. An explanation for the absence of this hazard in other local plans is that coastal hazards have sometimes been included within other hazard categories such as flood and coastal storms (hurricanes). In addition, the DHSES Mitigation Section just recently released Hazard Mitigation Planning Standards (October 2012) that requires that local plans developed or updated after October 15, 2012 now address this hazard if it poses a threat locally.

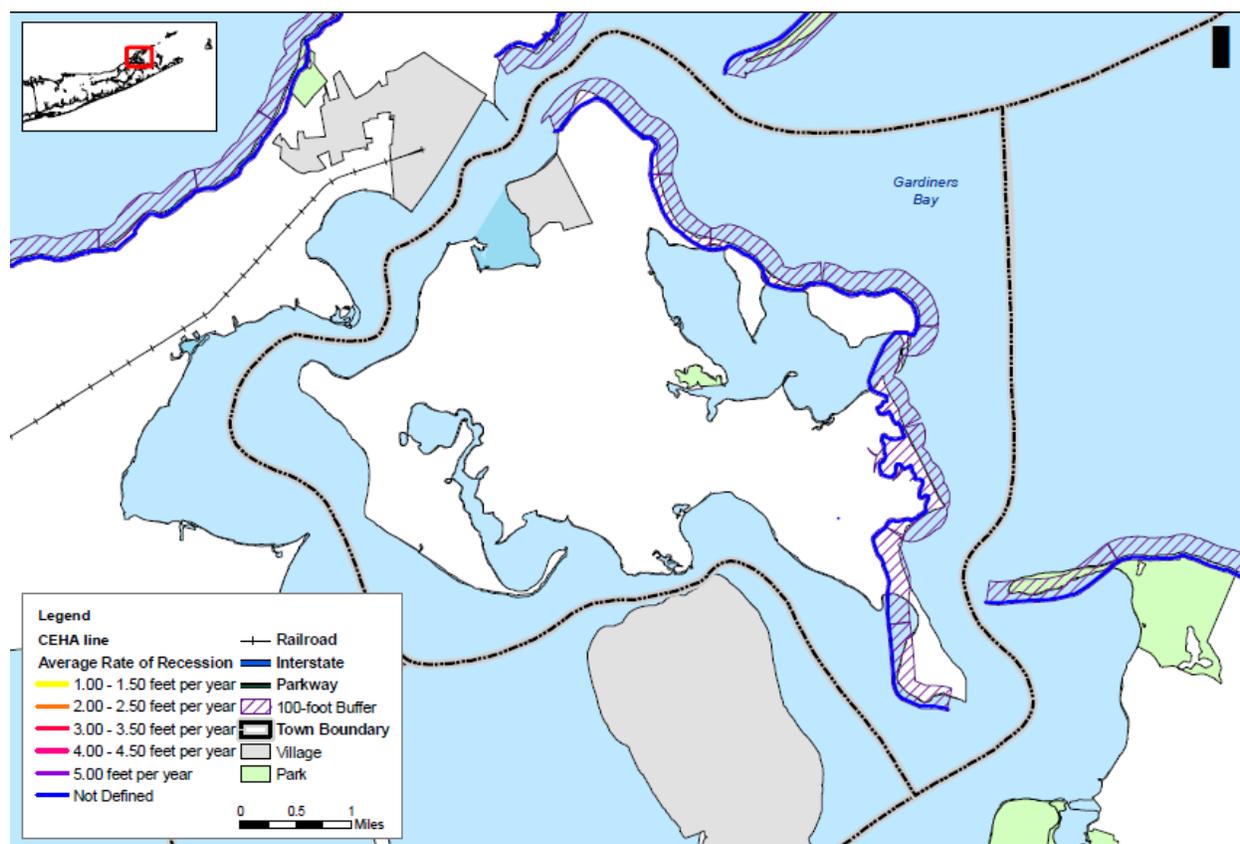
Based on previous occurrences and severity, the following are the counties most vulnerable to coastal erosion (by historical frequency, property damage, and future probability):

1. Suffolk County (Atlantic Ocean)
2. Nassau County (Atlantic Ocean)
3. New York City (Bronx, Kings, New York, Queens, and Richmond Counties (Atlantic Ocean))
4. Erie County (Lake Erie)
5. Chautauqua County (Lake Erie)

The Suffolk County LHMP provides significant information related to the vulnerability of its communities and shorelines to coastal erosion. DEC provides CEHAs areas have been mapped



Figure 3.5e: DEC Coastal Erosion Hazard Areas Line in the Town of Shelter Island



Source: DEC

### Impacts to Vulnerability Assessments since the 2011 Plan

The impacts of multiple storms – Hurricane Irene and Tropical Storm Lee in 2011, and Hurricane Sandy in October 2012 - provided an unprecedented opportunity to study coastal impacts from multiple tropical events and their resulting conditions, including coastal erosion. Prior to the storms, dunes on New York's southern shores were among the highest on the Atlantic coast, and as such during a Category 1 hurricane, only 9 percent of coastal areas were likely to overwash (Source: United States Geological Survey (USGS)). These high dunes were vulnerable to extreme erosion during a Category 1 hurricane, with 76 percent of the dunes very likely to experience erosion. This was especially documented from Hurricane Sandy, where protective sand dunes along barrier islands in New York were completely eroded in places increasing vulnerability to more extreme erosion during future storms. (Source: USGS Report)

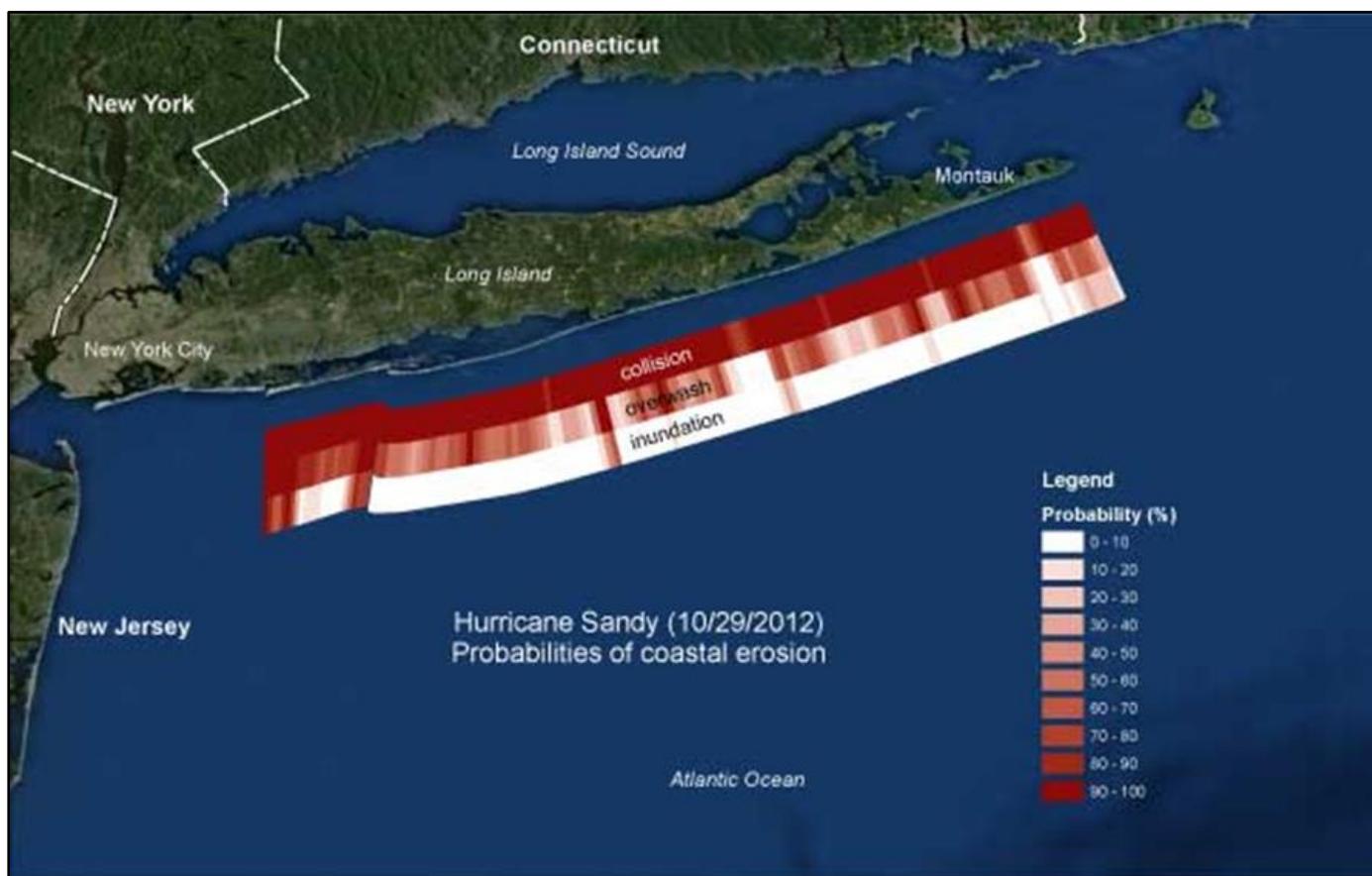
Hurricane Sandy provided an opportunity for USGS to assess and model the potential impacts of the storm on coastline changes as the storm was approaching. Elevated water levels and waves during tropical storms can lead to dramatic coastal change through erosion of beaches and dunes. USGS has developed a storm-impact scale that predicts the likelihood of coastal change by comparing modeled elevations of storm-induced water



levels to known elevations of coastal topography in order to define three coastal change regimes. These regimes describe how the physical form of the beach and storm processes tend to interact, and the resulting modes of coastal change along beaches and dunes, which often serve as the “first line of defense” for many coasts exposed to tropical storms and hurricanes.

Long Island was one of the shoreline sectors modeled. “Collision” occurs when waves attack the base of dunes and cause dune-front erosion. Under higher surge or wave run-up conditions, waves can overtop dunes leading to “overwash” which can include dune erosion, landward dune migration, and overwash deposition on low, narrow islands. In extreme cases, such deposition can bury roads and parts of buildings. The most extreme coastal change regime is associated with “inundation”, where the elevation of storm surge plus wave setup exceeds the elevation of the primary dune or beach berm. Under these conditions the beach and dune can be severely eroded and low, narrow islands may be breached. In the maps below, red colors indicate high probability while white indicates low probability.

**Figure 3.5f: Probabilities of Coastal Erosion, Hurricane Sandy Model**



Source: USGS, October 2012



### Coastal Erosion Impact Analysis –USGS Fire Island Survey

Impacts from coastal erosion may affect the State’s population, property and infrastructure, environment, and economy. In addition to potential increases in coastal flooding and wind damage, erosion can also lead to compromised environmentally-sensitive ecosystems.

The USGS Survey serves as an appropriate model to study the impact of erosion on a specific site. Focusing on the coastal systems on Fire Island immediately prior to and following Hurricane Sandy, the survey identified that more than 54.4% of the island’s beaches and sand dunes were lost from the storm, weakening the island’s ability to withstand damage from future storms<sup>13</sup>. In addition, Fire Island sustained millions of dollars in damages to sand dunes and beaches, boardwalks and visitor facilities during the storm. Estimates from the U.S. Army Corps of Engineers for sand renourishment along will top \$100 million. Fire Island, a barrier island approximately five miles off the Atlantic shore of Long Island, lost beach volume because of Sandy, with most of the sand carried offshore by waves and storm surge, according to the study. The survey was undertaken by scientists two days prior to the storm’s landfall and continued two days following impact and then once a month through June 2013. The study reported that the storm removed so much sand that the elevation of the beach itself dramatically dropped. In addition, the loss of shoreline changed the island’s shape by redistributing 14 percent of the sand further inland, resulting in some inland sections now being more resilient to future storms, while outlying areas are more vulnerable.

**Figure 3.5g** shows water inundation on Fire Island as a result of Hurricane Sandy



Source: *Newsday*

The outcome of the damage to Fire Island’s shoreline is that storm waves and water levels can now reach further into the island. Although there are only an estimated 300 permanent residents, a seasonal population of more than 75,000 occupies multi-million dollar residences on the island.

<sup>13</sup> The Wall Street Journal article summarizing USGS Report, August 27, 2013



## Population

New York State is the third largest state in the nation with over 19 million people. The largest, most densely populated, and highly developed urban area in the country is New York City, which encompasses five boroughs and an estimated 1,850 miles of tidal shoreline<sup>14</sup>.

While the state has designated Coastal Erosion Hazard Areas (CEHAs), the current mapping available as of the 2014 update does not allow GIS analysis to identify total population at risk to coastal erosion. Population estimates for hurricane storm surge zones in New York State, as identified by Sea, Lake and Overland Surge Heights (SLOSH) models, provide the best data at this time to identify population that is potentially vulnerable to coastal erosion; however, while all residents within storm surge zones aren't living close enough to a shoreline to be affected, there is some percentage of the population living within susceptible shoreline that may be impacted. (See **Figure 3.5g** for map locations of Storm Surge Zones.) Current population estimates for hurricane storm surge zones are:

Surge Zone	Population
Category 1	517,904
Category 2	1,549,103
Category 3	2,429,424
Category 4	3,222,374

## Property, Infrastructure, and the Economy

Many homes and buildings are constructed on coastal regions, as beach-front homes are often in high demand and many coastal towns are popular resort areas. Consequently, land values are quite high. Some homes and infrastructure at the water's edge risk being submerged by the sea or destroyed by high winds and waves in coastal storms. Homes and infrastructure in coastal neighborhoods risk flooding if beach erosion becomes extensive, and can suffer serious damage leading to high economic impacts. As coastal erosion occurs, the amount of land that can be used for these various uses decreases, which in turn may increase the value of the land. On the other hand, expanding areas of coastal erosion could also limit the use of parcels impacted by erosion, or eliminate them from being used for development altogether.

Coastal erosion can lead to both direct and indirect economic impacts. Coastal storms and erosion can lead to both direct and indirect economic impacts. The cost of damaged and destroyed homes businesses and infrastructure in coastal areas takes a tremendous toll on local communities in terms of direct costs related to rebuilding, particularly for uninsured

<sup>14</sup> Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service. Footnote: Figures were obtained in 1939–1940 with recording instrument on the largest-scale maps and charts then available. Shoreline of outer coast, offshore islands, sounds, bays, rivers, and creeks is included to head of tidewater, or to point where tidal waters narrow to width of 100 feet.



losses. In addition, indirect economic impacts can occur due to losses in jobs, tax revenues, and services if homes and businesses are slow to rebuild, or never rebuild. Coastal areas are especially vulnerable to economic impact if supporting marine commerce and tourism industries that rely on the natural features of coastal areas are heavily impacted.

There have been multiple beach-fill operations to maintain the beaches on Fire Island in recent years, financed by a special local erosion control tax district or by FEMA. The state has been working with the U.S. Army Corps of Engineers on a long term plan to reduce storm impacts, including erosion, for the south shore region of Suffolk County, constituting 83 miles of shoreline. Beach renourishment projects have been conducted in recent years and numerous projects are planned to repair damaged property and infrastructure caused by Hurricane Sandy. State efforts on the Adaptation Task Force and the Climate Adaptation Plan are aimed at supporting adaptive measures that will help address risks to property and infrastructure from shoreline erosion and inundation<sup>15</sup>.

**Table 3.5c: Currently Funded Projects that Address Coastal Protection**

Project Name	Project Scope	Funding
Oakwood Beach, Staten Island (PL 84-99)	Repair levee and replace damaged electrical equipment	\$200,000 100% federal
Coney Island Public Beach (PL 84-99)	Repair and re-nourish beach to original design profile	\$28,000,000 100% federal
Rockaway Public Beach (PL 84-99)	Repair and re-nourish beach to original design profile	\$84,000,000 100% federal
Fire Island Inlet, Gilgo Beach (PL 84-99)	Repair and re-nourish Gilgo Beach back to pre-storm profile	\$21,046,640 100% federal
Tobay Beach, Town of Oyster Bay	Re-nourish beach area to support new dunes and pavement	\$2,355,250 100% State (NY Works)
Overlook Beach, Town of Babylon	Repair beach; linked to USACE Gilgo Project (PL 84-99)	\$424,000 100% Town funded (NY Works up front, reimbursed by Town)
Westhampton Interim Project (PL 84-99)	Repair and re-nourish beach to original design profile	\$34,000,000 100% federal
West of Shinnecock (PL 84-99)	Repair and re-nourish beach to original design profile	\$10,000,000 100% federal
Coney Island / Sea Gate	Stabilize beach through re-nourishment and building T-groins	\$30,000,000 100% federal

<sup>15</sup> CMP, 309 Assessment 2011-2016, p. 19



Project Name	Project Scope	Funding
Rockaway Storm Damage Reduction Project	Study being completed analyzing three alternatives to increase beach stability, relocate boardwalk, and increase resiliency	\$1,500,000 study 100% federal \$150,000,000 construction 100% federal
Long Beach Island Storm Damage Reduction Project	Complete study of beach and dune erosion; construct beach and dune system	\$1,000,000 study 100% federal \$200,000,000 construction 100% federal
Fire Island to Montauk Point (FIMP)	Beach and dune re-nourishment, breach closure planning, elevation of homes on mainland Long Island, elevation of utilities and roads	\$700,000,000 estimated (likely over \$1 billion) 100% federal
Fire Island Stabilization Project part of FIMP	Rebuilding dunes to 15' and beach re-nourishment; may involve property acquisition to allow new alignment	Cost unknown 100% federal (anticipated)
Montauk Point Lighthouse Storm Damage Reduction Project	Stabilize rock revetments and slopes supporting Montauk Lighthouse	\$500,000 – study 100% federal \$18,000,000 construction 50% federal / 50% non-federal
South Shore Staten Island	USACE to complete feasibility study to provide protection for structures using beaches, dunes, interior drainage areas, seawalls, and revetments	\$1,500,000 Study 100% federal \$350,000,000 construction 65% federal / 35% non-federal
Oakwood Beach Natural Infrastructure Feasibility Study	Mini-feasibility study to see if wetlands can be added to USACE project for South Shore of Staten Island Feasibility Study	\$469,520 100% State NY Works
Village of Asharoken Storm Damage Reduction Project	Complete feasibility study and conduct design and construct measures, including renourishment, to protect road connecting Eaton's Neck to mainland Long Island	\$1,500,000 feasibility study 100% federal \$30,000,000 65% federal / 35% non-federal
Village of Bayville Storm Damage Reduction Project	Feasibility study to determine measures needed to protect Village from flooding	\$2,000,000 feasibility study 100% federal Cost unknown – construction
Hashamomuck Cove Storm Damage Reduction Project	Feasibility study to determine method to protect County Route 48	\$2,600,000 feasibility study 100% federal \$13,000,000 construction 65% federal / 35% non-federal



Project Name	Project Scope	Funding
Lake Montauk Harbor Storm Damage Reduction and Navigation Project	Feasibility study to re-nourish beach, build a groin, and expand navigational channel to provide heightened protection to properties	\$1,000,000 feasibility study 100% federal \$34,000,000 80% federal / 20% non-federal
Robert Moses Beach Phase II	Dredge approximately 1,200,000 CY of sand; requires impact analysis	\$40,000,000 100% State

Source: NYSDEC, Coastal Erosion Management Section

The New York State Department of State's (DOS) Coastal Management Program researched areas affected by previous coastal hazard events in their document "309 Assessment and Strategies" (2011-2016) and identified the number of communities that have mapped the impacts from these events. Because more detailed information was not available, DOS used the flood stage frequency information produced by FEMA for the National Flood Insurance Program as a primary source of information. The report notes that, although this information was relatively rudimentary for the purposes of land use planning, it is recognized that community resilience depends on effective land use. Therefore, DOS will continue to seek more accurate information on storm frequency and the distribution of coastal erosion impacts for the purpose of providing improved technical assistance to partners in local government. FEMA is in the process of updating floodplain mapping for the New York City area and the shore communities of Lakes Erie and Ontario. DHSES will monitor new data related to the impacts of coastal events as it is developed to include in the next plan update.

Local jurisdictions identified in the DOS 309 Assessment as having a moderate level of risk to shoreline erosion (including bluff and dune erosion) were Nassau and Suffolk Counties on the Atlantic Coast, and all counties on Lake Ontario<sup>16</sup>.

Infrastructure along all coastlines is at a high risk of being impacted by events that cause coastal erosion, including coastal storms and flooding.

## Environment

Erosion is a naturally occurring process that balances wave climate and sediment supply. Normal erosion processes are necessary for certain ecological communities (both in riverine and coastal areas). The increasing impacts from coastal storms and sea level rise are expected to directly impact coastal erosion. While the placement of hardened erosion control measures may be used to protect sensitive environmental areas along the coastlines, these shore defense structures may actually limit or destroy coastal habitats and the ecosystem services they provide. This erosion may have significant effects on coastal habitats, which can lead to social and economic impacts on coastal communities. With the

<sup>16</sup> "309 Assessment and Strategies" (2011-2016), NYS Coastal Management Program



reduction of coastal habitats and the ecological services they provide, coastal communities will potentially experience more frequent and destructive flooding, compromised water supplies and smaller or fewer beaches.

### **Local Plan Integration/Risk Assessments**

The process used to review and integrate LHMP data into the 2014 SHMP update is described in **Section 5.2**. Review of current plans indicates that there is not a uniform methodology that has been used, when developing local plans, by all counties to assess severity (impacts and consequences), vulnerability, and potential losses for all hazards. DHSES uses the “HAZNY” software which is available for counties in developing hazard profiles and assessing risks; however, not all counties use this tool for the purpose of mitigation planning.

Fifty-six (56) local mitigation plans were reviewed for the 2014 update to identify vulnerabilities at the jurisdictional level. Two counties, Suffolk and Nassau Counties, identified coastal erosion as a hazard and assessed it as a moderate risk.

The Erie County All-Hazards Mitigation Plan considers the probability of a future seiche as moderately high, and vulnerability as moderate. The plan also considered seiche as having a moderate potential of occurrence since this region commonly has storm systems with moderate to high winds. When a seiche does occur it has a high monetary loss and causes moderate damage. According to the Erie County HAZNY analysis, the impact of a seiche could cause serious injury or death (likely, but not in large numbers), moderate damage to private property, and moderate structural damage to public facilities.



**Figure 3.5h: Post-Hurricane Sandy Coastal Protection Project**

*Source: K.W. Wilsey/FEMA --Belle Harbor, N.Y., May 21, 2013 --The New York City Parks Department, with partial funding from FEMA's Public Assistance program, is constructing a baffle wall in the Rockaways, from Beach 126th Street to Beach 149th Street, to replace the older wall damaged during Hurricane Sandy. Workers are installing steel "H" pilings driven to a depth of 25 feet to increase stability. The baffle wall will end up being four feet above street level.*

**Figure 3.5i: Before and After: Coastal Flood Elevation Project**

Source: K.C. Wilsey/FEMA. Freeport, N.Y., May 20, 2013 --After the storm surge from Hurricane Sandy flooded their house with 5 feet of water, the homeowners made the decision to elevate their house above the new flood level of 12 feet determined by New York State and FEMA

### Changes in Development in Hazard-Prone Areas

Many people may be adversely affected by development on relatively small areas of land. In addition to the potential threat to human life from storm-impacted eroding shorelines, uncontrolled erosion and sediment from these areas may cause considerable economic damage to individuals and society in general. If conditions such as sea level rise and severe



storms continue to increase and become more severe, more extensive regulations may be required to eliminate inappropriate development in vulnerable areas.

The Suffolk County Hazard Mitigation Plan describes the potential impact of development in areas vulnerable to hazards:

*According to the Long Island Regional Planning Board (LIRPB), New York State has one of the most densely developed and heavily used coastlines in the U.S. The growing population in the New York City/Long Island metropolitan area increases the demand for recreational, residential, and commercial development. In 1990, Suffolk County ranked as one of the top ten counties in the country in terms of residential construction growth. The County beaches are a prime recreational resource attracting more than 20 million visitors annually (LIRPB, 1989) and serve as the foundation of a multibillion-dollar regional tourism industry. Highly desirable for a variety of uses, these coastal areas are also extremely dynamic and subject to significant changes due to both natural processes associated with wind, waves and tides, and human activities. The dynamic nature of Long Island's south shore coupled with a large population's desire to live, work, and play along this coast present unique challenges for decision makers, residents and coastal resource users who are concerned with balancing use, conservation, and development along this urban and suburban coastal area.<sup>17</sup>*

The **Federal Coastal Barrier Resources Act** (CBRA) (1982) prohibited the use of Federal funding and flood insurance to support building and development in sensitive coastal areas. The **Coastal Barrier Resources System** (CBRS) a system of protected coastal areas that include ocean-front land, the Great Lakes and Other Protected Areas (OPAs). The CBRA restricts development in the CBRS in an effort to protect the barrier system and prevent future flood damage. Residents within a CBRS area are eligible for federally regulated flood insurance only if their property was built before 1982 and their community participates in the NFIP.

There are a significant number of CBRA units in New York, including 101 units on Long Island alone. Although the CBRA has served to regulate development, continuing pressure to construct buildings and infrastructure in coastal areas to support economic growth has led to increased costs related to post-disaster repairs and community redevelopment. Subsidies and other financial benefits are frequently offered by local governments to attract economic development, maintaining the cycle of disasters and redevelopment.

A number of initiatives from State agencies address the reduction or elimination of coastal erosion and control of development in vulnerable areas through regulation, building codes and standards, and public education. Several of these initiatives are described below.

While all shore lines are subject to wind, water and gravitational forces of erosion, some shorelines are at greater risk than others. The **New York State Department of Environmental Conservation** (DEC) implements the Coastal Erosion Hazard Areas

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<sup>17</sup> Suffolk County DMA 2000 Hazard Mitigation Plan , October 2008, p. 5.4.5-22



program which identifies coastal erosion hazard areas and establishes standards for the issuance of coastal erosion management permits to control certain activities and development in those areas. New York State's CEHA program was established both to protect lives and property from the threat of coastal erosion and to protect the natural protective features that mitigate or slow the forces of coastal erosion. Coastal development in New York State is closely regulated under programs established by DEC.

The CEHA program (Article 34 of the Environmental Conservation Law) was developed in conjunction with the Waterfront Revitalization and Coastal Resources Act to address erosion and development along the state's higher energy shorelines. The CEHA areas in the marine portion of New York are limited to the open ocean coastlines and the exposed coasts of Long Island Sound (i.e., not in the harbors or bays). Additional areas are identified on the shorelines of Lake Erie and Lake Ontario. The law is implemented under the Coastal Erosion Management Regulations (6NYCRR Part 505) administered by DEC. The regulations focus on minimizing actions that could cause erosion and erosion threats to public property and safety through the use of building setbacks and construction restrictions, preservation of natural protective features, and establishment of guidelines for erosion control structures.

The CEHA regulations under Part 505 are in the process of being revised with a goal of strengthening them to address resiliency in coastal projects (e.g., pilings above floodplains on reconstruction). The revision of CEHA regulations was started prior to Hurricane Sandy with completion anticipated in late 2015 or early 2016.

**Figure 3.5a (Section 3.5.1, page 6)** highlights the areas in New York State where coastal erosion has been identified as a problem and where the CEHA regulations are in-place. Detailed maps have been developed to delineate the hazard areas. In many communities detailed orthoimagery is available so that individual roads, structures, and land features can be identified.



Table 3.5d: DEC, CEHA Programs by Effective Dates and Community as of March 2013

Region	County	CEHA administered by local jurisdiction	CEHA administered by DEC	Effective Date	
1	Nassau		Centre Island, Village of	09/25/92	
			Long Beach, City of	08/22/92	
			Oyster Bay, Town of	08/22/92	
			Atlantic Beach, Village of		09/14/89
			Bayville, Village of		12/01/92
			Glen Cove, City of		08/07/90
			Hempstead, Town of		05/27/92
			Kings Point, Village of		11/21/89
			Lattingtown, Village of		10/05/89
	Sands Point, Village of		02/27/89		
1	Suffolk		Babylon, Town of	12/18/89	
			Belle Terre, Village of	09/28/89	
			Brookhaven-N, Town of	03/28/95	
			Brookhaven-S, Town of	06/14/01	
			East Hampton, Village of	09/21/89	
			Huntington, Town of	01/23/90	
			Lloyd Harbor, Village of	10/05/89	
			Ocean Beach, Village of	12/13/99	
			Old Field, Village of	02/01/93	
			Port Jefferson, Village of	06/13/89	
			Quogue, Village of	02/06/89	
			Riverhead, Town of	05/23/91	
			Sagaponack, Village of	06/01/11	
			Saltaire, Village of	05/17/99	
			Shoreham, Village of	07/10/92	
			Southampton, Town of	05/24/89	
			Southampton, Village of	02/06/89	
			Southold, Town of	11/04/91	
			West Hampton Dunes, Village of	11/13/95	
			Westhampton Beach, Village of	11/13/95	
		East Hampton, Town of	06/20/91		
		Islip, Town of	10/09/99		
		Nissequogue, Village of	07/10/92		
		Shelter Island, Town of	07/10/92		
		Smithtown, Town of	07/10/92		
<b>Note: As of March 2013, Part 505 implementation has not been completed for the Village of Asharoken.</b>					
2	New York City Area		Kings County	01/31/91	
			Queens County	01/31/91	
			Richmond County	01/31/91	
3	Westchester	New Rochelle, City of		12/08/89	



Region	County	CEHA administered by local jurisdiction	CEHA administered by DEC	Effective Date
			Larchmont, Village of	03/10/93
			Mamaroneck, Town of	03/10/93
			Mamaroneck, Village of	03/10/93
			Rye, City of	03/10/93
<b>6</b>	<b>Jefferson</b>	Ellisburg, Town of		09/06/89
<b>7</b>	<b>Cayuga</b>	Sterling, Town of		12/24/91
			Fair Haven, Village of	03/11/93
	<b>Oswego</b>	Oswego, City of		05/24/89
			Mexico, Town of	08/10/91
			New Haven, Town of	03/11/93
			Oswego, Town of	03/11/93
			Richland, Town of	08/10/91
			Sandy Creek, Town of	08/10/91
			Scriba, Town of	03/11/93
<b>8</b>	<b>Monroe</b>	Greece, Town of		01/04/90
		Hamlin, Town of		09/05/90
		Rochester, City of		09/08/92
			Irondequoit, Town of	04/14/91
			Parma, Town of	04/14/91
			Penfield, Town of	04/14/91
			Webster, Town of	04/14/91
	<b>Orleans</b>	Kendall, Town of		03/01/90
		Yates, Town of		10/06/89
	<b>Wayne</b>		Carlton, Town of	10/20/91
		Huron, Town of		11/10/91
		Sodus, Town of		11/10/91
			Ontario, Town of	03/10/00
		Sodus Point, Village of	11/10/91	



Region	County	CEHA administered by local jurisdiction	CEHA administered by DEC	Effective Date	
			Williamson, Town of	11/10/91	
			Wolcott, Town of	11/10/91	
9	Chautauqua	Dunkirk, Town of		08/03/89	
		Sheridan, Town of		06/05/92	
			Dunkirk, City of	02/27/93	
			Hanover, Town of	07/17/93	
			Pomfret, Town of	02/27/93	
			Portland, Town of	02/27/93	
			Ripley, Town of	02/27/93	
			Silver Creek, Village of	07/17/93	
			Westfield, Town of	02/27/93	
	Erie	Hamburg, Town of		05/21/93	
			Brant, Town of	05/08/91	
			Evans, Town of	05/08/91	
	Niagara	Wilson, Town of		07/11/01	
				Newfane, Town of	03/04/93
				Porter, Town of	05/08/91
				Somerset, Town of	03/04/93
Wilson, Village of				09/20/91	

Source: DEC Coastal Erosion Management Section, 2013

**New York State Department of State (DOS)** addresses management of designated Coastal Areas, including New York State's tidal coastal waters and the adjacent shorelands as well as the Great Lakes, major rivers and designated inland waterways with the state Coastal Management Program. The Waterfront Revitalization of Coastal Areas and Inland Waterways Act offers local governments the opportunity to participate in the State's Coastal Management Program (CMP), on a voluntary basis, by preparing and adopting local waterfront revitalization programs (LWRP) providing more detailed implementation of the State's CMP through use of existing broad powers such as zoning and site plan review. When a LWRP is approved by the New York State Secretary of State, State agencies' actions must be consistent with the approved LWRP to the maximum extent practicable. When the federal government concurs with the incorporation of a LWRP into the CMP, federal agencies' actions must be consistent with the approved addition to the CMP.



The 19 NYCCR Part 600, 601, 602 and 603 provide the rules and regulations that implement each of the provisions of Local Waterfront Revitalization Programs and other areas defined in that law and in Executive Law, Article 42.

The **DOS, Office of Planning and Development (DOS OPD)** works with communities throughout New York State to help them make the most of their waterfronts. The DOS OPD encourages and provides assistance to local governments for the development of Local Waterfront Revitalization Programs (LWRPs). Currently, 89 communities are implementing local plans. Videos and guidebooks are available to educate the public about waterfront revitalization, re-using abandoned buildings, watershed planning and making communities more resilient to coastal storms, including coastal erosion. A recent publication by DOS, *Guidance for New York Rising Community Reconstruction Plan* serves as a planning toolkit for community reconstruction plans. In late 2013, the OPD, with the help of consulting firms and local community committees, is initiating a program in approximately 50 communities to use the guide to establish a planning process, inventory community assets, assess and quantify risk, and determine needs and opportunities in order to improve community resilience. The results of these community-level plans should provide additional data related to local coastal risks that can be incorporated in local plan updates as well as the 2017 NYS HMP update.

**Table 3.5e** provides a list of current **Local Waterfront Revitalization Plans in New York State** as of August, 2010.

**Table 3.5e: Local Waterfront Revitalization Plans in New York State**

County	Type	LWRP Community	Local Adoption	SOS Approval	OCRM Concurrence
Albany	City	Albany	10/7/91	10/8/91	12/11/91
	City	Watervliet	2/16/06	2/24/06	3/3/06
Broome	City	Binghamton	11/21/05	12/23/05	Inland Community (IN)
Chautauqua	Village	Bemus Point	11/16/10	3/16/11	IN
	Village	Celeron	6/8/09	3/16/11	IN
	Town	Chautauqua	3/10/08	3/16/11	IN
	Town	Ellery	4/8/10	3/16/11	IN
	Town	Ellicot	5/17/10	3/16/11	IN
	Village	Lakewood	5/24/10	3/16/11	IN
	Village	Mayville	3/11/08	3/16/11	IN
	Town	North Harmony	11/9/09	3/16/11	IN
Columbia	City	Hudson	12/1/11	ON HOLD	
Cortland	City	Cortland	PENDING		IN
	Town	Cortlandville	PENDING		IN



County	Type	LWRP Community	Local Adoption	SOS Approval	OCRM Concurrence
	Town	Cuylar	PENDING		IN
	Town	Homer	PENDING		IN
	Town	Lapeer	PENDING		IN
	Town	Marathon	PENDING		IN
	Village	Marathon	PENDING		IN
	Town	Preble	PENDING		IN
	Town	Virgil	PENDING		IN
<b>Dutchess</b>	City	Beacon*	3/7/11	12/12/11	4/5/12
	City	Beacon	10/21/91	4/29/92	8/19/92
	Town	Poughkeepsie	1/20/99	4/2/99	6/10/99
	Town	Red Hook	5/2/95	9/20/95	10/12/95
	Town	Rhinebeck	2/13/07	4/24/07	7/21/07
	Village	Tivoli	4/8/91	4/29/91	7/29/91
<b>Erie</b>	Town	Brant	8/11/87	1/20/88	7/26/88
	Town	Evans*	10/20/11	2/22/13	UNDERWAY
	Town	Evans	12/17/86	2/18/87	3/26/87
	Town	Grand Island	7/1/06	12/28/06	Denied
	Town	Hamburg*	5/23/11	3/9/12	7/12/12
	Town	Hamburg	3/23/87	6/3/89	2/10/90
	City	Lackawanna	6/19/89	6/21/89	2/13/90
	City	Tonawanda *	11/19/91	12/27/93	6/8/94
	City	Tonawanda	8/19/86	2/4/87	3/26/87
	City	Tonawanda*	4/7/08	9/17/08	2/26/10
	City	Tonawanda	4/19/93	12/13/96	3/26/97
<b>Essex</b>	Town	Essex	12/12/02	7/29/03	IN
	Town	Wilmington	3/9/10	4/20/10	IN
<b>Franklin</b>	Village	Malone	10/13/11	3/9/12	IN
	Town	Malone	10/13/11	3/10/12	IN
<b>Franklin &amp; Essex</b>	Village	Saranac Lake	10/27/03	1/6/04	IN
<b>Greene</b>	City	Athens	9/23/99	9/20/01	3/21/02
<b>Herkimer</b>	City	Little Falls	12/1/05	12/15/10	IN
<b>Jefferson</b>	Village	Cape Vincent	10/13/87	6/9/88	7/14/88
	Town	Clayton	7/25/12	2/4/13	7/18/13
	Village	Clayton	3/28/12	2/4/13	7/18/13
	Village	Clayton *	4/1/86	5/28/86	7/7/86
	Town	Dexter	12/12/84	5/20/85	4/16/85
	Village	Sackets Harbor	4/9/86	5/22/86	7/7/86



County	Type	LWRP Community	Local Adoption	SOS Approval	OCRM Concurrence
<b>Kings</b>	City	New York City	9/1/82	9/1/82	9/1/82
	City	New York City*	10/1/99	5/28/02	8/8/02
<b>Monroe</b>	Town	Hamlin*	11/10/05	8/20/08	2/26/10
	Town	Hamlin	10/14/91	12/2/91	3/12/92
	Town	Irondequoit	5/21/88	8/9/88	12/7/88
	Town	Penfield*	UNDERWAY		
	Town	Penfield	6/3/91	10/10/91	1/14/92
	Village	Pittsford	11/15/05	6/23/06	IN
	Town	Pittsford	11/15/05	6/23/06	IN
	City	Rochester*	3/22/11	12/15/11	7/12/12
	City	Rochester	9/13/90	11/23/90	1/28/91
Town	Webster	9/4/97	4/9/98	7/9/98	
<b>Montgomery</b>	City	Amsterdam	11/17/92	2/22/93	IN
	Village	Fort Plain			IN
<b>Nassau</b>	Village	Bayville	10/28/02	2/11/03	5/16/03
	Village	Sag Harbor*	2/1/06	5/1/06	7/1/06
	Village	Sag Harbor*	12/1/98	4/1/99	6/1/99
	Village	Sag Harbor	6/1/86	6/1/86	10/1/86
<b>Niagara</b>	Village	Lewiston*	3/21/11	9/23/11	12/6/11
	Village	Lewiston	12/18/89	2/26/91	4/24/91
	Village	Middleport	8/19/02	1/27/03	IN
	Town	Newfane	3/26/97	1/14/98	3/6/98
	City	North Tonawanda	4/16/88	4/1/88	9/7/88
	Town	Somerset	8/9/05	12/13/05	11/2/07
	Town	Wheatfield	3/25/13	UNDERWAY	
	Village	Youngstown	10/19/89	6/20/90	7/5/90
<b>Onondaga</b>	Town	Clay	3/19/12	2/4/13	IN
<b>Orange</b>	City	Newburgh	5/14/01	8/20/01	8/14/02
<b>Orleans</b>	Town	Carlton	7/14/98	8/16/02	1/5/04
	Town	Kendall	8/13/98	8/16/02	1/5/04
	Town	Yates	4/8/99	8/16/02	1/5/04
<b>Oswego</b>	City	Oswego	4/28/86	9/8/86	12/16/86
<b>Rensselaer</b>	Village	Castleton on	2/22/93	3/17/95	5/15/95



County	Type	LWRP Community	Local Adoption	SOS Approval	OCRM Concurrence
		Hudson			
	Town	North Greenbush	7/14/90	9/6/90	10/19/90
	City	Rensselaer	5/22/86	3/13/87	6/10/87
	Town	Schodack	12/30/91	3/17/95	5/15/95
<b>Rockland</b>	Village	Haverstraw	8/11/03	5/20/04	1/14/05
	Village	Nyack	1/23/92	4/16/92	6/22/92
	Village	Piermont	1/7/92	2/18/92	5/27/92
	Town	Stony Point	6/14/94	10/27/94	1/13/95
<b>Saratoga</b>	Town	Waterford	9/8/09	4/20/10	IN
	Village	Waterford	9/13/08	4/20/10	IN
<b>St. Lawrence</b>	Village	Morristown	11/7/90	4/25/91	7/29/91
	Town	Morristown	11/13/90	4/25/91	7/29/91
	City	Ogdensburg	9/8/86	3/27/87	6/25/87
	Village	Waddington	11/5/90	4/2/91	7/29/91
	Town	Waddington	11/5/90	4/2/91	7/29/91
<b>Suffolk</b>	Town	East Hampton	12/1/99	12/20/07	8/1/08
	Village	Greenport*	5/1/96	7/15/96	9/1/96
	Village	Greenport	11/1/87	11/1/88	7/1/89
	Village	Head of the Harbor	11/1/89	6/28/91	10/1/91
	Village	Lloyd Harbor	9/1/96	5/27/97	7/1/97
	Village	Nissequogue	n/a	6/1/91	10/1/91
	Village	Ocean Beach	4/24/10	10/27/10	4/8/11
	Town	Smithtown	5/2/89	8/16/89	10/1/89
	Town	Southold*	6/21/11	UNDERWAY	
	Town	Southold	11/30/04	6/21/05	11/2/05
<b>Sullivan</b>	Town	Delaware	8/18/99	12/23/99	IN
<b>Ulster</b>	Town	Esopus	7/8/87	11/17/87	7/1/88
	City	Kingston	7/7/92	10/27/92	10/6/93
	Town	Lloyd	5/11/94	3/17/95	4/18/95
	Village	Saugerties	2/4/85	10/8/85	8/12/85
<b>Washington</b>	Village	Whitehall	n/a	12/13/06	IN
<b>Wayne</b>	Village	Sodus Point*	7/21/11	3/9/12	7/12/12
	Village	Sodus Point	6/5/05	12/28/06	4/17/08
<b>Westchester</b>	Village	Croton on	3/16/92	6/15/92	8/17/92



County	Type	LWRP Community	Local Adoption	SOS Approval	OCRM Concurrence
		Hudson			
	Village	Dobbs Ferry	8/9/05	11/1/06	11/19/07
	Village	Larchmont*	12/5/94	11/3/95	3/5/96
	Village	Larchmont	6/30/86	10/28/86	4/21/87
	Town	Mamaroneck*	12/7/94	11/3/95	3/5/96
	Town	Mamaroneck	6/30/86	10/28/86	4/21/87
	Village	Mamaroneck	11/13/84	5/21/85	8/12/85
	Village	Ossining*	3/16/11	10/25/11	2/1/12012
	Village	Ossining	7/2/91	7/11/92	6/8/93
	City	Peekskill	1/26/04	7/6/04	1/14/05
	Village	Port Chester	7/6/92	8/18/92	11/30/92
	City	Rye	6/19/90	6/28/91	9/16/91
	Village	Sleepy Hollow	11/19/96	6/5/97	7/14/97

Source: New York State Department of State, Division of Coastal Resources and Waterfront Revitalization; Coastal Management Program

(Please note: A LWRP Community with an (\*) represents a community that has been amended.)

Communities that have “OCRM Approval” are approved by the Office of Coastal Resource Management, NOAA, and the U.S. Department of Commerce. The policies in these LWRPs are designed to provide more detailed local implementation of the state’s CMP. In essence, these policies superseded the standard state coastal policies. Federal, state and local actions are required to be consistent with these policies within the local program boundary. Outside of approved local programs but inside the state coastal area boundary, federal, state and local actions are required to be consistent with the state coastal policies.

Inland communities (IN) are not part of the federal coastal waters and therefore do not receive OCRM review/approval. However, when they are approved by the Secretary of State (SOS) they become state waterfront revitalization programs and their policies are enforceable for local and state actions within the program boundaries.

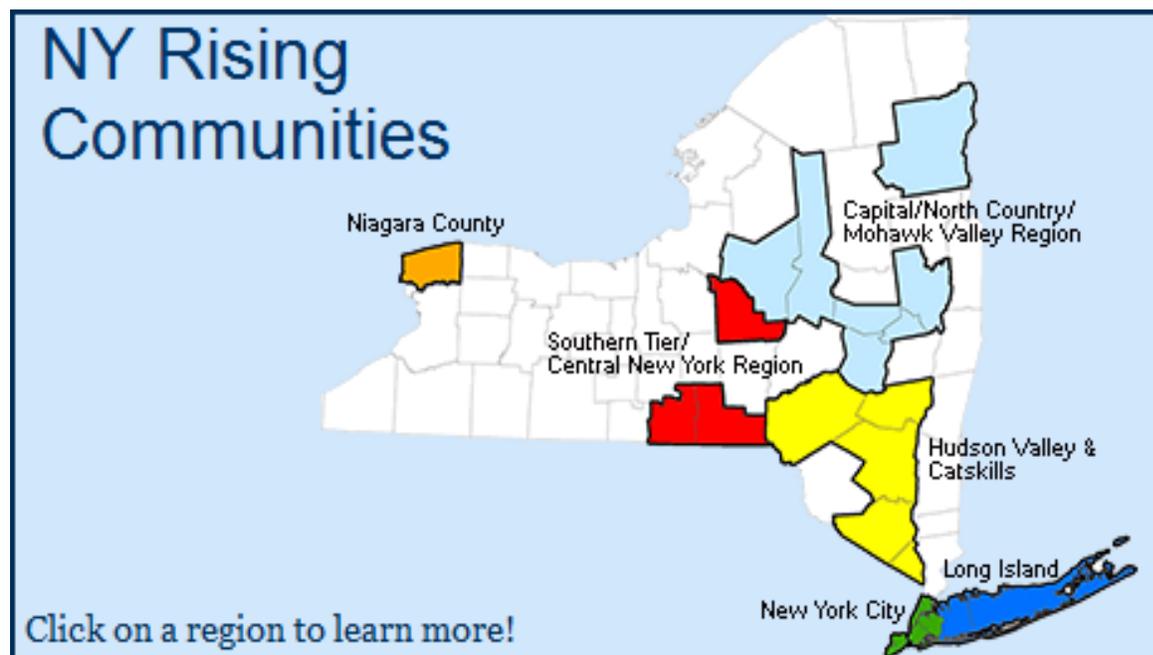
Individual state agencies make their own determinations with respect to consistency of their actions with local waterfront revitalization programs.

The **New York Rising Community Reconstruction Program** (formerly Community Reconstruction Zones) was established to provide additional rebuilding and revitalization assistance to communities severely damaged by Hurricanes Sandy and Irene and Tropical Storm Lee. To facilitate community redevelopment planning and the resilience of communities, the State established the New York Rising Community Reconstruction Program and has allocated \$25 million for planning in the most affected communities<sup>18</sup>. Later allocations of funds will be used to support the implementation of projects and activities identified in the plans that the designated communities will produce.

<sup>18</sup> <http://stormrecovery.ny.gov/>, October 2013



Figure 3.5j: NY Rising Communities



Source: NY Rising Communities Program (<http://stormrecovery.ny.gov/community-reconstruction-program>)

An indicator of changes in development is the number of authorized building permits within local jurisdictions, as well as the statewide trend. Some indication of the increase in development also occurs with population growth. Coastal areas that are prone to growth in vulnerable areas have development controls through CEHA regulation, as well as the Local Waterfront Revitalization Program's planning initiatives. **Section 3.1** describes the statewide trend in population growth and numbers of building permits that indicate a significant increase in permits issued in the months immediately following Hurricane Sandy, but relatively slow increase in development projected long-term.

### 3.5.3 Assessing Vulnerability of State Facilities

New York State owns and occupies a number of buildings and facilities in areas that could potentially be vulnerable to coastal erosion, including public parks and recreation facilities. It is difficult to collect and analyze state facility data specifically related to coastal erosion; however, the vulnerability of coastal areas demonstrated through storm surge mapping indicates a significant number of state buildings located in areas that could potentially be vulnerable to coastal erosion. At the time of the 2014 update, this storm surge mapping is the best data available to assess potential vulnerability of state buildings to coastal erosion. A project to produce a statewide inventory of facilities was initiated in August 2013, with a projected completion date of the initial pilot for mid-2014. The pilot will identify and assess one category of state critical infrastructure, residential facilities, developing the methodology for what is anticipated to be a multi-year project. The methodology will include analysis of vulnerability and estimated potential losses to state facilities from

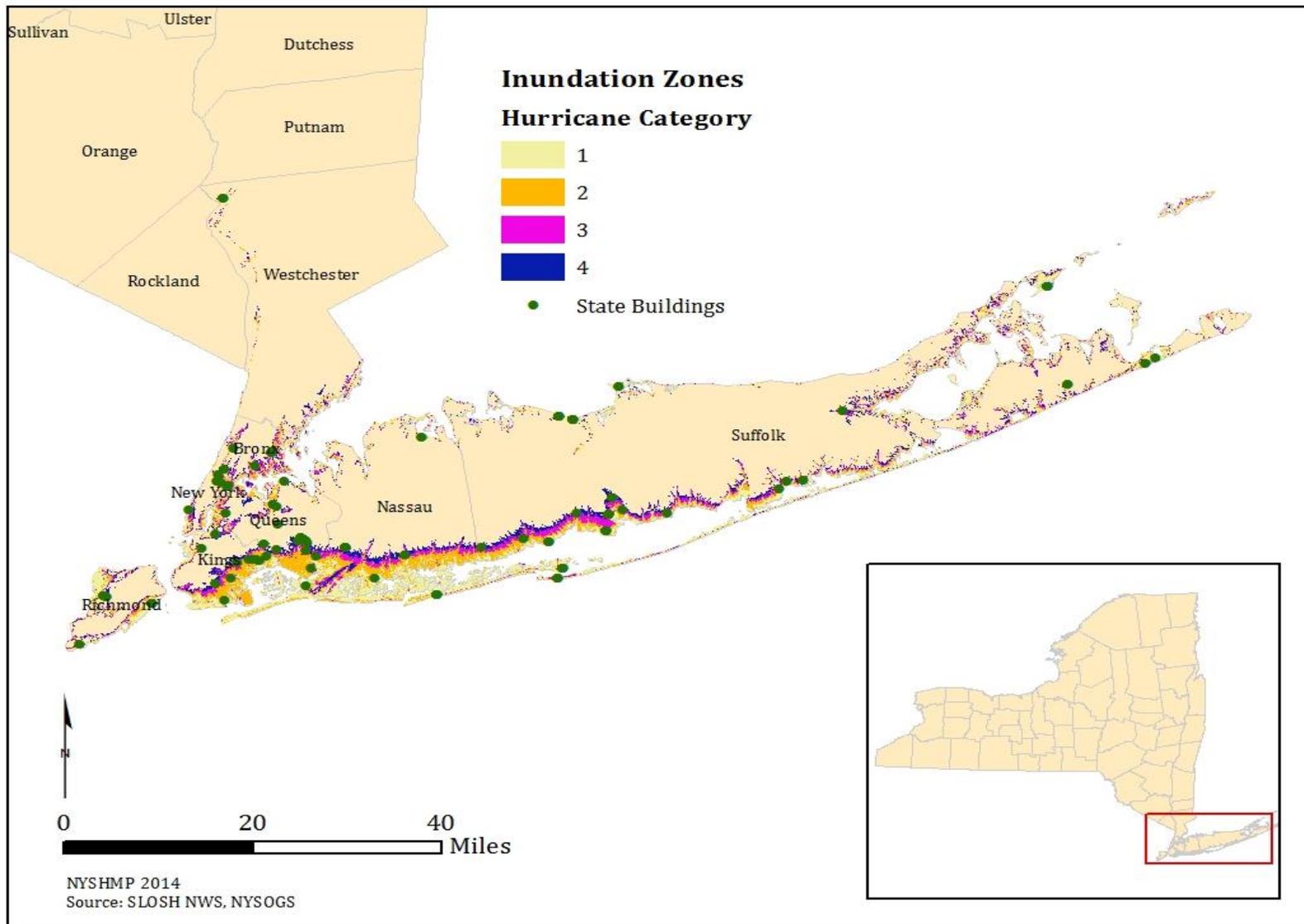


future hazard events. Additional data and analysis is needed to identify specific locations in relation to actual areas vulnerable to erosion.

**Figure 3.5k** shows the state buildings which are potentially at risk from coastal events such as hurricane surge, based on NOAA's SLOSH inundation model projections. It should be noted that not all state buildings located in storm surge zones will be vulnerable to coastal erosion as some may be thousands of feet from the shoreline; however, for the purpose of modeling vulnerability, storm surge zones provide a starting point for further analysis of specific structures at risk.



Figure 3.5k: State Buildings in Storm Surge Zones



### 3.5.4 Estimated Losses by Jurisdiction

Fifty-six local mitigation plans were reviewed for the 2014 update. Eleven LHMPs identified coastal erosion as a hazard. Several studies conducted prior to and after Hurricane Sandy provide significant information related to local impacts and potential losses. These studies are described within **Section 3.5.2**.

An estimate of potential losses based on life and property costs is provided in Table 3.5e, which describes the number of coastal events and cost of damages for those counties impacted by recorded erosion events between 1960 and 2012<sup>19</sup>. Based on this data, Suffolk County has had the most significant impact from coastal events: 13 events with a total property loss of \$49,322,786. In addition, Suffolk County has suffered 11 fatalities. Nassau County, although it has the highest fatalities from a coastal event (14), has lower property losses of \$721,786 as a result of those events. Additional counties with significant property losses (each with \$714,286) due to coastal events include:

- Bronx
- Kings
- New York
- Queens
- Richmond

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<sup>19</sup> Source: SHELDUS. Data does not include costs associated with Hurricane Sandy in October 2012.

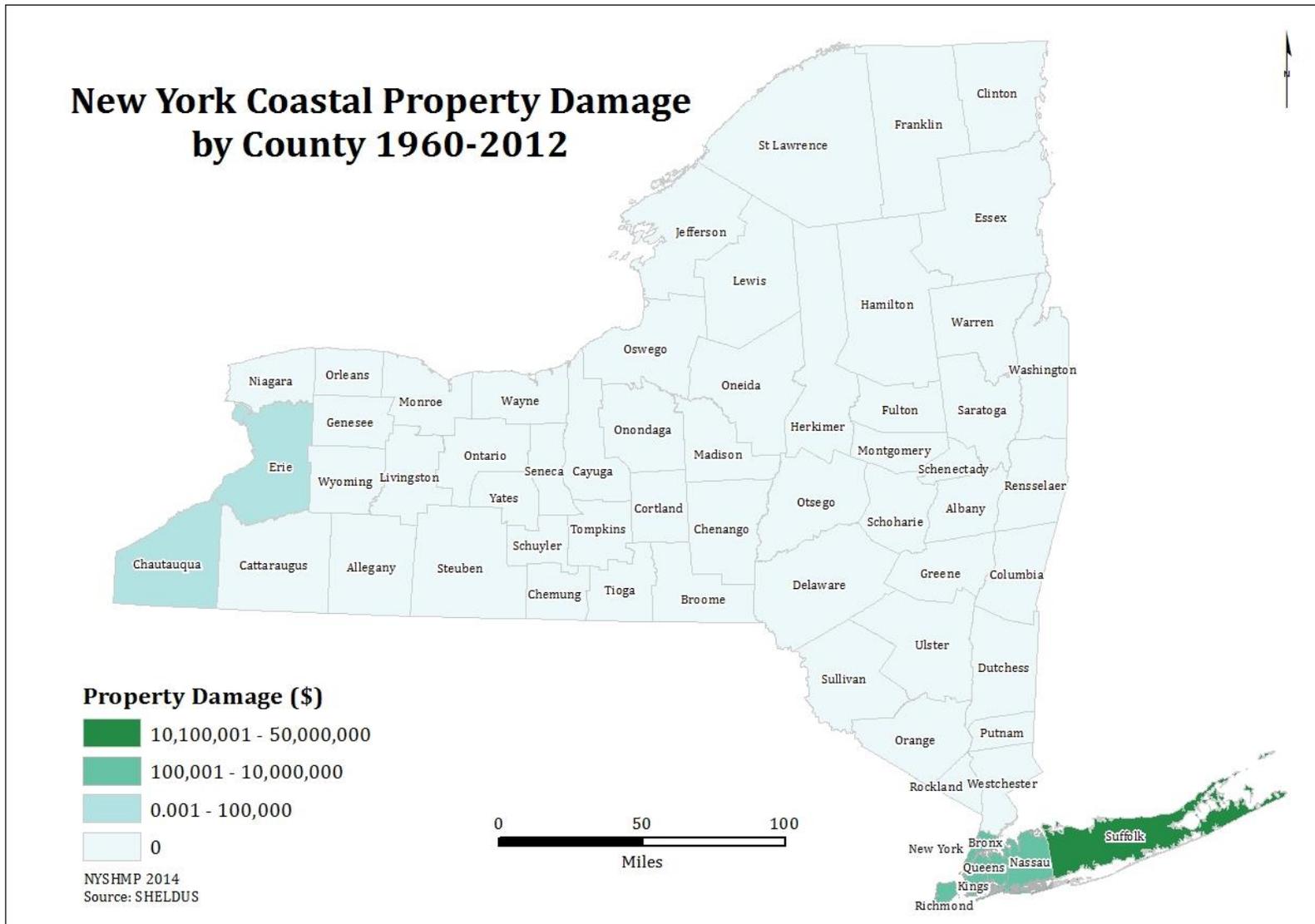


**Table 3.5f: Number of Coastal Events and Cost of Damages by County (1960-2012):**  
 (only counties with recorded events that sustained injuries, fatalities, and property damage are listed. ***This table does not include data related to Hurricane Sandy.***)

County	Historical Record (1960-2012)					Recent Record (2010-2012)				
	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Bronx	3			\$714,286		1				
Chautauqua	4			\$40,000		3			\$40,000	
Erie	7			\$65,000		6			\$65,000	
Kings	4	2	2	\$714,286		1			\$65,000	
Nassau	13	14	6	\$721,786		3	3			
New York	5			\$714,286		3				
Niagara	1									
Orange	1									
Putnam	1									
Queens	13	10		\$714,286		3				
Richmond	2			\$714,286						
Rockland	1									
Suffolk	14	11	1	\$49,322,786						
Westchester	2	2								
<b>Total</b>	<b>71</b>	<b>39</b>	<b>95</b>	<b>\$53,721,002</b>	<b>\$0</b>	<b>20</b>	<b>3</b>	<b>0</b>	<b>\$170,000</b>	<b>\$0</b>



**Figure 3.5I: Total Dollar Value Loss Due to Previous Coastal Events (1960-2012\*)**



Source: SHELDUS (\*Does not include property damages resulting from Hurricane Sandy.)



Eleven LHMPs identify coastal erosion or seiche as a hazard; however, only Suffolk and Nassau Counties provide a ranking for coastal erosion, with Nassau ranking it as moderately high, and Suffolk ranking it as moderate. The other nine (9) plans identified it as a hazard but provided no ranking. (See **Section 2** for summary of all local plan hazard rankings.)

Erie County addressed seiche in its plan and notes that:

*This hazard was included because of its potential for monetary loss in municipalities along Lake Erie. The probability of a future seiche is moderately high. When a seiche does occur it has a high monetary loss and does cause moderate damage. The vulnerability for a seiche in Erie County is moderate. According to the Erie County HAZNY, the impact of a seiche could cause; serious injury or death is likely, but not in large numbers, moderate damage to private property, and moderate structural damage to public facilities.<sup>20</sup>*

### Nassau County LHMP

The Nassau County LHMP notes that sufficient data was not available at the time of the plan update to estimate coastal erosion damages; consequently, vulnerability was expressed as the value of improvements in the current mapped CEHA. The plan describes the methodology used to estimate potential losses from coastal erosion noting that damages could be severe, but are most likely only in the 16 coastal communities with mapped CEHAs, and only within the areas of those communities closest to the shoreline.

*“On a county-wide basis, 1,262 parcels, (or 1.49 percent of the land within the county) falls within mapped CEHAs. The assessed value of improved property on these parcels is equal to nearly \$4.85 million, roughly 2.1 percent of the assessed value of all improved property county-wide.”<sup>21</sup>*

In addition, the Nassau LHMP identifies 602 emergency facilities and 2 police departments that could be impacted by coastal erosion.

When updated CEHA maps are released, this section of the SHMP will be updated to reflect new areas and/or assets located in the coastal erosion hazard area. Additional data on historic costs incurred to reconstruct buildings and/or infrastructure due to coastal erosion impacts would assist in estimating future losses. Expanding upon the Suffolk and Nassau County Real Property databases to include more detailed information related to whether a building is present on a parcel, building square footage, type of construction, year built, and building replacement cost/value would enable a more accurate assessment of exposure and loss estimates over time.

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<sup>20</sup> Erie County LHMP, 2005

<sup>21</sup> Nassau County LHMP, 2007, p. 167-168



### Suffolk County LHMP

Although the Suffolk County LHMP noted that there was not sufficient data available to estimate coastal erosion damages to the general building stock, the plan described the process used to estimate the number of parcels exposed to coastal erosion using the Suffolk County Real Property. Parcel centroids were overlaid on the CEHA line and 1,000 foot seaward buffer. Of the 728,401 parcel centroids provided, 6,729 (or .92 percent of the parcels in Suffolk County) were located within the coastal hazard area. Then, assessed value building data by parcel was provided from the Suffolk County Treasurer's Office to determine the total building assessed value of \$75.1 million. This process was limited to the assessed value of 3,298 parcels due to only 49-percent of the Real Property parcel centroids which could be joined to the Treasurer's Office by tax map number. Assuming that the remaining 51-percent of parcels contained roughly the same building assessed value, it was noted that this figure could be doubled. Therefore, the estimated total assessed value of buildings located in the coastal erosion hazard area in Suffolk County is \$150 million<sup>22</sup>.

### New York City LHMP (Bronx, Kings, New York, Queens, Richmond Counties)

Over the past 100 years, the average erosion rate along much of Long Island's south shore, including parts of New York City's CEHAs, was at a rate of one to two feet per year. Coastal erosion causes extensive damage to public and private property and coastal natural resources. It may also endanger human lives. Approximately 1,427 acres or 0.7% of New York City's land area is located within a CEHA.

The following table presents a summary of building lots, acreage, and buildings that lie within a CEHA.

**Table 3.5g: Number of Exposed Lots within CEHAs in New York City<sup>23</sup>**

Number and Acreage of Exposed Lots within CEHAs			
Coastal Erosion Hazard Area (CEHA)	Lots Exposed	Acreage Exposed	Buildings Exposed
Coney Island, Brooklyn	165	304.5	37
The Rockaways, Queens	96	708	24
South Shore, Staten Island	300	415	146
<b>Total</b>	<b>561</b>	<b>1,427.5</b>	<b>207</b>

<sup>22</sup> Suffolk County LHMP, 2008, p. 5.4-59

<sup>23</sup> New York City LHMP, 2009, p. 78.



The New York City Plan also identifies three critical roadways within the New York City CEHAs:

- Verrazano Narrows Bridge
- I-278 (Highway)
- Shore Parkway

The New York City Plan notes that Hazus-MH does not have a direct way to estimate loss due to coastal erosion; however, by using a modified Hazus-MH flood model, which assumed a total loss of all CEHA from the current shoreline to the NPF line, the total value of all buildings could be calculated.

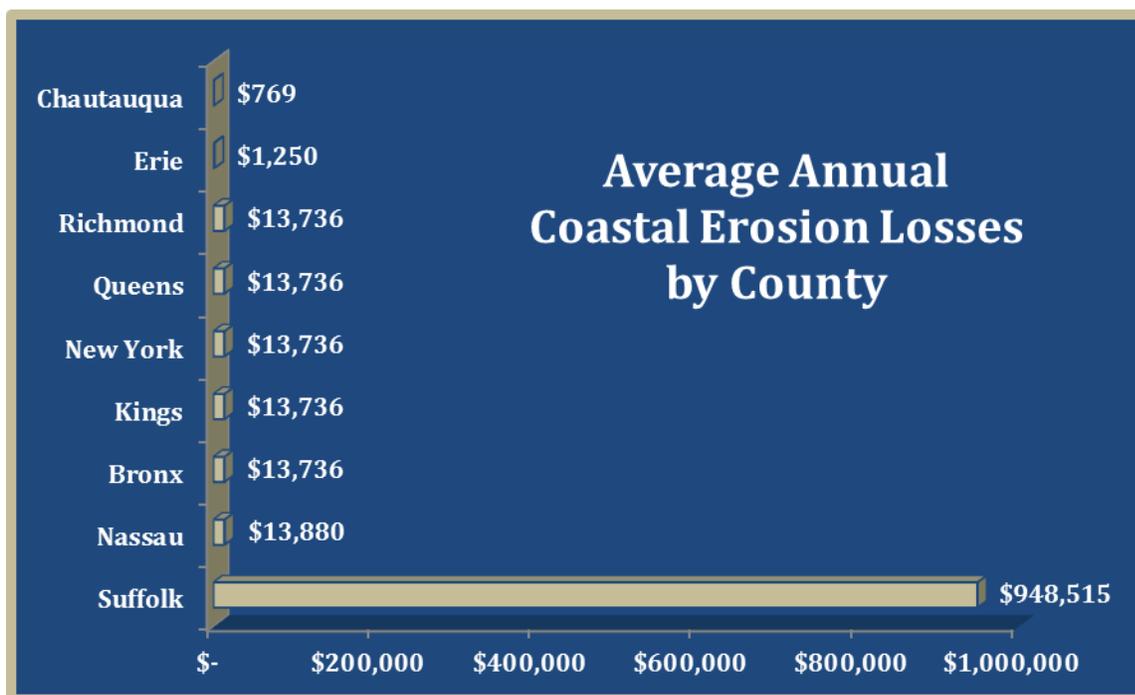
**Table 3.5g** provides the annualized losses for coastal erosion events. The data used was based on SHELDUS records from 1960-2012, with the exception of hurricane, earthquake, and flood hazards which were derived from HAZUS-MH 2.1. For those specific hazards, a probabilistic run was generated to determine the total annual losses for each county found within the State. The information provided by SHELDUS was determined by taking the total economic losses divided by the number of years of record (52) to obtain the losses per year. **Figure 3.5n**, illustrates the top nine counties annualized losses with a total of \$1,033,096 in coastal erosion losses for the entire State of New York.

**Table 3.5h: Average Annual Coastal Erosion Losses by County 1960-2012**

County	Coastal Erosion	County	Coastal Erosion	County	Coastal Erosion
Suffolk	\$ 948,515	Essex	\$ -	Putnam	\$ -
Nassau	\$ 13,880	Franklin	\$ -	Rensselaer	\$ -
Bronx	\$ 13,736	Fulton	\$ -	Rockland	\$ -
Kings	\$ 13,736	Genesee	\$ -	Saratoga	\$ -
New York	\$ 13,736	Greene	\$ -	Schenectady	\$ -
Queens	\$ 13,736	Hamilton	\$ -	Schoharie	\$ -
Richmond	\$ 13,736	Herkimer	\$ -	Schuyler	\$ -
Erie	\$ 1,250	Jefferson	\$ -	Seneca	\$ -
Chautauqua	\$ 769	Lewis	\$ -	St Lawrence	\$ -
Albany	\$ -	Livingston	\$ -	Steuben	\$ -
Allegany	\$ -	Madison	\$ -	Sullivan	\$ -
Broome	\$ -	Monroe	\$ -	Tioga	\$ -
Cattaraugus	\$ -	Montgomery	\$ -	Tompkins	\$ -
Cayuga	\$ -	Niagara	\$ -	Ulster	\$ -
Chemung	\$ -	Oneida	\$ -	Warren	\$ -
Chenango	\$ -	Onondaga	\$ -	Washington	\$ -
Clinton	\$ -	Ontario	\$ -	Wayne	\$ -
Columbia	\$ -	Orange	\$ -	Westchester	\$ -
Cortland	\$ -	Orleans	\$ -	Wyoming	\$ -
Delaware	\$ -	Oswego	\$ -	Yates	\$ -
Dutchess	\$ -	Otsego	\$ -	<b>Total</b>	<b>\$ 1,033,096</b>



Figure 3.5m: Average Annual Coastal Erosion Losses by County 1960-2012



Source: SHEL DUS

### 3.5.5 Estimated Losses to State Buildings and Critical Facilities

Because of the direct relationship between storm surge, high waves and high wind to the impacts in sensitive coastal areas, it is possible to use hurricane assessment tools and methods as a starting point to identify potential losses to buildings and critical infrastructure within coastal areas.

For the purpose of current analysis of state building exposure to coastal erosion, hurricane storm surge zones are used to provide a dataset that indicates potential exposure based on coastal areas potentially impacted by erosion. Storm surge models provide some general estimation of losses based on inundation levels; however, this should be used primarily for response planning since it is unlikely that all structures within the surge zones will be impacted in any one storm event.

**Table 3.5i** details the GIS analysis results from state-owned buildings in the storm surge zone. The table provides the name of the agency that owns the buildings, the total count of buildings, and replacement cost in the high peak gust wind hazard zones.



Table 3.5i: State Building Exposure in Hurricane Surge Zones

Agency	Number of Buildings	Replacement Cost
Office of General Services (OGS)	2	\$60,024,059
Department of Health (DOH)	1	\$17,116,294
Department of Cyber Security (DOCS)	3	\$24,722,629
Office of Parks, Recreation and Historic Preservation (OPRHP)	359	\$138,643,712
Department of Environmental Conservation (DEC)	8	\$2,622,073
Office of Mental Health (OMH)	47	\$254,738,080
Office of People with Developmental Disabilities (OPWDD)	69	\$126,508,892
Department of State Police (DSP)	1	\$663,990
Division of Military and Naval Affairs (DMNA)	5	\$26,178,541
Department of Transportation (DOT)	13	\$994,864
Dormitory Authority of the State of New York (DASAS)	1	\$874,379
<b>TOTAL</b>	<b>509</b>	<b>\$653,087,513</b>

Source: National Weather Service (NWS), NYSOGS

Losses caused by coastal erosion may include:

- Evacuation routes severed
- Undermined structures
- Inland structures exposed to storm surge and storm-induced high water
- Destruction of protective sand dunes, beaches and bluffs, increasing vulnerability in future storms

All state-owned and operated facilities and sites in CEHA areas, including parks and recreational facilities are potentially at risk for loss from coastal erosion. Perhaps the best indication of the extent of vulnerability is based on the damages to state parks and recreational facilities from Hurricane Sandy in October 2012, which reached approximately \$320 million. As of September 2013, state agencies are coordinating multi-year projects, many with the federal government, totaling more than \$2.0 billion to repair critically eroded beaches and related infrastructure.

Although New York State government agencies do not have a central repository for data related to state-owned and operated facilities, some data is maintained through the Office of Governmental Services (OGS) as well as several other agencies, as indicated in **Table 3.5g**; however, the current data is not comprehensive.



Additional data will be available for the next plan update following a statewide facility inventory project initiated in 2013. The first phase, a pilot project to develop the methodology based on inventory and analysis of residential facilities against wind, flood and seismic hazards, is scheduled for completion in mid-2014.

### **Effects of Changes in Development on Loss Estimates**

The occurrence of significant damages to property and infrastructure from coastal storms has been relatively infrequent in New York in the past, but the consequences are potentially extreme. Development indicators such as population change and building permits demonstrate that there was relatively little overall change in both indicators between 2011 and 2014.

The coastal areas of New York City are the most vulnerable areas to the pressure of development; however, a number of controls are in place through policies and programs to limit or control development in hazard-prone areas such as CEHA's and flood zones. These initiatives are described in this section beginning on page 3.5-26.

Additional data related to population change for all counties is provided in **Sections 1 and 3.1**.

Dunes and bluffs are especially effective protection against storm-induced high water. They are also reservoirs of sand and gravel for beaches and offshore sandbar and shoal formations. Maintaining, improving, or replacing natural vegetative cover is the preferred method of shoreline stabilization. Engineering solutions to coastal erosion, such as building seawalls and groins, can reduce some coastal erosion effects in the near term; however, these solutions may also disrupt waves and ocean currents near the coast and cause more erosion of neighboring downdrift beaches. A feature that obstructs natural nearshore currents, such as a jetty, will impact land nearby due to increased wave reflection. In addition, shoreline armoring results in loss of sediment supply to adjacent areas, leading to accelerated erosion.

Construction of erosion protection structures is expensive, often only partially effective over time, and may even be harmful to adjacent or nearby properties. In some areas of the coastline, major erosion protection structures of great length would be required to reduce future damages due to erosion. However, in those instances where properly designed and constructed erosion protection structures will be likely to minimize or prevent damage or destruction to existing manmade private and public property, natural protective features, and other natural resources, construction of erosion protection structures may be allowed. In such cases, the construction, modification, or restoration of erosion protection structures is subject to specific requirements.

The DEC has adopted a focus for building resiliency. CEHA permits are required for most activities in designated natural protective feature areas. New development (building, permanent shed, deck, pool, garage, etc.) is prohibited in near-shore areas, beaches, bluffs,



and primary dunes. A permit is required for restoring structures within these areas damaged by erosion or flooding, even if the structure was not within a protective feature area when it was originally built. Such a permit would be denied for rebuilding structures damaged by more than 50 percent if the lot has sufficient land outside the natural protective feature area to permit a landward relocation. The CEHA does not include a provision empowering the commissioner of the DEC to purchase property when denying a permit would require just compensation under the takings clause of the U.S. Constitution. Moreover, variances can be granted if the applicant can prove “practical difficulty or unnecessary hardship” without compromising the CEHA regulations. Therefore, if there is not sufficient land outside the natural protective feature area to rebuild the structure inland, the landowner may still be able to obtain a permit by seeking the minimum variance necessary to maintain some lawful use of the property, consistent with the regulations.

**Figure 3.5n: Area Impacted by Coastal Erosion**



Source: NYS DEC

Because CEHA regulations require that the permitted property owner must prove they will be safe from flood and erosion in order to rebuild, there is the potential for reduced and/or resilient development in sensitive coastal areas.

The New York State Shore Protection Act allows New York State the opportunity to partner with USACE on projects to protect its shorelines. Currently, \$1.2 billion is committed to USACE shore protection projects in New York,

which due to Chapter 4, Title X, Division A of the Disaster Relief Appropriations Act of 2013, Public Law 113-2 enacted January 29, 2013 (DRAA 13), is 100% federally funded with no State or local cost share requirements.

A guide issued by the New York State Soil & Water Conservation Committee provides minimum standards and specifications for meeting criteria set forth by the DEC for stormwater discharges associated with construction activity that can lead to coastal erosion. These standards and specifications focus on minimizing erosion and sediment impacts from construction activity involving soil disturbance and show how to use soil, water, plants, and other measures to reduce or eliminate impacts from erosion. Proper use of these standards should assist in protecting the waters of the state from sediment loads during runoff events.



### 3.5.6 Data Limitations and Key Sources and Documents

The Mitigation Plan Development Team researched the earthquake risk as it affects the State. The contents of this section results from research and outreach including the following sources:

#### Data Limitations

- CEHA re-mapping update is underway. Recommend CEHA GIS Data layer be added in 2017 plan update
- State Facility Inventory project initiated in September 2013; pilot to develop and test methodology is scheduled for completion in 2014.
- Limited data is available related to coastal erosion from local hazard mitigation plans. Additional studies to quantify impacts and losses on vulnerable populations, property, environment and critical infrastructure will enhance future SHMP updates.

#### Key Sources and Documents

- New York State Department of Environmental Conservation, Coastal Management Program; <http://www.dec.ny.gov/lands/28923.html>
- Environmental Conservation Law, Article 3-0301, Article 34
- 6 NYCRR Part 505 Coastal Erosion Management Regulations
- Title 4, Chapter 7 of the Unconsolidated Laws of New York of 1945 "Projects to Prevent Shore Erosion" also known as the New York State Shore Protection Act
- Catastrophic Hazard Analysis, Regional Catastrophic Planning Team (NY, NJ, PA, CT), FEMA. 2011
- Spatial Hazard Events and Loss Database for the United States (SHELDUS)
- "New York State Coastal Management Program: 309 Assessment and Strategies (July 1, 2011 to June 30, 2016)"; New York State Department of State, November 2010.
- Tanski, J.J. 2010 "New York" In James G. Titus and Daniel Hudgens (editors). *The Likelihood of Shore Protection along the Atlantic Coast of the United States. Volume 1: Mid-Atlantic.* New York Sea Grant Extension Program; Report to the U.S. Environmental Protection Agency. Washington, D.C.
- Agency interviews:
  - NYS DEC - Coastal Management, Hudson Estuary Program
  - NYS Parks, Recreation and Historic Preservation
  - NYSDOS – Community Waterfront Revitalization Program



## Section 3.6: DROUGHT

### 2014 SHMP Update

- Reformatted Drought Profile into the new outline
- Added additional drought types
- Added four drought stages
- Added New York State (NYS) regional drought indicator weighting system
- Enhanced the location section
- Inserted updated map of NYS drought events from 1960-2012
- Inserted updated table for estimated losses by jurisdiction
- New map displaying jurisdiction property loss
- Updated local plan integration section

### 3.6.1 Drought Profile

Hazard	Definition and Key Terms
<b>Drought</b>	<i>Drought</i> - A prolonged period with no rain, particularly during the planting and growing season in agricultural areas. Limited winter precipitation accompanied by moderately long periods during the Spring and Summer months can also lead to drought conditions.

#### Characteristics

Drought is a normal, recurrent feature of climate, although at times considered a random event. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another. Drought is a temporary aberration; it differs from aridity, which is restricted to low rainfall regions and is a permanent feature of climate.

Drought is an insidious hazard of nature<sup>1</sup>. Although it has scores of definitions, it originates from a deficiency of precipitation over an extended period of time, usually a season or more. Drought can have a widespread impact on the environment and the economy, depending upon its severity, although it typically does not result in loss of life or damage to property, as do other natural disasters. Drought should be considered relative to some long-term average conditions of balance between precipitation and evapotranspiration (i.e., evaporation + transpiration) in a particular area, a condition often perceived as “normal.” It is also related to the timing (i.e., principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness (i.e., rainfall intensity, number of rainfall events, antecedent moisture conditions, etc. ) of the rains. Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with drought in many regions of the world and can significantly affect its severity.

<sup>1</sup>National Drought Mitigation Center. <http://drought.unl.edu/DroughtBasics/WhatisDrought.aspx>



Drought should not be viewed as merely a physical phenomenon or natural event. Its impacts on society result from the interplay between a natural event (less precipitation than expected resulting from natural climatic variability) and the demand people place on water supply. Human activity often exacerbates the impact of drought. Recent droughts in both developing and developed countries, resulting economic and environmental impacts and personal hardships have highlighted the vulnerability of all societies to this natural hazard. According to the National Weather Service - Climate Prediction Center there are four identified drought types: Meteorological/ Climatological, Hydrological, Agricultural, and Socioeconomic.

- ***Meteorological/Climatological Drought*** is defined in terms of the departure from a normal precipitation pattern and the duration of the drought hazard and has a slow-onset that usually takes at least three months to develop and may last for several seasons or years.

**Links to Climate Change:** While this type of drought normally results from natural climatic cycles and conditions, there is increasing scientific evidence that the effects of climate change may impact the normal temperature cycles, potentially resulting in rising summer temperatures. These, along with little change in summer rainfall, are projected to increase the frequency of short-term (one to three month) droughts. This scenario will lead to impacts to the natural and managed ecosystems across the state, including agriculture, water supply, and hydrology. Additional information related to the characteristics, vulnerabilities and losses related to climate change is described in **Section 3.4, Climate Change**

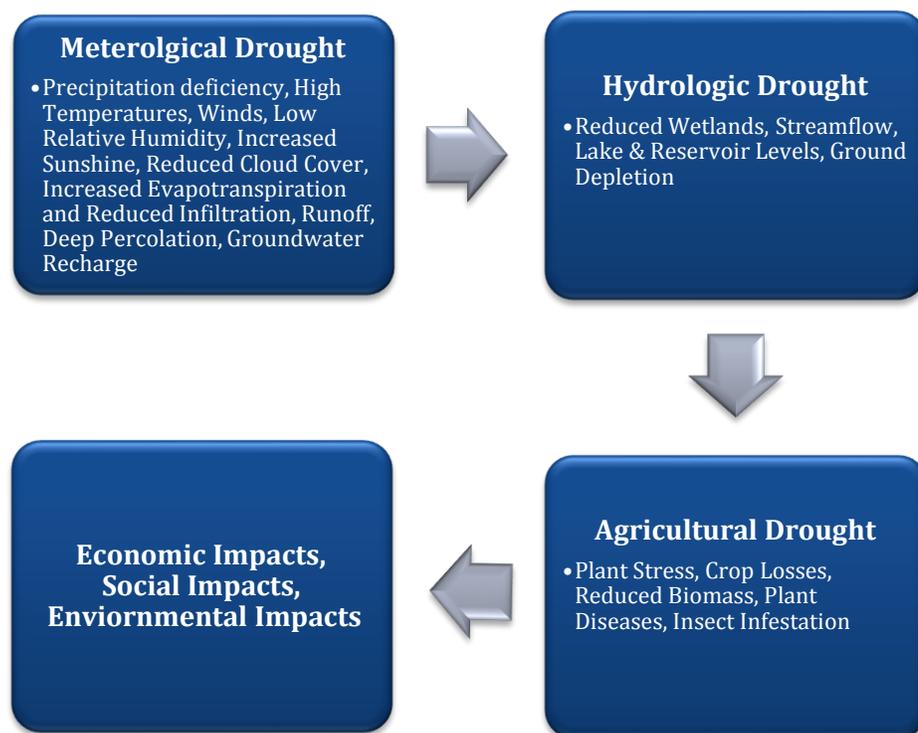
- ***Hydrological Drought*** is associated with the effects of substandard periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (i.e., stream flow, reservoir and lake levels, groundwater). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system. Hydrological droughts are usually out of phase with, or lag the occurrence of, meteorological and agricultural droughts. It takes longer for precipitation deficiencies to show up in components of the hydrological system such as soil moisture, stream flow, and ground water and reservoir levels.
- ***Agricultural Drought*** links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, and reduced ground water or reservoir levels. Crop water demand depends on prevailing weather conditions, biological characteristics of the specific crops, its stage of growth, and the physical and biological properties of the soil.



- **Socioeconomic Droughts** occur when physical water shortage begins to affect the population, individually and collectively. Most socioeconomic definitions of drought associate it with supply, demand, and economic good.

Although climate is a primary contributor to hydrological drought, other factors such as changes in land use (e.g., deforestation, increases in impervious area), land degradation, and the construction of dams all affect the hydrological characteristics of the basin. Because regions are interconnected by hydrologic systems, the impact of meteorological drought may extend well beyond the borders of the precipitation-deficient area. For example, meteorological drought may severely affect portions of the northern Adirondack region of the State; however, since the Hudson River and its tributaries drain this region to the south, there may be significant hydrologic impacts downstream. Similarly, changes in land use upstream may alter hydrologic characteristics such as infiltration and runoff rates, resulting in more variable streamflow and a higher incidence of hydrologic drought downstream. Land use change is one of the ways human actions alter the frequency of water shortage even when no change in the frequency of meteorological drought has been observed. **Figure 3.6a** shows the interrelationship of the hydrological cycle.

**Figure 3.6a: Interrelationship of the Hydrological Cycle**



Agriculture effects from drought vary depending on the time of year, period of precipitation, amount of stored soil moisture, type of crop, stage of growth, and meteorological measures (i.e. temperature, humidity, and wind). Precipitation scarcities as little as four to six inches can be the foundation of an agriculture drought situation.

The Department of Environmental Conservation (DEC) and the New York State Drought Management Task Force identifies droughts in the following four stages:

1. **Normal** is considered the standard moisture soil levels found throughout the State.
2. **Drought Watch** is the first stage. This stage is declared by DEC and is intended to give advanced notice of a developing drought. At this stage, the general public is urged to conserve water. Public water purveyors and industries are urged to update and begin to implement individual drought contingency plans.
3. **Drought Warning** is the second stage. This stage also is declared by DEC and is a notice of impending and imminent severe drought conditions. A warning declaration includes stepping up public awareness and increasing voluntary conservation. Public water supply purveyors and industries are urged to continue to implement local drought contingency plans. Federal, state, and local water resources agencies are notified to prepare for emergency response measures.
4. **Drought Emergency** is the third stage. This stage is declared by the New York State Disaster Preparedness Commission (DPC), based upon recommendation of the Task Force. It is a notice of existing severe and persistent drought conditions. An emergency declaration is a notice for local water resources agencies to mandate conservation and implement other emergency response measures. A continuing and worsening drought emergency may result in the Governor declaring a drought disaster. It is a notice of the most severe and persistent drought conditions. At this stage a significant proportion of communities in the impacted area likely are unable to respond adequately.

The State of New York uses two methodologies to determine the various drought stages. According to the “NYS Comprehensive Emergency Management Plan”, the commonly used indicator is the Palmer Drought Index (PDI) that is primarily based on soil conditions<sup>2</sup>. These are typically the first indicators that a moisture deficit is present. These values range from -5 to +5, with positive values indicating wetter conditions and negative values representing drier conditions.

The second methodology used was created by DEC and is referred to as the State Drought Index (SDI), which evaluates drought conditions on a more comprehensive basis by measuring whether numerous indicators reach dire thresholds. The data collected is compared against critical threshold values to show a normal or changeable drought condition. The indicators are weighted on a regional basis to reflect the unique circumstances of each drought management region.

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(The New York State Disaster Preparedness Commission, 2012)<sup>2</sup>



**Table 3.6a: Illustrates the State Drought Index (SDI) range of values for each drought by stages.**

Drought Stage	Drought Index Range
Normal	100 – 150
Watch	75 – 100
Warning	50– 70
Emergency	0– 50

Source: NYS DPC, Drought Management Coordination Annex, May 2012  
(Note: \*The value of the State Drought Index equals the sum of the weighted indicator values.)

The data gathered below in **Table 3.6b**, demonstrates the New York State regional weighting system for each drought indicator, **Figure 3.6f** on page 17 is a map that identifies drought management regions as established by DEC.

**Table 3.6b: Drought Indicator Regional Weighting Values**

Regions	Stage	Indicator Values			
		Precipitation	Reservoir/ Lake Storage	Stream Flow	Groundwater Levels
I	Normal	20 - 30	10 - 15	10- 15	60 - 90
	Watch	15 - 20	7.5 - 10	7.5 - 10	45 - 60
	Warning	10 - 15	5 - 7.5	5 - 7.5	30 - 45
	Emergency	0 - 10	0 -5	0 - 5	0 - 30
II and IV	Normal	30 - 45	20 - 30	20 - 30	30 - 45
	Watch	22.5 - 30	15 - 20	15 - 20	22.5 - 30
	Warning	15 - 22.5	10 - 15	10- 15	15 - 22.5
	Emergency	0 - 15	0 - 10	0 - 10	0 - 15
IIA	Determined by the New York City Department of Environmental Protection using their reservoir refill probability curves				
III and VIII	Normal	30 - 45	10 – 15	20 – 30	40 - 60
	Watch	22.5 - 30	7.5 – 10	15 – 20	30 - 40
	Warning	15 - 22.5	5 - 7.5	10 – 15	20 - 30
	Emergency	0 - 15	0 – 5	0 – 10	0 - 20
V, VI and VII	Normal	30 - 45	40 – 60	20 – 30	10-15
	Watch	22.5 - 30	30 – 40	15 – 20	7.5 - 10
	Warning	15 - 22.5	20 – 30	10 – 15	5 - 7.5
	Emergency	0 - 15	0 – 20	0 – 10	0 - 5



## Location

New York State has an abundant supply of water found throughout the State with streams, lakes, and coastal areas that have an average annual precipitation ranging from 60 inches in the Catskills to 28 in the Lake Champlain Valley. The normal variations in the area's weather can lead to periods of dry weather even though the State has a moderately humid climate. The State of New York's last two severe droughts were in the mid-1960s and then again in the mid-1980s.

The State is divided into nine drought management regions based loosely on the drainage basins and county lines. The precipitation, lake and reservoir levels, stream flow, and groundwater level is monitored by DEC at least once a month and more frequently if droughts appear present. The data generated is used to assess and analyze each regions condition and then classified anywhere from *normal* to *drought emergency*.

In some cases, the different areas within the regions make their own determination of what drought stage they fall within based on their own criteria. An example of this is New York City's systems that are greatly dependent on upstate reservoirs for its water supply. The City drought conditions are based on probability assessments of reservoirs being full by June each year.

## Previous Drought Occurrences

New York State local communities generally have access to an ample amount of water supply that's used for agriculture, recreation, industrial, medical, residential, and drinking needs. In the 1960s and then again in the 1980s the State was impacted by two major drought occurrences. During the 1960s, the State of New York had an extended period of droughts that affected the entire state. The worst stint lasted from 1964 to 1965 placing a severe impact on agriculture, water quality, and forest and human health. As a result, there were widespread impacts, including forest fires, crop failure, fish kills, water shortages, harmful algal blooms, and heat related deaths.<sup>3</sup>

The drought of the 60s ended in 1967 only for the State to experience another drought in 1980 that has had a continuing affect into the present. Although New York State has seen an increasing number of occurrences of prolonged dry spells, none have been severe enough to classify officially as droughts. In response to water deficiency spells, recurring drought awareness efforts have been implemented as the agricultural communities and home owners struggle to cope with drought conditions.

The table below (**Table 3.6c**) is an overview of drought occurrences in New York State dating from August 1993 to October 2007.

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<sup>3</sup> New York State Comprehensive Emergency Management Plan: *Disaster Preparedness Commission (DPC)/ readiness, response, recovery. Drought Management Coordination Annex, May 2012*



**Table 3.6c: Past Occurrences of Drought in New York State**

Date	County/Area Effected	Types of Damages	Dollar Amount of Damages
<b>August - December 1993</b>	Albany, Columbia, Delaware, Dutchess, Greene, Otsego, Rensselaer, Schoharie, Sullivan, Ulster	The damage primarily affected the agriculture sector's feed grain. The estimated losses were over 40% and in some areas nearly 100% in feed losses. There were significant losses in hay, corn, and a few other fruit and vegetable crops.	\$50,000,000
<b>February - April 1994</b>	Delaware, Dutchess, Greene, Otsego, Schoharie, Sullivan, Ulster	New York City experienced a reduction in the usable storage of the City's water supply.	Unknown
<b>October 1994</b>	Statewide	Albany County had a record breaking month in October 1994, tying for 7th driest county in that month.	Unknown
<b>June - September 1995</b>	Catskills, Hudson Valley, Mohawk Valley, Southern Tier	<p>The lack of rainfall across much of eastern NYS prompted officials to enforce water restrictions in some areas and seek federal aid in other parts.</p> <ul style="list-style-type: none"> <li>- Rensselaer and Oneida Counties had significant damage to various vegetables and grain crops.</li> <li>- Vine crops were hard hit. Plants either died or experienced limited production. Other crops severely impacted include: corn, hay, peppers and onion.</li> <li>- Private drinking wells ran dry. Municipal water supplies in Montgomery County were dangerously low. Water tankers were brought into Herkimer and Montgomery Counties to assist farmers and residents with dry wells.</li> <li>- The salt front had migrated</li> </ul>	Unknown



Date	County/Area Effected	Types of Damages	Dollar Amount of Damages
		<p>north on the Hudson River, causing communities that drew drinking water from the Hudson to experience high levels of sodium in their drinking water.</p> <ul style="list-style-type: none"> <li>- The Susquehanna River was 1/3 of its normal level.</li> <li>- The Capital District annual crop harvest was down 35%</li> <li>- The Mohawk Valley crop yields were down 30-60%.</li> </ul>	
<b>August 1 – 31, 1997</b>	Sullivan County	<p>An extremely dry summer created major crop failure at the end of August 1997. Having an effect on sweet corn and tomatoes, two of the major money making crops for small farmers.</p> <ul style="list-style-type: none"> <li>- Sullivan County had some of the worst crop damage.</li> <li>- According to figures provided by individual farmers as well as the New York State Agricultural Extension Service, losses neared a quarter of a million dollars. In many cases, financial assistance was granted.</li> <li>- For the period from June 1st to the end of August, precipitation figures across the region averaged less than 30% of normal levels.</li> </ul>	\$200,000



Date	County/Area Effected	Types of Damages	Dollar Amount of Damages
<b>September 1 – 30, 1999</b>	Broome, Cayuga, Chemung, Chenango, Cortland, Delaware, Madison, Oneida, Oneida, Onondaga, Otsego, Schuyler, Seneca, Steuben, Sullivan, Tioga, Tompkins, Yates	<p>A very dry spring and summer season caused major crop failures and some wells to run dry. Many streams and rivers were also brought to their lowest recorded levels.</p> <ul style="list-style-type: none"> <li>- Most affected crops were corn and hay, which was a major blow for dairy farmers</li> <li>- According to figures from the New York State Department of Agriculture and Markets, the worst drought damage was reported in Cayuga (\$17.7 million), Steuben (\$15.3 million) and Madison (\$5.9 million) Counties</li> </ul>	\$ 50,000,000
<b>November 2001 – January 2002</b>	Orange, Putnam, Rockland, Westchester, New York City, Long Island	New York City's combined storage in water supply reservoir systems was at a low 41% capacity (normal levels for this time of year are 71%).	Unknown
<b>April – October 2002</b>	New York City, Long Island, Westchester, Orange, Putnam, Rockland,	Ground water and water storage facilities were below normal. New York City reservoir system reached a low of 64.5%, which was 34% below normal.	Unknown
<b>September – October 2007</b>	Hamilton and northern Herkimer Counties	Some portions of the Adirondack region accrued 90 day rainfall deficits of 8 to 12 inches from normal levels. The Palmer Drought Severity Index reached severe drought levels. Natural stream flow levels dropped into the lowest 10 percentile of recorded flows. Shallow wells and farm ponds reportedly ran dry in portions of Northern Herkimer County. In addition, reservoir levels had become low enough to stop recreational activities and some hydropower generation.	Unknown



**Table 3.6d, Figure 3.6b, and Figure 3.6c** found below displays historical and economic (property and crop damage) loss information for drought events dating from 1960 – 2012. The data derives primarily from the Spatial Hazard Events and Loss Database for the United States (SHELDUS). The State of New York has recorded 104 previous occurrences with no reported injuries or deaths directly related to this specific hazard. Although previous events have appeared, including one declaration, overall this hazard has caused the State minimal damage yet could potentially have a substantial influence to the agriculture industry.

Drought, a “low” ranked hazard, has estimated economic losses of less than \$1.2 million with a significant amount in crop loss. This specific hazard can significantly impact New York State due to the fact that 60% of its topography is forested creating a relatively large economic asset for State residents. Approximately \$2 billion in high-paying jobs are found in rural areas of the State employing 47,000 New Yorkers<sup>4</sup>.

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<sup>4</sup> *New York Wood Products Development Council Annual Report for 2010-2011*  
[http://www.agriculture.ny.gov/NY\\_Wood\\_Prod\\_Dev\\_Council\\_Annual\\_Report.pdf](http://www.agriculture.ny.gov/NY_Wood_Prod_Dev_Council_Annual_Report.pdf)



Table 3.6d: Drought Events and Losses by County

County	Historical Record (1960-2012)						
	Future Probability %	Recurrence Interval	Number of Events	Fatalities	Injuries	Property Damage	Crop Damage
Albany	6	17	3	0	0	\$16,667	\$2,685,185
Allegany	0	0	0	0	0	\$0	\$0
Bronx	0	0	0	0	0	\$0	\$0
Broome	6	17	3	0	0	\$38,406	\$4,825,234
Cattaraugus	0	0	0	0	0	\$0	\$0
Cayuga	4	26	2	0	0	\$21,739	\$3,158,568
Chautauqua	0	0	0	0	0	\$0	\$0
Chemung	4	26	2	0	0	\$21,739	\$3,158,568
Chenango	4	26	2	0	0	\$16,667	\$4,607,843
Clinton	2	52	1	0	0	\$16,667	\$1,666,667
Columbia	6	17	3	0	0	\$16,667	\$2,685,185
Cortland	6	17	3	0	0	\$38,406	\$4,825,234
Delaware	8	13	4	0	0	\$38,406	\$5,010,420
Dutchess	6	17	3	0	0	\$16,667	\$2,685,185
Erie	0	0	0	0	0	\$0	\$0
Essex	2	52	1	0	0	\$16,667	\$1,666,667
Franklin	2	52	1	0	0	\$16,667	\$1,666,667
Fulton	6	17	3	0	0	\$38,406	\$2,069,243
Genesee	0	0	0	0	0	\$0	\$0
Greene	6	17	3	0	0	\$16,667	\$2,685,185
Hamilton	6	17	3	0	0	\$38,406	\$2,069,243
Herkimer	6	17	3	0	0	\$38,406	\$2,069,243
Jefferson	4	26	2	0	0	\$21,739	\$402,576
Kings	0	0	0	0	0	\$0	\$0
Lewis	4	26	2	0	0	\$21,739	\$402,576



Historical Record (1960-2012)							
County	Future Probability %	Recurrence Interval	Number of Events	Fatalities	Injuries	Property Damage	Crop Damage
Livingston	0	0	0	0	0	\$0	\$0
Madison	6	17	3	0	0	\$38,406	\$4,825,234
Monroe	0	0	0	0	0	\$0	\$0
Montgomery	6	17	3	0	0	\$38,406	\$2,069,243
Nassau	0	0	0	0	0	\$0	\$0
New York	0	0	0	0	0	\$0	\$0
Niagara	0	0	0	0	0	\$0	\$0
Oneida	8	13	4	0	0	\$38,406	\$5,010,420
Onondaga	4	26	2	0	0	\$21,739	\$3,158,568
Ontario	0	0	0	0	0	\$0	\$0
Orange	4	26	2	0	0	\$16,667	\$1,851,852
Orleans	0	0	0	0	0	\$0	\$0
Oswego	4	26	2	0	0	\$21,739	\$402,576
Otsego	8	13	4	0	0	\$38,406	\$5,010,420
Putnam	4	26	2	0	0	\$16,667	\$1,851,852
Queens	0	0	0	0	0	\$0	\$0
Rensselaer	6	17	3	0	0	\$16,667	\$2,685,185
Richmond	0	0	0	0	0	\$0	\$0
Rockland	2	52	1	0	0	\$0	\$185,185
Saratoga	4	26	2	0	0	\$16,667	\$1,851,852
Schenectady	4	26	2	0	0	\$16,667	\$1,851,852
Schoharie	6	17	3	0	0	\$38,406	\$2,069,243
Schuyler	4	26	2	0	0	\$21,739	\$3,158,568
Seneca	4	26	2	0	0	\$21,739	\$3,158,568
St Lawrence	6	17	3	0	0	\$38,406	\$2,069,243
Steuben	2	52	1	0	0	\$0	\$2,941,176
Suffolk	0	0	0	0	0	\$0	\$0



Historical Record (1960-2012)							
County	Future Probability %	Recurrence Interval	Number of Events	Fatalities	Injuries	Property Damage	Crop Damage
Sullivan	8	13	4	0	0	\$16,667	\$4,993,028
Tioga	6	17	3	0	0	\$38,406	\$4,825,234
Tompkins	4	26	2	0	0	\$21,739	\$3,158,568
Ulster	6	17	3	0	0	\$16,667	\$2,685,185
Warren	4	26	2	0	0	\$16,667	\$1,851,852
Washington	4	26	2	0	0	\$16,667	\$1,851,852
Wayne	2	52	1	0	0	\$21,739	\$217,391
Westchester	2	52	1	0	0	\$0	\$185,185
Wyoming	0	0	0	0	0	\$0	\$0
Yates			1	0	0	\$0	\$2,941,176

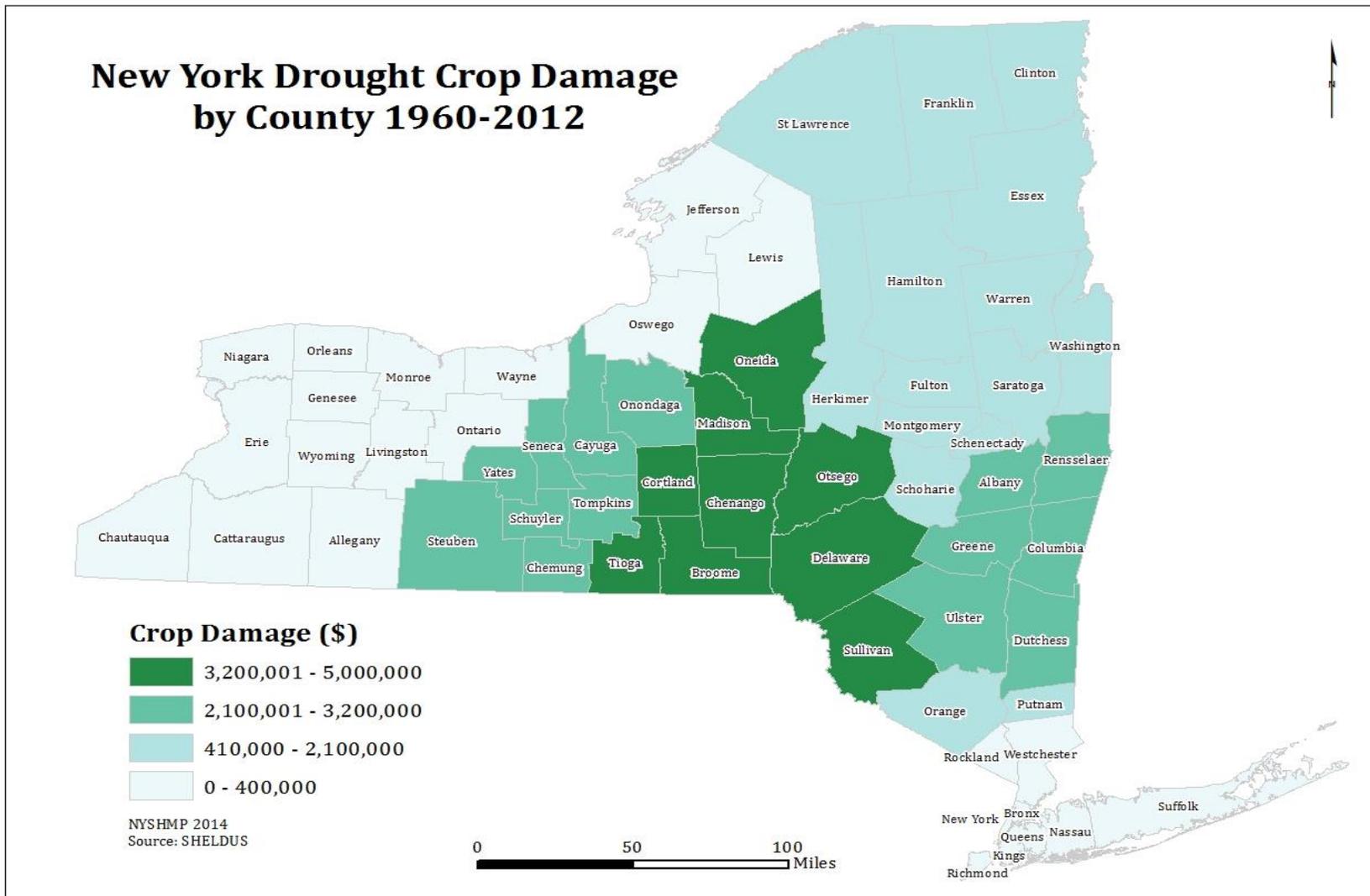
Source: Spatial Hazard Events & Losses Database for the U.S. (SHELDUS) (\*Future Probability equals the number of events divided by the number of years of record [52], expressed as a percentage.)

**Figure 3.6b** and **Figure 3.6c** illustrate the number of events accounted for in each county found within the State, as well as the total loss in crop damage from 1960-2012. The total crop loss for the State is more than \$1.15 million primarily affecting the crops in Delaware, Oneida, and Otsego Counties.



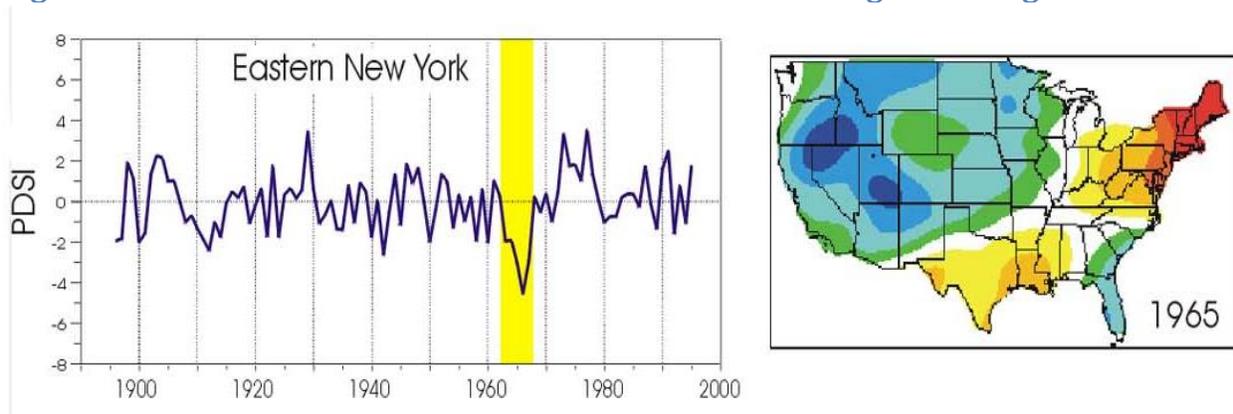


**Figure 3.6c: New York State Drought Crop Damage**



**Figure 3.6d** shows the Palmer Drought Index (PDI) values for Eastern New York along with the drought coverage in North America for the year of 1965. The map to the right shows that while the east coast of North America was experiencing droughts the west coast had wetter conditions. The 1965 drought was one of the worst on record for eastern New York.

**Figure 3.6d: New York PDI's from 1900-2000 and U.S. Drought Coverage in 1965<sup>5</sup>**



Data found in the table and figure below was derived from a FEMA data source that examines Presidential Declarations from 1954 to 2013. **Table 3.6d** and **Figure 3.6e** illustrates the affected counties from drought events. Although the data dates back to 1954, New York State’s only Presidential Declaration was August 1965.

**Table 3.6d: Major Drought Presidential Declared Disasters**

Disaster Number	Date Declared	Affected Counties
DR- 204	08/18/1965	Delaware County, Dutchess County, Kings County, Nassau County, New York County, Orange County, Putnam County, Queens County, Richmond County, Rockland County, Suffolk County, Sullivan County, Ulster County and Westchester County.

Source: FEMA, 2013

**Figure 3.6e** displays the Presidential Declared Disaster totals by county for drought events for the period of 1954 through July 2013. Counties with the greatest number of drought declarations are concentrated around the southeastern counties of New York.

<sup>5</sup> [http://www.ncdc.noaa.gov/paleo/drought/drght\\_temporal.html](http://www.ncdc.noaa.gov/paleo/drought/drght_temporal.html)

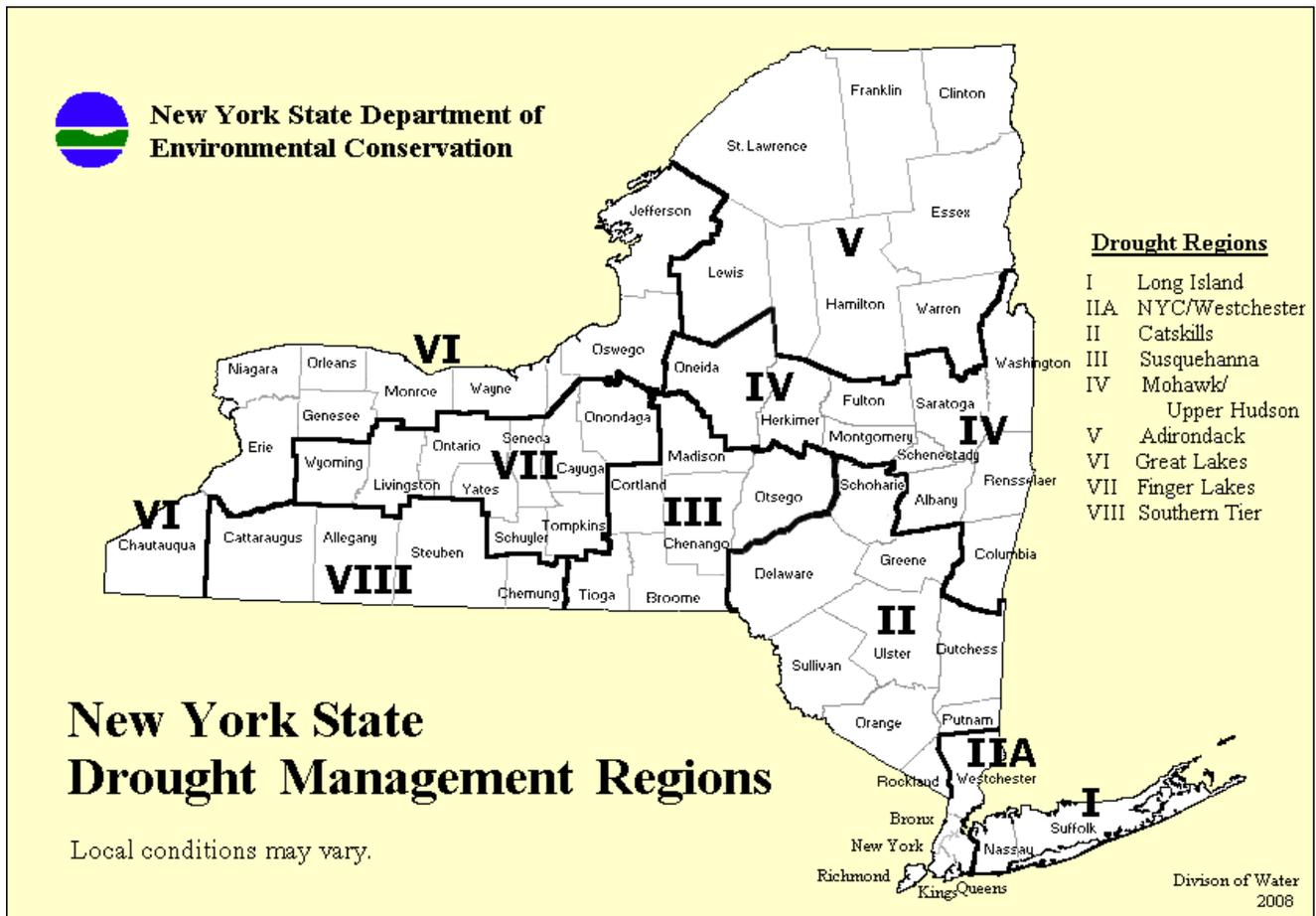




Generally, New York State receives ample annual precipitation to recharge the State's reservoirs, lakes, rivers, and groundwater aquifers. But from 1979-81, particularly the winter and spring of 1981, precipitation levels declined and drought-related impacts and problems started to become evident. Of particular concern were water shortages in the southern part of the State, including the New York City metropolitan area, where nearly two-thirds (2/3) of the State's population resides. As a result, the State's Drought Task Force was formed.

**Figure 3.6f** identifies drought management regions as established by NYS DEC.

**Figure 3.6f: New York State Drought Management Regions**



Source: New York State (NYS) Drought Management Plan (EDMP)

**Table 3.6e** provides is a list of the counties located within each of the eight drought management regions.

**Table 3.6e: Counties within Drought Management Regions**

Region	Counties
<b>I Long Island</b>	Nassau, Suffolk
<b>IIA NYC</b>	New York City and Westchester. Additional upstate communities that draw water from the New York City water supply system are also subject to its Drought Management Plan and Rules. (See Appendices D and E)
<b>II Catskills</b>	Delaware, Dutchess, Greene, Orange, Putnam, Rockland, Schoharie, Sullivan, Ulster
<b>III Susquehanna</b>	Broome, Chenango, Cortland, Madison, Otsego, Tioga
<b>IV Mohawk/ Upper Hudson</b>	Albany, Columbia, Fulton, Herkimer (south), Montgomery, Oneida, Rensselaer, Saratoga, Schenectady, Washington
<b>V Adirondacks</b>	Clinton, Essex, Franklin, Hamilton, Herkimer (north), Lewis, St. Lawrence, Warren
<b>VI Great Lakes</b>	Chautauqua, Erie, Genesee, Jefferson, Monroe, Niagara, Cayuga (north), Orleans, Oswego, Wayne
<b>VII Finger Lakes</b>	Livingston, Onondaga, Ontario, Schuyler, Seneca, Cayuga (south), Tompkins, Wyoming, Yates
<b>VIII Southern Tier</b>	Allegany, Cattaraugus, Chemung, Steuben

Source: New York State (NYS) Drought Management Plan (EDMP)

The New York State Drought Plan was written in 1982 and last updated in May 2012. Public water supplies are the main focus of the plan, which is primarily based on lessons learned from the 1980–81 and 1984–85 droughts. The Drought Management Task Force (DMTF) operates the plan, and the lead agency on the DMTF is the Department of Environmental Conservation.

The plan is divided into two parts: a state drought preparedness plan focusing on monitoring and evaluating conditions and options to minimize drought impacts, and a drought response plan that defines specific actions to be taken during various stages of drought. This arrangement is unique among state drought plans. The New York State Drought Management Plan also recommends programs and projects that should be



completed to better prepare the State for drought, based on two time scales: short-term (up to 3 years), and long-term (3–10 years).

New York State recently enacted new legislation to regulate the use of water resources of the State by implementing a water withdrawal permitting, registration and reporting program. The DEC has the authority to regulate water usage under the Environmental Conservation Law, §§ 3-0301(2)(m), article 15 titles 15, 16 and 33, title 10 of article 21). Part 601 provides for Water Withdrawal Permitting, Reporting and Registration (Exclusive of Long Island Wells regulated under Part 602). The law became effective on February 15, 2012 and final implementing regulations became effective on April 1, 2013. The law regulates the use of the water resources of the state by implementing a water withdrawal permitting, registration and reporting program for water withdrawals equaling or exceeding a threshold volume. The regulations include protections for present and future needs for sources of potable water supply. In certain conditions, permits may be modified to prevent over- allocation or use of a water source to protect the environment and health, safety and welfare of the public, such as during a drought.<sup>6</sup>

After identifying communities that are most susceptible in the event of drought activities, New York State's Department of Environmental Conservation (DEC) recognizes that many small and mid-sized communities will need alternate water supply systems available for dozens of communities depending on the scope/ severity of the occurrence. New York State believes that the approach of partnering public/ private entities will make the State better prepared for water shortages and adequately protect public health. As stated in the May 2012 *New York State Comprehensive Emergency Management Plan-Drought Management Coordination Annex*, "This partnership should include identification of water suppliers, haulers, well drillers, water testers, and other similar private experts and providers who could be called upon to serve the communities during a disaster."

### Probability of Future Drought Events

Sporadic occurrences of drought are not uncommon within the United States. The State of New York streams, lakes, and coastal regions are supplied by an annual average precipitation ranging from 28 to 60 inches per year. Although the State manages mild moist climates, typical variations in weather patterns can lead to dry periods. According to the Department of Environmental Conservation, the last severe drought for the State was in the mid-1960's and then again in the early and mid-1980's. Based on historical occurrences, New York State's overall annual future probability is three percent. From data gathered by the SHEL DUS database Delaware, Oneida, and Otsego Counties are most probable to experience a drought event.

While it is unknown how climate change impacts regional water supply, however it has been identified that water resources are stressed and any added stress from climate change only increases the competition for water resources. Warmer climates increase potential drought frequency, severity, and create longer-lasting events. As mentioned in **Section**

<sup>6</sup> [http://www.dec.ny.gov/enb/20121121\\_not0.html](http://www.dec.ny.gov/enb/20121121_not0.html)



**3.4-Climate Change**, it is projected for at least one short-term drought occurrence to happen every summer if greenhouse emission levels continue to increase specifically in the Catskill and Adirondack Mountains.

For the sake of the 2014 Update, the planning team reviewed Delaware County's LHMP, one of three counties most probable for drought occurrences. Delaware County LHMP identified a single significant event in September 1999 that was recorded in the NOAA NCDC Storm Event database. Records indicate impacts of major crop failure and drying wells, in addition to several streams and rivers being at their lowest recorded levels. Due to the damage to the crops within the county, specifically corn and hay, many dairy farmers experienced problems. Delaware County's probability of future drought hazard events, with respect to the HAZNY report, describes the frequency as an "infrequent event", occurring once every eight years to fifty years<sup>7</sup>.

#### Justification for Minimal Vulnerability/ Loss Assessment

Drought occurrences can potentially affect any area in the State; however the hazard received an overall "low" ranking following the HAZNY-Mitigation methodology. It was acknowledged that there are potential cost-effective and technically feasible initiatives and programs that address drought mitigation. Specifically New York State's Drought Management Task Force which was established in 1980 and then reconstituted in 2002 under the Disaster Preparedness Commission. The Department of Environmental Conservation has been involved in the monitoring and evaluation of drought occurrences for many years, and has been directed by the Task Force to prepare a Drought Forecasting Plan<sup>8</sup>.

Consequently, it is determined that there is not sufficient evidence based on probability to justify further analysis for the 2014 plan update, but it is recommended that local jurisdictions consider addressing drought preparedness measures in future plan updates.

### 3.6.2 Assessing Drought Vulnerability by Jurisdiction

The sequence of impacts associated with meteorological, agricultural, and hydrological drought further emphasizes their differences. When drought begins, the agricultural sector is usually the first to be affected because of its heavy dependence on stored soil water. Soil water can be rapidly depleted during extended dry periods. If precipitation deficiencies continue, then people dependent on other sources of water will begin to feel the effects of the shortage. Those who rely on surface water (i.e., reservoirs and lakes) and subsurface water (i.e., ground water), for example, are usually the last to be affected. A short-term drought that persists for 3 to 6 months may have little impact on these sectors, depending on the characteristics of the hydrologic system and water use intensity.

<sup>7</sup> Delaware County LHMP [www.dcdes.org](http://www.dcdes.org).

<sup>8</sup> [http://www.dec.ny.gov/enb/20121121\\_not0.html](http://www.dec.ny.gov/enb/20121121_not0.html)



When precipitation returns to normal and meteorological drought conditions have abated, the sequence is repeated for the recovery of surface and subsurface water supplies. Soil water reserves are replenished first, followed by stream flow, reservoirs and lakes, and ground water. Drought impacts may diminish rapidly in the agricultural sector because of its reliance on soil water, but linger for months or even years in other sectors dependent on stored surface or subsurface supplies. Ground water users, are often the last to be affected by drought during its onset, may be last to experience a return to normal water levels. The length of the recovery period is a function of the intensity of the drought, its duration, and the quantity of precipitation received as the drought event terminates.

Many economic impacts occur in agriculture and related sectors, including forestry, fisheries, and waterborne activities, because of the reliance of these sectors on surface and subsurface water supplies. In addition to obvious losses in yields in crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also bring increased problems with insects and diseases to forests and reduce growth. The incidence of forest and grass fires increases substantially during extended droughts, which in turn places human and wildlife populations, as well as property, at higher levels of risk.

Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected. Reduced income for farmers has a rippling effect. Retailers and others who provide goods and services to farmers face reduced business. This leads to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue for Local, State, and Federal government. Less discretionary income affects the recreation and tourism industries. Prices for food, energy, and other products increase as supplies are reduced. In some cases, local shortages of certain goods result in the need to import these goods from outside the affected region. Reduced water supply impairs the navigability of rivers and results in increased transportation costs because products must be transported by rail, or truck. Hydropower production may also be curtailed significantly, due to the effects of a drought.

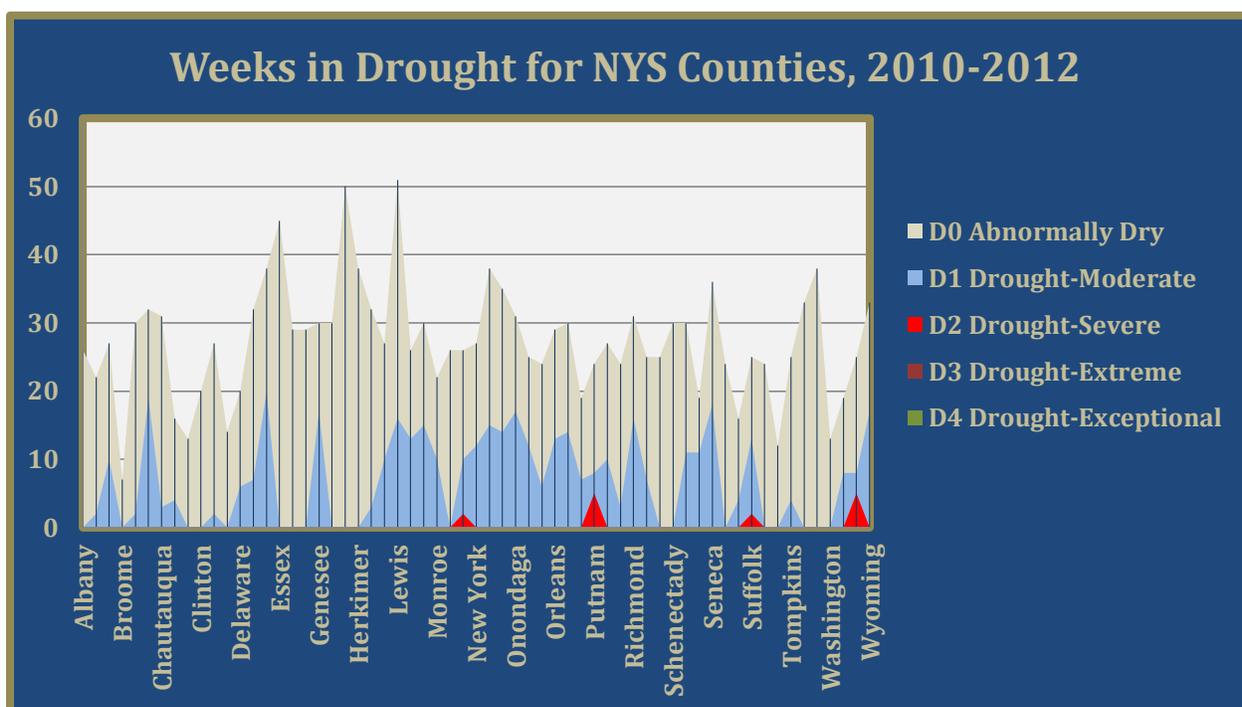
Environmental losses are the result of damages to plant and animal species, wildlife habitat, and air and water quality; forest and grass fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. As more effects of climate change are felt in future years, environmental impacts may become more intensified. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes, and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity of the landscape. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects.



Social impacts mainly involve public safety, health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. Many of the impacts specified as economic and environmental have social implications as well.

**Figure 3.6g** shows graphically the total number of weeks between 2010 and 2012 in which New York counties had 50% or more land area under drought, as classified by the U.S. Drought Monitor. As the graphic shows, the majority of New York counties experienced abnormally dry conditions. A significant number of counties also experienced moderate drought, and some counties had severe drought. No counties were in extreme or exceptional drought. This graph does not specifically show which counties were in what type of drought, but provides a snapshot of which drought level was most pervasive during the period of 2010 through 2012.

**Figure 3.6g: Weeks in Drought for New York 2010-2012**



Source: SHELDUS

**Table 3.6f** summarizes the number of weeks during the years 2010 to 2012 in which each county had 50% or more land area in drought. Lewis County had the highest number of weeks with abnormally dry conditions (D0), at 51 weeks. In the moderate drought category (D1), Erie County had the highest total of 20 weeks. In severe drought (D2), Putnam and Westchester had the highest, both at five weeks. No New York counties had 50% or more area in extreme (D3) or exception drought (D4). Overall, Lewis County had the greatest total of weeks in any sort of drought category, at 67 weeks.



**Table 3.6f: Total Weeks in Drought by County, 2010-2011**

County	Number of Weeks County Area $\geq$ 50% in Drought				
	D0	D1	D2	D3	D4
Albany	26	0	0	0	0
Allegany	22	2	0	0	0
Bronx	27	10	0	0	0
Broome	7	0	0	0	0
Cattaraugus	30	2	0	0	0
Cayuga	32	19	0	0	0
Chautauqua	31	3	0	0	0
Chemung	16	4	0	0	0
Chenango	13	0	0	0	0
Clinton	20	0	0	0	0
Columbia	27	2	0	0	0
Cortland	14	0	0	0	0
Delaware	20	6	0	0	0
Dutchess	32	7	0	0	0
Erie	38	20	0	0	0
Essex	45	0	0	0	0
Franklin	29	0	0	0	0
Fulton	29	0	0	0	0
Genesee	30	17	0	0	0
Greene	30	0	0	0	0
Hamilton	50	0	0	0	0
Herkimer	38	0	0	0	0
Jefferson	32	3	0	0	0
Kings	27	10	0	0	0
Lewis	51	16	0	0	0
Livingston	26	13	0	0	0
Madison	30	15	0	0	0
Monroe	22	10	0	0	0
Montgomery	26	0	0	0	0
Nassau	26	10	2	0	0
New York	27	12	0	0	0
Niagara	38	15	0	0	0
Oneida	35	14	0	0	0
Onondaga	31	17	0	0	0
Ontario	25	12	0	0	0
Orange	24	6	0	0	0
Orleans	29	13	0	0	0
Oswego	30	14	0	0	0
Otsego	19	7	0	0	0
Putnam	24	8	5	0	0
Queens	27	10	0	0	0
Rensselaer	24	3	0	0	0
Richmond	31	16	0	0	0



County	Number of Weeks County Area $\geq$ 50% in Drought				
	D0	D1	D2	D3	D4
Rockland	25	7	0	0	0
Saratoga	25	0	0	0	0
Schenectady	30	0	0	0	0
Schoharie	30	11	0	0	0
Schuyler	19	11	0	0	0
Seneca	36	18	0	0	0
St Lawrence	24	0	0	0	0
Steuben	16	4	0	0	0
Suffolk	25	13	2	0	0
Sullivan	24	0	0	0	0
Tioga	12	0	0	0	0
Tompkins	25	4	0	0	0
Ulster	33	0	0	0	0
Warren	38	0	0	0	0
Washington	13	0	0	0	0
Wayne	19	8	0	0	0
Westchester	25	8	5	0	0
Wyoming	33	17	0	0	0
Yates	37	15	0	0	0
<b>TOTAL</b>	<b>1,699</b>	<b>432</b>	<b>14</b>	<b>0</b>	<b>0</b>

Source: SHELDUS

### Local Plan Integration/ Risk Assessment

Since August 2013, 56 FEMA-approved local hazard mitigation plans (LHMP) have been reviewed for the 2014 Update. The State's planning team had the opportunity to review local county risk assessments to help the State better understand its vulnerability in terms of the jurisdictions most threatened by classified hazards. In its analysis, the State Hazard Mitigation Plan (SHMP) Team reviewed the processes used by local governments to rank hazards based on their vulnerabilities and potential losses (i.e., people, buildings, and dollar values) associated with the hazards of greatest concern.

Where data was available, the State extracted the ranking impact information from the LHMP hazard analysis. This ranking feature is based on a combination of probability, severity, and extent of the hazard and was determined to be the best measure of overall risk in the plans. This ranking was either numeric or described in terms of high, moderately high, moderate, or low. In cases where this information was not available, it was noted if the hazard was identified in the individual county local plans.

During the review of the local plan risk assessments, it was determined that a number of local plans used the New York HAZNY ranking system, and measured each hazard on a scale rating from 44 (low) to 400 (high). This analysis also revealed that a number of county-level plans included manmade hazards in their analysis, but the State hazard mitigation plan's 2014 update focused solely on natural hazards.



The local risk assessment summary allowed for an analysis of which hazards are of high concern to particular counties. **Table 3.2a** in **Section 3.2** lists all the hazards and the number of counties that ranked them at each of the scale levels: High, Moderately High, Moderate, Moderately Low, and Low. None of the State's Counties considered drought as a high-ranking hazard. All counties either ranked drought as a moderate, moderately low, or a low hazard. Specifically, two counties ranked drought as moderate, twenty-four moderately low, and ten counties ranked it as a low hazard. **Table 3.6g** displays the highest ranked county hazards, however due to low ranking there is no data available in the local plans.

**Tables 3.6g Summary of Drought Hazard Impacts and Rankings by County**

Local County Drought Hazard Impacts		
Highest Occurrences	Highest Fatalities	Highest Property Damage
*Delaware, Oneida, Otsego, Sullivan	N/A	*Delaware, Oneida, Otsego, Broome, Cortland, Fulton, Hamilton, Herkimer, Madison, Montgomery, Schoharie, St. Lawrence, and Tioga
*Broome, Cortland, Fulton, Hamilton, Herkimer, Madison, Montgomery, Schoharie, St. Lawrence, Tioga, Albany, Columbia, Dutchess, Greene, Rensselaer, and Ulster	N/A	*Cayuga, Chemung, Jefferson, Lewis, Onondaga, Oswego, Schuyler, Seneca, Tompkins, and Wayne

Source: *SHELDUS, 2013* (\*Please note: Highest Occurrences and Property Damage are the same value for the counties listed.)

Local County Drought Hazard Rankings
<b>Moderate/Moderately Low/ Low</b>
Drought is ranked as a moderate, moderately low, or low hazard by all counties throughout New York State.

Source: *LHMP, 2013*

## Development in Hazard Prone Areas

Because Droughts are not limited to geographical boundaries or population groups, it is difficult to identify development and population trends that impact this hazard. Current land use and building codes incorporate standards that address and mitigate drought accumulation.



### 3.6.3 Assessing Drought Vulnerability of State Facilities

NYS has no recorded incidence of any damages to state buildings or critical infrastructures due to drought conditions.

### 3.6.4 Estimating Potential Losses by Jurisdiction- Overview

Overall, infrastructure such as highways, bridges, and electric conveyance systems are not affected by drought nor do they cause structural damage. A rare exception is severe soil shrinkage. When it arises, severe soil shrinkage compromises the foundation upon which the infrastructure stands. Soil shrinkage requires expansive soil, a soil type that contracts or expands as moisture content decreases or increases, to cause damage to property and/or infrastructure.

Direct and indirect potential impacts are explained in previous sections, yet accurate loss estimates for drought are not available. Reduced water levels and a decrease in water usage will have a direct economic impact on businesses and industries that are water-dependent. The indirect impacts associated with drought are broad but so diffuse that financial estimates of potential damages are not feasible.

**Table 3.6h** provides the annualized losses for drought events. The data used was based on SHEL DUS records from 1960-2012, with the exception of hurricane, earthquake, and flood hazards which were derived from HAZUS-MH 2.1. For those specific hazards, a probabilistic run was generated to determine the total annual losses for each county found within the State. The information provided by SHEL DUS was determined by taking the total economic losses divided by the number of years of record (52) to obtain the losses per year. **Figure 3.6h**, illustrates the top ten counties annualized losses with a total of \$2,234,615 in drought losses for the entire State of New York.



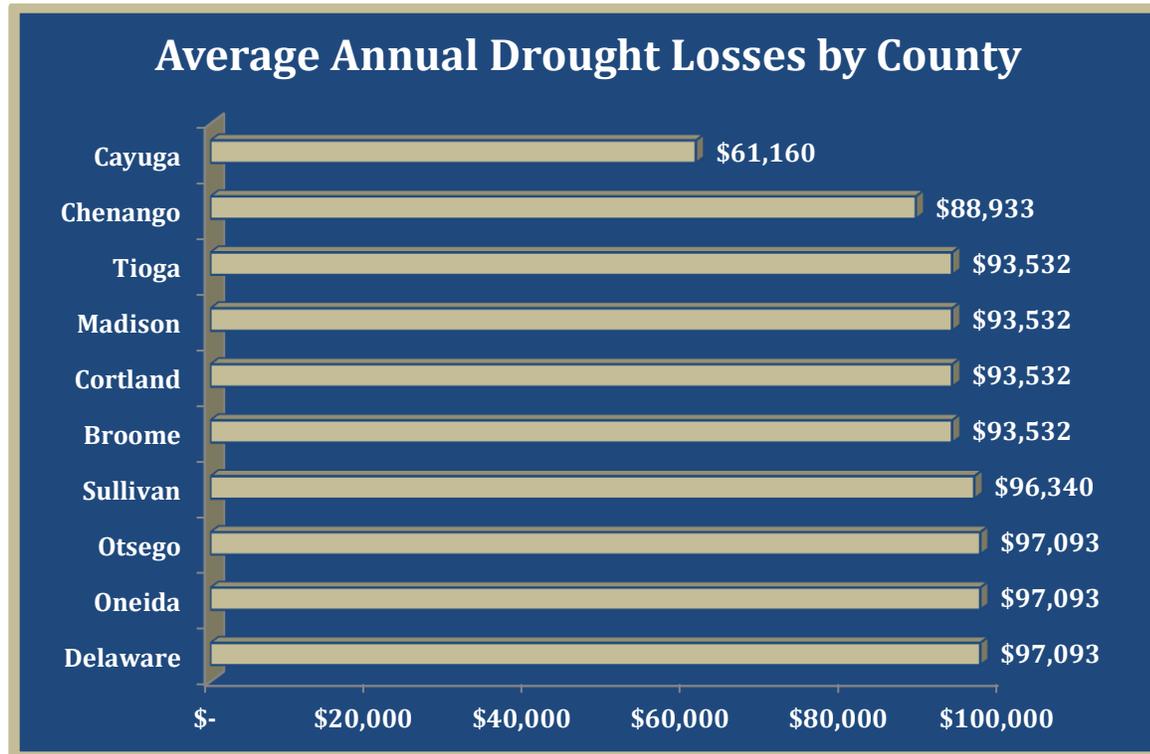
Table 3.6h: Average Annual Drought Losses by County 1960-2012

County	Drought	County	Drought	County	Drought
Delaware	\$ 97,093	Rensselaer	\$ 51,959	Rockland	\$ 3,561
Oneida	\$ 97,093	Ulster	\$ 51,959	Westchester	\$ 3,561
Otsego	\$ 97,093	Fulton	\$ 40,532	Allegany	\$ -
Sullivan	\$ 96,340	Hamilton	\$ 40,532	Bronx	\$ -
Broome	\$ 93,532	Herkimer	\$ 40,532	Cattaraugus	\$ -
Cortland	\$ 93,532	Montgomery	\$ 40,532	Chautauqua	\$ -
Madison	\$ 93,532	Schoharie	\$ 40,532	Erie	\$ -
Tioga	\$ 93,532	St Lawrence	\$ 40,532	Genesee	\$ -
Chenango	\$ 88,933	Orange	\$ 35,933	Kings	\$ -
Cayuga	\$ 61,160	Putnam	\$ 35,933	Livingston	\$ -
Chemung	\$ 61,160	Saratoga	\$ 35,933	Monroe	\$ -
Onondaga	\$ 61,160	Schenectady	\$ 35,933	Nassau	\$ -
Schuyler	\$ 61,160	Warren	\$ 35,933	New York	\$ -
Seneca	\$ 61,160	Washington	\$ 35,933	Niagara	\$ -
Tompkins	\$ 61,160	Clinton	\$ 32,372	Ontario	\$ -
Steuben	\$ 56,561	Essex	\$ 32,372	Orleans	\$ -
Yates	\$ 56,561	Franklin	\$ 32,372	Queens	\$ -
Albany	\$ 51,959	Jefferson	\$ 8,160	Richmond	\$ -
Columbia	\$ 51,959	Lewis	\$ 8,160	Suffolk	\$ -
Dutchess	\$ 51,959	Oswego	\$ 8,160	Wyoming	\$ -
Greene	\$ 51,959	Wayne	\$ 4,599	<b>Total</b>	<b>\$ 2,234,615</b>

Source: SHELDUS, 2013



Figure 3.6h: Average Annual Drought Losses by County 1960-2012



Source: SHELDUS, 2013

### 3.6.5 Estimating Potential Losses of State Facilities

Although state agencies maintain internal databases that identify location and value of properties within their areas of responsibility, New York State does not currently have a comprehensive data set of state-owned and operated assets that can be integrated into the GIS methodology for analysis. However, a state facilities inventory project was initiated in August 2013, which will gather information that can be used to build a comprehensive data set. The pilot phase, which will look at a specific critical facility category and develop the methodology for the project, is expected to be completed in mid-2014. At that time, the next phase of the project will be developed for what is anticipated to be a multi-year project.



### 3.6.6 Data Limitations and Other Key Documents

The drought hazard in New York State is often underestimated because other natural hazards occur more frequently (e.g., hurricanes, tornadoes, flooding) and are much more visible. The Mitigation Planning Team researched the drought hazard as it affects the State. Contents of this section result from research and outreach from the following sources:

- The New York State Department of Environmental Conservation, Bureau of Water Resources Management, Division of Water, staff and website, <http://www.dec.state.ny.us>
- New York State Climate Office, Department of Earth and Atmospheric Sciences at Cornell University web site, <http://www.nrcc.cornell.edu/drought/>
- The National Drought Mitigation Center <http://droughtmonitor.unl.edu/monitor.html>
- National Weather Service, Climate Prediction Center, [http://www.cpc.ncep.noaa.gov/products/monitoring\\_and\\_data/drought.shtml](http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml)
- The National Climatic Data Center, <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>
- United States Department of Agriculture, Natural Resource Conservation Service, <http://www.nrcs.usda.gov/>
- The United States Geological Survey, <http://ny.water.usgs.gov/projects/duration/>
- The New York State Disaster Preparedness Commission. (2012). *New York State Comprehensive Emergency Management Plan: Drought Management Coordination Annex*. Disaster Preparedness Commission .

**Please note:** data obtained from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™) is a county-level hazard data set for the U.S. for 18 different natural hazard event types such as thunderstorms, hurricanes, floods, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data derives from the national data source, National Climatic Data Center's monthly Storm Data publications. Using the latest release of SHELDUS™ 12.0, the database includes every loss causing and/or deadly event between 1960 through 1992 and from 1995 onward. Between 1993 and 1995, SHELDUS™ reflects only events that caused at least one fatality or more than \$50,000 in property or crop damages.



## Section 3.7: Earthquake

### 2014 SHMP Update

- Expanded characteristics section
- Restructured section format
- Updated data, maps, case studies
- Applied new numbering system to hazard profile
- Added local plan vulnerability table listed by counties

### 3.7.1 Earthquake Profile

An earthquake follows sudden movements in the Earth that are caused by abrupt releases of seismic energy accumulated over long periods of time. Forces from plate tectonics help shape the Earth's surface, and when unexpected slips along fault lines occur, changes in the Earth create jolts below the surface causing ground shaking activity. The massive plates slowly move over, under, and past each other at gradual rates. However, sometimes the plates lock together and are unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free, thus, producing an earthquake.

The seismic waves caused by earthquakes can potentially destroy buildings, infrastructure, and cause loss of life. Aftershocks, which follow mainshocks, are normally smaller and can continue for a period of weeks, months, or years after the initial shock hits. In addition to creating ground acceleration, earthquakes can trigger surface faulting, volcanic activity, tsunamis, landslides, and liquefaction depending on the conditions.



## Characteristics

Provided below are some key terms regarding earthquake events. <sup>1</sup>

Hazard	Key Terms and Definition
Earthquake	<ul style="list-style-type: none"> <li>• <u>Earthquake</u>- Both sudden slip on a fault, and the resulting ground shaking and radiated seismic energy caused by the slip, or by volcanic or magmatic activity, or other sudden stress changes in the earth.</li> <li>• <u>Earthquake hazard</u>- Anything associated with an earthquake that may affect the normal activities of people. This includes surface faulting, ground shaking, landslides, liquefaction, tectonic deformation, tsunamis, and seiches.</li> <li>• <u>Earthquake risk</u>- The probable building damage, and number of people that are expected to be hurt or killed if a likely earthquake on a particular fault occurs</li> <li>• <u>Magnitude</u>- A number that characterizes the relative size of an earthquake. Magnitude is based on measurement of the maximum motion recorded by a seismograph.</li> <li>• <u>Velocity</u>- How fast a point on the ground is shaking as a result of an earthquake.</li> <li>• <u>Intensity</u>- A number (written as a Roman numeral) describing the severity of an earthquake in terms of its effects on the earth's surface and on humans and their structures.</li> <li>• <u>Acceleration</u>- Change from one speed, or velocity, to another is called acceleration</li> <li>• <u>Peak Acceleration</u>- The largest acceleration recorded by a particular station during an earthquake</li> <li>• <u>Seismic Waves</u>- Vibrations that travel outward from the earthquake fault at speeds of several miles per second. Although fault slippage directly under a structure can cause considerable damage, the vibrations of seismic waves cause most of the destruction during earthquakes</li> <li>• <u>Aftershocks</u>- Aftershocks are earthquakes that follow the largest shock of an earthquake sequence. They are smaller than the mainshock and within 1-2 rupture lengths distance from the mainshock. Aftershocks can continue over a period of weeks, months, or years. In general, the larger the mainshock, the larger and more numerous the aftershocks, and the longer they will continue.</li> <li>• <u>Epicenter</u>- The point on the earth's surface vertically above the hypocenter (or focus), point in the crust where a seismic rupture begins</li> <li>• <u>Hypocenter</u>- The location beneath the earth's surface where the rupture of the fault begins</li> </ul>



	<ul style="list-style-type: none"> <li>• <i>Fault</i>- A fault is a fracture along which the blocks of crust on either side have moved relative to one another parallel to the fracture.</li> <li>• <i>Seiche</i>- The sloshing of a closed body of water from earthquake shaking.</li> </ul>
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Source: USGS/FEMA

Earthquake intensity and classification are commonly measured using two different scales, the Maximum Modified Mercalli Intensity Scale (MMI) and the Richter Magnitude Scale (often shortened to Richter Scale). The MMI Scale estimates the shaking strength of an earthquake at a specific location, such as the epicenter, or over a specific area by considering its effects on people, objects, and buildings. The strength reduces as the distance from the epicenter increases<sup>2</sup>. The Richter scale uses whole numbers and decimal fractions to quantify the energy released during an earthquake. This determination is based on logarithms from the amplitude of waves recorded by seismographs<sup>3</sup>. **Table 3.7a**, found below, provides ranking and classification definitions for the two scales.

**Table 3.7a: Modified Mercalli Scale vs. Richter Scale**

## Modified Mercalli Scale vs. Richter Scale

Category	Effects	Richter Scale (approximate)
I. Instrumental	Not felt	1-2
II. Just perceptible	Felt by only a few people, especially on upper floors of tall buildings	3
III. Slight	Felt by people lying down, seated on a hard surface, or in the upper stories of tall buildings	3.5
IV. Perceptible	Felt indoors by many, by few outside; dishes and windows rattle	4
V. Rather strong	Generally felt by everyone; sleeping people may be awakened	4.5
VI. Strong	Trees sway, chandeliers swing, bells ring, some damage from falling objects	5
VII. Very strong	General alarm; walls and plaster crack	5.5
VIII. Destructive	Felt in moving vehicles; chimneys collapse; poorly constructed buildings seriously damaged	6
IX. Ruinous	Some houses collapse; pipes break	6.5
X. Disastrous	Obvious ground cracks; railroad tracks bent; some landslides on steep hillsides	7
XI. Very disastrous	Few buildings survive; bridges damaged or destroyed; all services interrupted (electrical, water, sewage, railroad); severe landslides	7.5
XII. Catastrophic	Total destruction; objects thrown into the air; river courses and topography altered	8

Source: <http://www.sms-tsunami-warning.com/pages/mercalli-scale>

<sup>2</sup><http://quake.abag.ca.gov/shaking/mmi/>

<sup>3</sup> [http://earthquake.usgs.gov/learn/glossary/?term=Richter scale](http://earthquake.usgs.gov/learn/glossary/?term=Richter%20scale)



Peak Ground Acceleration (PGA) and Spectral Acceleration (SA) are commonly used in terms of expressing earthquake hazards. As defined by USGS, “PGA (peak acceleration) is what is experienced by a particle on the ground. SA (spectral acceleration) is approximately what is experienced by a building, as modeled by a particle on a massless vertical rod having the same natural period of vibration as the building”.<sup>4</sup> They are measured by the acceleration in gravity (g) or the percent acceleration force of gravity (%g). Mapping both PGA and SA hazards, allows susceptible location to be identified.

**Table 3.7b** entitled “Modified Mercalli Intensity (MMI) and PGA Equivalents” provides the corresponding intensity equivalents in terms of (MMI) as well as perceived shaking and potential damage expected for given values.

**Table 3.7b: Modified Mercalli Intensity (MMI) and PGA Equivalents**

MMI	Acceleration (%g)(PGA)	Perceived Shaking	Potential Damage
I	< .17	Not Felt	None
II	.17 – 1.4	Weak	None
III	.17 – 1.4	Weak	None
IV	1.4 – 3.9	Light	None
V	3.9 – 9.2	Moderate	Very Light
VI	9.2 - 18	Strong	Light
VII	18 – 34	Very Strong	Moderate
VIII	34 – 65	Severe	Moderate to Heavy
IX	65 – 124	Violent	Heavy
X	> 124	Extreme	Very Heavy
XI	> 124	Extreme	Very Heavy
XII	> 124	Extreme	Very Heavy

Source: USGS, 2013

**Note:** Any jurisdiction that has a PGA of 3% or higher, is required by FEMA to fully profile the Earthquake Hazard, in order to receive approval of its Local Hazard Mitigation.

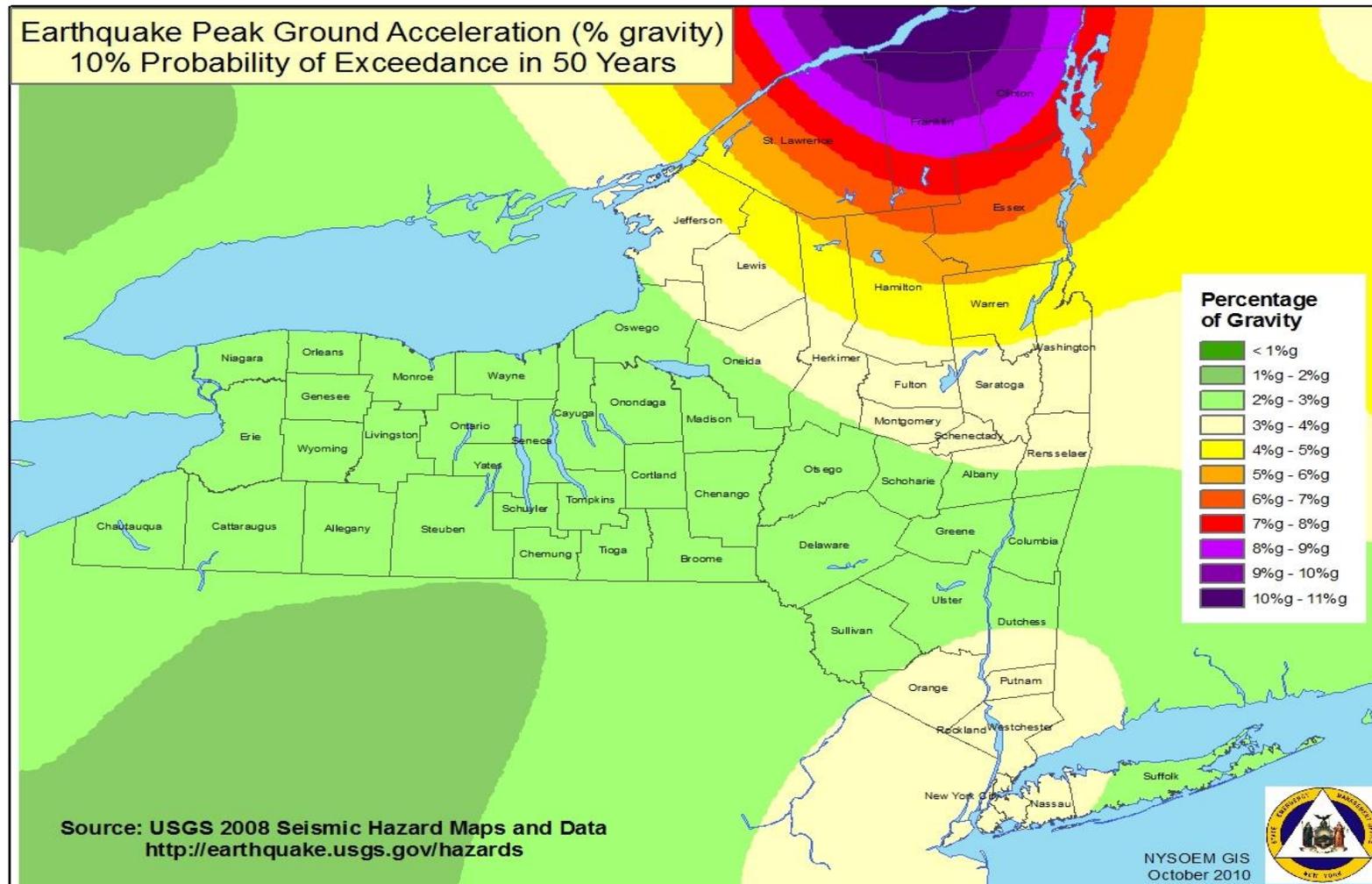
## Location

The potential for Earthquakes exists across New York State and the entire Northeastern side of the United States. Scientific and historical data exists which indicate those areas of the country having a higher risk based on the likelihood of occurrence and the resulting ground motion. An Earthquake Hazard Map, commonly referred to as a %PGA map, for the State of New York State is included in the figure below. **Figure 3.7a** captures the %PGA values for New York State with a 10% chance of being exceeded over a 50 year time period.

<sup>4</sup> [http://earthquake.usgs.gov/learn/glossary/?term=spectral%20acceleration%20\(SA\)](http://earthquake.usgs.gov/learn/glossary/?term=spectral%20acceleration%20(SA))



Figure 3.7a: PGA % Seismic Hazard Map (USGS 2008 Seismic Hazard Map)



*Note: Figure 3.7a map is based on USGS 2008 seismic hazard values. The U.S. Geological Survey updated the National Seismic Hazard Maps by incorporating new seismic, geologic, and geodetic information on earthquake rates and associated ground shaking. These 2008 maps supersede versions released in 1996 and 2002.*



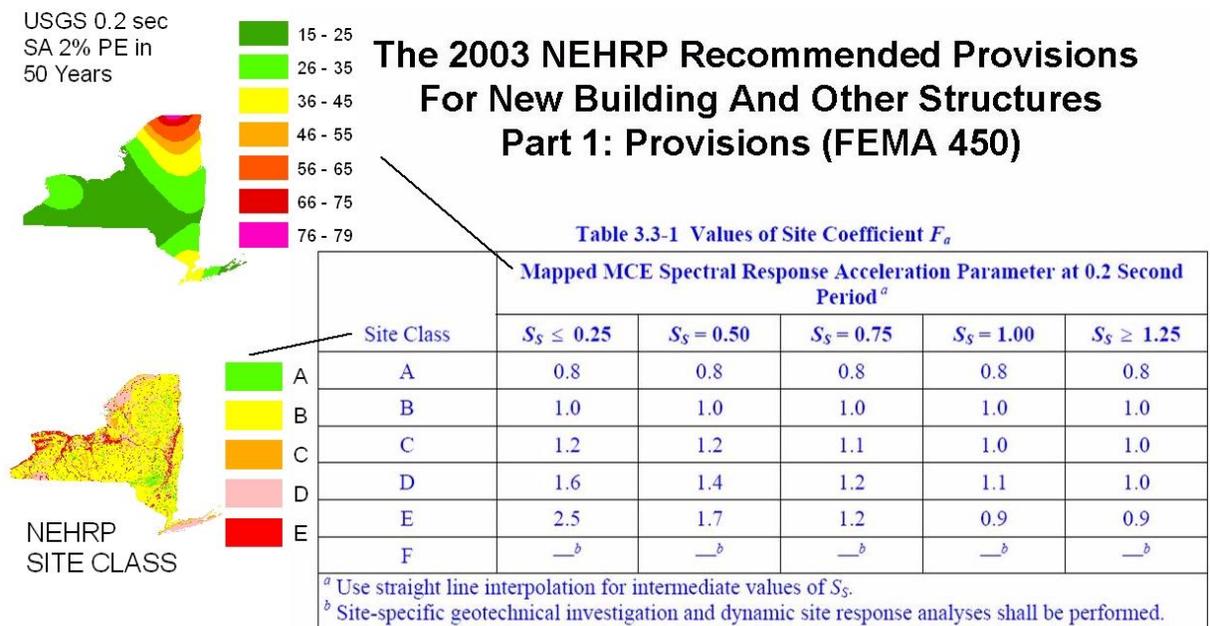
**Figure 3.7a** indicates general regions that have seismic risks that tend to be higher. Those regions include; The North and Northeast third (1/3) of NYS (The North Country/Adirondack Region including a portion of the Greater Albany-Saratoga region). In the USGS 2008 Seismic Hazard Map there was a notable shift in seismic risk as compared to the 2002 mapping. In the 2002 map, the Southeast corner (including the greater NYC area and western Long Island), as well as the Northwest corner (including the City of Buffalo and vicinity) of NY State were also once at risk however no longer pose a threat.

An in depth analysis on measuring %PGA located in the *Data Appendix-Earthquake Section* of the 2014 Update features the case study, “New York State Earthquake Probability That Factors the Effect of Local Soil Conditions: Adjusted USGS 0.2 Second Spectral Acceleration (SA) with 2% Probability of Exceedance in 50 Years”. This study includes maps extracted from the 2011 Hazard Mitigation Plan that displays county level earthquake hazard maps that factor soil conditions. The inclusion of these maps from the 2011 Hazard Mitigation Plan serves as a resource for local planning, and to demonstrate the type of analysis that can be done at the local level. For the sake of the 2014 Hazard Mitigation Plan update, a detailed adjusted spectral acceleration map for each individual county was not completed; however updated and aggregated mapping was done at the state level. A sampling of this case study (**Figure 3.7b, 3.7c**) was used below to assist with explaining the overlaid mapping feature to determine the NEHRP Soil Classification map used in **Figure 3.7a**.

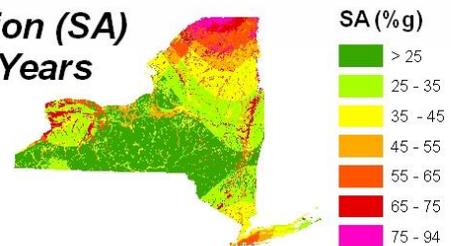
This classification of the State’s surficial geologic materials by NEHRP soil site class has enabled the effect of soils to be factored with the USGS seismic hazard maps to give an adjusted, more regionally refined picture, of the State’s earthquake hazard based. The level of adjustment to USGS map is based on use of the NEHRP’s soil site coefficients for each soil class, which varies according to the USGS mapped accelerations. The reference for the appropriate coefficient is found in “The 2003 NEHRP Recommended Provisions for New Building and Other Structures – Part: Provisions (FEMA 450). These coefficients provide the level of increase or decrease to the USGS’s seismic hazard map spectral accelerations. See **Figure 3.7b** below.



**Figure 3.7b: The 2003 NEHRP Recommended Provisions for New Building and Other Structures**



**Adjusted USGS 0.2 sec Spectral Acceleration (SA) with a 2% Probability of Exceedance in 50 Years Based on Soil Site Class and Acceleration Parameter Coefficients**



A review of the adjusted maps that factor soil conditions will show some areas of the state with a significantly higher hazard than is shown on the USGS map. A special note for building officials, this analysis is to be used for hazard modeling not construction design.





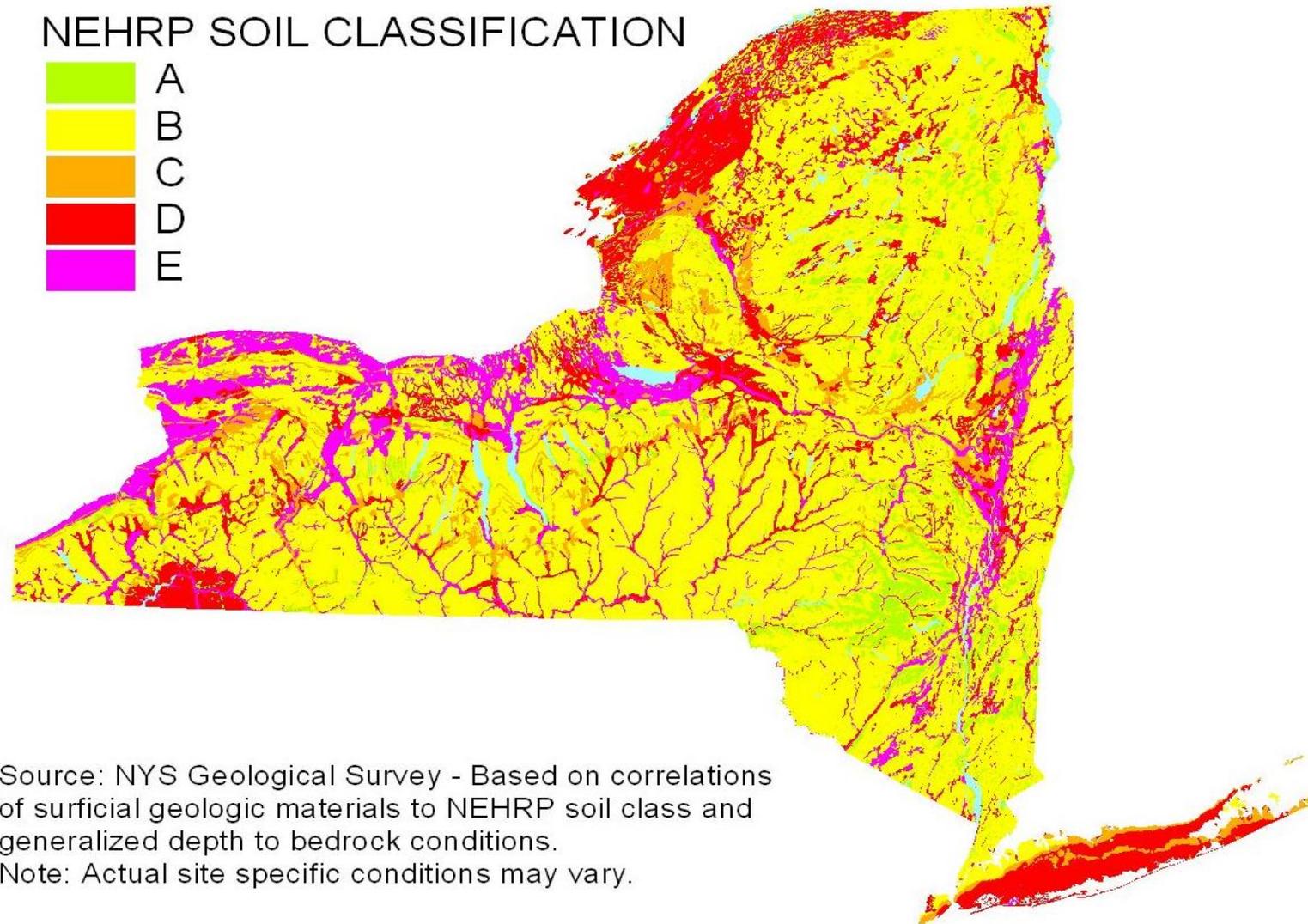
**Table 3.7c: Five Soil Classes**

SOIL CLASSIFICATION	TYPES OF SOIL
<b>A</b>	Very hard rock (e.g., granite, gneisses; and most of the Adirondack Mountains)
<b>B</b>	Rock (sedimentary) or firm ground
<b>C</b>	Stiff Clay
<b>D</b>	Soft to medium clays or sands
<b>E</b>	Soft soil (including fill, loose sand, waterfront, lake bed clays)

**Figure 3.7b** displays the NEHRP Map that includes the five soil classifications found throughout the State that range from hard rock to soft soil. The figure illustrates the regions that generally have higher seismic risk.



**Figure 3.7d: NEHRP Soil Classification Map**



Source: NYS Geological Survey - Based on correlations of surficial geologic materials to NEHRP soil class and generalized depth to bedrock conditions.  
Note: Actual site specific conditions may vary.



Overlaying the NEHRP soil classes map with the Percent Peak Ground Acceleration (%PGA) map, provides a clearer indication of the areas that may experience an amplification of ground motion and higher risk at a given magnitude. For instance, areas of New York State that would experience an amplification of ground motion during seismic activity according to the NEHRP soil classification map would include but not be limited to the following:

- Northwest New York - Northern Erie County, North Central
- Northeast NY - Jefferson, St. Lawrence, and Northern Franklin Counties
- Upper Hudson River area of Eastern NY - Northern Saratoga, Washington and Southern Warren Counties
- Southeastern NY- Western Nassau County, and New York City

The %PGA is a common earthquake measurement that shows three things: the geographic area affected (all colored areas on the map), the probability of an earthquake of each given level of severity (10% chance in 50 years), and the strength of ground movement (severity) expressed in terms of percent of the acceleration force of gravity (%g) (the PGA is indicated by color).

### Previous Earthquake Occurrences

**Figure 3.7e** shows historical earthquake events and the associated magnitude for the New York State. During the period of 1973 to 2012, there were eight events of Magnitude 4 or higher. The greatest event during this period was a Magnitude 5.2 that occurred in April 2002 in Clinton County. Magnitudes 1 through 3 earthquake events dominate this time frame.





**Table 3.7d** shows the total count of earthquake events for each county during the period of 1973 through 2012. Albany County has the highest number of events with 41 occurrences, followed by Essex and Clinton Counties. These numbers indicate where areas of historically higher earthquake activity occur.

**Table 3.7d: Historical Earthquake Occurrences by County**

County	No. of Earthquakes	County	No. of Earthquakes	County	No. of Earthquakes
Albany	41	Herkimer	1	Richmond	0
Allegany	0	Jefferson	1	Rockland	2
Bronx	0	Kings	0	Saratoga	1
Broome	0	Lewis	4	Schenectady	2
Cattaraugus	0	Livingston	6	Schoharie	2
Cayuga	0	Madison	0	Schuyler	0
Chautauqua	0	Monroe	0	Seneca	0
Chemung	0	Montgomery	0	St Lawrence	6
Chenango	0	Nassau	0	Steuben	2
Clinton	15	New York	2	Suffolk	1
Columbia	0	Niagara	4	Sullivan	0
Cortland	0	Oneida	0	Tioga	0
Delaware	0	Onondaga	0	Tompkins	0
Dutchess	6	Ontario	0	Ulster	0
Erie	6	Orange	12	Warren	4
Essex	19	Orleans	0	Washington	2
Franklin	13	Oswego	0	Wayne	0
Fulton	4	Otsego	2	Westchester	13
Genesee	0	Putnam	4	Wyoming	7
Greene	0	Queens	0	Yates	0
Hamilton	7	Rensselaer	0	<b>Total</b>	<b>189</b>

Source: USGS

**Table 3.7e** below lists significant earthquakes in New York State according to the NYS Geological Survey data. (Note: this table does not cover every event from 1737-2005, only those mentioned in the 2006 NYS Statistical Yearbook)



Table 3.7e: Earthquake History of New York State 1737-2005

Earthquake History Throughout New York State 1737-2005			
Date	Location	Size	Damage Estimates
December 18, 1737	New York City	5.2	Bells rang, several chimneys fell
January 16, 1840	Herkimer	3.7	No reference and/or No damage reported
September 2, 1847	Offshore NYC	3.5	No reference and/or No damage reported
September 9, 1848	Rockland Lake	V	Felt by many
March 12, 1853	Lowville	VI	Machinery knocked over
February 7, 1855	Saugerties <sup>1</sup>	VI	Cryoseism <sup>2,3</sup>
October 23, 1857	Buffalo (Lockport <sup>1</sup> )	4.0	Bells rang, crocks fell from shelves
December 18, 1867	Canton	4.7	Sleepers awakened
December 11, 1874	Tarrytown	3.4	No reference and/or No damage reported
November 4, 1877	Lyon Mountain <sup>1</sup>	VII	Chimneys down, walls cracked, window damaged, crocks overturned
August 10, 1884	New York Bight (NYC)	5.2	Chimneys and bricks fell, walls cracked
May 28, 1897	Dannemora	4.5	No reference and/or No damage reported
February 3, 1916	Schenectady	3.8	Broke windows, people thrown out of bed
March 18, 1928	Saranac Lake	4.0	No reference and/or No damage reported
August 12, 1929	Attica	5.2	250 chimneys fell, brick buildings damaged, Attica prison walls, wells went dry
April 20, 1931	Warrensburg	4.8	Chimneys fell, church spire twisted
April 15, 1934	Dannemora	3.9	House shifted
July 9, 1937	Brooklyn <sup>1</sup>	3.5	No reference and/or No damage reported
September 5, 1944	Cornwall, Ontario/Massena, NY	5.8	Nearly all chimneys fell, buildings damaged, \$2 million damage
September 5, 1944	Cornwall, Ontario/Massena, NY	4.5	Chimneys destroyed, houses damaged
September 3, 1951	Rockland County	3.6	No reference and/or No damage reported
January 1, 1966	Attica	4.7	Chimneys and walls damaged



Earthquake History Throughout New York State 1737-2005			
Date	Location	Size	Damage Estimates
June 13, 1967	Attica	3.9	Chimneys and walls damaged
May 23, 1971	Blue Mountain Lake	4.1	No reference and/or No damage reported
May 23, 1971	Blue Mountain Lake	3.5	No reference and/or No damage reported
June 7, 1974	Wappingers Falls	3.0	Windows broken
June 9, 1975	Plattsburgh (Altona)	3.5	Chimneys and fireplaces cracked
November 3, 1975	Raquette Lake	4.0	No reference and/or No damage reported
February 2, 1983	Scarsdale-Lagrangeville	3.0	Chimneys cracked
October 7, 1983	Goodnow, Adirondack Mountains	5.1	Tombstones rotated, some cracked chimneys, windows broken, walls damaged
October 19, 1985	Ardsley	4.0	Windows broken, walls damaged
June 17, 1991	Richmondville	4.0	No reference and/or No damage reported
March 10, 1992	East Hampton, Suffolk County	4.1	No reference and/or No damage reported <sup>2</sup>
April 20, 2000	Newcomb	3.8	Aftershock of the 1983 event. No damage reported
April 20, 2002	Au Sable Forks	5.1	Cracked walls, chimneys fell, road collapsed, power outages
May 24, 2002	Au Sable Forks	3.1	Aftershock of the April 20, 2002 event, no damage reported

Source: NYS Statistical Yearbook 2006, 1=Location Unknown, 2=Damage Uncertain, 3=Frostquake

Records indicate from 1973 to 2012 there were only two (2) damaging earthquakes in the State of New York with an intensity of 5 or greater on the MMI Scale. The Massachusetts Institute of Technology Earth Research Laboratory concludes that, “....more than 400 earthquakes with magnitude greater than 2.0 have occurred in New York State between 1730 and 1986.” The study, “*Do Earthquakes Occur in New York State?*” referenced by the *New York City Emergency Management (NYCEM)*, also supports existence of seismic hazards in NYS mentioning, “This (data) ranks New York as having the third highest earthquake activity level east of the Mississippi during this period; only South Carolina and Tennessee were more seismically active.”

According to a U.S. Department of Commerce Study, “*Earthquake History of the United States*”, there is record of seismic activity in New York State dating back as far as 1737, with a December 18<sup>th</sup> occurrence in the New York City area. The earthquake reached a Modified Mercalli Intensity (MMI) VII, meaning the quake was capable of having very strong shaking



and moderate damage. The %PGA equivalent to a quake of that magnitude ranges from 10-34% gravity. This New York City earthquake which reportedly caused chimneys to fall is estimated to have had a 4.5 Richter magnitude, and is one of two (2) major earthquakes on record.

On April 20, 2002, in the Northeast portion of the State, a damaging earthquake reaching a magnitude of 5.1 on the Richter scale was recorded. Dubbed the North Country or Ausable Forks Earthquake, this quake caused a widespread of light to moderate damage. This tremor resulted in a Presidential Disaster Declaration (DR-1415) and over \$2 million dollars in eligible damage. **Table 3.7f** represents the 2002 Presidential Declaration for the 2002 quake affecting Washington, Warren, Hamilton, Franklin, Essex, and Clinton Counties.

**Table 3.7f: New York State Declared Earthquake Disasters from 1950-2012**

New York State Declared Earthquake Disasters from 1950-2012	
Disaster # and Date	Counties Affected
FEMA: DR: 1415, 5/16/2002	Washington, Warren, Hamilton, Franklin, Essex, and Clinton

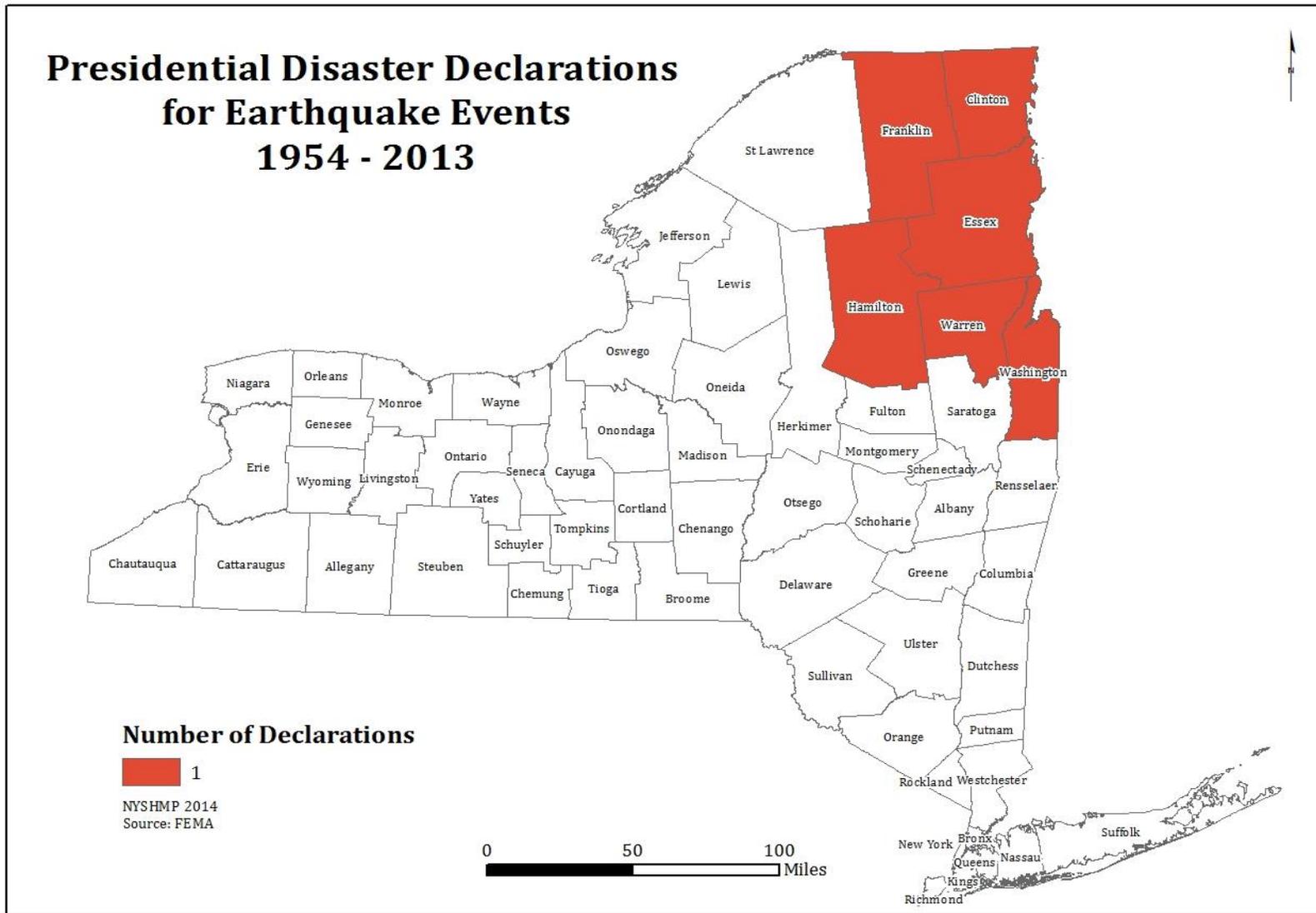
Source: FEMA

One of the more recent damage causing earthquakes was reported on August 23, 2011, in New York City as a result of a 5.8 magnitude quake that originated in Mineral, Virginia, just northwest of Richmond. Precautionary evacuations had taken place at John F. Kennedy International Airport, Newark Liberty International Airport and briefly at City Hall, however there were no documented injuries reported. Minor damage was reported from Brooklyn's housing development in Red Hook West Houses where partial chimneys collapsed in one of the community buildings. Other notable earthquakes were felt in Western New York on June 23, 2010 and then again this year in Northern New York on May 17, 2013; both of which originated in Canada with tremors reaching 5.0 or greater magnitudes.

**Figure 3.7f** indicates the counties that have had Presidential Disaster Declarations from 1954 to 2013. Counties with the greatest number of earthquake declarations are concentrated in northeastern New York.



Figure 3.7f: Presidential Disaster Declarations



Following the April 20th, 2002 event there were recordings of four aftershocks that hit the region; these were recorded as follows:

- **M 4.0** at 7:04 a.m., April 20
- **M 1.7** at 7:08 a.m., April 20
- **M 2.9** at 7:45 a.m., April 20
- **M 2.2** at 7:47 a.m., April 21
- **M 2.3** at 7:49 a.m., April 21

The only additional noteworthy event found was an earthquake of a 2.5 magnitude that occurred on June 03, 2010 in the Massena, New York area. This event was reported to be felt throughout various areas of the State.

### Probability of Future Earthquake Events

Although there's a 100 percent chance at any given moment for an earthquake to occur, many people may never experience a quake. Oftentimes the seismic waves are so light that they can only be detected by exceptionally sensitive instruments. According to USGS, there are an estimated 700 shocks each year with the capability of shaking homes, rattling windows, displacing objects, or even strong enough to cause property damage, death, and injury. Fortunately, many of these potentially devastating earthquakes are centered in unpopulated areas far removed from civilization.



Source: New York State DHSES

With advances in technology and earthquake study, future predictive studies may use recognized scientific methods as well as simple historic frequency to show future potential. Using historical information to predict future occurrences, it was determined that NYS can expect damaging earthquake events on average only once every 22 years.

Furthermore, earthquakes are more likely to occur within one of the three (3) regions identified previously. The NYSGS study by W. Mitronovas, "Earthquake Hazard in New York State" describes the probability of in the following terms,

*"...at present an earthquake of magnitude 3.5 to 4 occurs, on the average, every 3 years somewhere in the State. Such earthquakes do not cause any appreciable damage (except for cracks in plaster, perhaps) but are large enough to be felt strongly by many people near the epicenter."*



Additionally, according to an article in the *CompuServe New York Magazine Online Cover* titled “New York Earthquake: The Quake Next Time-Waiting for the Big One” by Graver, Fred, Charlie Rubin, as referred to in the NYCEM Year Two study, “Geologists predict that an earthquake of magnitude 5.0 [some sources describe 5.0 as moderately destructive] or above on the Richter scale has a 2% probability of occurring in the New York area within the next 50 years.”

In summary, the frequency of damaging earthquakes within and adjacent to New York State has been relatively low. However, the fact that large, damaging earthquakes have occurred here in the past, combined with the State's high population density and number of old, deteriorating buildings suggests that many people are at risk from damaging earthquakes in New York State.

### 3.7.2 Assessing Earthquake Vulnerability by Jurisdiction

#### Earthquake Impact Analysis

The potential of an earthquake, although a very rare occurrence in this geographical region, exist across the entire State of New York. It is important for an evaluation of the assets that are exposed or vulnerable to this hazard and any other hazard to be identified. Earthquakes typically occur with little to no warning and can have a direct or indirect impact on:

- Life, safety and health of residents;
- Building stock;
- Critical facilities;
- The Economy;
- Future growth and development

The extent of damage caused by earthquakes depends on population density as well as building and infrastructure construction in affected areas. Soil type, buildings age and building codes may assist in determining areas that are more vulnerable than others. The impacts on population, existing structures, transportation, and the economy within the State are presented in a subsequent section for eight probabilistic earthquake events.

**Table 3.7g** displays vulnerable populations found within seismic zones listed by county. **Figure 3.7f** illustrates New York State's seismic zones that are referenced in the table below.



Table 3.7g: Populations at Risk in Earthquake Seismic Zones by County

Population at Risk in Earthquake Seismic Zones by County							
Spectral Acceleration (%g)							
8-16		16-20		20-24		24-28	
Allegany	41,873	Albany	304,204	Dutchess	138,727	Essex	12
Broome	200,600	Allegany	7,073	Erie	852,540	Hamilton	1,859
Cattaraugus	62,637	Cattaraugus	17,680	Fulton	43,877	Herkimer	1,515
Cayuga	80,026	Chautauqua	8,290	Genesee	46,694	Jefferson	2,111
Chautauqua	126,615	Columbia	63,096	Hamilton	513	Kings	580,436
Chemung	88,830	Delaware	759	Herkimer	2,538	Lewis	3,109
Chenango	50,477	Dutchess	158,755	Jefferson	51,160	Nassau	1,185,712
Cortland	49,336	Erie	66,495	Lewis	22,159	Orange	28,953
Delaware	47,221	Fulton	11,654	Montgomery	2,294	Putnam	17,689
Greene	287	Genesee	13,385	Nassau	148,181	Queens	871,793
Herkimer	673	Greene	48,934	Niagara	209,231	Richmond	184,943
Livingston	7,038	Herkimer	59,528	Oneida	6,605	Rockland	241,882
Madison	73,442	Jefferson	62,952	Orange	305,496	Saratoga	671
Monroe	239,157	Lewis	1,797	Orleans	9,613	St. Lawrence	3,662
Oneida	22,298	Livingston	58,355	Putnam	82,021	Suffolk	25,457
Onondaga	467,026	Monroe	505,108	Saratoga	125,823	Warren	15,129
Ontario	102,669	Montgomery	47,925	Schenectady	12	Washington	6,102
Oswego	111,359	Niagara	7,126	Suffolk	729,727	Westchester	358,219
Otsego	50,002	Oneida	205,975	Ulster	8,606		
Schoharie	124	Ontario	5,262	Warren	43,349		
Schuyler	18,343	Orange	38,359	Washington	49,523		
Seneca	35,251	Orleans	33,270	Westchester	3,958		
Steuben	98,988	Oswego	10,747	Wyoming	22,107		
Suffolk	124,839	Otsego	12,257				
Sullivan	21,485	Rensselaer	159,429				
Tioga	51,125	Saratoga	93,113				
Tompkins	101,564	Schenectady	154,715				
Ulster	934	Schoharie	32,625				
Wayne	93,716	Suffolk	612,081				



Population at Risk in Earthquake Seismic Zones by County							
Spectral Acceleration (%g)							
8-16		16-20		20-24		24-28	
<b>Yates</b>	25,348	<b>Sullivan</b>	56,062				
		<b>Ulster</b>	172,953				
		<b>Washington</b>	7,591				
		<b>Wyoming</b>	20,048				

Population at Risk in Earthquake Seismic Zone by County							
Spectral Acceleration (%g)							
28-32		32-36		36-40		40-60	
<b>Bronx</b>	1,384,838	<b>Essex</b>	7,499	<b>Essex</b>	5,712	<b>Clinton</b>	82,128
<b>Essex</b>	8,912	<b>Hamilton</b>	1,239	<b>Franklin</b>	172	<b>Essex</b>	17,235
<b>Hamilton</b>	1,094	<b>St. Lawrence</b>	17,555	<b>Hamilton</b>	131	<b>Franklin</b>	51,427
<b>Herkimer</b>	265			<b>St. Lawrence</b>	12,638	<b>St. Lawrence</b>	64,164
<b>Kings</b>	1,923,994						
<b>Lewis</b>	22						
<b>Nassau</b>	4,458						
<b>New York</b>	1,585,229						
<b>Queens</b>	1,358,499						
<b>Richmond</b>	283,068						
<b>Rockland</b>	69,798						
<b>St. Lawrence</b>	13,925						
<b>Warren</b>	7,229						
<b>Washington</b>	0						
<b>Westchester</b>	586,183						



## Local Plan Integration/ Risk Assessments

Since August 2013, 56 FEMA-approved local hazard mitigation plans (LHMP) have been reviewed for the 2014 Update. The State's planning team had the opportunity to review local county risk assessments to help the State better understand its vulnerability in terms of the jurisdictions most threatened by classified hazards. In its analysis, the State of New York reviewed the processes of local governments and how their hazards were ranked based on their jurisdictions and the potential losses (i.e., people, buildings, and dollar values) associated with the hazards of greatest concern.

Where data was available, the State extracted the ranking impact information from the LHMP hazard analysis. This ranking feature is based on a combination of probability, severity, and extent of the hazard and was determined to be the best measure of overall risk in the plans. This ranking was either numeric or described in terms of high, moderately high, moderate, or low. In cases where this information was not available, ranking values were not determined yet considered if identified in the individual county local plans.

For the sake of the 2014 Update, a proper analysis and summary of the data was required. During the review of the local plan risk assessments, all rankings used were based on the New York HAZNY ranking system, and measured on a scale rating from 44 (low) to 400 (high). This analysis revealed that selected county-level plans did include manmade hazards in their analysis, but the State hazard mitigation plan's 2014 Update focused solely on natural hazards.

The local risk assessment summary allowed for an analysis of which hazards are of high concern to particular counties. **Table 3.2a** in **Section 3.2** lists all the hazards and the number of counties that ranked them at each of the scale levels: High, Moderately High, Moderate, Moderately Low, and Low. According to the plans reviewed, 49 counties recognized earthquake as a hazard. No counties within NYS identified earthquake as a high hazard, six counties considered it a moderately high hazard, one ranked it a moderate hazard, fourteen ranked it moderately low, and fifteen considered it a low hazard. **Table 3.7f** displays the highest ranked county hazard impacts and the high and / or moderately high ranked risk assessment scores for Earthquake.



**Table 3.7h: Summary of Earthquake Hazard Impacts and Rankings by County**

Local County Earthquake Impacts
No SHELDUS data

Source: New York State Emergency Management Office

Local County Earthquake Hazard Rankings	
High	Moderately High
N/A	Allegany "Western Region", Niagara, Orleans, Oswego, Rensselaer, and Westchester

Source: LHMP

### Hazus- MH2 Analysis

This section presents the results of New York State Emergency Management Office's (now New York State Office of Emergency Management) Hazus-MH 2.1 based county level earthquake loss estimates. Included are results from a 2004 study and a 2008 study. It provides a useful method to quantify and compare the relative earthquake risk of New York State counties through an annualized loss estimation methodology, which is still a valid methodology for the 2014 Update.

*Note: Difference in estimates of total annualized losses for New York State counties between NYSEMO's 2004 and 2008 studies is due to software changes between HAZUS-MH versions and the use of soil site conditions that were incorporated into the 2008 study as opposed to the use of HAZUS software default "D" NEHRP soil class used in the 2004 study. The differences in total state annualized losses found in the FEMA 2008 "HAZUS-MH Estimated Annualized Earthquake Losses for the United States" and the 2008 NYSEMO study are due to use of local soils conditions in the NYSEMO study as opposed to default soils used in the FEMA study.*

The Hazus-MH methodology factors both the variation in earthquake hazards and the magnitude in the built environment. For example, annualized loss allows the comparison of risk between states having areas of high potential for earthquakes with average lower population densities to states having regions of lower probability for earthquakes with high population densities. The *annualized loss* methodology combines the estimated losses associated with ground shaking for eight return periods: 100, 250, 500, 750, 1000, 1500, 2000, 2500-year, which are based on values from the USGS seismic probabilistic curves. The aggregation of these losses and exceedance probabilities are then annualized providing the estimated cost of earthquakes to a state each year.

**Table 3.7i** provides the breakdown of annualized losses, extracted from the Hazus probabilistic earthquake run. The top counties with the highest total annualized losses include: New York, Kings, Queens, Nassau, and Westchester.



Table 3.7i: Hazus-MH Earthquake Loss Estimation by County

County	Structural Damage	Non Structural Damage	Contents Damage	Inventory Loss	Relocation Loss	Capital Related Loss	Wage Loss	Rental Income Loss	Total Loss
Albany	\$171	\$501	\$165	\$4	\$128	\$58	\$83	\$76	\$1,186
Allegany	\$10	\$26	\$8	\$0	\$7	\$2	\$3	\$3	\$58
Bronx	\$582	\$2,475	\$840	\$9	\$303	\$105	\$139	\$265	\$4,718
Broome	\$45	\$122	\$35	\$1	\$33	\$13	\$18	\$18	\$285
Cattaraugus	\$18	\$51	\$16	\$1	\$13	\$4	\$6	\$6	\$114
Cayuga	\$19	\$51	\$14	\$1	\$13	\$5	\$7	\$6	\$116
Chautauqua	\$30	\$88	\$29	\$1	\$20	\$9	\$13	\$11	\$200
Chemung	\$16	\$42	\$12	\$1	\$12	\$5	\$8	\$6	\$103
Chenango	\$13	\$34	\$10	\$0	\$10	\$3	\$4	\$4	\$79
Clinton	\$168	\$544	\$202	\$7	\$115	\$45	\$67	\$57	\$1,205
Columbia	\$28	\$77	\$24	\$1	\$18	\$7	\$11	\$9	\$173
Cortland	\$11	\$30	\$9	\$0	\$8	\$3	\$5	\$4	\$70
Delaware	\$16	\$42	\$12	\$0	\$11	\$3	\$6	\$5	\$96
Dutchess	\$122	\$376	\$126	\$3	\$69	\$31	\$42	\$37	\$806
Erie	\$368	\$1,257	\$479	\$16	\$238	\$97	\$132	\$146	\$2,734
Essex	\$62	\$209	\$72	\$2	\$47	\$21	\$31	\$26	\$470
Franklin	\$109	\$368	\$134	\$3	\$80	\$24	\$39	\$38	\$795
Fulton	\$30	\$88	\$28	\$1	\$22	\$7	\$10	\$11	\$197
Genesee	\$23	\$73	\$29	\$2	\$16	\$6	\$9	\$7	\$165
Greene	\$19	\$55	\$16	\$0	\$13	\$5	\$8	\$7	\$123
Hamilton	\$11	\$35	\$11	\$0	\$8	\$2	\$4	\$4	\$76
Herkimer	\$29	\$85	\$27	\$1	\$22	\$9	\$12	\$11	\$196
Jefferson	\$71	\$201	\$60	\$2	\$48	\$21	\$31	\$28	\$460
Kings	\$1,128	\$4,734	\$1,666	\$28	\$590	\$210	\$295	\$492	\$9,143
Lewis	\$17	\$49	\$16	\$1	\$12	\$3	\$6	\$5	\$108
Livingston	\$18	\$53	\$18	\$1	\$12	\$4	\$6	\$6	\$117
Madison	\$22	\$57	\$17	\$1	\$14	\$6	\$8	\$7	\$131
Monroe	\$230	\$687	\$228	\$7	\$152	\$68	\$97	\$83	\$1,551
Montgomery	\$23	\$69	\$23	\$1	\$18	\$6	\$10	\$9	\$160
Nassau	\$884	\$3,002	\$1,190	\$19	\$442	\$221	\$295	\$223	\$6,276
New York	\$1,574	\$6,204	\$2,432	\$34	\$842	\$543	\$617	\$712	\$12,958



County	Structural Damage	Non Structural Damage	Contents Damage	Inventory Loss	Relocation Loss	Capital Related Loss	Wage Loss	Rental Income Loss	Total Loss
Niagara	\$78	\$266	\$101	\$4	\$50	\$21	\$29	\$28	\$577
Oneida	\$97	\$275	\$83	\$3	\$68	\$29	\$40	\$40	\$634
Onondaga	\$152	\$422	\$128	\$4	\$111	\$45	\$64	\$59	\$985
Ontario	\$29	\$81	\$26	\$1	\$19	\$9	\$12	\$10	\$187
Orange	\$171	\$537	\$197	\$5	\$98	\$43	\$62	\$52	\$1,165
Orleans	\$13	\$39	\$14	\$1	\$8	\$3	\$4	\$4	\$87
Oswego	\$36	\$96	\$27	\$1	\$27	\$9	\$13	\$12	\$221
Otsego	\$21	\$55	\$15	\$0	\$15	\$6	\$9	\$7	\$127
Putnam	\$49	\$162	\$58	\$1	\$25	\$9	\$13	\$11	\$329
Queens	\$1,011	\$4,114	\$1,449	\$20	\$516	\$171	\$235	\$394	\$7,910
Rensselaer	\$65	\$201	\$63	\$1	\$51	\$16	\$23	\$25	\$446
Richmond	\$251	\$943	\$343	\$4	\$123	\$45	\$60	\$79	\$1,847
Rockland	\$193	\$667	\$260	\$5	\$103	\$48	\$67	\$56	\$1,400
Saratoga	\$107	\$321	\$103	\$2	\$77	\$32	\$42	\$38	\$722
Schenectady	\$97	\$282	\$106	\$7	\$64	\$26	\$31	\$38	\$651
Schoharie	\$12	\$34	\$10	\$0	\$9	\$3	\$4	\$4	\$76
Schuyler	\$4	\$10	\$3	\$0	\$3	\$1	\$1	\$1	\$23
Seneca	\$8	\$20	\$6	\$0	\$5	\$2	\$2	\$2	\$46
St Lawrence	\$178	\$585	\$206	\$5	\$125	\$44	\$72	\$62	\$1,276
Steuben	\$20	\$53	\$16	\$1	\$15	\$5	\$8	\$7	\$123
Suffolk	\$691	\$2,127	\$793	\$21	\$341	\$159	\$210	\$169	\$4,512
Sullivan	\$32	\$93	\$27	\$1	\$20	\$7	\$11	\$12	\$203
Tioga	\$9	\$22	\$6	\$0	\$6	\$2	\$3	\$3	\$51
Tompkins	\$21	\$57	\$15	\$0	\$14	\$6	\$9	\$8	\$131
Ulster	\$76	\$219	\$70	\$2	\$47	\$21	\$28	\$27	\$489
Warren	\$61	\$190	\$64	\$2	\$44	\$29	\$36	\$27	\$452
Washington	\$33	\$96	\$31	\$1	\$23	\$8	\$12	\$11	\$216
Wayne	\$29	\$70	\$22	\$1	\$17	\$6	\$9	\$8	\$161
Westchester	\$641	\$2,308	\$894	\$17	\$349	\$168	\$221	\$210	\$4,807
Wyoming	\$14	\$40	\$15	\$1	\$9	\$3	\$5	\$4	\$91
Yates	\$6	\$17	\$5	\$0	\$4	\$1	\$2	\$2	\$38

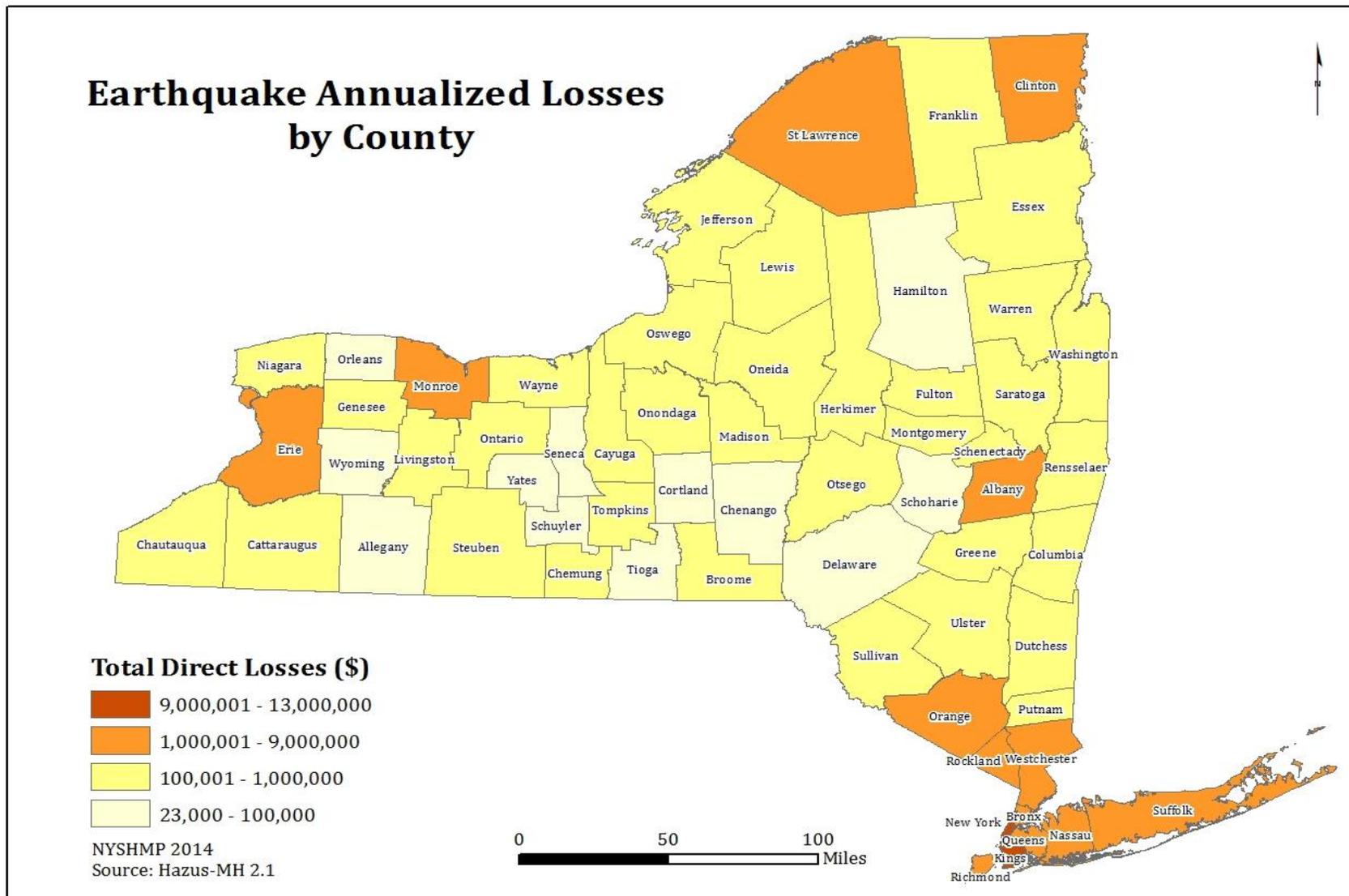
Source: Hazus-MH 2.1, Values are in thousands of dollars



**Figure 3.7g** shows total annualized losses by county for New York from a Hazus<sup>®MH</sup> probabilistic earthquake hazard run. The annualized loss total is the sum of direct building losses from capital stock and income losses. New York, Kings, and Queens Counties make up the top three counties with the highest annualized losses.



Figure 3.7g: Earthquake Annualized Losses by County



Hazus-MH was used to provide earthquake building and transportation loss estimates for the State of New York. The National Earthquake Hazard Reduction Program (NEHRP) soil classification for New York was incorporated for this earthquake run. **Table 3.7j** provides building inventory value for the counties of New York State. Kings, Queens, Suffolk, New York, and Nassau Counties, the highest ranked in estimated losses, would potentially lose a total of \$834,697 in both residential and non-residential building loss. The results below use default data to generate loss estimates; with values provided in millions of dollars.

**Table 3.7j: Building Inventory Value (millions of dollars)**

County	Residential	Non Residential	Total
Albany	\$18,615	\$9,473	\$28,088
Allegany	\$2,508	\$747	\$3,255
Bronx	\$66,088	\$16,837	\$82,925
Broome	\$10,978	\$4,475	\$15,453
Cattaraugus	\$4,580	\$1,711	\$6,292
Cayuga	\$4,286	\$1,386	\$5,672
Chautauqua	\$8,034	\$3,218	\$11,252
Chemung	\$4,352	\$1,918	\$6,271
Chenango	\$2,403	\$1,001	\$3,404
Clinton	\$3,862	\$1,555	\$5,417
Columbia	\$4,269	\$1,254	\$5,523
Cortland	\$2,416	\$1,049	\$3,466
Delaware	\$3,069	\$859	\$3,929
Dutchess	\$18,637	\$5,327	\$23,964
Erie	\$60,331	\$22,488	\$82,819
Essex	\$2,512	\$659	\$3,171
Franklin	\$2,511	\$784	\$3,295
Fulton	\$3,136	\$961	\$4,098
Genesee	\$3,301	\$1,572	\$4,874
Greene	\$3,242	\$776	\$4,019
Hamilton	\$777	\$120	\$897
Herkimer	\$3,411	\$1,085	\$4,496
Jefferson	\$6,251	\$1,976	\$8,228
Kings	\$132,670	\$37,601	\$170,272
Lewis	\$1,576	\$381	\$1,958
Livingston	\$3,338	\$1,183	\$4,521
Madison	\$3,665	\$1,216	\$4,882
Monroe	\$45,990	\$17,076	\$63,067



County	Residential	Non Residential	Total
Montgomery	\$2,470	\$1,004	\$3,475
Nassau	\$111,337	\$36,901	\$148,238
New York	\$114,968	\$83,932	\$198,901
Niagara	\$13,437	\$4,511	\$17,949
Oneida	\$12,862	\$4,368	\$17,230
Onondaga	\$27,936	\$12,253	\$40,190
Ontario	\$6,102	\$2,396	\$8,498
Orange	\$22,097	\$7,794	\$29,892
Orleans	\$2,239	\$751	\$2,990
Oswego	\$5,932	\$2,020	\$7,953
Otsego	\$3,392	\$1,057	\$4,450
Putnam	\$7,746	\$1,499	\$9,246
Queens	\$130,195	\$28,411	\$158,606
Rensselaer	\$8,846	\$2,825	\$11,671
Richmond	\$32,372	\$6,519	\$38,892
Rockland	\$20,466	\$6,625	\$27,091
Saint Lawrence	\$5,390	\$1,606	\$6,996
Saratoga	\$11,741	\$3,408	\$15,149
Schenectady	\$9,138	\$5,606	\$14,745
Schoharie	\$1,814	\$455	\$2,270
Schuyler	\$972	\$352	\$1,325
Seneca	\$1,800	\$583	\$2,383
Steuben	\$5,060	\$1,996	\$7,057
Suffolk	\$118,835	\$39,844	\$158,680
Sullivan	\$6,175	\$1,498	\$7,674
Tioga	\$2,512	\$722	\$3,234
Tompkins	\$5,109	\$1,950	\$7,060
Ulster	\$11,496	\$3,922	\$15,418
Warren	\$4,410	\$1,550	\$5,961
Washington	\$3,048	\$821	\$3,869
Wayne	\$5,272	\$2,177	\$7,449
Westchester	\$67,540	\$23,665	\$91,206
Wyoming	\$2,197	\$831	\$3,028
Yates	\$1,530	\$546	\$2,076
<b>Total</b>	<b>\$1,213,244</b>	<b>\$433,086</b>	<b>\$1,646,360</b>

Source: Hazus-MH 2.1



**Table 3.7k** provides earthquake building loss estimates for specific occupancy types for the State of New York. Loss estimates include income and capital-related categories. Total building-related losses were \$74.85 million; residential buildings make up the greatest percentage of losses with more than 56 percent of total loss. Values are provided in millions of dollars.

**Table 3.7k: Earthquake Building Loss Estimates by Building Occupancy**

Building Loss Estimates (millions of dollars)							
Category	Area	Single Family	Other Residential	Commercial	Industrial	Other	Total
Income Losses	Wage	\$0.00	\$0.34	\$2.71	\$0.07	\$0.23	\$3.36
	Capital-Related	\$0.00	\$0.14	\$2.30	\$0.04	\$0.04	\$2.52
	Rental	\$0.37	\$1.75	\$1.50	\$0.03	\$0.08	\$3.73
	Relocation	\$1.36	\$1.30	\$2.25	\$0.20	\$0.61	\$5.72
	<b>Subtotal</b>	<b>\$1.74</b>	<b>\$3.53</b>	<b>\$8.75</b>	<b>\$0.35</b>	<b>\$0.96</b>	<b>\$15.33</b>
Capital Stock Losses	Structural	\$2.93	\$2.98	\$3.05	\$0.51	\$0.61	\$10.07
	Non-Structural	\$10.14	\$14.26	\$8.35	\$1.54	\$1.80	\$36.09
	Content	\$3.22	\$3.72	\$4.23	\$1.01	\$0.92	\$13.10
	Inventory	\$0.00	\$0.00	\$0.08	\$0.17	\$0.01	\$0.26
	<b>Subtotal</b>	<b>\$16.28</b>	<b>\$20.96</b>	<b>\$15.72</b>	<b>\$3.23</b>	<b>\$3.33</b>	<b>\$59.52</b>
	<b>Total</b>	<b>\$18.02</b>	<b>\$24.48</b>	<b>\$24.47</b>	<b>\$3.58</b>	<b>\$4.29</b>	<b>\$74.85</b>

Source: Hazus-MH 2.1

**Table 3.7l** provides direct economic building loss estimates for a 100-Year earthquake event for each county in the State of New York. Total building-related losses were recorded as \$17.01 million, with the greatest amount of losses found in St. Lawrence County estimating more than \$4.5 million. Values are provided in thousands of dollars.



Table 3.7I: Direct Economic Building Losses for 100-Year Earthquake Event

Direct Economic Building Losses for 100-Year Return Earthquake Event (value in thousands of dollars)									
County	Structural Damage	Non-Structural Damage	Contents Damage	Inventory Damage	Relocation Loss	Capital Related Loss	Wages Loss	Rental Income Loss	Total Loss
Albany	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Allegany	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Bronx	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Broome	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Cattaraugus	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Cayuga	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Chautauqua	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Chemung	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Chenango	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Clinton	\$ 830	\$ 1,782	\$ 374	\$ 13	\$ 534	\$ 176	\$ 276	\$ 285	\$ 4,269
Columbia	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Cortland	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Delaware	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Dutchess	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Erie	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Essex	\$ 303	\$ 639	\$ 99	\$ 2	\$ 205	\$ 70	\$ 107	\$ 121	\$ 1,547
Franklin	\$ 539	\$ 1,235	\$ 270	\$ 6	\$ 371	\$ 90	\$ 152	\$ 183	\$ 2,847
Fulton	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Genesee	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Greene	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Hamilton	\$ 56	\$ 110	\$ 12	\$ 0	\$ 38	\$ 7	\$ 12	\$ 17	\$ 252
Herkimer	\$ 36	\$ 64	\$ 6	\$ 0	\$ 24	\$ 7	\$ 9	\$ 10	\$ 156



Direct Economic Building Losses for 100-Year Return Earthquake Event (value in thousands of dollars)									
County	Structural Damage	Non-Structural Damage	Contents Damage	Inventory Damage	Relocation Loss	Capital Related Loss	Wages Loss	Rental Income Loss	Total Loss
Jefferson	\$ 244	\$ 432	\$ 43	\$ 1	\$ 141	\$ 43	\$ 64	\$ 93	\$ 1,062
Kings	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Lewis	\$ 75	\$ 134	\$ 14	\$ 1	\$ 49	\$ 11	\$ 19	\$ 20	\$ 321
Livingston	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Madison	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Monroe	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Montgomery	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Nassau	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
New York	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Niagara	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Oneida	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Onondaga	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Ontario	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Orange	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Orleans	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Oswego	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Otsego	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Putnam	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Queens	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Rensselaer	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Richmond	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Rockland	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Saint Lawrence	\$ 899	\$ 1,949	\$ 374	\$ 10	\$ 586	\$ 167	\$ 289	\$ 308	\$ 4,581



Direct Economic Building Losses for 100-Year Return Earthquake Event (value in thousands of dollars)									
County	Structural Damage	Non-Structural Damage	Contents Damage	Inventory Damage	Relocation Loss	Capital Related Loss	Wages Loss	Rental Income Loss	Total Loss
Saratoga	\$ 47	\$ 82	\$ 8	\$ 0	\$ 29	\$ 7	\$ 8	\$ 14	\$ 194
Schenectady	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Schoharie	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Schuyler	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Seneca	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Steuben	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Suffolk	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Sullivan	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Tioga	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Tompkins	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Ulster	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Warren	\$ 288	\$ 526	\$ 58	\$ 1	\$ 182	\$ 90	\$ 116	\$ 118	\$ 1,379
Washington	\$ 94	\$ 163	\$ 16	\$ 0	\$ 59	\$ 14	\$ 23	\$ 32	\$ 402
Wayne	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Westchester	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Wyoming	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Yates	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Total</b>	<b>\$ 3,411</b>	<b>\$ 7,118</b>	<b>\$ 1,273</b>	<b>\$ 36</b>	<b>\$ 2,218</b>	<b>\$ 681</b>	<b>\$ 1,074</b>	<b>\$ 1,200</b>	<b>\$ 17,010</b>

Source: Hazus, All values are in thousands of dollars



**Table 3.7m** provides earthquake transportation loss estimates for specific transportation systems. The total inventory amount is also provided by Hazus-MH and shown in the table; values are in millions of dollars.

**Table 3.7m: Earthquake Transportation Loss Estimate**

Transportation Loss Estimates (millions of dollars)		
System	Inventory Value	Economic Loss
<b>Highway</b>	\$406,863	\$1,165
<b>Railways</b>	\$8,197	\$21
<b>Bus</b>	\$332	\$24
<b>Ferry</b>	\$73	\$12
<b>Port</b>	\$1,002	\$42
<b>Airport</b>	\$5,939	\$91
<b>Total</b>	<b>\$422,407</b>	<b>\$1,355</b>

Source: Hazus-MH 2.1

**Table 3.7n** provides direct economic transportation loss estimates on a 100 -Year return for an earthquake event. The total inventory amount is also provided by Hazus-MH and shown in the table; values are in thousands of dollars.



Table 3.7n: Direct Economic Transportation Loss for 100-Year Return Earthquake

Direct Economic Transportation Losses for 100-Year Return Earthquake Event (value in thousands of dollars)						
County	Highway	Railway	Bus Facility	Ports	Ferries	Airport
Albany	\$ 1	\$ 7	\$ 2	\$ 22	\$ -	\$ 10
Allegany	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1
Bronx	N/A	N/A	N/A	N/A	N/A	N/A
Broome	\$ -	\$ -	\$ 1	\$ -	\$ -	\$ 3
Cattaraugus	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1
Cayuga	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3
Chautauqua	\$ -	\$ -	\$ -	\$ -	\$ 2,662	\$ 2
Chemung	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1
Chenango	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5
Clinton	\$ 3	\$ 55	\$ 18	\$ -	\$ 1,331	\$ 147
Columbia	\$ -	\$ 1	\$ -	\$ 1	\$ -	\$ 3
Cortland	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2
Delaware	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Dutchess	\$ -	\$ 2	\$ -	\$ -	\$ -	\$ 12
Erie	\$ -	\$ 5	\$ 3	\$ 5	\$ -	\$ 3
Essex	\$ 2	\$ 25	\$ 12	\$ -	\$ 3,993	\$ 76
Franklin	\$ 1	\$ -	\$ 23	\$ -	\$ -	\$ 187
Fulton	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 7
Genesee	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2
Greene	\$ -	\$ -	\$ 1	\$ 5	\$ -	\$ 3
Hamilton	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 13
Herkimer	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Jefferson	\$ -	\$ -	\$ 2	\$ -	\$ 1,331	\$ 10
Kings	N/A	N/A	N/A	N/A	N/A	N/A
Lewis	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Livingston	\$ -	\$ 1	\$ -	\$ -	\$ -	\$ 1
Madison	\$ -	\$ 1	\$ -	\$ -	\$ -	\$ 3
Monroe	\$ -	\$ 1	\$ 1	\$ 1	\$ -	\$ 4
Montgomery	\$ -	\$ 2	\$ -	\$ -	\$ -	\$ -
Nassau	N/A	N/A	N/A	N/A	N/A	N/A
New York	N/A	N/A	N/A	N/A	N/A	N/A



Direct Economic Transportation Losses for 100-Year Return Earthquake Event (value in thousands of dollars)						
County	Highway	Railway	Bus Facility	Ports	Ferries	Airport
Niagara	\$ -	\$ -	\$ 1	\$ -	\$ -	\$ 2
Oneida	\$ -	\$ 2	\$ 3	\$ -	\$ -	\$ 12
Onondaga	\$ -	\$ 2	\$ 1	\$ -	\$ -	\$ 5
Ontario	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2
Orange	\$ -	\$ -	\$ 3	\$ 5	\$ -	\$ 5
Orleans	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1
Oswego	\$ -	\$ -	\$ 1	\$ 3	\$ -	\$ 3
Otsego	\$ -	\$ -	\$ 1	\$ -	\$ -	\$ 8
Putnam	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Queens	N/A	N/A	N/A	N/A	N/A	N/A
Rensselaer	\$ -	\$ 1	\$ 1	\$ 11	\$ -	\$ -
Richmond	N/A	N/A	N/A	N/A	N/A	N/A
Rockland	\$ -	\$ -	\$ 1	\$ 3	\$ 1,331	\$ -
Saint Lawrence	\$ 3	\$ -	\$ 24	\$ 8	\$ -	\$ 245
Saratoga	\$ -	\$ 2	\$ 1	\$ -	\$ -	\$ 7
Schenectady	\$ -	\$ 2	\$ 1	\$ -	\$ -	\$ 7
Schoharie	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Schuyler	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Seneca	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2
Steuben	\$ -	\$ -	\$ 1	\$ -	\$ -	\$ 2
Suffolk	N/A	N/A	N/A	N/A	N/A	N/A
Sullivan	\$ -	\$ -	\$ 1	\$ -	\$ -	\$ 5
Tioga	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Tompkins	\$ -	\$ -	\$ 1	\$ -	\$ -	\$ 2
Ulster	\$ -	\$ -	\$ 4	\$ 9	\$ -	\$ 6
Warren	\$ -	\$ -	\$ 5	\$ -	\$ -	\$ 13
Washington	\$ -	\$ 7	\$ -	\$ -	\$ -	\$ -
Wayne	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2
Westchester	\$ -	\$ 1	\$ 3	\$ 11	\$ 1,331	\$ 2
Wyoming	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1
Yates	\$ 9	\$ 118	\$ 117	\$ 86	\$ 11,979	\$ 831
<b>Total</b>	<b>\$ 19</b>	<b>\$ 235</b>	<b>\$ 233</b>	<b>\$ 170</b>	<b>\$ 23,958</b>	<b>\$ 1,662</b>

Source: Hazus, All values are in thousands of dollars



## Development in Hazard Prone Areas

Because Earthquakes are not limited to geographical boundaries or population groups, it is difficult to identify development and population trends that impact this hazard. Current land use and building codes incorporate standards that address and mitigate earthquake accumulation.

### 3.7.3 Assessing Earthquake Vulnerability of State Facilities

Direct building-related economic losses (which are all expressed in dollars) comprise of two groups. The first group consists of losses that are directly derived from building damage, (Capital Stock Loss) and include:

- Cost of repair and replacement of damaged and destroyed buildings
- Cost of damage to building contents
- Losses of building inventory (contents related to business activities)

The second group consists of losses that are related to the length of time the facility is non-operational or the immediate economic consequences of damage, also termed (Income Related Loss or Functional Loss):

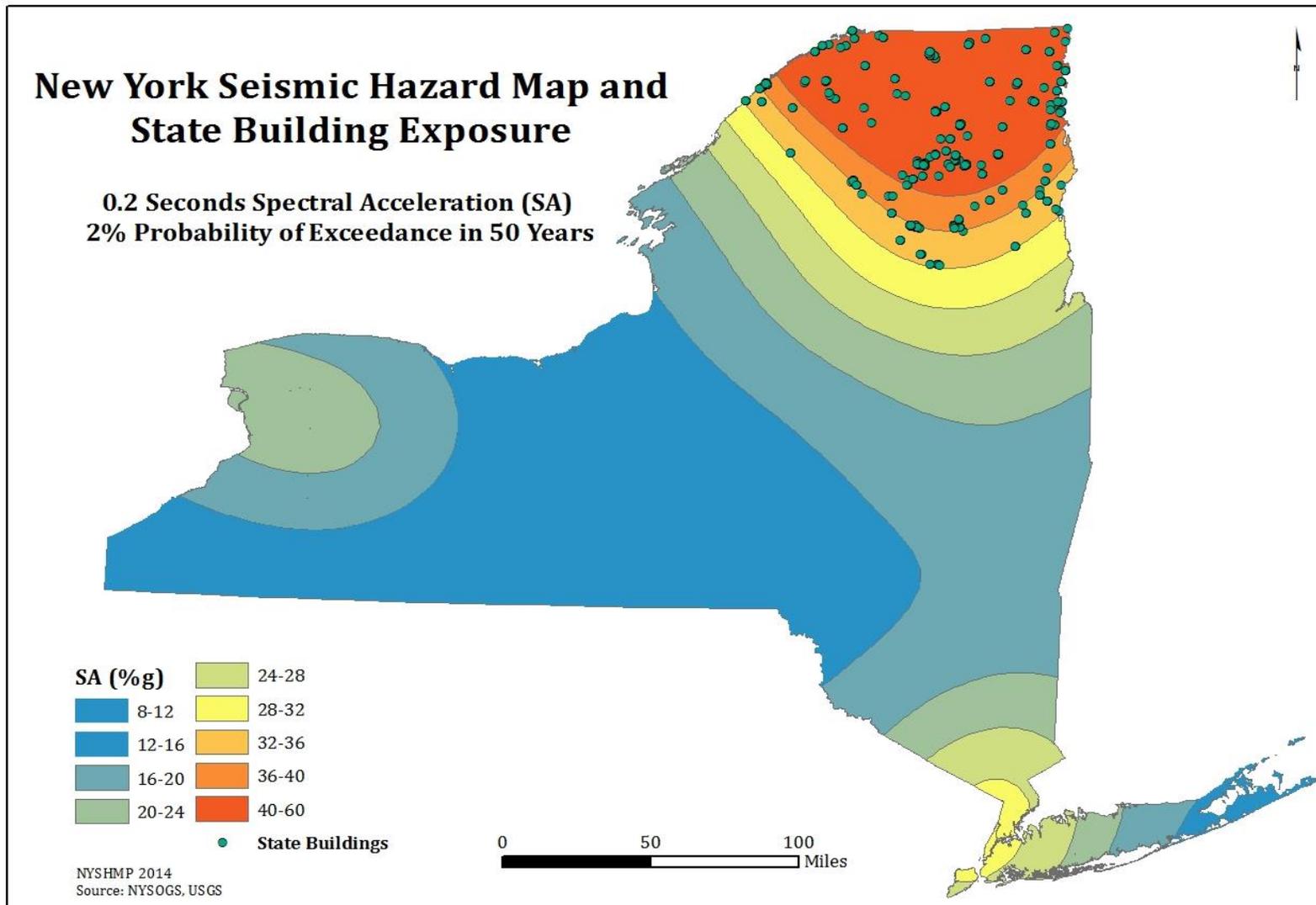
- Relocation expenses (for business and institutions)
- Capital-related income losses (a measure of the loss of productivity, services or sales)
- Wage losses (consistent with income loss)
- Rental Income losses (to building owners)

In terms of general building stock total dollar value exposure Kings County Ranks second to New York (Manhattan) with a total value of \$133 Billion. Furthermore, Kings County and the other 4 boroughs of New York City are in a higher hazard area with a 6 %PGA value – (in %g). A six %PGA is a higher than average acceleration than throughout the rest of the State, with the exception of some of the Northern Adirondack Counties. In those areas the %PGA values range up to 10%g; however have much lower populations, lower population density, and smaller numbers of structures in its built environment.

**Figure 3.7h** shows New York's seismic hazard map with state-owned building exposure in potential high ground shaking areas. The map illustrates the best the probability of earthquakes expressed in terms of a two percent probability exceedance and spectral acceleration (SA). Spectral acceleration is used as a better indicator of damage to specific buildings types and heights. Total exposed buildings, with currently available data, includes 1,641 buildings, with a total replacement value of \$628,036,209 dollars.



Figure 3.7h: New York Seismic Hazard Map and State Building Exposure



The analysis found in **Table 3.7o** below, involved the creation of a GIS layer for state facilities using the coordinate information and an overlay onto an earthquake hazard layer developed using USGS 2008 Percent Peak Ground Acceleration (%PGA) value data. The table shows the outcome of the overlay in terms of the number, dollar replacement value, and percent of state facilities, by agency, within each classification of seismic potential. The seismic potential classes begin at 4 %PGA which represents a lower threat of seismic activity increasing to 10 %PGA indicating the highest seismic threat in NYS.

It is acknowledged that there are limitations of this analysis to provide site specific accuracy and that its applicability may not be appropriate beyond a general indication. Instead, the analysis results may be best used as a guide to help target facilities that might benefit from further analysis. The mitigation strategy process has identified activities that will advance the accuracy of the State facilities risk assessment through further analysis. Future analysis will include use of NEHRP soil classification data **Figure 3.7a**, and the gathering of data to include site specific and building specific attribute information such as construction type, i.e. wood, masonry, reinforced concrete, steel, etc. and continued application of GIS technology. Site specific analysis will allow targeting of the most vulnerable facilities.

A statewide inventory pilot project was initiated in August 2013, which will establish the methodology to conduct a multi-year comprehensive assessment of state facilities for risk and losses. The pilot is anticipated to be completed by mid-2014.

#### 3.7.4 Estimating Potential Losses by Jurisdiction- Overview

The 2014 Update does not include a description of potential dollar loss estimations by jurisdiction for the earthquake hazard because of the absence of county-level data. As hazard data and risk assessment specific to earthquakes are enhanced in local mitigation plans, it will be incorporated into a state risk assessment repository for integration into SHMP updates. Additionally, application of GIS technology will become more accessible and can address earthquake specific characteristics, such as real property data layers to support of future landslide hazard vulnerability analysis.

#### 3.7.5 Estimating Potential Losses of State Facilities

**Table 3.7o** presents the result of the earthquake hazard vulnerability assessment and loss analysis for State Facilities. The results present a gross estimate of potential earthquake losses to the identified vulnerable State facilities in terms of dollar value of exposed property. In this plan, earthquake hazard vulnerability analysis and loss estimation methodology was supported by GIS technology and involved collaboration with key state agencies. Collaboration resulted in the identification of two state databases that provided key facility information. The NYS Offices of General Services (OGS) fixed asset data base and Cyber Security Critical Infrastructure Coordination (CSCIC) database included fields that provide facility location data and replacement value in dollars.



**Table 3.7o** details the GIS analysis results from the State-Owned buildings in the high seismic ground shaking zones. The table provides the name of the agency that owns the buildings, the total count of buildings, and replacement cost in the high seismic hazard zones. There are 1,641 state owned buildings with a total replacement cost of \$628,036,209.

**Table 3.7o: State-Owned Buildings in High Seismic Hazard Zones**

State Agency	Number of Buildings	Replacement Cost
Office of General Services (OGS)	41	\$11,084,079
Department of Corrections and Community Supervision (DOCCS)	691	\$371,893,675
Office of Parks, Recreation and Historic Preservation (OPRHP)	153	\$11,448,476
Department of Environmental Conservation (DEC)	489	\$32,961,951
Office of Mental Health (OMH)	88	\$102,290,234
Office of People with Developmentally Disabilities (OPWDD)	88	\$61,353,113
Division of State Police (DSP)	3	\$3,883,722
Department of Military and Naval Affairs (DMNA)	6	\$4,774,851
Department of Transportation (DOT)	73	\$24,265,688
Office of Child and Family Services (OCFS)	6	\$1,478,292
Department of Education (EDU)	2	\$2,051,432
Adirondack Park Agency (APA)	1	\$550,696
<b>Total</b>	<b>1,641</b>	<b>\$628,036,209</b>

Source: Hazus-MH 2.1, NYSOGS

As specified previously, the methodology used to gather the data for jurisdiction vulnerabilities was also utilized to obtain State facility losses. Using Hazus-MH earthquake loss estimation software from FEMA, in an April 2008 report entitled, *Hazus MH Estimated Annualized Earthquake Losses for the United States*, New York State ranked fourth behind California, Washington, and Oregon in annualized earthquake loss (AEL). This report also ranked New York State 26<sup>th</sup> in annualized earthquake loss ratio (AELR) which addresses annualized loss as a fraction of the replacement value of the building stock.



### 3.7.6 Data Limitations and Other Key Documents

The Mitigation Plan Development Team researched the earthquake risk as it affects the State. The contents of this section result from research and outreach including the following sources;

- *Isachsen, Y.W., E. Landing, J. M. Lauber, et al., "Do Earthquakes Occur in New York State?", Geology of New York: A simplified Account, Albany: New York State Museum/Geological Survey, 1991, pp. 231-238,*
- FEMA 366 / April 2008 Report – "HAZUS-MH Estimated Annualized Earthquake Losses for the United States." Produced in cooperation with National Institute of Building Sciences (NIBS). This report cites New York earthquake events as high loss potential, although low frequency, and provides calculated annualized earthquake losses and comparisons by State.
- New York City Consortium for Earthquake Loss Mitigation (NYCEM) <http://www.nycem.org/default.asp>.
- United States Geological Survey (USGS), [www.usgs.gov](http://www.usgs.gov).
- New York State Geological Survey (NYSGS).
- Lamont-Doherty Earth Observatory, Columbia University Earth Institute
- Boston College Weston Observatory.
- New York State Statistical Yearbook, 2003 and 2006, The Nelson A. Rockefeller Institute of Government, State University of New York.
- Multidisciplinary Center for Earthquake Engineering Research (MCEER) at the State University of New York at Buffalo, New York.

**Please note:** data obtained from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™) is a county-level hazard data set for the U.S. for 18 different natural hazard event types such as thunderstorms, hurricanes, floods, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data derives from the national data source, National Climatic Data Center's monthly Storm Data publications. Using the latest release of SHELDUS™ 12.0, the database includes every loss causing and/or deadly event between 1960 through 1992 and from 1995 onward. Between 1993 and 1995, SHELDUS™ reflects only events that caused at least one fatality or more than \$50,000 in property or crop damages.

Wombs



## Section 3.8: EXTREME TEMPERATURES

### 2014 SHMP Update

- Reformatted document into new outline
- Updated Maps and Figures and moved to appendix

### 3.8.1 Extreme Temperatures Profile

Hazard	Definitions and Key Terms
<p style="text-align: center;"><b>Extreme Temperatures (Heat and Cold)</b></p>	<ul style="list-style-type: none"> <li>• <u>Extreme Heat</u>- Temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks are defined as extreme heat.</li> <li>• <u>Extreme Cold</u>- Although no specific definition exists for Extreme Cold, the following are characteristics of an Extreme Cold event in New York State: temperatures at or below zero degrees for an extended period of time. Note that Extreme Cold events are usually part of Winter Storm events but can occur during anytime of the year and have devastating effects on New York State agricultural production.</li> </ul>

### Characteristics

#### Extreme Heat

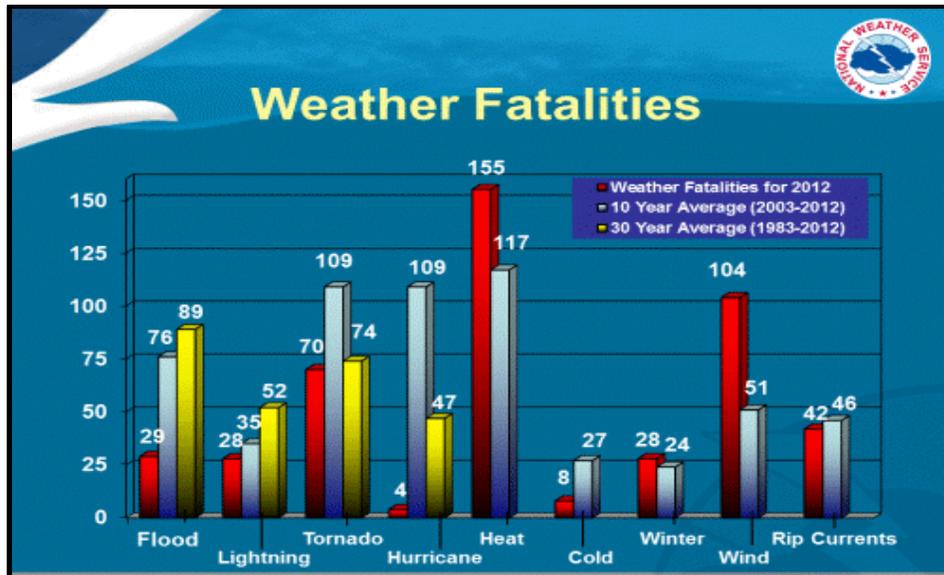
Extreme heat is defined as temperatures which hover 10 degrees or more above the average high temperature for a region and last for several weeks. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. Excessively dry and hot conditions can provoke dust storms and low visibility. Droughts occur when a long period passes without substantial rainfall. A heat wave combined with a drought is a very dangerous situation.

Although the event may not be as notable as other hazards which affect New York State (NYS), its effects can have devastating consequences. While it is hard to quantify the exact total number of deaths which are advanced by heat wave weather, in a normal year, documented records indicate about 162 people nationwide succumb to the conditions of summer heat. Its annual fatality potential is matched by no other natural hazards which are profiled by NYS (See **Figure 3.8a**). In the disastrous heat wave of 1980, nationally more than 1,250 people died as a result of extreme heat. In terms of New York State, from



1960 – 2012 there have been 140 fatalities as a result of extreme heat; 31 of the 140 fatalities took place in a period of 2 years, ranging from 2010 - 2012.

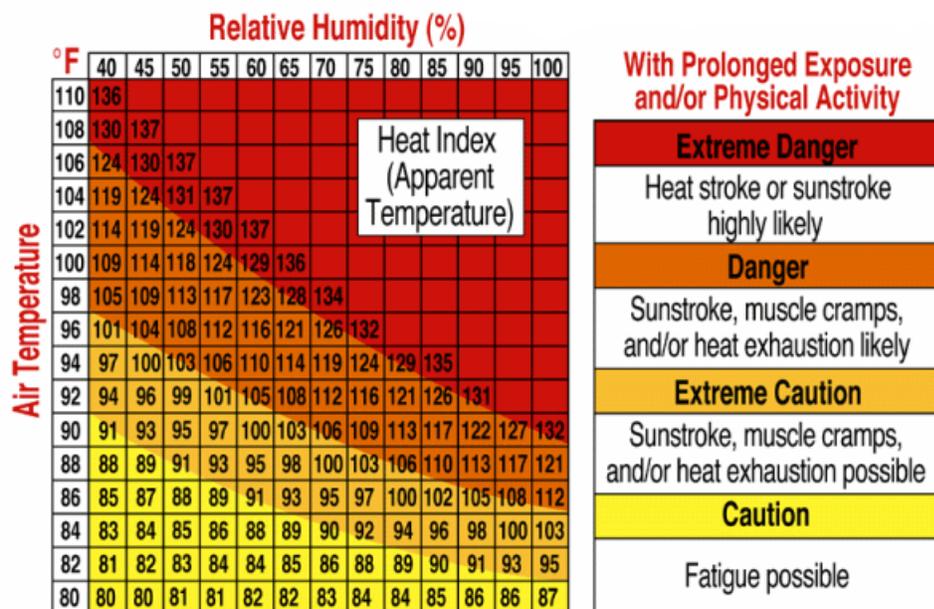
**Figure 3.8a: National Weather Fatalities**



Source: National Weather Service

Displayed below in **Figure 3.8b**, created by the National Weather Service, is the Heat Index (HI) chart that accurately measures apparent air temperature as it increases with relative humidity. The Heat Index can be used to determine what effects temperature and humidity can have on the population. The table also describes the adverse effects that prolonged exposures can have on individuals. To determine the Heat Index, the temperature and the relative humidity are needed. Once both values are identified, the Heat Index will be the corresponding number of both the values. This data collection provides a measure of how temperatures actually feel. It is important to know that Heat Index (HI) values are devised for shady, light wind conditions. Exposure to full sunshine can increase HI values by up to 15 degrees. Also, strong winds, particularly with very hot, dry-air can be extremely hazardous to individuals.

**Figure 3.8b: Heat Index**



Source: National Weather Service Weather Forecast Office

The National Weather Service (NWS) provides alerts when Heat Indices approach hazardous levels. **Table 3.8a** provides the alert procedures for NWS. In the event of an extreme heat advisory, NWS does the following:

- Includes HI values and city forecasts
- Issues special weather statements including who is most at risk, safety rules for reducing risk, and the extent of the hazard and HI values
- Provides assistance to state/local health officials in preparing Civil Emergency Messages in severe heat waves



**Table 3.8a: National Weather Service Alerts**

Alert	Criteria
<b>Heat Advisory</b>	Issued 12-24 hours before the onset of the following conditions: heat index of at least 100F but less than 105F for at least 2 hours per day.
<b>Excessive Heat Watch</b>	Issued by the National Weather Service when heat indices of 105°F (41°C) or greater are forecast in the next 24 to 72 hours.
<b>Excessive Heat Warning</b>	Issued within 12 hours of the onset of the following criteria: heat index of at least 105°F for more than 3 hours per day for 2 consecutive days, or heat index more than 115°F for any period of time

Source: NOAA, National Weather Service

Exposure to excessive heat can pose a number of health risks to individuals. **Table 3.8b** below defines different health hazards and some of the symptoms associated with extreme heat conditions.

**Table 3.8b: NWS Effects Extreme Heat Hazards**

Health Hazard	Symptoms
<b>Sunburn</b>	Redness and pain. In severe cases: swelling of skin, blisters, fevers, and headaches.
<b>Dehydration</b>	Excessive thirst, dry lips and slightly dry mucous membranes
<b>Heat Cramps</b>	Painful spasms, usually in muscles of legs and abdomen, and possible heavy sweating
<b>Heat Exhaustion</b>	Heavy sweating; weakness; cold, pale and clammy skin; weak pulse; possible fainting and vomiting
<b>Heat Stroke</b>	High body temperature (104°F or higher), hot and dry skin, rapid and strong pulse, and possible coma

Source: NYC Heat Emergency Plan



**Extreme Cold**

Extreme Cold conditions typically accompany winter storm events and it is recommended to review the winter storm hazard profile of this plan for additional information. The National Oceanic and Atmospheric Administration (NOAA) acknowledge that extensive exposure to extreme cold temperatures can cause frostbite or hypothermia and can become life-threatening. Infants and elderly people are most susceptible to the effects of the extreme changes in temperatures.

What constitutes extreme cold varies in different parts of the country. In the South, near freezing temperatures are considered extreme cold. Freezing temperatures can cause severe damage to citrus fruit crops and other vegetation. Pipes may freeze and burst in homes that are poorly insulated or without heat. In the North, extreme cold is defined as temperatures well below zero.

**Table 3.8c** defines National Weather Service terms for Extreme Cold hazards.

**Table 3.8c: NWS Extreme Cold Hazards**

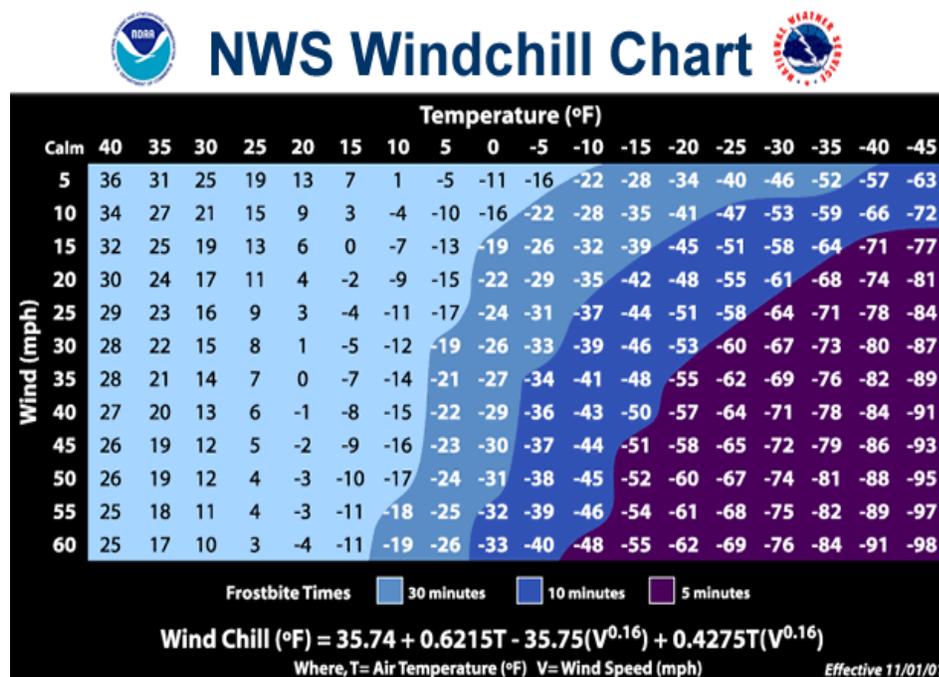
Health Hazard	Symptoms
<b>Wind Chill</b>	Wind chill is not the actual temperature but rather how wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature. Animals are also affected by wind chill; however, cars, plants and other objects are not.
<b>Frostbite</b>	Frostbite is damage to body tissue caused by extreme cold. A wind chill of -20 degrees Fahrenheit (F) will cause frostbite in just 30 minutes. Frostbite causes a loss of feeling and a white or pale appearance in extremities, such as fingers, toes, ear lobes or the tip of the nose. If symptoms are detected, get medical help immediately! If you must wait for help, slowly re-warm affected areas. However, if the person is also showing signs of hypothermia, warm the body core before the extremities.
<b>Hypothermia</b>	Hypothermia is a condition brought on when the body temperature drops to less than 95 degrees Fahrenheit (F). It can kill. For those who survive, there are likely to be lasting kidney, liver and pancreas problems. Warning signs include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness and apparent exhaustion. Take the person's temperature. If below 95 degrees F, seek medical care immediately!

Source: NOAA

**Figure 3.8.c**, depicts NOAA's Windchill Chart. NOAA's 2001 *Winter Storms The Deceptive Killers* preparedness guide documents that 50% of the deaths related to extreme cold temperatures happen to people over 60 years old, more than 75% happen to males, and about 20% occur in the home.



Figure 3.8.c: NWS Windchill Chart



Source: National Weather Service

**Location**

The State of New York’s geographical positioning and typical air masses combined with the atmospheric circulation provides general climatic controls for the region making the entire State susceptible to extreme temperatures. Varying land elevations, character of the landscape, and close proximity to large bodies of water play a significant role in the State’s temperatures. Dry air frequently arrives in the State from the northern interior of the continent bringing in masses of cold. From the south and southwestern regions of the continent winds transport warm, humid air that travel from the Gulf of Mexico and bordering subtropical waters. The third great air mass flows from the North Atlantic Ocean inland creating cool, cloudy, and damp weather conditions.

Extensive periods of either extreme cold or warm temperatures are a result from movement of great high pressure systems into and through the eastern United States. Under higher than normal atmospheric pressures when Arctic air masses are present, extreme winter temperatures hover over New York, flowing southward from central Canada or the Hudson Bay. High-pressure systems often move just off the Atlantic coast, become more or less stagnant for several days, and then a persistent airflow from the southwest or south affects the State. This circulation brings the very warm, often humid weather of the summer season and the mild, more pleasant temperatures during the fall, winter, and spring seasons.



### Previous Extreme Temperatures Occurrences

Below in **Table 3.8d** is a synopsis of previous extreme heat occurrences for the State of New York dating from June 1994 to August 2006. According to National Climatic Data Center (NCDC) Storm Events Database, there were a recorded number of fifteen injuries and seventy-nine deaths as a result of extreme heat.



**Table 3.8d: Past Occurrences of Extreme Heat in New York State**

<b>Date</b>	<b>County/Area Affected</b>	<b>Injuries</b>	<b>Fatalities</b>	<b>Description</b>
<b>June 15-18, 1994</b>	Ulster	50	0	Record Heat occurred across much of eastern New York during the middle of June. In Dolgeville, 50 students were treated for heat exhaustion when all fans and air conditioners in the Dolgeville Elementary School failed.
<b>July 13, 1995</b>	Kings	Unknown	7	A heat wave during the month of July was responsible for several deaths. Hundreds were treated for various problems related to heat and high humidity. Temperatures rose to a record high of 102 in Central Park and hovered at 90 degrees or higher during July.
<b>July 4-July 6, 1999</b>	NYC, Westchester, Putnam, Suffolk, Orange, Nassau	0	33	An extremely hot and humid air mass covered the region from July 4th through July 6th. On Sunday July 4th, temperatures soared into the mid and upper 90s. The combination of high temperatures and moderate humidity caused most heat indices to range from 100 to 105 degrees. On Monday July 5th, many new maximum temperature records were set throughout NYC metropolitan region. With temperatures and Heat indices in the 100's, widespread blackouts were observed throughout the region. The Heat Wave was directly responsible for killing 33 people in the New York Metro Area: 14 in Brooklyn, 13 from Manhattan, 3 from Queens, 2 from Westchester County, and 1 from the Bronx.
<b>August 1-10, 2001</b>	Broome, Cayuga, Chemung, Chenango, Cortland, Delaware, Madison, Oneida, Onondaga, Otsego, Schuyler, Seneca, Steuben, Sullivan, Tioga, Tompkins, Yates	0	0	August was a very warm month across central New York. The first 9 days of the month featured a significant heat wave with several days of locations reporting temperatures in the upper 90's to lower 100's. Numerous high temperature records were set during this time. The heat wave peaked on the 9th when many locations saw temperatures above 100 degrees and some locations equaled or exceeded all-time temperature records for the month of August.



Date	County/Area Affected	Injuries	Fatalities	Description
<b>August 8-10, 2001</b>	Nassau, NYC, Putnam, Rockland, Suffolk, Westchester	0	4	A Bermuda high pressure system "pumped" hot temperatures and high humidity across the region. The 6 day heat wave began on Sunday, August 5th, when temperatures first reached 90 degrees at Central Park. Record high temperatures at Central Park were broken on two consecutive days, August 8th and 9th. High temperatures at Central Park reached 103 degrees on the 9th and 99 degrees on the 7th and 8th. Heat indices peaked across the entire region on Thursday, August 9th to between 105 and 110 degrees. Heat indices were also quite high on Friday, August 10th, reaching 105 to 110 degrees, as humidity levels increased, despite slightly lower temperatures. As temperatures rose, the demand for electricity increased. Power outages occurred within the region between Aug 7 <sup>th</sup> and Aug 10 <sup>th</sup> . Long Island Power Authority reported about 21,000 outages throughout Long Island. Excessive Heat conditions caused portions of the Sunrise Highway to "buckle", which caused road closures. A total of 4 deaths were attributed to the heat. Three individuals from Manhattan and one from Brooklyn, ranging in ages from 57 - 82.
<b>August 8-9, 2001</b>	Albany, Columbia, Dutchess, Fulton, Greene, Herkimer, Montgomery, Rensselaer, Saratoga, Schenectady, Ulster	15	0	A strong Bermuda high developed early in August and brought the most extensive heat wave of the summer to eastern New York and adjacent New England. Record temperatures were recorded in parts of Upstate New York. High humidity levels in addition to the heat produced heat indices between 105 - 110 near Albany and, 110 -115 in the Poughkeepsie region. St. Clare's Hospital in Schenectady reported 9 cases of heat-related symptoms. The victims were all children campers at the Pattersonville Camp also in Schenectady County. Four more campers were treated at the campsite. While there no other heat related problems reported to the National Weather Service, the heat led to record state electricity consumption, three days in a row. Governor Pataki closed down the State government at 2:00 PM on August 9 to conserve power. Hot weather also caused the railroad bridge to malfunction between the cities of Albany and Rensselaer, resulting in delays for four of Amtrak's passenger trains on August 9



Date	County/Area Affected	Injuries	Fatalities	Description
<b>July 2-4, 2002</b>	Nassau, New York City, Orange, Putnam, Rockland, Suffolk, Westchester	0	0	Temperatures rose into the mid and upper 90's across the region, averaging 10 - 15 degrees above normal. A record high was reached at LaGuardia Airport, at 98°. High humidity coupled with high temperatures produced heat indices of 100 - 105 degrees throughout the region. Hospital emergency rooms report minor cases of heat exhaustion and other heat-related ailments. Small power failures throughout the 4 <sup>th</sup> of July left as many as 20,000 homes without electricity. There were brownouts throughout the NYC Metropolitan Area.
<b>August 1-3, 2006</b>	Nassau, NYC, Orange, Putnam, Rockland, Suffolk, Westchester	0	42	Three consecutive days of excessive heat occurred mainly from noon to midnight. With temperatures hovering in the 90s to 100 degrees and surface dew points in the mid-70s, heat indices ranged from 105 - 115 degrees. The excessive heat conditions resulted in 42 deaths and scattered power outages throughout the NYC Metropolitan Area. Forty of the forty-two deaths occurred within NYC: 14 in Queens, 14 in Brooklyn, 9 in Manhattan, and 3 in the Bronx. The NYC Office of Emergency Management opened 383 cooling centers that served 25,000 people per day. They also opened 6000 pools and extended their routine hours of operation. Record temperatures were set throughout the region.

Source: National Climatic Data Center: NCDC Storm Events Database



Displayed below in **Table 3.8e**, **Figure 3.8d**, and **Figure 3.8e** are historical and recent loss data for extreme temperatures for the time frame of 1960 – 2012. Statistics derive primarily from SHELDUS, the Spatial Hazard Events and Loss Database for the United States. From 1960-2012 Franklin, Clinton and St. Lawrence Counties were ranked the highest for extreme temperatures events. However since 2010, New York, Queens, and Kings Counties have all experienced a significant spike in the number of events. Although extreme temperatures do not have a direct impact on the State’s property damage the agriculture sector has experienced a \$2,150,000 loss in this 52 year period.

**Table 3.8e: Extreme Temperature Events and Losses by County from 1960-2012**

County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability %	Recurrence Interval	Number of Events	Fatalities	Injuries	Property Damage	Crop Damage	Number of Events	Fatalities	Injuries	Property Damage	Crop Damage
Albany	0	0	8	1	1	\$2,890	\$0	0	0	0	\$0	\$0
Allegany	0	0	1	0	0	\$806	\$0	0	0	0	\$0	\$0
Bronx	6	17	13	12	0	\$36,521	\$0	7	5	0	\$0	\$0
Broome	0	0	7	0	1	\$2,890	\$0	0	0	0	\$0	\$0
Cattaraugus	0	0	17	0	0	\$1,289	\$0	0	0	0	\$0	\$0
Cayuga	0	0	3	0	0	\$2,890	\$0	0	0	0	\$0	\$0
Chautauqua	8	13	1	0	0	\$806	\$0	0	0	0	\$0	\$0
Chemung	0	0	3	0	0	\$806	\$0	0	0	0	\$0	\$0
Chenango	0	0	6	0	1	\$2,890	\$0	0	0	0	\$0	\$0
Clinton	0	0	22	0	1	\$806	\$500,000	2	0	0	\$0	\$500,000
Columbia	0	0	3	0	1	\$806	\$0	0	0	0	\$0	\$0
Cortland	0	0	6	0	1	\$2,890	\$0	0	0	0	\$0	\$0
Delaware	0	0	6	0	1	\$2,890	\$0	0	0	0	\$0	\$0
Dutchess	0	0	6	1	5	\$37,021	\$0	0	0	0	\$0	\$0
Erie	13	7	1	0	0	\$806	\$0	0	0	0	\$0	\$0
Essex	0	0	21	0	1	\$806	\$500,000	2	0	0	\$0	\$500,000
Franklin	0	0	24	0	1	\$806	\$450,000	4	0	0	\$0	\$450,000
Fulton	0	0	8	0	1	\$2,890	\$0	0	0	0	\$0	\$0
Genesee	0	0	2	0	0	\$806	\$0	0	0	0	\$0	\$0
Greene	0	0	4	0	0	\$806	\$0	1	0	0	\$0	\$0
Hamilton	0	0	7	0	1	\$2,890	\$0	0	0	0	\$0	\$0
Herkimer	0	0	15	0	1	\$2,890	\$0	1	0	0	\$0	\$0
Jefferson	0	0	2	0	0	\$2,890	\$0	0	0	0	\$0	\$0
Kings	8	13	15	31	0	\$36,521	\$0	9	6	0	\$0	\$0
Lewis	0	0	2	0	0	\$2,890	\$0	0	0	0	\$0	\$0
Livingston	0	0	1	0	0	\$806	\$0	0	0	0	\$0	\$0
Madison	0	0	4	0	1	\$2,890	\$0	0	0	0	\$0	\$0
Monroe	0	0	1	0	0	\$806	\$0	0	0	0	\$0	\$0
Montgomery	0	0	9	1	1	\$2,890	\$0	0	0	0	\$0	\$0

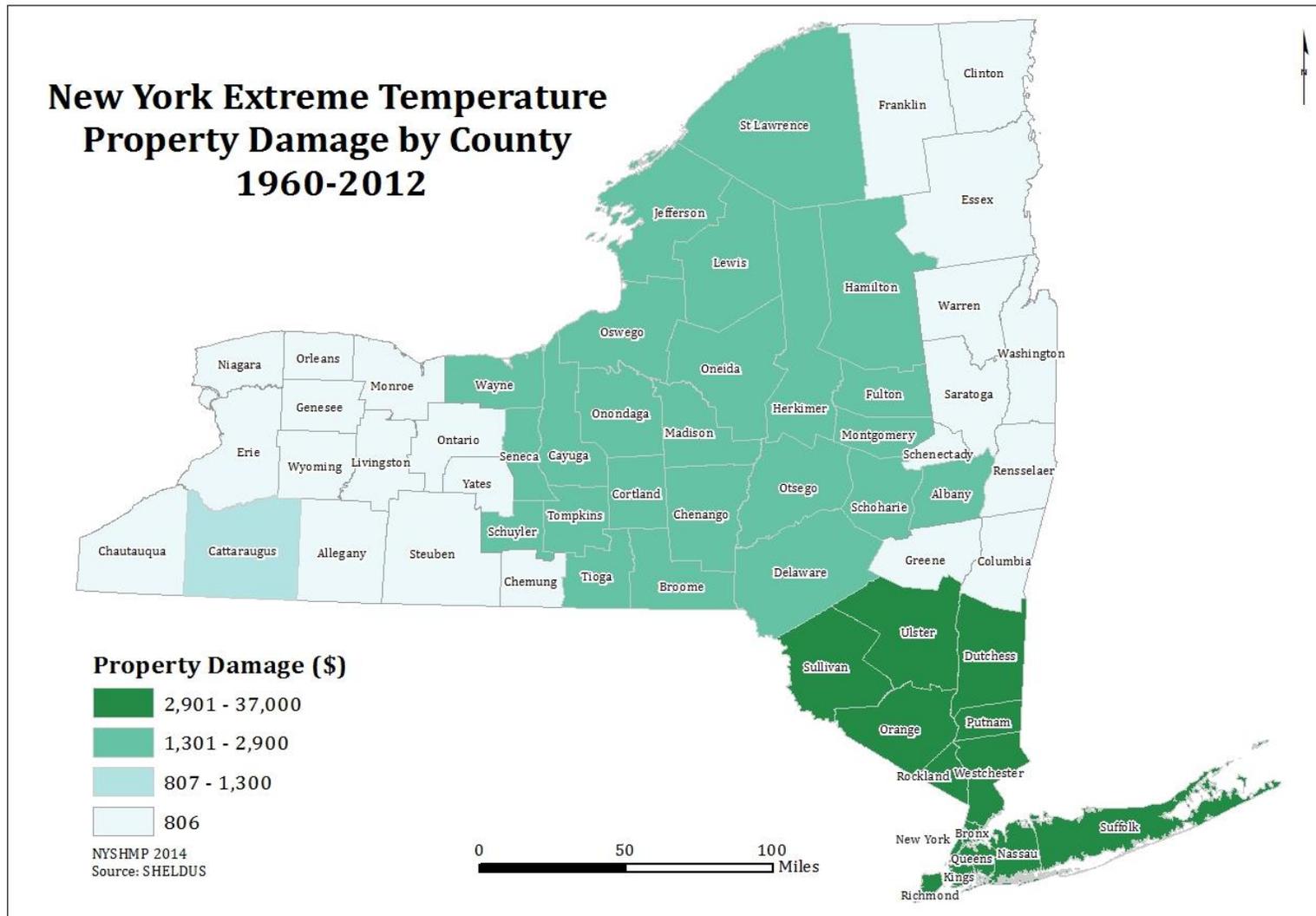


County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability %	Recurrence Interval	Number of Events	Fatalities	Injuries	Property Damage	Crop Damage	Number of Events	Fatalities	Injuries	Property Damage	Crop Damage
Nassau	25	4	6	5	0	\$36,521	\$0	2	1	0	\$0	\$0
New York	10	10	20	25	0	\$36,521	\$0	16	8	0	\$0	\$0
Niagara	2	52	1	0	0	\$806	\$0	0	0	0	\$0	\$0
Oneida	0	0	4	0	1	\$2,890	\$0	0	0	0	\$0	\$0
Onondaga	0	0	7	3	0	\$2,890	\$0	0	0	0	\$0	\$0
Ontario	0	0	1	0	0	\$806	\$0	0	0	0	\$0	\$0
Orange	2	52	6	5	1	\$36,521	\$0	1	1	0	\$0	\$0
Orleans	0	0	2	1	0	\$806	\$0	0	0	0	\$0	\$0
Oswego	0	0	4	3	0	\$2,890	\$0	1	0	0	\$0	\$0
Otsego	0	0	7	1	1	\$2,890	\$0	0	0	0	\$0	\$0
Putnam	2	52	6	4	1	\$36,521	\$0	0	0	0	\$0	\$0
Queens	25	4	18	19	0	\$36,521	\$0	11	6	0	\$0	\$0
Rensselaer	0	0	7	0	1	\$806	\$0	0	0	0	\$0	\$0
Richmond	4	26	7	6	0	\$36,521	\$0	3	2	0	\$0	\$0
Rockland	2	52	5	5	0	\$36,521	\$0	0	0	0	\$0	\$0
Saratoga	0	0	10	2	1	\$806	\$0	0	0	0	\$0	\$0
Schenectady	0	0	7	0	1	\$806	\$0	0	0	0	\$0	\$0
Schoharie	0	0	8	0	1	\$2,890	\$0	0	0	0	\$0	\$0
Schuyler	0	0	4	0	0	\$2,890	\$0	0	0	0	\$0	\$0
Seneca	0	0	3	0	0	\$2,890	\$0	0	0	0	\$0	\$0
St Lawrence	0	0	22	0	1	\$2,890	\$700,000	3	0	0	\$0	\$700,000
Steuben	0	0	3	0	0	\$806	\$0	0	0	0	\$0	\$0
Suffolk	27	4	5	7	0	\$36,521	\$0	0	0	0	\$0	\$0
Sullivan	0	0	6	0	1	\$36,521	\$0	0	0	0	\$0	\$0
Tioga	0	0	6	0	1	\$2,890	\$0	0	0	0	\$0	\$0
Tompkins	0	0	4	0	0	\$2,890	\$0	0	0	0	\$0	\$0
Ulster	0	0	5	0	1	\$36,521	\$0	0	0	0	\$0	\$0
Warren	0	0	10	0	1	\$806	\$0	0	0	0	\$0	\$0
Washington	0	0	7	0	1	\$806	\$0	0	0	0	\$0	\$0
Wayne	0	0	2	0	0	\$2,890	\$0	0	0	0	\$0	\$0
Westchester	4	26	7	8	0	\$36,521	\$0	1	2	0	\$0	\$0
Wyoming	0	0	1	0	0	\$806	\$0	0	0	0	\$0	\$0
Yates	0	0	1	0	0	\$806	\$0	0	0	0	\$0	\$0
<b>Total</b>			<b>430</b>	<b>140</b>	<b>30</b>	<b>\$600,983</b>	<b>\$2,150,000</b>	<b>64</b>	<b>31</b>	<b>0</b>	<b>\$0</b>	<b>\$2,150,000</b>





**Figure 3.8e: New York Extreme Temperature Property Damage**



The data found in **Table 3.8f** illustrates the total number of excessive heat, extreme cold/wind chill events, deaths, injuries, and losses recorded by the National Climatic Data Center database. The information generated was from January 1996 to July 2013. According to data drawn from the NCDC/ NOAA there have been a total of 55 deaths and \$63,000 in property damage since 1996.

**Table 3.8f: National Climatic Data Center Recorded Extreme Temperature Events From 1996-2013**

Excessive Heat, Extreme Cold/ Wind Chill Events and Losses From 1996-2013						
County	Date	Type	Death	Injuries	Property Loss	Crop Loss
Richmond	7/19/2013	Excessive Heat	1	0	\$ -	\$ -
Bronx	7/19/2013	Excessive Heat	1	0	\$ -	\$ -
New York (Manhattan)	7/19/2013	Excessive Heat	1	0	\$ -	\$ -
Kings (Brooklyn)	7/19/2013	Excessive Heat	4	0	\$ -	\$ -
Queens	7/19/2013	Excessive Heat	1	0	\$ -	\$ -
Orange	7/19/2013	Excessive Heat	0	0	\$ -	\$ -
Ulster	7/19/2013	Excessive Heat	0	0	\$ -	\$ -
Dutchess	7/19/2013	Excessive Heat	0	0	\$ -	\$ -
Nassau	7/19/2013	Excessive Heat	0	0	\$ -	\$ -
Suffolk	7/19/2013	Excessive Heat	0	0	\$ -	\$ -
Richmond	7/7/2013	Excessive Heat	1	0	\$ -	\$ -
New York (Manhattan)	7/18/2012	Excessive Heat	0	0	\$ -	\$ -
Queens	7/18/2012	Excessive Heat	0	0	\$ -	\$ -
Orange	7/18/2012	Excessive Heat	0	0	\$ -	\$ -
Rockland	7/18/2012	Excessive Heat	0	0	\$ -	\$ -
Westchester	7/18/2012	Excessive Heat	0	0	\$ -	\$ -
Bronx	7/18/2012	Excessive	0	0	\$ -	\$ -



Excessive Heat, Extreme Cold/ Wind Chill Events and Losses From 1996-2013						
County	Date	Type	Death	Injuries	Property Loss	Crop Loss
		Heat				
<b>Putnam</b>	7/18/2012	Excessive Heat	0	0	\$ -	\$ -
<b>Queens</b>	6/20/2012	Excessive Heat	1	0	\$ -	\$ -
<b>Suffolk</b>	7/22/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Nassau</b>	7/22/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Suffolk</b>	7/22/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Dutchess</b>	7/22/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Ulster</b>	7/22/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Westchester</b>	7/22/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Rockland</b>	7/22/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Suffolk</b>	7/22/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Putnam</b>	7/22/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Orange</b>	7/22/2011	Excessive Heat	1	0	\$ -	\$ -
<b>Kings (Brooklyn)</b>	7/21/2011	Excessive Heat	7	0	\$ -	\$ -
<b>Queens</b>	7/21/2011	Excessive Heat	2	0	\$ -	\$ -
<b>Richmond</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>New York (Manhattan)</b>	7/21/2011	Excessive Heat	4	0	\$ -	\$ -
<b>Bronx</b>	7/21/2011	Excessive Heat	6	0	\$ -	\$ -
<b>Greene</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Ulster</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Dutchess</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Albany</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Columbia</b>	7/21/2011	Excessive	0	0	\$ -	\$ -



Excessive Heat, Extreme Cold/ Wind Chill Events and Losses From 1996-2013						
County	Date	Type	Death	Injuries	Property Loss	Crop Loss
		Heat				
<b>Rensselaer</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Schenectady</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Saratoga</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Warren</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Washington</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Chenango</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Delaware</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Broome</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Tompkins</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Sullivan</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Oneida</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Seneca</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Yates</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Schuyler</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Otsego</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Oneida</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Madison</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Cayuga</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Tioga</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Steuben</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Onondaga</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -
<b>Cortland</b>	7/21/2011	Excessive Heat	0	0	\$ -	\$ -



Excessive Heat, Extreme Cold/ Wind Chill Events and Losses From 1996-2013						
County	Date	Type	Death	Injuries	Property Loss	Crop Loss
Lewis	1/24/2011	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Oswego	1/24/2011	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Jefferson	1/24/2011	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Herkimer	1/23/2011	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Warren	1/23/2011	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Greene	1/23/2011	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Ulster	1/23/2011	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Fulton	1/23/2011	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Saratoga	1/23/2011	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Hamilton	1/23/2011	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Kings (Brooklyn)	7/24/2010	Excessive Heat	2	0	\$ -	\$ -
Queens	7/4/2010	Excessive Heat	4	0	\$ -	\$ -
Richmond	7/4/2010	Excessive Heat	2	0	\$ -	\$ -
New York (Manhattan)	7/4/2010	Excessive Heat	2	0	\$ -	\$ -
Herkimer	1/25/2009	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Hamilton	1/16/2009	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
St. Lawrence	1/14/2009	Extreme	0	0	\$ -	\$ -



Excessive Heat, Extreme Cold/ Wind Chill Events and Losses From 1996-2013						
County	Date	Type	Death	Injuries	Property Loss	Crop Loss
		Cold/Wind Chill				
<b>Essex</b>	1/14/2009	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Clinton</b>	1/14/2009	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Franklin</b>	1/14/2009	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Broome</b>	10/5/2007	Excessive Heat	0	0	\$ -	\$ -
<b>Onondaga</b>	10/5/2007	Excessive Heat	0	0	\$ -	\$ -
<b>St. Lawrence</b>	3/9/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Clinton</b>	3/9/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Essex</b>	3/9/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Franklin</b>	3/9/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>St. Lawrence</b>	3/9/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Clinton</b>	3/9/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Essex</b>	3/9/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Franklin</b>	3/9/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>St. Lawrence</b>	3/6/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Bronx</b>	3/6/2007	Extreme Cold/Wind Chill	1	0	\$ -	\$ -



Excessive Heat, Extreme Cold/ Wind Chill Events and Losses From 1996-2013						
County	Date	Type	Death	Injuries	Property Loss	Crop Loss
Franklin	3/6/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
St. Lawrence	3/6/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Essex	3/6/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Clinton	3/6/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Kings (Brooklyn)	2/4/2007	Extreme Cold/Wind Chill	3	0	\$ -	\$ -
New York (Manhattan)	2/4/2007	Extreme Cold/Wind Chill	1	0	\$ -	\$ -
Bronx	2/4/2007	Extreme Cold/Wind Chill	3	0	\$ -	\$ -
Queens	2/4/2007	Extreme Cold/Wind Chill	4	0	\$ -	\$ -
Franklin	1/25/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
St. Lawrence	1/25/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Essex	1/25/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Clinton	1/25/2007	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Steuben	5/17/2002	Extreme Cold/Wind Chill	0	0	\$ 5,000	\$ -
Schuyler	5/17/2002	Extreme Cold/Wind Chill	0	0	\$ 3,000	\$ -
Oneida	5/17/2002	Extreme Cold/Wind Chill	0	0	\$ 5,000	\$ -



Excessive Heat, Extreme Cold/ Wind Chill Events and Losses From 1996-2013						
County	Date	Type	Death	Injuries	Property Loss	Crop Loss
Madison	5/17/2002	Extreme Cold/Wind Chill	0	0	\$ 5,000	\$ -
Delaware	5/17/2002	Extreme Cold/Wind Chill	0	0	\$ 10,000	\$ -
Cortland	5/17/2002	Extreme Cold/Wind Chill	0	0	\$ 3,000	\$ -
Chenango	5/17/2002	Extreme Cold/Wind Chill	0	0	\$ 8,000	\$ -
Broome	5/17/2002	Extreme Cold/Wind Chill	0	0	\$ 3,000	\$ -
Oneida	5/17/2002	Extreme Cold/Wind Chill	0	0	\$ 5,000	\$ -
Otsego	5/17/2002	Extreme Cold/Wind Chill	0	0	\$ 10,000	\$ -
Tompkins	5/17/2002	Extreme Cold/Wind Chill	0	0	\$ 3,000	\$ -
Tioga	5/17/2002	Extreme Cold/Wind Chill	0	0	\$ 3,000	\$ -
Albany	4/15/2002	Excessive Heat	0	0	\$ -	\$ -
Albany	12/1/2001	Excessive Heat	0	0	\$ -	\$ -
Schuyler	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Madison	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Delaware	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Cortland	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Otsego	9/28/2000	Extreme Cold/Wind	0	0	\$ -	\$ -



Excessive Heat, Extreme Cold/ Wind Chill Events and Losses From 1996-2013						
County	Date	Type	Death	Injuries	Property Loss	Crop Loss
		Chill				
<b>Onondaga</b>	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Oneida</b>	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Chenango</b>	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Broome</b>	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Tioga</b>	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Sullivan</b>	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Steuben</b>	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Yates</b>	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Tompkins</b>	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Cayuga</b>	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Seneca</b>	9/28/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Hamilton</b>	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
<b>Schenectady</b>	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
<b>Albany</b>	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
<b>Washington</b>	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
<b>Warren</b>	3/8/2000	Excessive Heat	0	0	\$ -	\$ -



Excessive Heat, Extreme Cold/ Wind Chill Events and Losses From 1996-2013						
County	Date	Type	Death	Injuries	Property Loss	Crop Loss
Saratoga	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
Herkimer	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
Schoharie	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
Saratoga	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
Dutchess	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
Albany	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
Rensselaer	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
Greene	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
Ulster	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
Columbia	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
Montgomery	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
Fulton	3/8/2000	Excessive Heat	0	0	\$ -	\$ -
Orange	1/27/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Putnam	1/27/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Rockland	1/27/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Westchester	1/27/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Nassau	1/27/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Suffolk	1/27/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Bronx	1/27/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -



<b>Excessive Heat, Extreme Cold/ Wind Chill Events and Losses From 1996-2013</b>						
<b>County</b>	<b>Date</b>	<b>Type</b>	<b>Death</b>	<b>Injuries</b>	<b>Property Loss</b>	<b>Crop Loss</b>
<b>New York (Manhattan)</b>	1/27/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Richmond (Staten Is.)</b>	1/27/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Queens</b>	1/27/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Kings (Brooklyn)</b>	1/27/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Nassau</b>	1/21/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Queens</b>	1/21/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Kings (Brooklyn)</b>	1/21/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Bronx</b>	1/21/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>New York (Manhattan)</b>	1/21/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Richmond (Staten Is.)</b>	1/21/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Westchester</b>	1/21/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Rockland</b>	1/21/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Suffolk</b>	1/21/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Putnam</b>	1/21/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Orange</b>	1/21/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -



<b>Excessive Heat, Extreme Cold/ Wind Chill Events and Losses From 1996-2013</b>						
<b>County</b>	<b>Date</b>	<b>Type</b>	<b>Death</b>	<b>Injuries</b>	<b>Property Loss</b>	<b>Crop Loss</b>
<b>Putnam</b>	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Orange</b>	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Westchester</b>	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Rockland</b>	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Kings (Brooklyn)</b>	1/17/2000	Extreme Cold/Wind Chill	1	0	\$ -	\$ -
<b>Queens</b>	1/17/2000	Extreme Cold/Wind Chill	2	0	\$ -	\$ -
<b>Suffolk</b>	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Nassau</b>	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Bronx</b>	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>New York (Manhattan)</b>	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Richmond (Staten Is.)</b>	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Suffolk</b>	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Albany</b>	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Hamilton</b>	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Fulton</b>	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -



Excessive Heat, Extreme Cold/ Wind Chill Events and Losses From 1996-2013						
County	Date	Type	Death	Injuries	Property Loss	Crop Loss
Schenectady	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Schoharie	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Saratoga	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Washington	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Warren	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Herkimer	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Montgomery	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Schenectady	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
Rensselaer	1/17/2000	Extreme Cold/Wind Chill	0	0	\$ -	\$ -
<b>Total</b>			<b>55</b>	<b>0</b>	<b>\$ 63,000</b>	<b>\$ -</b>

Source: National Climatic Data Center NOAA, <http://www.ncdc.noaa.gov/stormevents/choosedates>

### Probability of Future Extreme Temperatures Events

Based on historical events from 1960-2012 and average probability models, an average annualized future probability assessment was completed for the sixty-two counties found within the State of New York. The total future probability percentage for each county was added together and then divided by 62 for both extreme heat and extreme cold hazards. The data revealed that there is an overall 6% average future probability that an extreme heat occurrence will impact New York State in any given year. New York, Queens, and Kings Counties are the most probable to experience an extreme heat event. In comparison, extreme cold events have a 7% average future probability in a given year to occur, and are most likely to occur in Franklin, Clinton, and Cattaraugus Counties. Considering the State



as a whole, Franklin, Clinton, and St. Lawrence Counties were most probable to experience an extreme temperature event whether it's an extreme heat or cold/ windchill occurrence.

Records show that there has been an increase in climate change over the years and since 1970 the global temperature averages have risen by 0.9 degrees primarily resulting from greenhouse gases<sup>1</sup>. A big focus on limiting greenhouse gas emissions to keep climates close to what scientist refer to as the "Holocene" time period, (a time period during which human civilization was evolved) would help with minimizing extreme heat waves and reducing extreme weather frequencies. The increase in average temperatures have caused more days above 90°F, longer warmer seasons, and a spike in heavier precipitation.

#### **Justification for Minimal Vulnerability/ Loss Assessment**

Extreme Temperature occurrences are typically regional in scale; and, while past occurrences have resulted in loss of life, the severity is not considered likely to cause a life safety threat to large populations. Extreme temperature was ranked as "low" with a HAZNY-Mitigation score of 19. Consequently, it is determined that there is not sufficient evidence that Extreme Temperatures has a high level of risk to justify further analysis for the 2014 Plan update, but it is recommended that local hazard mitigation plans consider addressing Extreme Temperature preparedness measures in future plans.

The information provided in the Risk Assessment sections below serves as guidance for impact and consequence analysis and local hazard mitigation planning.

### **3.8.2 Assessing Extreme Temperatures Vulnerability by Jurisdiction**

Extreme temperatures can cause serious injury or death but not in large numbers. Extreme temperature occurrences can take place as often as once a year or once every seven years. None of the recent events have caused any apprehensions regarding an increase in frequency or severity of such events impacting New York State's capabilities to handle such measures. During periods of extreme temperatures, inadequate protection from harsh elements is especially dangerous. Consequently, during extreme temperature conditions, New York State has concerns for specific populations who have been identified as especially vulnerable.

Situational and physical characteristics help to identify vulnerable populations that may not comfortably or safely access and use disaster resources. Specifically, when discussing heat related emergency preparedness, the following groups could be considered vulnerable or at greater risk in extreme temperature emergencies. Information on some of the

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<sup>1</sup><http://news.nationalgeographic.com/news/2012/08/120820-extreme-weather-heat-waves-science-environment-global-warming/> "What's Causing Extreme Weather? Rotten luck and a warmer planet are at play, according to scientists."



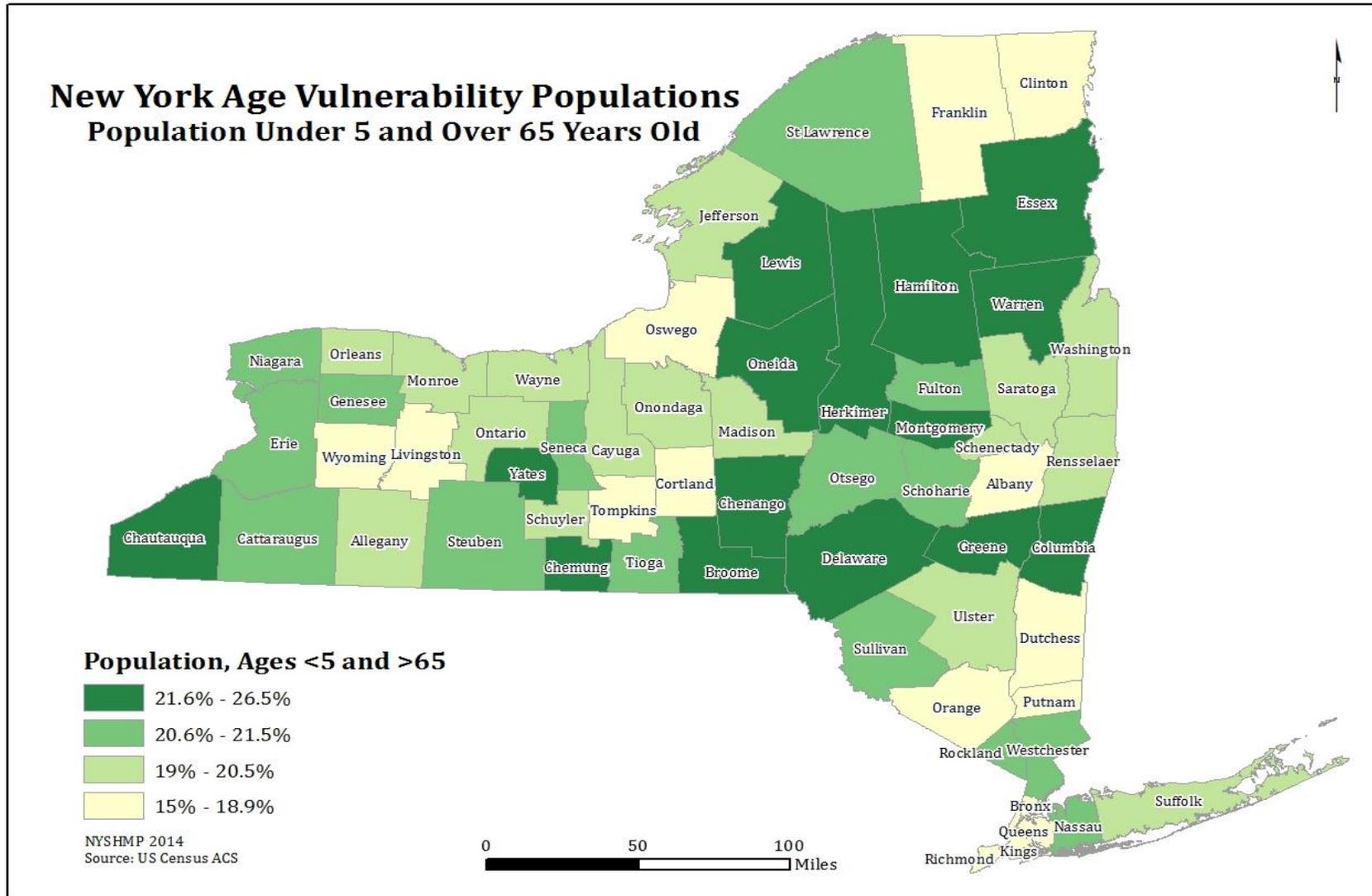
following identified populations can be obtained from the United States Census Bureau website, <http://www.census.gov>:

- Homeless Infants and small children under age five
- Women who are pregnant
- Elderly people (age 65 and older)
- Persons who have obesity
- Persons who are bedridden
- Persons with mental illness/disabilities
- Persons with cognitive disorders
- Persons with medical conditions (e.g., heart disease, diabetes, high blood pressure, insulin)
- Persons requiring life-saving medications (e.g., for high blood pressure, depression, insomnia)
- Persons who utilize medical equipment (e.g., ventilators, oxygen, G-tubes)
- Individuals with drug or alcohol addictions
- Persons who use mobility devices (e.g., wheelchairs, walkers, canes)
- Persons who are non-ambulatory
- Those with sensory impairments (blind/visually impaired or deaf/hard of hearing)
- Persons who are under extreme working conditions
- Persons who are poor
- Persons who are socially isolated
- Persons who do not speak English with minimal access to information

**Figure 3.8f** shows the spatial distribution of age-vulnerable populations. Individuals under 5 years old and over 65 are considered more vulnerable in disasters because of dependency, mobility, physicality, and other characteristics that make them more vulnerable in disaster situations. Hamilton, Delaware, and Yates Counties are the top three counties with the highest percentage of age-vulnerable populations in the State. This map contains a broad stroke of information for the counties. When profiling extreme temperatures, it is incumbent upon local municipalities to investigate their jurisdiction's number of vulnerable population to gain an accurate assessment of the represented age groups.



Figure 3.8f: New York Age Vulnerable Populations



## Local Plan Integration/ Risk Assessments

Since August 2013, 56 FEMA-approved local hazard mitigation plans (LHMP) have been reviewed for the 2014 Update. The State's planning team had the opportunity to review local county risk assessments to help the State better understand its vulnerability in terms of the jurisdictions most threatened by classified hazards. In its analysis, the State of New York reviewed the processes of local governments and how their hazards were ranked based on their jurisdictions and the potential losses (i.e., people, buildings, and dollar values) associated with the hazards of greatest concern.

Where data was available, the State extracted the ranking impact information from the LHMP hazard analysis. This ranking feature is based on a combination of probability, severity, and extent of the hazard and was determined to be the best measure of overall risk in the plans. This ranking was either numeric or described in terms of high, moderately high, moderate, or low. In cases where this information was not available, ranking values were not determined yet considered if identified in the individual county local plans.

For the sake of the 2014 Update, a proper analysis and summary of the data was required. During the review of the local plan risk assessments, all rankings used were based on the New York HAZNY ranking system, and measured on a scale rating from 44 (low) to 400 (high). This analysis revealed that selected county-level plans did include manmade hazards in their analysis, but the State hazard mitigation plan's 2014 Update focused solely on natural hazards.

The local risk assessment summary allowed for an analysis of which hazards are of high concern to particular counties. **Table 3.2a** in **Section 3.2** lists all the hazards and the number of counties that ranked them at each of the scale levels: High, Moderately High, Moderate, Moderately Low, and Low. None of the State's counties ranked Extreme Temperature as a neither "high" nor "moderate" hazard. However Delaware, Orleans, Rensselaer, Ulster, and Westchester County Counties ranked it as "moderately high". Specifically, there were sixteen counties that identified it as "moderately low", and four ranked it as a "low" hazard. **Table 3.8g** displays the highest ranked county Extreme Temperature hazards, because none of the counties ranked it as "high" the 2014 update considered "moderately high" ranking.



**Tables 3.8g: Summary of Extreme Temperature Hazard Impacts and Rankings by County**

Local County Extreme Temperature Hazard Impacts		
Highest Occurrences	Highest Fatalities	Highest Property Damage
Franklin	Kings	St. Lawrence
Clinton	New York	Clinton
St. Lawrence	Queens	Essex
Essex	Bronx	Franklin
New York	Westchester	N/A

Source: SHELDUS

Local County Extreme Temperature Hazard Rankings	
High	Moderately High
N/A	Delaware, Orleans, Rensselaer, Ulster, and Westchester

Source: LHMP

### Development in Hazard Prone Areas

Because Extreme Temperatures are not limited to geographical boundaries or population groups, it is difficult to identify development and population trends that impact this hazard. Current land use and building codes incorporate standards that address and mitigate extreme temperature accumulation.

### 3.8.3 Assessing Vulnerability of State Facilities to Extreme Temperatures

State owned and operated facilities could be vulnerable to multiple impacts and consequences of hazards related to extreme temperatures. **Table 3.8h** describes some of these vulnerabilities, which can potentially affect state facilities. Information in this table can serve as a guide to continuity planning for state agencies.



**Table 3.8h:** Potential Impacts and Consequences to State Facilities from Hazards Associated with Extreme Temperatures**Table 3.8h: Impact and Consequences to State Facilities**

<i>Hazard</i>	<i>Potential Impacts and Consequences to State Facilities</i>
<b>Extreme Temperatures</b>	<ul style="list-style-type: none"> <li>• Power Failure</li> <li>• Loss of critical infrastructure (communications, mechanical systems, power, water supply, technology)</li> <li>• Long-term conditions – rotating closures or full shut-down</li> </ul>

### 3.8.4 Estimating Potential Losses by Jurisdiction- Overview

Based on historical data derived by SHELDUS, from 1960 to 2012 the State of New York has had over \$3 billion in economic losses with \$1,186,555,000 of those losses generated since 2010. Broome, Tioga, and Delaware Counties found in the southwestern region of the State have had the greatest amount of property damage over the last five decades. Although crop damage contributes to far less of the State’s total economic loss, Essex, Orleans, and Clinton Counties have suffered the most in crop damage totaling \$7,868,494 since 1960.

**Table 3.8i** provides the annualized losses for extreme temperature events. The data used was based on SHELDUS records from 1960-2012, with the exception of hurricane, earthquake, and flood hazards which were derived from Hazus-MH 2.1. For those specific hazards, a probabilistic run was generated to determine the total annual losses for each county found within the State. The information provided by SHELDUS was determined by taking the total economic losses divided by the number of years of record (52) to obtain the losses per year. **Figure 3.8g**, illustrates the top ten counties annualized losses with a total of \$51,933 in extreme temperature losses for the entire State of New York.

**Table 3.8i: Average Annual Extreme Temperature Losses by County 1960-2012**

County	Extreme Temperature	County	Extreme Temperature	County	Extreme Temperature
St Lawrence	\$ 13,517	Chenango	\$ 56	Allegany	\$ 16
Clinton	\$ 9,631	Cortland	\$ 56	Chautauqua	\$ 16
Essex	\$ 9,631	Delaware	\$ 56	Chemung	\$ 16
Franklin	\$ 8,669	Fulton	\$ 56	Columbia	\$ 16
Dutchess	\$ 712	Hamilton	\$ 56	Erie	\$ 16
Bronx	\$ 702	Herkimer	\$ 56	Genesee	\$ 16
Kings	\$ 702	Jefferson	\$ 56	Greene	\$ 16
Nassau	\$ 702	Lewis	\$ 56	Livingston	\$ 16
New York	\$ 702	Madison	\$ 56	Monroe	\$ 16



County	Extreme Temperature
Orange	\$ 702
Putnam	\$ 702
Queens	\$ 702
Richmond	\$ 702
Rockland	\$ 702
Suffolk	\$ 702
Sullivan	\$ 702
Ulster	\$ 702
Westchester	\$ 702
Albany	\$ 56
Broome	\$ 56
Cayuga	\$ 56

County	Extreme Temperature
Montgomery	\$ 56
Oneida	\$ 56
Onondaga	\$ 56
Oswego	\$ 56
Otsego	\$ 56
Schoharie	\$ 56
Schuyler	\$ 56
Seneca	\$ 56
Tioga	\$ 56
Tompkins	\$ 56
Wayne	\$ 56
Cattaraugus	\$ 25

County	Extreme Temperature
Niagara	\$ 16
Ontario	\$ 16
Orleans	\$ 16
Rensselaer	\$ 16
Saratoga	\$ 16
Schenectady	\$ 16
Steuben	\$ 16
Warren	\$ 16
Washington	\$ 16
Wyoming	\$ 16
Yates	\$ 16
<b>Total</b>	<b>\$ 51,933</b>

Source: SHELDUS, 2013

Figure 3.8g: Average Annual Extreme Temperature Losses by County 1960-2012



Source: SHELDUS, 2013



### 3.8.5 Estimating Potential Losses of State Facilities

Although state agencies maintain internal databases that identify location and value of properties within their areas of responsibility, New York State does not currently have a comprehensive data set of state-owned and operated assets that can be integrated into the GIS methodology for analysis. However, a state facilities inventory project was initiated in August 2013, which will gather information that can be used to build a comprehensive data set. The pilot phase, which will look at a specific critical facility category and develop the methodology for the project, is expected to be completed in mid-2014. At that time, the next phase of the project will be developed for what is anticipated to be a multi-year project.

### 3.8.6 Data Limitations and Other Key Documents

The Extreme Temperature Hazard in New York State is often underestimated because other natural hazards occur more frequently (e.g., Floods, Tornadoes, Hurricanes) and its effects can vary based on region and vulnerable population within the State. The Mitigation Plan Development Team researched the extreme temperature hazard as it affects the State. Contents of this section result from research and outreach including the following sources:

- New York State Emergency Management Office, *New York State Comprehensive Emergency Management Plan Vol. II*
- National Weather Service, <http://www.noaa.gov/themes/heat.php>
- Federal Emergency Management Agency, <http://m.fema.gov/extreme-heat>
- New York City Office of Emergency Management, *New York City Heat Emergency Plan* [http://www.nyc.gov/html/oem/html/hazards/heat\\_safety.shtml](http://www.nyc.gov/html/oem/html/hazards/heat_safety.shtml)
- City of Long Beach New York, [http://www.longbeachny.org/index.asp?Type=B\\_BASIC&SEC=%7BF277C090-D853-4DA-A92C-8D99AFB90965%7D](http://www.longbeachny.org/index.asp?Type=B_BASIC&SEC=%7BF277C090-D853-4DA-A92C-8D99AFB90965%7D)
- National Climatic and Data Center, <http://www.ncdc.noaa.gov/oa/climate/severeweather/temperatures.html>
- State of California, *2007 Multi-Hazard Mitigation Plan*.
- The Climate of New York [http://nysc.eas.cornell.edu/climate\\_of\\_ny.html](http://nysc.eas.cornell.edu/climate_of_ny.html)

**Please note:** data obtained from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™) is a county-level hazard data set for the U.S. for 18 different natural hazard event types such as thunderstorms, hurricanes, floods, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data derives from the national data source, National Climatic Data Center's monthly Storm Data publications. Using the latest release of SHELDUS™ 12.0, the database includes every loss causing and/or deadly event between 1960 through 1992 and from 1995 onward. Between 1993 and 1995, SHELDUS™ reflects only events that caused at least one fatality or more than \$50,000 in property or crop damages.



## Section 3.9: FLOOD

*(Riverine overbank flooding, flash floods, alluvial fan floods, mudflows or debris floods, ice-jams, dam- and levee-break floods, local draining or high groundwater levels, fluctuating lake levels, and coastal flooding)*

### 2014 SHMP Updates

- The 2011 flood hazard section was five sub-sections; the 2014 section was consolidated to one section.
- The 2011 flood hazard section profiled seven hazard sub-types; the 2014 section profiles nine hazard sub-types: riverine overbank flooding, flash flooding, alluvial fan floods, mudflows or debris floods, dam-and levee-break, local draining or high groundwater levels, fluctuating lake levels, ice-jams, and coastal flooding.
- Coastal Erosion was removed as a flood hazard and relocated to Section 3.5 Coastal Erosion as a stand-alone hazard.
- The following figures/tables have been added:
  - Estimated Population, Total Parcels, NFIP Policies, and State Buildings Located in the 100-Year Flood Zone
  - Historical and Recent Events and Losses by County
  - Presidentially Declared and Undeclared Disasters
  - State Flood Events
  - State Property Damage
  - Total Dams and Dam Hazard Classification
  - NFIP Data including Repetitive and Severe Repetitive Loss, Insurance Coverage, and Premiums Paid
  - State Flood Map Status by County
- Vulnerability and loss data from local plans have been addressed.
- Probability of Future Events has been addressed.
- The Biggert Waters Flood Insurance Reform Act of 2012.

### 3.9.1 Flood Profile

New York State exhibits a unique blend of weather (climatological and meteorological) features that influence the potential for flooding. Factors include temperature, which is affected by latitude, elevation, proximity to water bodies and source of air masses; and precipitation, which includes snowfall and rainfall. Precipitation intensities and effects are influenced by temperature, proximity to water bodies, and general frequency of storm systems.



Hazard	Key Terms and Definitions
Flood	<ul style="list-style-type: none"> <li>• <u>Flood Watch</u> – Flooding is possible. Residents should listen to local radio and television weather station.</li> <li>• <u>Flash Flood Watch</u> – Flash flooding is possible. Residents should be prepared to move to higher ground, continue to listen to local radio and television weather station.</li> <li>• <u>Flood Warning</u> – Flooding is occurring or will occur soon; if advised to seek higher ground, residents should do so immediately.</li> <li>• <u>Flash Flood Warning</u> – A flash flood is occurring; residents should seek higher ground on foot immediately.</li> </ul>

### Characteristics

Flood is a natural hazard that can occur during any season and in any region of the country, placing hardship on the impacted communities. Flooding typically occurs during prolonged rainfalls over several days, intense rainfalls over a short period of time, or when an ice or debris jam causes a river or stream to overflow onto the surrounding area. Flooding can also result from the failure of a water control structure, such as a levee or dam. The most common cause of flooding is due to rain or snow melt that accumulates faster than soils can absorb it or rivers can carry it away. **Figure 3.9a** provides a visual of where the most commonly referred to rivers, creeks, reservoirs, and lakes are located throughout New York State, and which counties are vulnerable to flooding.

### Rivers and Creeks:

Black River, Canisteo River, Cattaraugus Creek, Chemung River, Chenango River, Cohocton River, Delaware River, Erie Canal, Genesee River, Hudson River, Mohawk River, Raquette River, Saranac River, Schoharie Creek, Sesquehanna River, St. Lawrence River, St. Regis River, Tonawanda Creek and Walkkill River

### Lakes and Reservoirs:

Allegheny Reservoir, Black Lake, Canandaigua Lake, Cayuga Lake, Chatauqua Lake, Cranberry Lake, Great Sacandaga Lake, Keuka lake, Lake Champlain, Lake Erie, Lake George, Lake Ontario, Oneida Lake, Pepacton Reservoir, Seneca Lake, Skaneateles Lake and Stillwater Reservoir.



Figure 3.9a: New York State Waterways



Source: Geoscience News and Information, 2013



All types of flooding can cause widespread damage throughout rural and urban areas, causing loss of life, injury, and severe water damage to residential and commercial buildings, electrical and communication networks, and agriculture. New York State has identified nine flood types that can cause loss of life and damage to property, infrastructure, agriculture, and the environment: riverine overbank flooding, flash floods, alluvial fan floods, mudflows or debris floods, dam- and levee-break floods, local draining or high groundwater levels, fluctuating lake levels, ice-jams, and coastal flooding.

### **Riverine Flooding**

Riverine floodplains range from narrow, confined channels in the steep valleys of hilly and mountainous areas to wide, flat areas along major rivers and low-lying coastal regions. The volume of water in the floodplain is a function of the size of the contributing watershed and topographic characteristics such as watershed shape and slope, and climatic and land-use characteristics.

In steep narrow valleys, flooding usually occurs quickly and is of short duration, and floodwaters are likely to be rapid and deep. In relatively flat floodplains, areas may remain inundated for days or even weeks, but floodwaters are typically slow-moving and relatively shallow, and may accumulate over long periods of time.



*Severe flooding caused by the spring and early summer's persistent rains damaged houses, closed roads and forced people to flee their homes in Mohawk Valley in Herkimer County in June 2006. (NYS, 2006)*

Flooding from large rivers usually results from large-scale weather systems that generate prolonged rainfall over wide areas. These same weather systems may cause flooding in hundreds of smaller basins that drain to major rivers. Small rivers and streams are susceptible to flooding from more localized weather systems that cause intense rainfall over small areas. In some parts of the State, annual spring floods result from snowmelt, and the extent

of flooding depends on the depth of winter snowpack and spring weather patterns. In the Northeast, winter thaws, sometimes combined with rain, can also cause significant flooding. Riverine flooding is most severe in the following river basins: Delaware, Susquehanna, Chemung, Erie-Niagara, Genesee, Allegany, Hudson, and Mohawk, as well as the Lake Champlain Basin.



## Flash Floods

Flash floods are characterized by a rapid rise in water level, high velocity, and large amounts of debris. They are capable of tearing out trees, undermining buildings and bridges, and scouring new channels. Major factors causing flash flooding are the intensity and duration of rainfall, the steepness of watershed, and stream gradients. The extent and density of watershed vegetation, the natural and artificial flood storage areas, and the configuration of the stream bed and floodplain are also important.

Flash floods can result from the failure of a dam, the sudden breakup of an ice jam, or an intense rainfall over a very short duration. All of these events can cause the release of a large volume of water in a short period of time. Flash flooding in urban areas is an increasingly serious problem due to removal of vegetation, increased paving, replacement of permeable ground cover with impermeable surfaces that increase runoff, and construction of drainage systems that increase the speed of runoff.

Flash flooding can occur throughout any region in New York State; however, the distinctive flash flood event that is characterized by fast-moving water and violent, damaging results requires a steep topography. Steep topography prevails in the Allegheny-Catskill plateau, which runs the entire width of New York State's Southern Tier, and the Adirondack Mountains to the north.

## Alluvial Fan Flooding

An alluvial fan is a triangle-shaped deposit of gravel, sand, and even smaller pieces of sediment, such as silt. This sediment is called alluvium. Alluvial fans are usually created as flowing water interacts with mountains, hills, or the steep walls of canyons. Streams carrying alluvium can comprise a trickle of rainwater, a fast-moving creek, a powerful river, or even runoff from agriculture or industry. As a stream flows down a hill, it picks up sand and other particles. The rushing water carries alluvium to a flat plain, where the stream leaves its channel to spread out. Alluvium is deposited as the stream fans out, creating the familiar triangle-shaped feature.<sup>1</sup>

Alluvial fans are subject to flooding and can be even more dangerous than the upstream canyons that feed them. Their slightly convex perpendicular surfaces cause water to spread until there is no zone of refuge. If the gradient is steep, active transport of materials down the fan creates a moving substrate that is inhospitable to travel on foot or wheels. But as the gradient diminishes downslope, water comes down from above faster than it can flow away downstream, and can pond to hazardous depths.<sup>2</sup>

There are no documented incidents of alluvial fan flooding in NYS; however, sediment deposition within stream channels is a factor in flooding in certain areas of NYS. Communities that are situated along streams or rivers where stream slope quickly changes

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<sup>1</sup> National Geographic Encyclopedia Entry

<sup>2</sup> Wikipedia



from a high gradient to a low gradient will often have sediment drop out and build up in the stream channel. This is a normal natural occurrence, and in unpopulated areas, the stream will clear or move its channel during a large storm event. However, in confined areas around culverts and bridges or within populated areas, the stream may not be able to act in its natural way and will leave its banks and cause flooding during relatively minor storm events. Where environmental permits can be obtained and it is practical, regular stream maintenance will often help alleviate flooding during minor storm events.

### **Mudflows & Debris Floods**

Mudflows are rivers of liquid and flowing mud on the surface of normally dry land, often caused by a combination of brush loss and subsequent heavy rains. Mudflows can develop when water saturates the ground, such as from rapid snowmelt or heavy or long periods of rainfall, causing a thick liquid downhill flow of earth. Mudflows are different from other earth movements such as landslides, slope failures, and even moving saturated soil masses in which masses of earth, rock, or debris move down a slope where there is not a flowing characteristic.

Debris can be caused naturally or exacerbated by human activity. Decayed trees, broken tree limbs, logs, and abandoned beaver dams are examples of natural debris. Littering or improper handling and storage of material within the floodplain can contribute to debris flooding. During heavy rainfall or severe storms, debris is washed into waterways, exacerbating flood damages and clean-up.

### **Ice Jam Floods**

The formation of ice jams depends on the weather and physical conditions in river channels. They are most likely to occur where the channel slope naturally decreases, in culverts, and along shallows where channels may freeze solid. Ice jams and resulting floods can occur during the following: **1)** fall freeze-up from the formation of frazil ice, **2)** midwinter periods when stream channels freeze solid, forming anchor ice, and **3)** spring breakup when rising water levels from snowmelt or rainfall break existing ice cover into large floating masses that lodge at bridges or other constructions.

Damage from ice jam flooding can exceed that caused by open water flooding. Flood elevations are usually higher than predicted for free-flow conditions, water levels may change rapidly, and additional physical damage is caused by the force of ice impacting buildings and other structures. Flooding caused by ice jams is similar to flash flooding. Ice jam formation causes a rapid rise of water at the jam and extends upstream. Failure or release of the jam causes sudden flooding downstream. While it is difficult to identify particular areas that are generally prone to ice jam flooding because the hazard can be localized, based on the causal characteristics, the ice jam flood hazard is most prevalent in locations of flat terrain and where climate includes extended periods of below-freezing temperatures.



Ice jams are common in the Northeast United States, and New York is no exception. In fact, according to the US Army Corps of Engineers, New York State ranks second in the nation for total number of ice jam events. Areas of New York that include characteristics contributing to ice jam flooding include the northern counties of the Finger Lakes region and far western New York, the Mohawk Valley of central and eastern New York, and the North Country. Because of the sometimes unpredictable nature of ice jam floods, FEMA's Flood Insurance Rate Maps often do not reflect ice jam flood threats.

### **Dam- and Levee-Break**

Dams provide essential benefits to our nation, such as flood control, drinking water, irrigation, and recreation. The safe operation and proper maintenance of these dams is critical to sustaining these benefits while preventing the possibility of a dam failure. Thousands of our nation's dams are in need of rehabilitation to meet current design and safety standards. They are not only aging, but are now subject to stricter criteria as a result of increased downstream development and advancing scientific knowledge predicting flooding, earthquakes, and dam failures.

A typical dam is a barrier constructed across a valley for impounding water or creating a reservoir, but there are other types of dams, including ring reservoirs. Dam failures can occur as a result of structural failures, such as progressive erosion of an embankment or overtopping and breaching by a severe flood. Earthquakes can also contribute to weakening of dams. Disastrous floods caused by dam failures, although not in the category of natural hazards, have caused great loss of life and property damage, primarily due to their unexpected nature and tremendous flow of floodwater.

The average age of our nation's dams is 52 years. By 2020, 70% of the total dams in the United States will be over 50 years old. Fifty years ago, dams were built with the best engineering and construction standards of the time. However, as the scientific and engineering data have improved, many dams are not expected to safely withstand current predictions regarding large floods and earthquakes.

Like many other states, NYS has a comprehensive dam safety program. **It is comprised of three governmental authorities regulating dam safety in NYS:**

- NYS Department of Environmental Conservation (DEC)
  - Environmental Conservation Law (ECL) Article 15, Part 673
- Federal Energy Regulatory Commission (FERC)
  - 18 CFR 12.22-24
- U.S. Army Corp of Engineers (USACE)
  - EP 1110-2-13, Dam Safety Preparedness

Dam safety emergency action plans, or EAPs, are formal dam failure procedures written by the dam owner/operator. The EAPs are site-specific plans and relate only to the facility's procedures to prevent/mitigate the occurrence of a catastrophic dam failure. USACE is



responsible to submit an EAP for dams they own, operate, and maintain. EAPs for hydroelectric dams fall under the purview of FERC, and DEC regulates dam safety and EAPs for all dams in NYS.

To support emergency planning and other tasks, dams are classified according to the potential impacts a dam failure may have on the surrounding areas. This hazard classification is only indicative of the potential consequences a dam failure may have and not the physical condition of the dam. **The New York classifications are below:**

- Class "A" (low hazard);
- Class "B" (significant/intermediate hazard);
- Class "C" (high hazard);
- Class "D" (non-hazard).

There are more than 5,700 active dams in NYS. Approximately 392 are classified as high hazard, and 757 as intermediate hazard. About 4,100 are classified as low hazard or "no hazard."

An EAP must be developed by the dam owner if a dam is classified as either a Class B (significant/ intermediate) or Class C (high-hazard). **All emergency action plans are required to include, but are not limited to:**

1. Procedures for the notification of an emergency, to include a notification flow chart.
2. Inundation maps or other acceptable description of the potential inundation area. The dam break analysis should consist of two scenarios: "sunny day failure" and "probable maximum flood" or PMF.
  - DEC regulations for EAPs:
    - i. Class "B" dams may have an engineer prepare a dam break analysis.
    - ii. Class "C" dams shall have an engineer prepare a dam break analysis.
  - FERC EAPs:
    - i. Class "B" and "C" dams shall have an engineer prepare a dam break analysis.
3. Procedures for implementing all other aspects of the emergency action plan. This includes:
  - Emergency detection and trigger events;
  - Timely evaluation of the emergency situation for appropriate course of action, which may include the declaration of an emergency condition level;
  - Security provisions; and
  - Emergency termination.
4. General responsibilities under the plan.
5. Procedures for exercising the plan.
6. Procedures for updating and maintaining the plan.



**During a potential or actual emergency, the dam owner/operator will notify off-site officials of a dam emergency using an emergency classification based on the conditions at the dam using the following letters/ descriptions:**

- Condition "A" – failure is imminent or has occurred.
- Condition "B" – there is potential for failure.
- Condition "C" – a non-failure emergency condition.

Ideally, the emergency manager should be involved in the EAP's development. **The emergency manager would need to, at the least:**

- Understand dam classification and emergency condition levels that could be declared;
- Check that notifications and responsibilities in the EAP are correctly identified;
- Understand the potential area of impact of a dam failure, which should serve as a starting point for the development of an annex to their CEMP.

EAP is not a local jurisdiction's response or flood plan; it is a specific facility's dam failure scenario plan. While the EAP would outline the dam owner's responsibility at the facility (e.g., notify local government), the emergency manager's responsibility encompasses the response activities that would be undertaken if the dam were to fail. Recipients of an EAP, in addition to the State, shall be all municipalities within the outlined inundation areas, as identified in the NYS Dam Safety Planning Emergency Action Plan dam break analysis.

The state generally inspects Class C dams every two years and Class B dams every four years. To support emergency planning efforts and raise awareness among local officials and emergency managers, a copy of each inspection report is sent to the chief executive of the community in which the dam is located. Municipal officials or emergency managers from any municipality in the dam's inundation area may receive a copy of the inspection report upon request.

Based on research and data provided by NYS and local counties, levee breaks are a low risk hazard; therefore, all stakeholders are primarily focusing on dam failure and safety.

The New York State Department of Environmental Conservation (DEC) is responsible for more than 100 flood control projects throughout the state. Most were constructed by USACE and are operated and maintained by DEC, in some cases with local municipal partners.

### **Levee Control Safety Projects**

Flood control projects consist of modified channels, floodwalls, levees, ponding areas, and various drainage structures as needed. The nature and design of projects often require significant amounts of land. Lands in fee title and permanent easements were obtained by NYS in order to construct, operate, and maintain these projects. These property rights



allow DEC and its agents to access project lands to perform all necessary work. Mowing, sediment removal from drainage channels and waterways, concrete repair, and functional checks of equipment are examples of activities performed to ensure the ongoing structural integrity and function of earthen levees, floodwalls, drainage structures, and other protective works features.

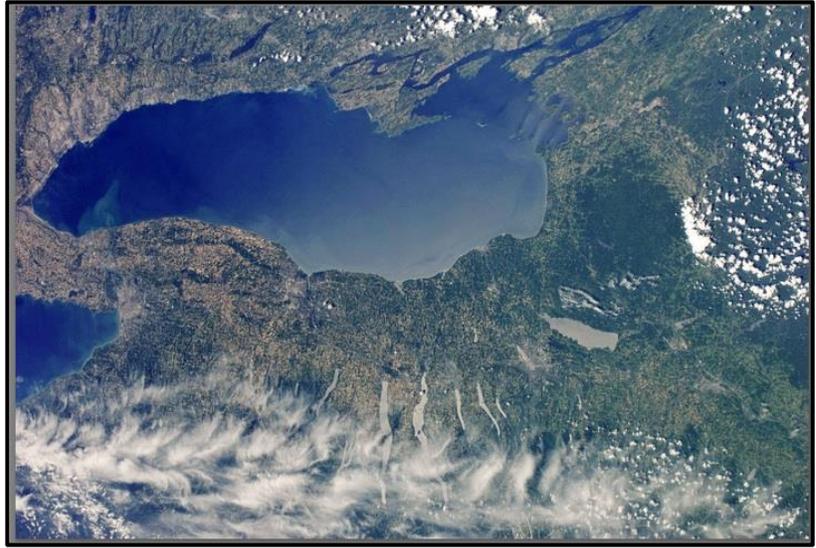
The purpose of the Flood Control Projects Program is to prevent loss of life and property damages from flooding while protecting the health, safety, and well-being of residents through construction and proper maintenance and operation of flood protection works. Under ECL Article 16, DEC is required to be the non-federal sponsor to participate in the Federal Flood Control Program. **There are two major components of the program:**

- 1. Project Operation and Maintenance and Major Repair and Rehabilitation:** DEC is required by contract with the federal government to operate, maintain, and rehabilitate projects in an “as constructed” state of readiness. Many of the large flood control projects are maintained entirely at State expense. The DEC Division of Water (DOW) and Division of Operations (OPS) jointly perform duties to operate these projects. The DOW observes weather and local conditions to determine when a project needs to initiate operation. Once initiated, DOW monitors the overall project to identify any weaknesses and also monitors the local conditions to determine when the operation of a project can cease. DOW identifies critical work needs, and the OPS performs maintenance and operations work, including mowing levees; cleaning ditches; lubricating equipment; and operating pumps, closures, structures, and gate valves. Repair and replacement work is accomplished in conformance with the State and USACE requirements to assure flood protection reliability. Major repairs and rehabilitation decisions are a significant component of DOW’s capital projects request and direction. Examples of major repairs or replacements include: stabilization in areas of channel bank erosion threatening levees and walls; rehabilitation of concrete walls and flumes; replacement of pump station electrical and mechanical equipment; and gravel shoal removal. As many projects are currently past their design life, major rehabilitation is required.
- 2. New Project Development:** Development of new flood protection projects with the federal government requires studies of economical and environmentally sensitive alternatives to provide flood protection, reduce flooding damages, and upgrade existing projects.



## Local Drainage or High Groundwater Levels

Locally heavy precipitation may produce flooding in areas other than delineated floodplains or along recognizable drainage channels. If local conditions cannot accommodate intense precipitation through a combination of infiltration and surface runoff, water may accumulate and cause flooding problems. During winter and spring, frozen ground and accumulations of snow may contribute to inadequate drainage and localized ponding. Similar to ice jams,



*Satellite view of Cayuga Lake located in the center of NYS Finger Lakes region. (Cayuga Lake Watershed Network, 2013)*

poor drainage flooding problems are localized but generally occur in areas with flat gradients and generally increase with urbanization, which speeds the accumulation of floodwaters because of the addition of impervious areas. Shallow sheet flooding may result unless channels have been improved to account for increased flows.

High groundwater levels may be of concern and can cause problems even where there is no surface flooding. Seasonally high groundwater is common in many areas and occurs only after long periods of above-average precipitation in others. High groundwater problems are known to occur in urban areas where groundwater pumping has ended and aquifer levels have rebounded. Basement flooding is a particular complaint in areas susceptible to high groundwater levels.

Areas of New York that include characteristics contributing to poor drainage type flooding include the Long Island communities, western New York, and, in general, the more urbanized areas.

New York State has 17 major basins. A drainage basin is a larger watershed containing the watersheds of several other smaller rivers and streams. A watershed is the land that water flows across or under on its way to a river, lake, stream, or bay. Water travels over farm fields, forests, suburban lawns, and city streets, or it seeps into the soil and travels as groundwater. Watersheds are separated from each other by high points, such as hills or slopes.

To picture a watershed, think of a small brook that flows into a river. The river then flows into a lake. All the land that surrounds the brook, river, and lake are in one watershed, because all the water in the area flows into the lake. In addition, the lake and its watershed

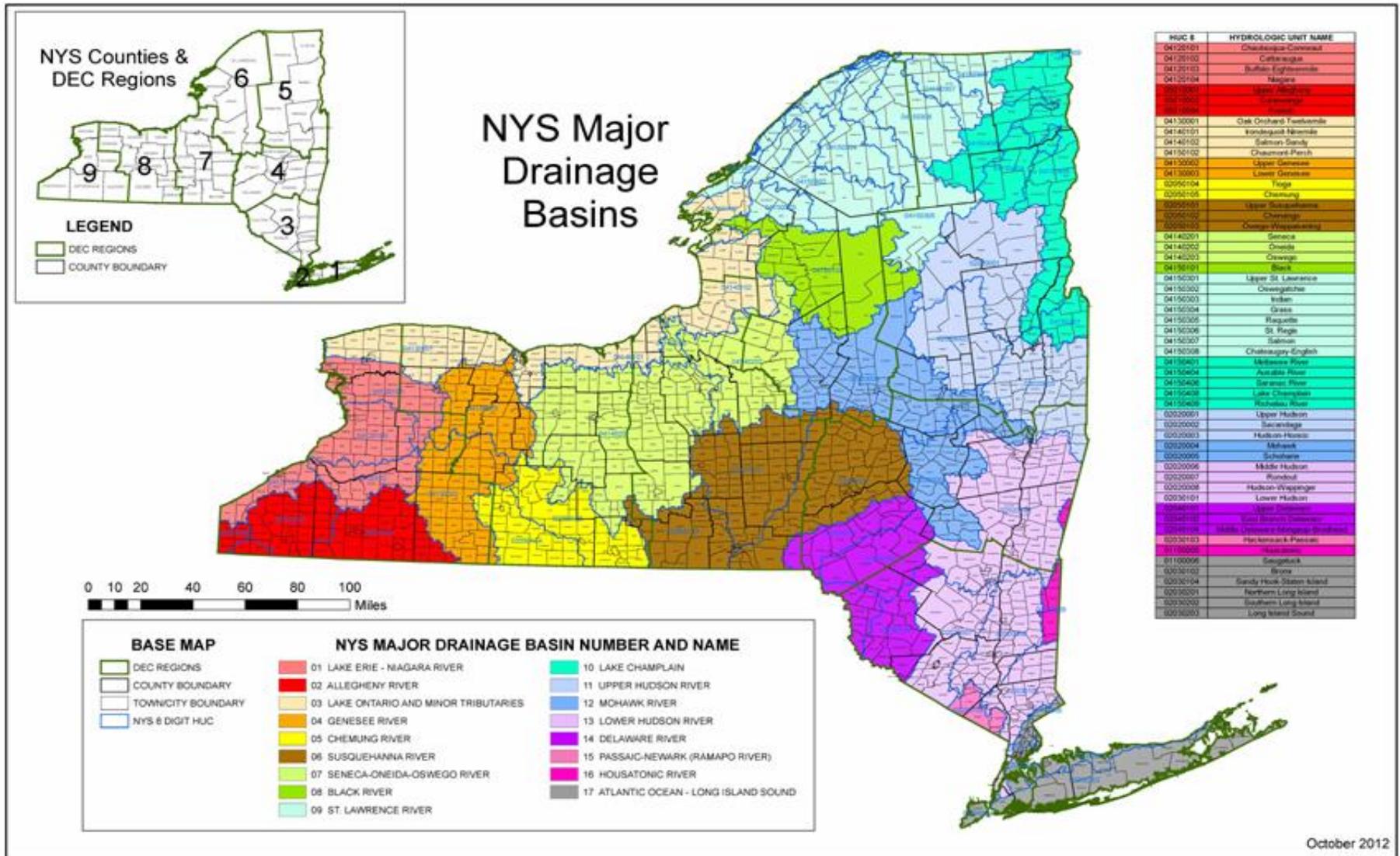


may be a part of a larger river's watershed. Water in the larger rivers eventually makes its way to the ocean.

New York State's hydrologic resources are geographically organized into 17 major drainage basins. As demonstrated in **Figure 3.9b**, the drainage basins are mapped and identified using the United States Geological Survey (USGS) eight-digit hydrologic unit code, or "huc code." These maps and associated codes provide a standardized base for use by water-resource organizations in locating, storing, retrieving, and exchanging hydrologic data. They are widely accepted for use in planning and describing water-use and related land-use activities (DEC, 2012). DEC provides facts and additional maps about each watershed's location, size, water quality, and more. This information is available for public access at <http://www.dec.ny.gov/lands/60135.html>



Figure 3.9b: New York State Major Drainage Basins/Watersheds



## Fluctuating Lake Levels

Water levels in lakes can fluctuate on a short-term seasonal basis or on a long-term basis over periods of months or years. Heavy seasonal rainfall can cause high lake levels for short periods of time, and snow melt can result in higher water levels during the spring. Long-term fluctuations are a less-recognized phenomenon that can cause high water and subsequent flooding problems lasting for years, or even decades.

In New York, Lakes Ontario and Erie experience seasonal and long-term fluctuations due to precipitation patterns over the vast Great Lakes drainage basin. The lakes have been known to exhibit high water levels for significant periods, in spite of the limited amount of relief offered to Lake Ontario downstream along the St. Lawrence River. Even during low water periods, however, storms can cause significant flooding when strong winds cause surges. Other large lakes in New York, including the Finger Lakes and Lake Champlain, also experience seasonal and long-term fluctuations in mean water levels.

## Coastal Flooding

There are two major types of coastal storm events that impact the State's marine coastline and the communities located on those shores. Hurricanes and tropical storms are one major type. Originating in the warm waters of the South Atlantic, these are high energy storm systems and their usual path, from south to north, puts Long Island's south shore at great risk. They can produce both high winds and heavy rainfall. When one of these storms makes landfall coincident with high tide, the wind-driven storm surge can overtop barrier dunes, threatening the areas behind them. Nor'easters can also cause flooding on our marine coasts. These storms form in the gap between a high and low pressure system and are sometimes referred to as "precipitation machines." They bring sustained high winds and heavy snow or rain, and are often responsible for storm surges on the north shore of Long Island. These coastal storms, including Nor'easters, tropical storms, and hurricanes, can reach the inland and upland portions of the State and bring torrential rains.



*Cars are submerged at the entrance to a parking garage in New York's Financial District in the aftermath of Hurricane Sandy, Tuesday, Oct. 30, 2012. New York City awakened Tuesday to a flooded subway system, shuttered financial markets and hundreds of thousands of people without power a day after a wall of seawater and high winds slammed into the city, destroying buildings and flooding tunnels. (AP Photo/Richard Drew)*

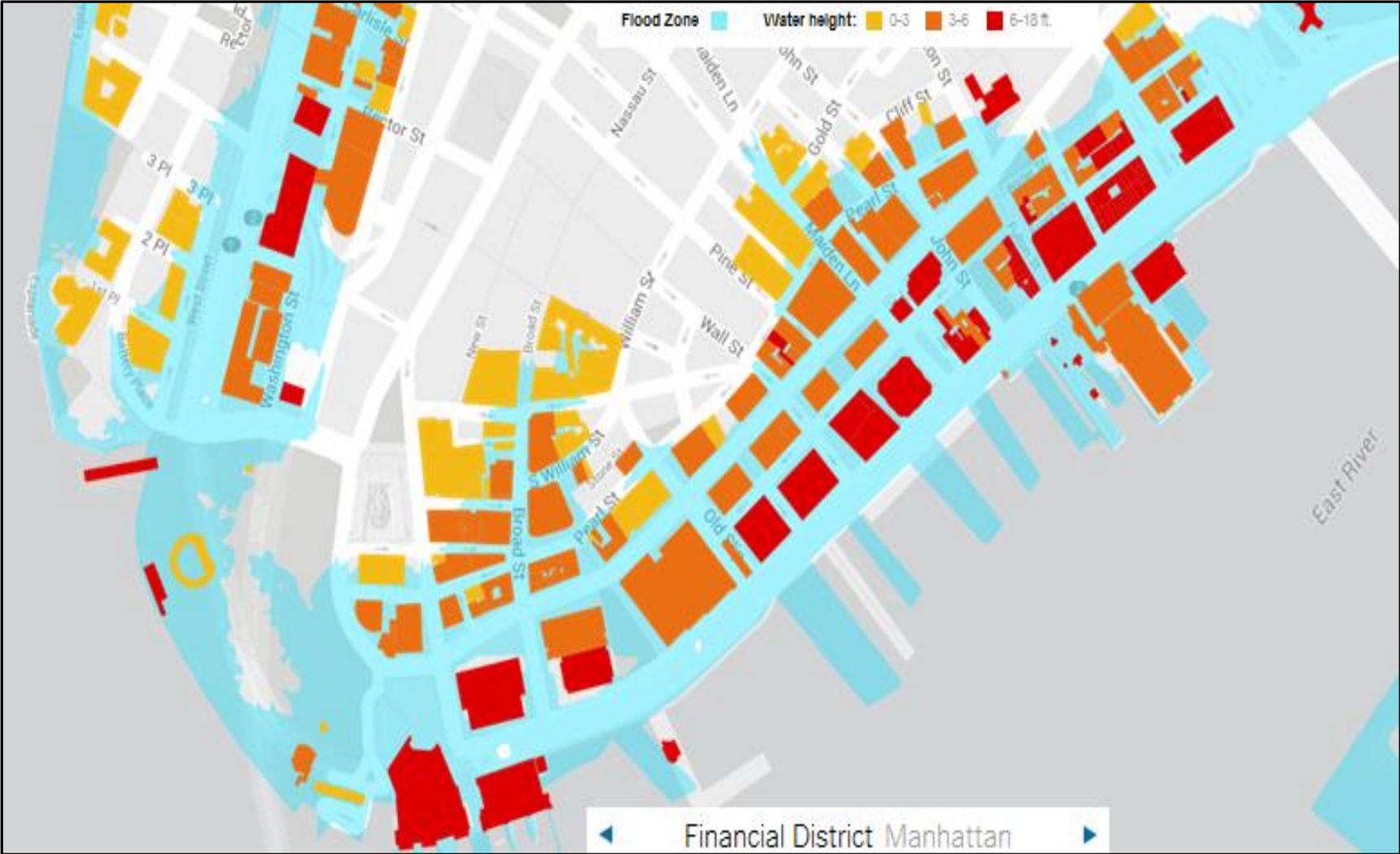
In 2012 Hurricane Sandy traveled through 24 states, crippling thousands of communities. The entire Eastern Seaboard was devastated from Florida to Maine, but Sandy caused millions of dollars in damage particularly in New York and New Jersey coastal communities. Its storm surge hit New York City on October 29<sup>th</sup>, immobilizing residents; flooding streets, subways, railways, and tunnels; and eliminating power resources in and around the city. Flood water levels ranged from one to eighteen feet high in coastal communities in and surrounding NYC.

The **Figures 3.9c** and **Figure 3.9d** below provided by *The New York Times* show a snapshot of areas located in flood areas and water level heights in Manhattan and Staten Island.

Flood areas are shown in **blue shading**; and water level heights are represented by **yellow (0-3 ft.), orange (3-6 ft.)** and **red (6-18 ft.) shading**.



Figure 3.9c: Manhattan’s Financial District Flooding Post-Hurricane Sandy



Source: New York Times, 2012 (Flood areas and levels from the FEMA, Andrew A. Beveridge, [socialexplorer.com](http://socialexplorer.com); building shapes from NYC Open Data)



Figure 3.9d: Oakwood, Staten Island Post-Hurricane Sandy



Source: New York Times, 2012 (Flood areas and levels from the FEMA, Andrew A. Beveridge, [socialexplorer.com](http://socialexplorer.com); building shapes from NYC Open Data)



Coastal communities are still recovering from Hurricane Sandy. **Section 3.5 Coastal Erosion** and **Section 3.12 Hurricane** discuss the impacts of Hurricane Sandy in greater detail. NYS has collaborated with community partners, not-for-profit organizations, and federal agencies such as FEMA and HUD to assist in the recovery efforts to restore businesses and communities along the East Coast. Mitigation projects in coastal communities are currently being funded to elevate structures and acquire properties located throughout New York, Kings, Queens, Richmond, Bronx, Suffolk, and Nassau counties.

Communities along the shores of Lake Erie and Lake Ontario also are faced with coastal flooding. High water levels in lakes, sometimes due to seasonal runoff, sometimes due to above-normal runoff over a longer-term period, can cause near-shore flooding (see discussion in the preceding section). But flooding along the Great Lakes can also come from a seiche. Like water sloshing in a bathtub, seiches are tide-like rises and drops in Great Lakes coastal water levels caused by prolonged strong winds that push water toward one side of the lake, causing the water level to rise on the downwind side of the lake and to drop on the upwind side. When the wind stops, the water sloshes back and forth, with the near shore water level rising and falling in decreasing amounts on both sides of the lake until it reaches equilibrium.

## Location

New York State exhibits a diverse blend of geo-physical features that influence the potential for flooding. Although some regions throughout the state are more susceptible to multiple flood types than others, there are no areas in NYS exempt from flooding. Land characteristics such as topography, elevations, latitudes, and water bodies (including waterways) are contributing factors to flooding.

Topography variations, commonly referred to as steep slopes and hilly terrain, are common in many areas of New York State. Simply put, steep slope features can cause large accumulations of water in the associated valleys or ravines, especially during intense or long-duration rainfalls. **Figure 1a in Section 1** of the plan shows a topographical representation of New York State.

Elevations in New York State range from sea level up to 5,000 ft. above sea level in the high peaks of the Adirondacks. Simply put, rising elevations can affect the flood hazard by having a tendency to increase precipitation amounts from storm systems; this effect is called orographic lift, and it can increase the depth of snow pack leading to spring flooding events.

Latitudes of New York State include those subject to frequent cold weather as air masses are modified moving over the cold far northern reaches of North America. This cold air movement predominates the weather pattern six months out of the year, resulting in large amounts of snowfall, particularly from lake effect (or enhanced) snow fall, and increases the threat of spring floods as moisture is released from the deep snow pack.



New York State has a significant exposure to water. In the interest of identifying the obvious factors, this is a major causal element of the flood hazard. **According to the New York State Department of Environmental Conservation, Bureau of Flood Protection and Dam Safety, Division of Water, water exposure includes the following;**

- Rivers and streams – 52,337 miles
- Reservoirs, ponds, and lakes (excluding the Great Lakes) – 7,849 acres
- Inland water (exclusive of the boundary water areas of Long Island Sound and New York Harbor, which is 1,530 sq. miles (includes NYS portion of Long Island Sound), Lake Ontario and Lake Erie – 1,637 sq. miles
- Great Lakes shoreline – 577 miles
- Atlantic Shoreline – 117.5 miles

Human use of land affects the hydraulics of effluent. Changes in land cover, including agriculture, development, and re-development, can have a significant causal effect on the flood hazard potential. For instance, development leading to increased amounts of impervious surfaces such as roads, parking lots, and buildings can increase rainwater runoff, and development in floodplains or wetlands can potentially result in an increased floodplain level.

Although some areas are more prone to flooding than others, no area is exempt from flood hazards: New York State contains more than 52,000 miles of rivers and streams with 1,480 communities designated as flood-prone areas. It is estimated that approximately 700,000 people live in these flood-prone areas, while millions more work, travel through, or use recreational facilities located in areas subject to flooding. In addition, areas outside mapped and recognized flood hazard zones can also experience flooding. FEMA reports that more than 30% of the claims filed under the NFIP are from damages incurred outside the 100-year floodplain. An example of this type of area is the common “urban flooding” resulting from undersized or poorly maintained drainage systems.

Based on information including historical flooding and flood disaster declarations, flood problems are most acute in the Delaware, Susquehanna, Genesee, Chemung, Hudson, Mohawk, and Allegheny River Basins. These major waterways, along with the tributary streams in the basins, are subject to direct flooding. Tributary streams also imperil persons and property by backwater flooding associated with the major waterways in the basins.

River basins are not the only areas of New York State exposed to flood hazards. New York has more than 3,000 miles of marine and lacustrine coastline that can cause flooding. This includes the lands adjacent to Lake Erie and Lake Ontario, the St. Lawrence and Niagara Rivers, the Hudson River estuary, the Kill van Kull and Arthur Kill, Long Island Sound, and the Atlantic Ocean and their connecting bays, harbors, shallows, and marshes. Long Island has 1,200+ miles of coastline, and the Great Lakes encompass an additional 1,000 miles along their shores. Twenty-five cities, 112 towns, and 103 villages are located on these shorelines and are vulnerable to flood hazards.



## Previous Flood Occurrences

New York State Office of Emergency Management (NYSOEM) Mitigation staff researched several data sources for historical flood records including NYSOEM archives, FEMA statistics, disaster declaration data, Spatial Hazard Events and Losses Databases for the United States (SHELDUS), and NOAA's National Climatic Data Center (NCDC) storm event database. According to FEMA, 52 major flood events resulting in Presidential disaster declarations occurred from 1954 to 2013. NYS has also encountered 101 undeclared flood occurrences dating as far back as 1635.

**Table 3.9a** documents major flood declaration events that occurred from 1954-2013.

**Table 3.9a: Major Flood Disaster Declarations (1954-2013)**

Disaster Number	Type/Location Individual Assistance (IA) Public Assistance (PA)	Declaration Date	Damage Amount
DR-4129	<b>Severe Storms &amp; Flooding</b> PA only – Allegany, Broome, Chautauqua, Chenango, Clinton, Cortland, Delaware, Essex, Franklin, Herkimer, Madison, Montgomery, Niagara, Oneida, Otsego, and Warren Counties	7/12/2013	Currently unavailable
EM-3351 DR-4085	<b>Hurricane Sandy</b> IA - Bronx, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, and Westchester Counties PA – Bronx, Green, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, and Westchester Counties	10/30/2012	FEMA Obligated Dollars as of 2014 Plan Update: IA \$999 million PA \$1.26 billion
EM-3341 DR-4031	<b>Remnants of Tropical Storm Lee</b> IA – Broome, Chemung, Chenango, Delaware, Fulton, Herkimer, Oneida, Orange, Otsego, Schenectady, Schoharie, Tioga, and Ulster Counties PA – Broome, Chemung, Chenango, Delaware, Herkimer, Montgomery, Oneida, Orange, Otsego, Schenectady, Schoharie, Tioga, Tompkins, and Ulster Counties	9/13/2011	FEMA Obligated Dollars as of 2014 Plan Update: IA \$55.2 million PA \$165.8 million
EM-3328 DR-4020	<b>Hurricane Irene</b> IA – Albany, Bronx, Clinton, Columbia, Delaware, Dutchess, Essex, Greene, Herkimer, Kings, Montgomery, Nassau, Orange, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, and Westchester Counties PA – Albany, Bronx, Clinton, Columbia, Delaware, Dutchess, Essex, Franklin, Fulton,	8/31/2011	FEMA Obligated Dollars as of 2014 Plan Update: IA \$103 million PA \$362.5 million



Disaster Number	Type/Location Individual Assistance (IA) Public Assistance (PA)	Declaration Date	Damage Amount
	Greene, Hamilton, Herkimer, Kings, Montgomery, Nassau, New York, Orange, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, and Westchester Counties		
DR-1993	<b>Severe Storms, Flooding, Tornadoes, &amp; Straight-line Winds</b> PA only – Allegany, Broome, Chemung, Chenango, Clinton, Delaware, Essex, Franklin, Hamilton, Herkimer, Lewis, Livingston, Madison, Niagara, Oneida, Onondaga, Ontario, Steuben, Tioga, Ulster, Warren, Wyoming, and Yates Counties	6/10/2011	FEMA Obligated Dollars as of 2014 Plan Update: PA \$25.9 million
DR-1899	<b>Severe Storms &amp; Flooding</b> PA Only – Nassau, Orange, Richmond, Rockland, Suffolk, and Westchester Counties	4/16/2010	Damages: \$78.7 million FEMA Obligated Dollars as of 2014 Plan Update: PA \$49.7 million
DR-1869	<b>Severe Storms &amp; Flooding Associated w/Tropical Depression Ida &amp; a Nor'easter</b> PA only – Nassau and Suffolk Counties	12/31/2009	Damages: \$44.4 million FEMA Obligated Dollars as of 2014 Plan Update: PA \$5.3 million
DR-1857	<b>Severe Storms &amp; Flooding</b> IA – Cattaraugus, Chautauqua and Erie Counties PA – Allegany, Cattaraugus, Chautauqua, Chenango, Cortland, and Erie Counties	9/1/2009	Damages: \$45.4 million FEMA Obligated Dollars as of 2014 Plan Update: IA \$4.6 million PA \$32.6 million
DR-1724	<b>Severe Storms &amp; Flooding</b> IA only – Kings and Queens Counties	8/31/2007	FEMA Obligated Dollars as of 2014 Plan Update: IA \$5.1 million
DR-1670	<b>Severe Storms &amp; Flooding</b> IA – Broome and Chenango Counties PA – Broome, Chenango, Delaware, Hamilton, Herkimer, Montgomery, Otsego, Sullivan, and Tioga Counties	12/12/2006	FEMA Obligated Dollars as of 2014 Plan Update: IA \$3 million PA \$30 million
DR-1665	<b>Severe Storms &amp; Flooding</b> IA – Erie, Genesee, Niagara, and Orleans, Counties PA – Erie, Genesee, Niagara, and Orleans, Counties	10/24/2006	Damages: \$141.58 million FEMA Obligated Dollars as of 2014 Plan Update: IA \$9.1 million PA: \$112.1 million
DR-1650	<b>Severe Storms &amp; Flooding</b> IA – Broome, Chenango, Delaware, Herkimer, Montgomery, Oneida, Orange, Otsego, Schoharie, Sullivan, Tioga, and Ulster Counties PA – Broome, Cortland, Fulton, Greene, Hamilton, Madison, Oneida, Rensselaer, Schenectady, Schoharie, Tioga, Tompkins, and Westchester Counties	7/1/2006	Damages: \$246.3 million FEMA Obligated Dollars as of 2014 Plan Update: IA \$31.5 million PA \$211.1 million



Disaster Number	Type/Location Individual Assistance (IA) Public Assistance (PA)	Declaration Date	Damage Amount
DR-1589	<b>Severe Storms &amp; Flooding</b> IA – Broome, Chenango, Cortland, Delaware, Orange, Rensselaer, Schenectady, Schoharie, Sullivan, Tioga, and Ulster Counties PA – Broome, Chenango, Cayuga, Chautauqua, Columbia, Cortland, Delaware, Greene, Madison, Montgomery, Niagara, Orange, Otsego, Putnam, Rensselaer, Schoharie, Sullivan, Tioga, Westchester, and Ulster Counties	04/19/2005	Damages: \$66.2 million FEMA Obligated Dollars as of 2014 Plan Update: IA \$8.1 million PA \$51.3 million
DR-1564	<b>Severe Storms &amp; Flooding</b> IA – Allegany, Broome, Cattaraugus, Madison, Monroe, Niagara, Oneida, Onondaga, Orleans, Steuben, Sullivan, Ulster, and Wayne Counties PA – Allegany, Broome, Cattaraugus, Chautauqua, Columbia, Delaware, Monroe, Niagara, Onondaga, Orange, Orleans, Steuben, Sullivan, Ulster, and Warren Counties	10/01/2004	Damages: \$18.03 million FEMA Obligated Dollars as of 2014 Plan Update: IA \$2.9 million PA \$14.1 million
DR-1565	<b>Tropical Depression Ivan</b> IA – Broome, Chenango, Delaware, Orange, Sullivan, and Ulster Counties PA – Broome, Chenango, Delaware, Orange, Schoharie, Steuben, Sullivan, Tioga, and Ulster Counties	10/01/2004	Damages: \$15.10 million FEMA Obligated Dollars as of 2014 Plan Update: IA \$1.6 million PA \$11.6 million
DR-1534	<b>Severe Storms &amp; Flooding</b> PA only – Allegany, Cattaraugus, Chautauqua, Delaware, Erie, Hamilton, Herkimer, Ontario, Saratoga, Schoharie, Steuben, Ulster, Washington, and Yates Counties	08/03/2004	FEMA Obligated Dollars as of 2014 Plan Update: PA \$18.7 million
DR-1486	<b>Severe Storms, Tornadoes, &amp; Flooding</b> IA - Allegany, Cattaraugus, Chemung, Columbia, Delaware, Fulton, Greene, Livingston, Montgomery, Ontario, Rensselaer, Schuyler, Steuben, and Yates Counties PA - Allegany, Cattaraugus, Chemung, Columbia, Delaware, Fulton, Livingston, Madison, Montgomery, Ontario, Schuyler, Steuben, Sullivan, Wyoming, and Yates Counties	08/29/2003	FEMA Obligated Dollars as of 2014 Plan Update: IA \$1.8 million PA \$23.7 million
DR-1335	<b>Severe Storms</b> PA only - Albany, Allegany, Cattaraugus, Chenango, Columbia, Dutchess, Erie, Essex, Greene, Herkimer, Lewis, Livingston, Madison, Montgomery, Niagara, Oneida, Onondaga, Orleans, Otsego, Rensselaer, Schenectady, Schoharie, Steuben, Sullivan, Tioga, Tompkins, Ulster, and Yates Counties	7/21/2000	Total Eligible Damages: \$34.6 million FEMA Obligated Dollars as of 2014 Plan Update: PA \$31 million



Disaster Number	Type/Location Individual Assistance (IA) Public Assistance (PA)	Declaration Date	Damage Amount
<b>EM-3149 DR-1296</b>	<b>Hurricane Floyd</b> IA - Albany , Dutchess , Essex , Greene , Orange , Putnam , Rensselaer , Rockland , Schenectady , Ulster and Westchester Counties PA - Albany, Essex, Greene, Nassau, Orange, Putnam, Rockland, Schoharie, Suffolk, Ulster, Warren, and Westchester Counties	9/19/1999	Property damages and debris accumulation. Total Eligible Damages: \$62.2 million FEMA Obligated Dollars as of 2014 Plan Update: IA Unavailable PA \$41.2 million
<b>DR-1233</b>	<b>Severe Flooding</b> IA - Cattaraugus, Clinton, Erie, Essex, Genesee, Livingston, Monroe and Wyoming Counties PA - Allegany, Cattaraugus, Clinton, Delaware, Erie, Essex, Franklin, Genesee, Livingston, Steuben, Sullivan, Tioga, Tompkins and Wyoming Counties	7/7/1998	Property damages, road closures. Two (2) deaths. Total Eligible Damages: \$27.8 million NWS NY Total Flood Damages for 1998 in 2013 Dollars: \$38.6 million
<b>DR-1148</b>	<b>Severe Flooding</b> IA - Chemung, Clinton, Delaware, Essex, Fulton, Montgomery, Schuyler, Steuben and Tompkins Counties PA - Chemung, Clinton, Delaware, Essex, Franklin, Fulton, Lewis, Montgomery, Schoharie, Schuyler, Steuben and Tompkins Counties	12/9/1996	Total Eligible Damages: \$25.6 million NWS NY Total Flood Damages for 1996 in 2013 Dollars: \$220 million
<b>DR-1146</b>	<b>Severe Storms &amp; Flooding</b> IA - Nassau, New York and Suffolk Counties PA - Nassau, Suffolk and Westchester Counties	11/19/1996	Total Eligible Damages: \$16.1 million NWS NY Total Flood Damages for 1996 in 2013 Dollars: \$220 million
<b>DR-1095</b>	<b>Severe Storm &amp; Flooding</b> IA - Albany, Allegany, Broome, Cattaraugus, Cayuga, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Essex, Greene, Madison, Montgomery, Orange, Otsego, Putnam, Rensselaer, Saratoga, Schenectady, Schoharie, Steuben, Sullivan, Tioga, Tompkins and Ulster Counties PA - Albany, Allegany, Broome, Cattaraugus, Cayuga, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Essex, Franklin, Greene, Herkimer, Jefferson, Lewis, Livingston, Madison, Montgomery, Onondaga, Ontario, Orange, Otsego, Putnam, Rensselaer, Saint Lawrence, Saratoga, Schenectady, Schoharie, Schuyler, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wyoming and Yates Counties	1/24/1996	Road closures, property damages, closed businesses and ten (10) deaths. Total Eligible Damages: \$160 million NWS NY Total Flood Damages for 1996 in 2013 Dollars: \$220 million



Disaster Number	Type/Location Individual Assistance (IA) Public Assistance (PA)	Declaration Date	Damage Amount
DR-974	<b>Coastal Storm, High Tides, Heavy Rain, &amp; Flooding</b> IA - Nassau, New York, Rockland, Suffolk, and Westchester Counties PA - Nassau, New York, Rockland, Suffolk, and Westchester Counties	12/21/1992	Damages: \$31.2 million NWS NY Total Flood Damages for 1992 & 1993 in 2013 Dollars: 1992 \$1.9 million 1993 \$55.5 million
DR-918	<b>Hurricane Bob, Long Island</b> PA only - Suffolk County	9/16/1991	Flooding, Property damage. Damages: \$11.7 million NWS NY Total Flood Damages for 1991 in 2013 Dollars: \$19.6 million
DR-792	<b>Flooding, East Central NY</b> IA - Delaware, Greene, Montgomery, Schoharie, and Ulster Counties PA - Delaware, Greene, Montgomery, Schoharie, and Ulster Counties	5/15/1987	Total Eligible Damages: \$3.6 million Damages for 1987 in 2013 Dollars: \$75.3 million
DR-750	<b>Hurricane Gloria, Long Island</b> PA only - Nassau and Suffolk Counties	10/18/1985	Flooding, Property damage. Damages: \$48.5 million NWS NY Total Flood Damages for 1985 & 1986 in 2013 Dollars: 1985 \$24.7 million 1986 \$30.8 million
DR-734	<b>Snow Melt, Ice Jams</b> PA only - Erie and Niagara Counties	3/22/1985	Total Eligible Damages: \$1.1 million NWS NY Total Flood Damages for 1985 in 2013 Dollars: \$24.7 million
DR-733	<b>Flooding, Northern NY</b> PA only - Lewis and Oswego Counties	3/20/1985	Total Eligible Damages: \$1.6 million NWS NY Total Flood Damages for 1985 in 2013 Dollars: \$24.7 million
DR-725	<b>Flooding, Western NY</b> PA only - Allegany, Steuben, and Yates Counties	9/25/1984	Total Eligible Damages: \$3.3 million NWS NY Total Flood Damages for 1984 in 2013 Dollars: \$217.5 million



Disaster Number	Type/Location Individual Assistance (IA) Public Assistance (PA)	Declaration Date	Damage Amount
DR-702	<b>Flooding, Southeastern NY</b> IA - Nassau, Orange, Rockland, Suffolk and Westchester County PA - Bronx, Kings, Nassau, New York, Orange, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, and Westchester Counties	4/17/1984	Total Eligible Damages: \$11.9 million NWS NY Total Flood Damages for 1984 in 2013 Dollars: \$217.5 million
DR-515	<b>Severe Storms &amp; Flooding</b> IA - Broome, Herkimer, Oneida, Tioga, Tompkins, Warren and Washington Counties PA - Broome, Herkimer, Oneida, Tioga, Tompkins, Warren and Washington Counties	7/21/1976	NWS NY Total Flood Damages for 1976 & 1977 in 2013 Dollars: 1976 \$38 million 1977 \$10.6 million
DR-512	<b>Flash Flooding</b> PA only - Chemung and Steuben Counties	6/29/1976	NWS NY Total Flood Damages for 1976 & 1977 in 2013 Dollars: 1976 \$38 million 1977 \$10.6 million
DR-494	<b>Ice Storms, Severe Storms, &amp; Flooding</b> IA - Cattaraugus, Chautauqua, Erie, Genesee, Livingston, Monroe, and Wyoming Counties PA - Cattaraugus, Chautauqua, Erie, Genesee, Livingston, Monroe, and Wyoming Counties	3/19/1976	NWS NY Total Flood Damages for 1976 & 1977 in 2013 Dollars: 1976 \$38 million 1977 \$10.6 million
DR-487	<b>Severe Storms, Heavy Rain, Landslides, &amp; Flooding</b> IA - Allegany, Broome, Cayuga, Chemung, Cortland, Madison, Onondaga, Oswego, Putnam, Queens, Rockland, Steuben, Tioga, Tompkins, Westchester, and Yates Counties PA - Allegany, Broome, Cayuga, Chemung, Cortland, Madison, Onondaga, Oswego, Putnam, Queens, Rockland, Steuben, Tioga, Tompkins, Westchester, and Yates Counties	10/2/1975	NWS NY Total Flood Damages for 1973 in 2013 Dollars: \$60.1 million
EM-3004	<b>NYS Barge Canal Flooding</b>	11/2/1974	Information unavailable
DR-447	<b>Severe Storms &amp; Flooding</b> IA - Herkimer, Oneida, Onondaga, and Oswego Counties PA - Herkimer, Oneida, Onondaga, and Oswego Counties	7/23/1974	Information unavailable
DR-401	<b>Severe Storms &amp; Flooding</b> IA - Columbia, Delaware, Dutchess, Rensselaer, Sullivan and Ulster Counties PA - Columbia, Delaware, Dutchess, Rensselaer, Sullivan and Ulster Counties	7/20/1973	NWS NY Total Flood Damages for 1973 in 2013 Dollars: \$5 million



Disaster Number	Type/Location Individual Assistance (IA) Public Assistance (PA)	Declaration Date	Damage Amount
DR-367	<b>High Winds, Wave Action, &amp; Flooding</b> IA - Cayuga, Genesee, Jefferson, Monroe, Niagara, Orleans, Oswego and Wayne Counties PA - Cayuga, Genesee, Jefferson, Monroe, Niagara, Orleans, Oswego and Wayne Counties	3/21/1973	NWS NY Total Flood Damages for 1973 in 2013 Dollars: \$5 million
DR-338	<b>Hurricane Agnes, Western &amp; Central NY</b> IA - Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Livingston, Madison, Monroe, Oneida, Onondaga, Ontario, Orange, Oswego, Rockland, Schuyler, Seneca, Steuben, Tioga, Tompkins, Ulster, Wayne, Westchester, Wyoming, and Yates Counties PA - Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Livingston, Madison, Monroe, Oneida, Onondaga, Ontario, Orange, Oswego, Rockland, Schuyler, Seneca, Steuben, Tioga, Tompkins, Ulster, Wayne, Westchester, Wyoming, and Yates Counties	6/23/1972	5000 homes destroyed or badly damaged. Twenty-four (24) deaths. Damages: \$703 million. NWS NY Total Flood Damages for 1972 in 2013 Dollars: \$747.7 million
DR-311	<b>Severe Storms &amp; Flooding</b> PA only - Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Ulster, and Westchester Counties	9/13/1971	NWS NY Total Flood Damages for 1971 in 2013 Dollars: \$1 million
DR-290	<b>Heavy Rains &amp; Flooding</b> PA only - Broome, Delaware, Schuyler and Tompkins Counties	7/22/1970	NWS NY Total Flood Damages for 1970 in 2013 Dollars: \$3.95 million
DR-275	<b>Heavy Rains &amp; Flooding</b> IA - Sullivan County PA - Sullivan County	8/26/1969	NWS NY Total Flood Damages for 1969 in 2013 Dollars: \$3.4 million
DR-233	<b>Severe Storms &amp; Flooding</b> IA - Allegany and Cattaraugus Counties PA - Allegany and Cattaraugus Counties	10/30/1967	NWS NY Total Flood Damages for 1967 in 2013 Dollars: \$777,000
DR-158	<b>Heavy Rains &amp; Flooding</b> No additional location detail available	8/23/1963	NWS NY Total Flood Damages for 1963 in 2013 Dollars: \$33.1 million
DR-129	<b>Severe Storm, High Tides &amp; Flooding</b> No additional location detail available	3/16/1962	Information unavailable
DR-52	<b>Eastern Catskills &amp; Lower Hudson Tributaries</b> No additional location detail available	3/29/1956	Eleven (11) deaths. Damages: \$11 million



Disaster Number	Type/Location Individual Assistance (IA) Public Assistance (PA)	Declaration Date	Damage Amount
DR-45	<b>Hurricane Diane, Southeastern NY</b> No additional location detail available	8/22/1955	Property damage, road closures, four (4) deaths NWS NY Total Flood Damages for 1955 in 2013 Dollars: \$30.1 million
DR-26	<b>Hurricane Carol, Long Island</b> No additional location detail available	10/7/1954	Property damage, road closures. Damages: Approximately \$3 million

*Source: NY State Emergency Management Office and Department of Environmental Conservation Archives, FEMA & SEMO Financial Records as of October 2013*

**Figure 3.9e** displays the presidentially declared disaster totals by county for flood events for the period of 1954 through July 2013. Counties with the greatest number of flood declarations include Delaware, Ulster, Broome, and Allegany.





Table 3.9b: Undeclared Historical Flooding Events (1635-1994)

Date	Location and Information (if available)
1994, February	Herkimer Co. (ice jam flood) \$687,000
1994, August	Chemung County \$7 million
1993, May	Central New York and Great Lakes Region \$7.1 million
1990, August	Putnam and Westchester Counties \$5 million
1989, August	City of Peekskill \$3 million
1986, September	Chautauqua and Cattaraugus Counties
1981, May	No Information Available
1981, February	Delaware River
1980, May	No Information Available
1978, March	No Information Available
1977, November	No Information Available
1977, April	No Information Available
1976, May	Oswego County
1976, March	Allegany and Chautauqua Counties
1976, June	Genesee, Chemung, Steuben, Wayne, Schuyler, Rockland, Otsego, Delaware, Chenango, and Schoharie Counties
1976, July	Erie, Cortland, Broome, Warren, Tompkins, and St. Lawrence Counties
1976, January	Ulster, Dutchess, Washington, Rensselaer, Westchester, Orange, Otsego, Saratoga, Jefferson, and Sullivan Counties
1976, February	Tioga, Allegany, Chautauqua, Greene, Broome, Delaware, Columbia, Chemung, Cattaraugus, and Counties
1976, August	New York City, Nassau, Suffolk, Chemung, Tioga, and Broome Counties
1976, April	Fulton ,Warren, Wayne, Saratoga, and Chenango Counties
1975, October	Schoharie, Rensselaer, Tioga, Washington, Oneida, Albany, Delaware, Broome, Chenango, and Otsego Counties
1975, November	Chautauqua and Erie Counties
1975, May	Delaware, Allegany, and Wyoming Counties
1975, June	Erie, Cattaraugus, Dutchess, Sullivan, Rockland, and Westchester Counties
1975, January	Wyoming County
1975, February	Chemung, Tioga, Steuben, Cattaraugus, Niagara, Chautauqua, Erie, Wyoming, and Allegany Counties
1975, August	Erie and Chautauqua Counties
1974, September	Westchester County
1974, November	Monroe County
1974, May	Monroe and Orleans Counties
1974, March	St. Lawrence County
1974, June	Western District Counties
1974, July	Onondaga, Oswego, Oneida, and Herkimer Counties



Date	Location and Information <i>(if available)</i>
1974, December	Schoharie and Delaware Counties
1973, March	Village of Champlain, Clinton County
1973, June	Clinton, Columbia, Delaware, Dutchess, Rensselaer, Sullivan, and Ulster Counties
1973, December	Albany, Broome, Columbia, Delaware, Greene, Rensselaer, and Schenectady Counties.
1973, April	Genesee, Livingston, Monroe, Ontario, and Wyoming Counties.
1972, May	Onondaga, Herkimer, Montgomery, Rensselaer, Saratoga, and Schenectady Counties
1972, March	Erie, Greene, Albany, Chautauqua, and Saratoga Counties
1972, June	Statewide Coastal Storm
1971, September	Eastern Counties
1971, August	Wayne, Seneca, Cayuga, Tompkins, Erie, Monroe, Onondaga, and Oneida Counties
1970, October	Schuyler and Sullivan Counties
1970, July	Cattaraugus, Schuyler, Tompkins, Broome, and Delaware Counties
1970, February	Schoharie, Sullivan, Erie, Greene, Dutchess, and Counties
1970, April	Orange and Otsego Counties
1969, May	Dexter and Jefferson Counties
1969, June	McGraw, Cortland County
1969, July	Sullivan County
1969, February	Delaware County
1969, August	Orange County
1969, April	Franklin County
1967, September	Cattaraugus and Allegany Counties (Two deaths and \$millions in damages)
1966, September	Fire Island, Suffolk County
1966, February	Chautauqua County
1964, March	Central NY State
1964, July	Rensselaer County
1963, March	Chautauqua County
1963, August	Erie County
1962, March	Suffolk County
1960, September	Long Island, Suffolk County (Hurricane Donna, \$1.9 million in damages)
1960, June	Broome County
1960, February	Schenectady County
1960, April	Ogdensburg, St. Lawrence County
1957, December	Hudson, Columbia County
1956, March	Cattaraugus County
1955, October	Southern NY Counties
1955, August	Southern NY Counties
1948 December -	Northeastern NY



Date	Location and Information <i>(if available)</i>
1949 January	(Tropical Storm, \$4 million in damages)
1944, September	Long Island, Suffolk County (Tropical Storm more than \$800,000 in damages)
1938, September	Ausable River and Southeastern NY. Hurricane related. Damages to South Shore of Long Island. >\$6million. Recurrence Interval 25 to 100-yr.
1936, March	Mohawk, Hudson and Susquehanna R., Recurrence Interval Approx. 100yr.
1913, March	Hudson, Genesee, Black and Mohawk R., Recurrence Interval 25 to > 100yr.
1903, October	Delaware River, Recurrence Interval > 100-yr
1875, March	Genesee River, Ice Jam
1869, April	Black River, Recurrence Interval 50 – 100-yr.
1865, March	Genesee River, central Rochester under water. One million \$ in damage. Recurrence interval > 100yr.
1821, September	Long Island, Tropical Storm, 21 deaths.
1815, September	Long Island, "Great September Gale of 1815." Many structures damaged.

Source: NY State Emergency Management Office and Department of Environmental Conservation Archives as of October 2013

SHELDUS recorded data documenting 3,312 individual flood event occurrences throughout New York State from 1960 to 2012, with property damage exceeding \$3.8 billion. Additionally, 287 flood events occurred in 48 out of 62 counties from 2010-2012 alone; property damage was more than \$1.1 billion. From 1960 to 2012, 164 fatalities occurred, 289 injuries were reported, and crop damage exceeded \$68 million. **Table 3.9c** represents historical and recent flood events and losses.



**Table 3.9c: Historical and Recent Flood Events and Losses**

County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Albany	123	1	64	4	9	\$ 55,169,600	\$ 1,035,906	3	1	0	\$ 45,000	\$ -
Allegany	110	1	57	1	11	\$ 16,413,727	\$ 816,067	12	0	10	\$ 702,000	\$ -
Bronx	71	1	37	2	8	\$ 19,496,339	\$ 825,144	4	1	0	\$ -	\$ -
Broome	242	0	126	11	10	\$ 812,780,802	\$ 1,051,900	29	0	0	\$ 507,367,000	\$ -
Cattaraugus	148	1	77	2	2	\$ 62,079,195	\$ 816,067	13	0	0	\$ 655,000	\$ -
Cayuga	69	1	36	1	1	\$ 3,666,634	\$ 966,067	0	0	0	\$ -	\$ -
Chautauqua	144	1	75	2	2	\$ 34,314,195	\$ 816,067	7	0	0	\$ 185,000	\$ -
Chemung	100	1	52	2	2	\$ 32,763,087	\$ 817,067	3	0	0	\$ 1,410,000	\$ -
Chenango	175	1	91	1	5	\$ 131,013,802	\$ 2,025,450	15	0	0	\$ 2,811,000	\$ -
Clinton	167	1	87	2	7	\$ 65,316,387	\$ 2,148,713	10	2	0	\$ 15,235,000	1,000,000
Columbia	104	1	54	0	2	\$ 56,466,764	\$ 876,573	0	0	0	\$ -	\$ -
Cortland	119	1	62	1	5	\$ 32,044,435	\$ 1,025,400	4	0	0	\$ 525,000	\$ -
Delaware	173	1	90	16	10	\$ 339,625,591	\$ 1,555,950	13	1	0	\$ 19,145,000	\$ -
Dutchess	108	1	56	2	12	\$ 58,682,687	\$ 1,033,478	0	0	0	\$ -	\$ -
Erie	200	1	104	4	1	\$ 24,352,418	\$ 1,354,400	6	0	0	\$ 47,000	\$ -
Essex	223	0	116	0	7	\$ 76,223,498	\$ 3,153,713	17	0	0	\$ 47,420,000	\$2,000,000
Franklin	87	1	45	0	3	\$ 13,003,807	\$ 940,380	7	0	0	\$ 9,265,000	\$ -
Fulton	81	1	42	1	5	\$ 0,507,181	\$ 1,031,275	0	0	0	\$ -	\$ -
Genesee	83	1	43	1	1	\$ 4,208,279	\$ 2,119,400	3	0	0	\$ 175,000	\$ -
Greene	133	1	69	3	5	\$ 62,799,475	\$ 1,029,906	3	2	0	\$ 180,000	\$ -
Hamilton	56	2	29	1	3	\$ 8,689,599	\$ 947,255	0	0	0	\$ -	\$ -
Herkimer	163	1	85	1	12	\$ 24,592,482	\$ 1,175,304	2	0	0	\$ 622,000	\$ -
Jefferson	65	2	34	1	1	\$ 2,734,085	\$ 813,952	4	1	0	\$ 290,000	\$ -
Kings	65	2	34	3	8	\$ 14,061,723	\$ 815,529	2	3	0	\$ -	\$ -
Lewis	94	1	49	0	1	\$ 3,022,835	\$ 863,952	8	0	0	\$ 1,194,000	\$ -
Livingston	79	1	41	1	1	\$ 13,032,462	\$ 916,067	3	0	0	\$ 120,000	\$ -
Madison	69	1	36	1	2	\$ 35,426,351	\$ 822,942	1	0	0	\$ 800,000	\$ -
Monroe	121	1	63	1	1	\$ 4,291,240	\$ 816,067	5	0	0	\$ 150,000	\$ -
Montgomery	125	1	65	12	9	\$ 19,303,238	\$ 1,032,775	1	1	0	\$ -	\$ -
Nassau	81	1	42	1	8	\$ 34,524,031	\$ 825,144	4	0	0	\$ 250,000	\$ -
New York	69	1	36	4	8	\$ 18,955,024	\$ 825,144	6	4	0	\$ -	\$ -
Niagara	81	1	42	1	1	\$ 4,038,862	\$ 2,066,067	1	0	0	\$ 15,000	\$ -



Historical Record (1960-2012)								Recent Record (2010-2012)				
County	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Oneida	135	1	70	5	8	\$ 67,578,026	\$ 1,170,204	9	0	0	\$ 3,235,000	\$ -
Onondaga	71	1	37	1	1	\$ 22,798,967	\$ 816,067	1	0	0	\$ 9,000,000	\$ -
Ontario	85	1	44	1	2	\$ 13,439,546	\$ 816,067	9	0	0	\$ 1,235,000	\$ -
Orange	83	1	43	3	5	\$ 55,611,734	\$ 1,034,478	1	1	0	\$ -	\$ -
Orleans	62	2	32	1	1	\$ 2,379,445	\$ 2,566,067	0	0	0	\$ -	\$ -
Oswego	69	1	36	0	1	\$ 1,361,922	\$ 816,067	14	0	0	\$ 100,000	\$ -
Otsego	119	1	62	1	6	\$ 130,661,979	\$ 1,032,775	8	0	0	\$ 61,245,000	\$ -
Putnam	65	2	34	0	5	\$ 51,085,187	\$ 1,033,478	0	0	0	\$ -	\$ -
Queens	77	1	40	12	29	\$ 19,003,339	\$ 825,144	3	6	0	\$ 30,000	\$ -
Rensselaer	119	1	62	1	8	\$ 59,192,169	\$ 1,080,906	0	0	0	\$ -	\$ -
Richmond	58	2	30	24	5	\$ 3,831,575	\$ 812,404	2	23	0	\$ -	\$ -
Rockland	62	2	32	1	3	\$ 27,707,223	\$ 825,144	0	0	0	\$ -	\$ -
Saratoga	112	1	58	2	8	\$ 57,687,644	\$ 1,032,781	0	0	0	\$ -	\$ -
Schenectady	94	1	49	3	9	\$ 26,597,208	\$ 1,027,781	0	0	0	\$ -	\$ -
Schoharie	115	1	60	3	5	\$ 23,713,846	\$ 1,031,275	0	0	0	\$ -	\$ -
Schuyler	62	2	32	1	1	\$ 6,731,908	\$ 816,067	1	0	0	\$ 10,000	\$ -
Seneca	50	2	26	1	1	\$ 1,896,004	\$ 816,067	0	0	0	\$ -	\$ -
St Lawrence	79	1	41	0	2	\$ 4,445,624	\$ 940,380	4	0	0	\$ 1,340,000	\$ -
Steuben	125	1	65	5	19	\$ 43,099,616	\$ 817,067	4	0	0	\$ 40,000	\$ -
Suffolk	75	1	39	2	10	\$ 34,268,960	\$ 825,144	2	1	0	\$ -	\$ -
Sullivan	133	1	69	2	5	\$ 222,144,245	\$ 1,032,972	13	1	0	\$ 2,760,000	\$ -
Tioga	142	1	74	3	3	\$ 599,262,522	\$ 818,067	13	0	0	\$ 480,075,000	\$ -
Tompkins	65	2	34	0	1	\$ 22,650,863	\$ 806,452	2	0	0	\$ 420,000	\$ -
Ulster	167	1	87	2	7	\$ 69,083,583	\$ 1,043,978	0	0	0	\$ -	\$ -
Warren	106	1	55	0	8	\$ 69,629,033	\$ 1,089,281	3	0	0	\$ 13,301,000	\$ -
Washington	100	1	52	0	5	\$ 52,602,011	\$ 1,031,781	2	0	0	\$ 106,000	\$ -
Wayne	77	1	40	1	1	\$ 5,914,115	\$ 1,016,067	1	0	0	\$ 10,000	\$ -
Westchester	79	1	41	5	12	\$ 99,522,452	\$ 825,144	4	1	1	\$ 60,000	\$ -
Wyoming	83	1	43	2	1	\$ 9,424,497	\$ 2,089,785	4	0	0	\$ 180,000	\$ -
Yates	48	2	25	1	1	\$ 10,040,546	\$ 816,067	1	0	0	\$ 800,000	\$ -

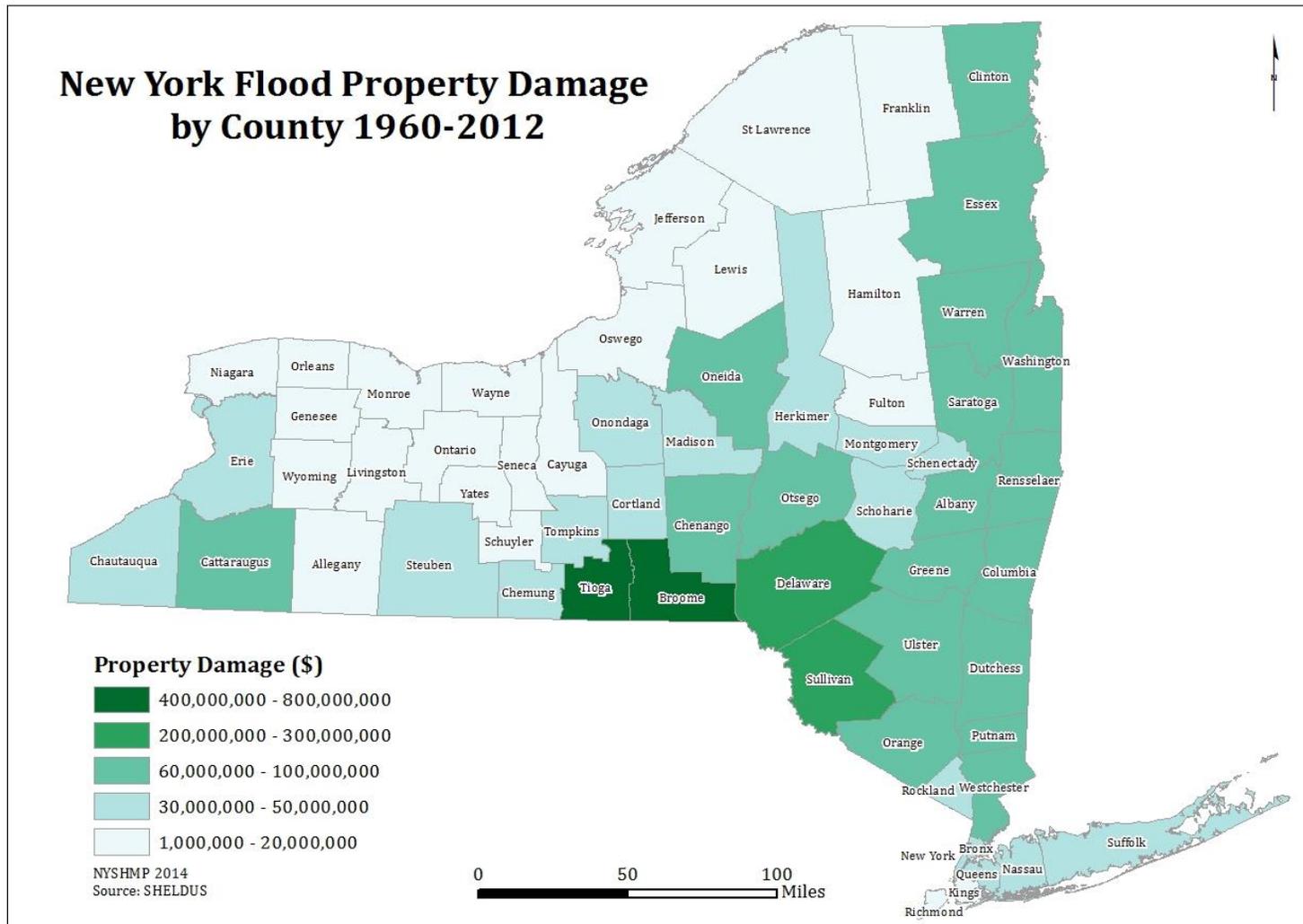
\*Future Probability equals the number of events divided by the number of years of record [52], expressed as a percentage.) Source: Spatial Hazard Events & Losses Database for the U.S. (SHELDUS) as of 2013





Additionally, Delaware, Ulster, Broome, and Allegany counties incurred between \$1.4 million and \$810 million in damages. **Figure 3.9g** represents the number of flood property damages by county from 1960-2012.

**Figure 3.9g: New York Flood Property Damage 1960-2012**





Dam safety is a major concern for the State. DEC, FERC, and USACE are working together to decrease dam vulnerability. The figures and table below document the number of dams in each county, dam and hazard class, and dam hazard classification by county.

**Figure 3.9i** provides a rounded total of the number of dams in New York, at the county level. Areas of darkest blue indicate which counties include a high number of dams. The dam inventory is maintained by the DEC.





**Table 3.9d** provides the total number of dams by hazard classification for each county. Westchester and Orange counties have the highest number of high-hazard dams (392; and 686 low-hazard dams), while Orange and Sullivan counties have the greatest total number of dams overall. There are 392 high-hazard dams, 686 intermediate dams, 4,119 low-hazard dams, 519 dams not assigned to a hazard class, and a grand total of 5,716 dams for the State.

**Table 3.9d: Dam Hazard Classification by County**

County	High	Intermediate	Low	None	Total
Albany	13	17	74	5	109
Allegany	3	4	110	7	124
Bronx	1	1	1	0	3
Broome	22	17	102	11	152
Cattaraugus	11	15	84	2	112
Cayuga	1	5	57	2	65
Chautauqua	6	8	89	4	107
Chemung	8	2	20	4	34
Chenango	9	10	115	4	138
Clinton	5	13	23	7	48
Columbia	2	16	93	2	113
Cortland	3	4	42	4	53
Delaware	8	20	144	5	177
Dutchess	14	42	165	43	264
Erie	4	6	159	15	184
Essex	4	14	96	14	128
Franklin	1	8	52	1	62
Fulton	6	16	42	2	66
Genesee	0	9	51	2	62
Greene	7	8	58	0	73
Hamilton	5	6	46	4	61
Herkimer	8	13	71	5	97
Jefferson	0	12	65	0	77
Kings	0	0	0	0	0
Lewis	4	8	73	0	85
Livingston	2	6	44	1	53
Madison	5	11	116	7	139
Monroe	9	6	40	5	60
Montgomery	2	9	35	2	48
Nassau	1	1	24	1	27
New York	1	0	0	0	1

County	High	Intermediate	Low	None	Total
Niagara	3	1	8	18	30
Oneida	9	9	118	6	142
Onondaga	11	10	57	1	79
Ontario	1	6	64	7	78
Orange	26	50	225	0	301
Orleans	2	6	9	23	40
Oswego	6	10	92	0	108
Otsego	2	9	110	6	127
Putnam	21	28	63	1	113
Queens	1	0	0	0	1
Rensselaer	9	16	47	1	73
Richmond	1	3	3	0	7
Rockland	13	16	53	0	82
Saratoga	7	12	75	6	100
Schenectady	2	2	18	2	24
Schoharie	7	19	57	4	87
Schuyler	3	2	37	1	43
Seneca	3	1	5	2	11
St Lawrence	18	19	52	3	92
Steuben	3	5	151	2	161
Suffolk	0	4	56	5	65
Sullivan	14	37	231	10	292
Tioga	5	7	46	80	138
Tompkins	5	4	25	52	86
Ulster	7	24	115	8	154
Warren	9	15	39	1	64
Washington	3	9	54	3	69
Wayne	2	3	46	8	59
Westchester	32	44	101	11	188
Wyoming	1	7	58	61	127
Yates	1	1	13	38	53
<b>Total</b>	<b>392</b>	<b>686</b>	<b>4119</b>	<b>519</b>	<b>5716</b>

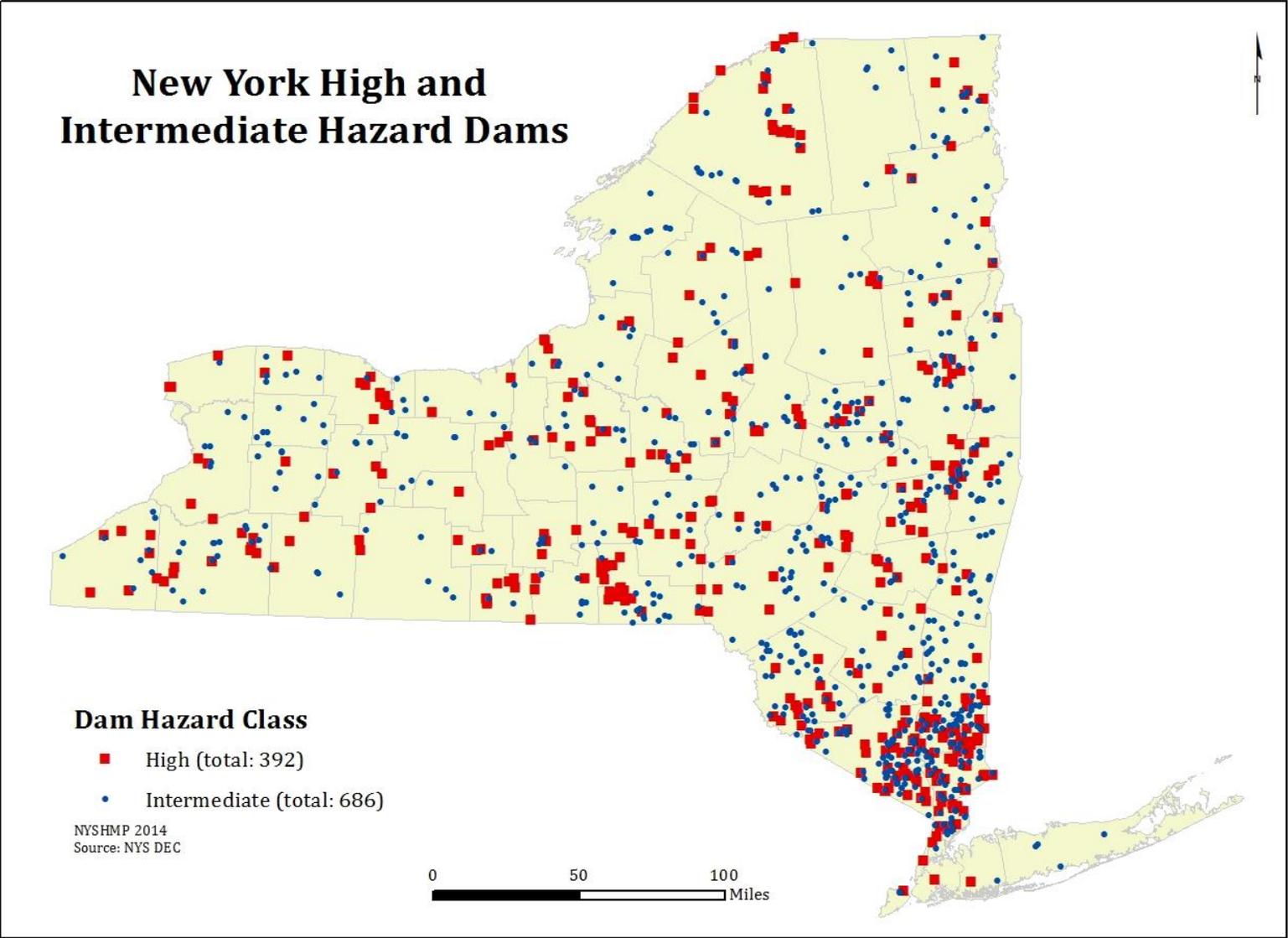
Source: New York State Department of Environmental Conservation, October 2013



**Figure 3.9j** provides the location of high-hazard and intermediate-hazard dams in the State. The map does not include low-hazard or not-assigned dams. A low-hazard dam means dam failure is unlikely. An intermediate dam means a failure may result in moderate damage and loss of human life is not expected. A high-hazard dam means a failure may result in serious and widespread damage, with loss of human life expected. In the State of New York, there are a total of 392 high-hazard dams, and 686 intermediate dams.



Figure 3.9j: New York High and Intermediate Hazard Dams

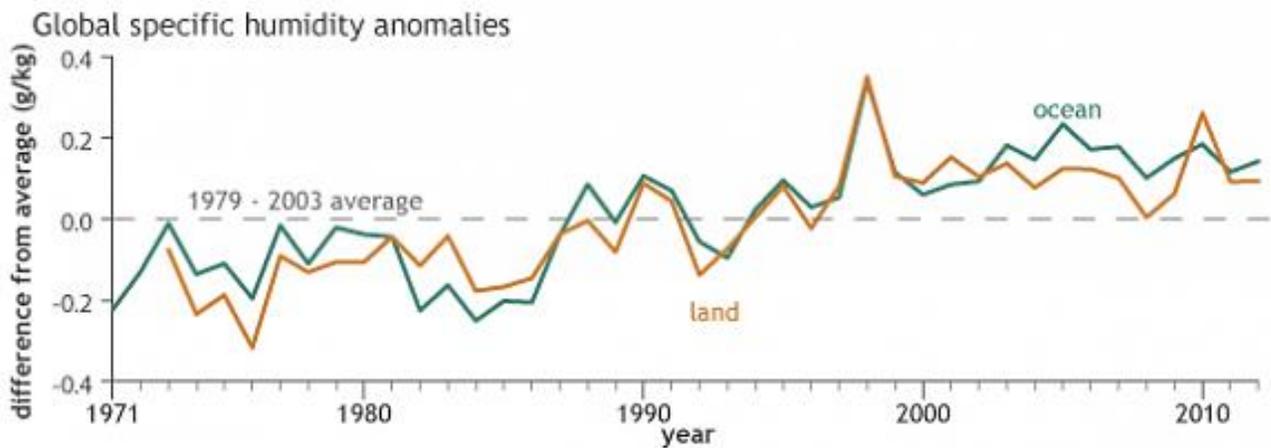


**Probability of Future Flood Events**

The probability of future flooding in NYS is extremely high; as climate change and sea level rise, more flood events will occur. According to the NOAA, sea level has been rising over the past century, and in recent years the pace has increased significantly. Global average sea level in 2012 was 1.4 inches above the 1993-2010 average, which was the highest yearly average in the satellite record to date.

NOAA consistently monitors humidity annually; since 1973 the earth has been becoming moister by roughly 0.1 grams of water vapor per kilogram of air every ten years, causing an increase in humidity. Scientists have measured a significant increase in specific humidity over the Earth’s surface, which is consistent with the long-term warming trend in the planet’s average surface temperature. **Figure 3.9k** below represents annual specific humidity since 1971 compared to the 1979-2003 average (dashed line) over land (brown line) and ocean (green line) based on direct humidity observations made since the early 1970s. This graph adapted from Bulletin of the American Meteorological Society BAMS State of the Climate 2012 report.

**Figure 3.9k: Annual Specific Humidity 1971-2010**

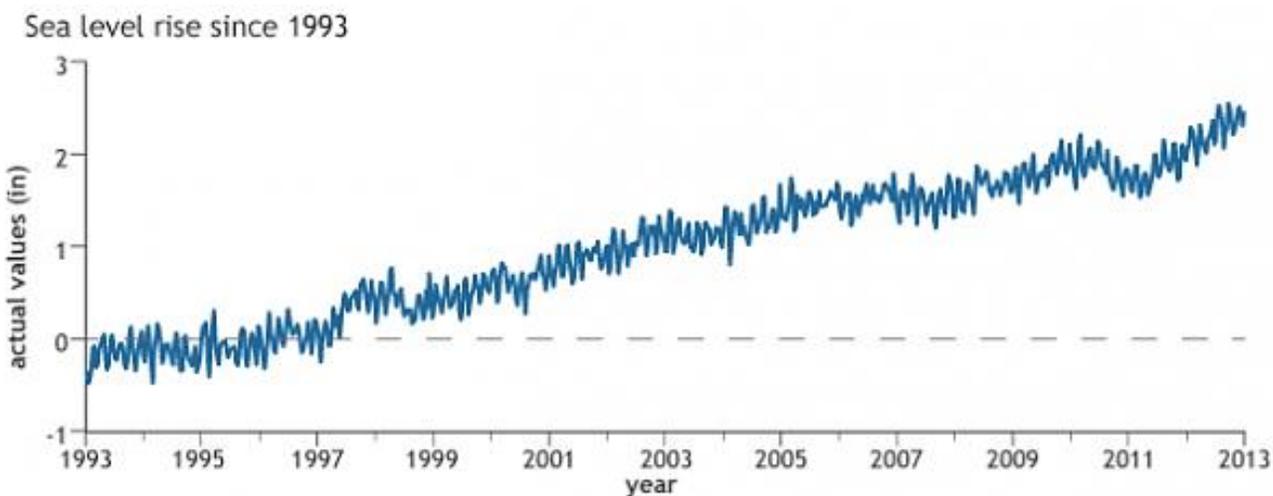


Source: NOAA as of 2012



Over the past eight years, meltwater from glaciers and ice sheets entering the ocean has been the dominant cause of sea level rise, accounting for more than twice the contribution from warming-caused expansion. The sharp divide in the North Atlantic between areas of above-average and below-average sea level are evidence that the warm waters of the Gulf Stream Current is reaching farther north than usual. (NOAA 2013) **Figure 3.9I** below represents yearly global sea level from 1993 through early 2013 compared to the 1993-2012 average, based on AVISO data. Graph adapted from BAMS State of the Climate in 2012.

**Figure 3.9I: Sea Level Rise 1993-2013**



Source: NOAA as of 2012

Given the history of occurrences, climate change, and sea level rise, it is probable that flood hazard events will become more frequent throughout New York State. The State is vulnerable to inland and coastal flood hazards, inland flooding as a result of winter storms, and coastal flooding from tropical storms and hurricanes. Using documented historical flood disaster and emergency declaration data to estimate the probability of future flooding, records indicate New York State has experienced 140 flood-related disasters since 1954; 51 of the events were designated major disasters. Based on the information researched, human population, economic conditions, property, infrastructure, and agriculture will continue to be vulnerable to flood hazards, costing the state billions of dollars in damage.

Using the historical occurrence, or more specific documentation if available, a *future probability and average annual losses* analysis was performed for flood events. The number of years recorded was divided by the number of occurrences, resulting in a simple past-determined recurrence interval. If the hazard lacked a definitive historical record, the probability was assessed qualitatively based on county history or other supporting data.

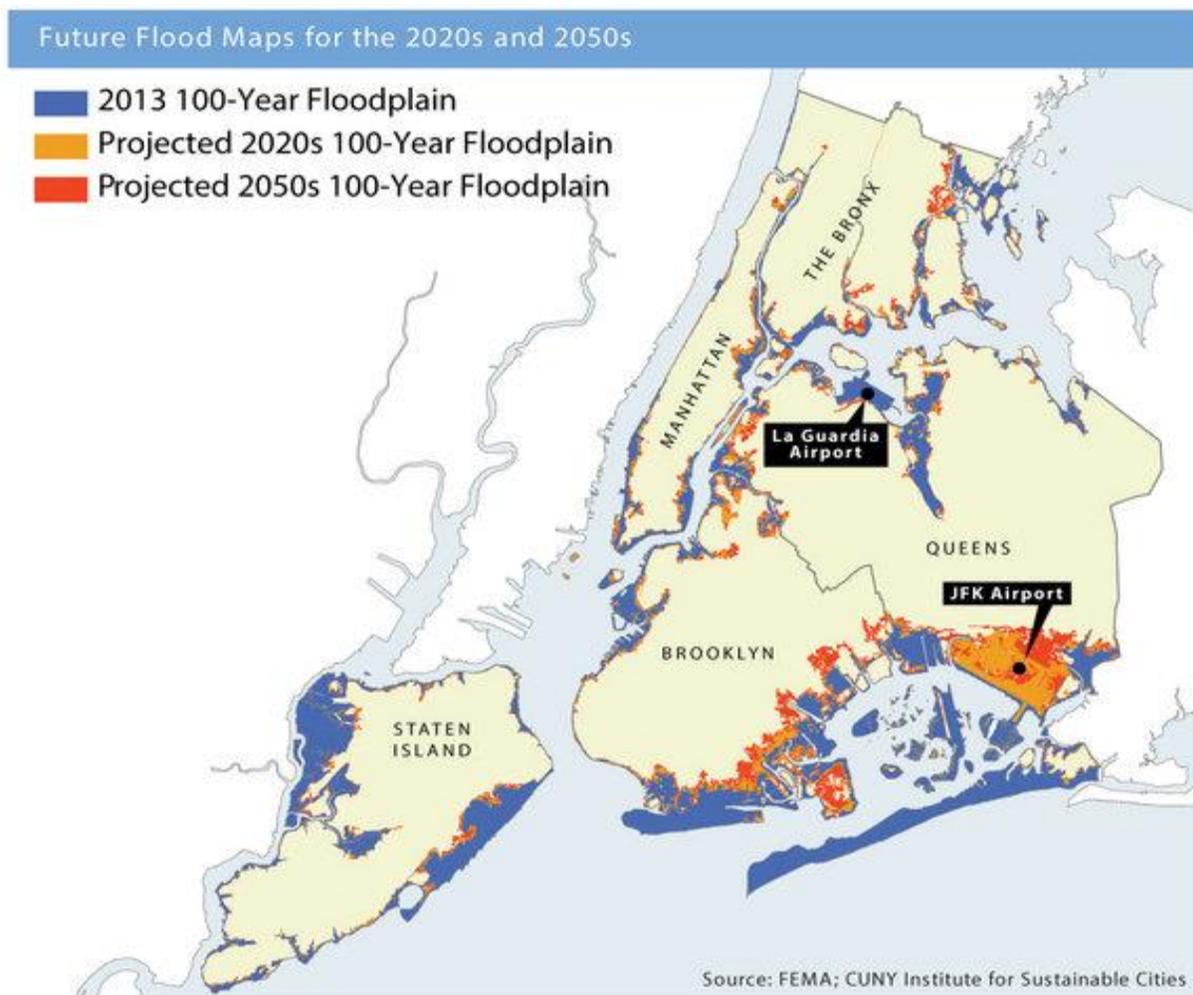


Based on a 52-year period of historical records found in **Table 3.9c**, the following can be expected on average in a typical year in New York State:

- 54 events
- Nearly \$2.7 million in property and crop damage
- 2.7 injuries
- 5.5 fatalities

**Figure 3.9m** depicts the areas of New York City and Long Island susceptible to inundation within the 100-year floodplain by the 2020s and 2050s.

**Figure 3.9m: Projected 100-Year Floodplain Maps**



Source: FEMA, City University of New York (CUNY) Institute for Sustainable Cities

### 3.9.2 Assessing Flood Vulnerability by Jurisdiction

#### Flood Impact Analysis

Flooding is the primary natural hazard in the State of New York causing damaging floods throughout the region annually. Floods can pose significant risks to health, safety, transportation and other services. Economic losses, disruption of commerce, unemployment due to flooded workplaces, inundated transportation systems, expenses for disaster relief, and cleanup due to flood damages are estimated to exceed \$100 million annually. In 2011 and 2012, New York State was severely impacted by Hurricane Irene, Tropical Storm Lee, and Hurricane Sandy. These three storms caused loss of lives and damaged properties, infrastructure, and transportation systems. Of the 62 NYS counties, 35 were affected. **Table 3.9e** represents FEMA funding obligated for Public Assistance and Individual Assistance funding for Irene, Lee, and Sandy.

**Table 3.9e: FEMA Funding from Hurricane Irene, Tropical Storm Lee, and Hurricane Sandy**

Disaster	Public Assistance Funding	Individual Assistance Funding
Hurricane Irene	\$1.26 billion	\$999 million
Tropical Storm Lee	\$165.8 million	\$55.2 million
Hurricane Sandy	\$362.5 million +	\$103 million +

#### National Flood Insurance Program

Flooding causes billions of dollars' worth of damage to homes and businesses around the country every year. Standard homeowners and commercial property policies do not cover flood losses. To meet the need for this vital coverage, the Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program (NFIP). NFIP was created by Congress in 1968. It was designed as an aid for homeowners, renters, and business owners residing in a participating Community Rating System (CRS) to protect themselves financially from flood events. Additionally, NFIP collects and stores a vast quantity of information on insured structures, including the number and location of flood insurance policies, number of claims per insured property, dollar value of each claim, aggregate value of claims, repetitive and severe repetitive flood loss properties, etc. Without doubt, the NFIP data presents a strong indication of the location of flood events among other indicators.

A floodplain is characterized as the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that becomes inundated with water during a



flood. The term 100-year and 500-year denote the area within the floodplain inundated during large flood events. The 100-year floodplain is not the flood that will occur once every 100 years, rather it is the flood that has a one-percent chance of being equaled or exceeded each year. The 500-year floodplain is the flood that has a .2% chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. This one percent annual chance flood is the standard used by most federal and state agencies and by the NFIP (FEMA, 2012).

### **NFIP Community Rating System**

The NFIP CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting three goals: 1) reduce flood damage to insurable property; 2) strengthen and support the insurance aspects of the NFIP; and 3) encourage a comprehensive approach to floodplain management.

The CRS is similar to — but separate from — the private insurance industry's programs that grade communities on the effectiveness of their fire suppression and building code enforcement. CRS discounts on flood insurance premiums range from 5% up to 45%. Those discounts provide an incentive for new flood protection activities that can help save lives and property in the event of a flood.

According to FEMA's website, nationwide more than 1,000 communities receive flood insurance premium discounts based on implementation of local mitigation, outreach, and educational activities that go beyond minimum NFIP requirements. While premium discounts are one of the benefits of participation in CRS, it is more important that these communities are carrying out activities that save lives and reduce property damage. FEMA NFIP statistics indicate that CRS communities represent a significant portion of the nation's flood risk as evidenced by the fact that more than 66% of the NFIP's policy base is located in these communities. New York communities participating in CRS are located in a higher flood risk area than other communities. Of the 1,549 communities participating in the NFIP program, 27 communities in 12 counties receive flood insurance discounts through participation in the CRS program.

### **Increasing overall CRS participation in New York State would have two potential significant positive impacts:**

- 1) Increased flood mitigation actions across the State and reduced flood losses.**
- 2) Added savings for individuals and families with NFIP policies.**

The CRS grants credit points for 18 different activities that fall into four series: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness.



NYS is proactive in integrating Flood Hazard Mitigation actions statewide; providing credits toward local governments meeting the minimum requirement of 500 points to become eligible to participate in the CRS program. Local participation can result in further premium cost reductions and provide added flood mitigation measures.

To be eligible for a CRS discount, a local community **must**:

- 1) Maintain FEMA elevation certificates for new construction in the floodplain. *(Please Note: A community must maintain certificates for buildings built after the date of its CRS application.)*
- 2) Prepare, adopt, implement, and update a comprehensive flood hazard mitigation plan using a standard planning process. *(Please Note: This is a minimum requirement for all repetitive loss communities.)*

To participate in the CRS, local communities can choose to undertake some or all of the 18 public information and floodplain management activities described in the CRS Coordinator's Manual. This manual is available in full detail on FEMA's website at [www.fema.gov](http://www.fema.gov), in addition to the CRS Guide.

**Table 3.9f** identifies local communities within New York State participating in the CRS program to reduce flooding risk and significantly lower flood insurance premium costs to its constituents. Communities with a "current class" nine or lower are eligible to participate in the program. **Please Note:** The red shading represents counties no longer eligible to participate in the CRS program as of July 2013.



Table 3.9f: 2013 NFIP CRS Participants

CRS#	Community	County	Current Class	% Discount for Special Flood Hazard Area (SFHA) *	% Discount for Non-Special Flood Hazard Area (SFHA) **	Status
360226	Amherst, Town of	Erie	7	15	5	C
360147	Ashland, Town of	Chemung	9	5	5	C
360988	Bayville, Village of	Nassau	8	10	5	C
360148	Big Flats, Town of	Chemung	8	10	5	C
360149	Chemung, Town of	Chemung	9	5	5	C
360772	Corning, City of	Steuben	9	5	5	C
360463	East Rockaway, Village of	Nassau	9	5	5	C
360150	Elmira, City of	Chemung	8	10	5	C
360151	Elmira, Town of	Chemung	9	5	5	C
360774	Erwin, Town of	Steuben	8	10	5	C
361194	Esperance, Town of	Schoharie	9	5	5	C
360464	Freeport, Village of	Nassau	7	15	5	C
360466	Great Neck Estates, Village of	Nassau	8	10	5	C
360417	Greece, Town of	Monroe	8	10	5	C
360153	Horseheads, Town of	Chemung	9	5	5	C
360154	Horseheads, Village of	Chemung	9	5	5	C
360308	Ilion, Village of	Herkimer	9	5	5	C
360047	Johnson City, Village	Broome	9	5	5	C
360247	Lackawanna, City of	Erie	9	5	5	C
360476	***Lawrence, Village of	Nassau	10	0	0	R
365338	Long Beach, City of	Nassau	8	10	5	C
360118	Moravia, Village of	Cayuga	8	10	5	C
360506	Niagara Falls, City of	Erie	8	10	5	C
360667	***Oneonta, City of	Otsego	10	0	0	R
360932	Scarsdale, Village of	Westchester	8	10	5	C
365342	***Southampton, Town of	Suffolk	10	0	0	R
360156	Southport, Town of	Chemung	9	5	5	C
360595	Syracuse, City of	Onondaga	8	10	5	C
360056	Union, Town of	Broome	8	10	5	C
360157	Wellsburg, Village of	Chemung	9	5	5	C

Source: FEMA, July 2013

\*SFHA (Zones A, AE, A1-A30, V, V1-V30, AO, and AH): Discount varies depending on class. (Zones A99, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, and AR/AO): 10% discount for Classes 1-6; 5% discount for Classes 7-9.

\*\*Non-SFHA (Zones B, C, X, D): 10% discount for Classes 1-6; 5% discount for Classes 7-9.

Status: C = Current, R = Rescinded (no longer eligible for NFIP)



Repetitive Loss Properties have received two or more claim payments of more than \$1,000 from the NFIP within any rolling 10-year period. (FEMA 2013) **Table 3.9g** presents the number of repetitive flood loss properties (RFLP) and repetitive dollar losses in the NFIP by county. It is clear the data indicate those jurisdictions most threatened and vulnerable to the flood hazard and potential loss.

FEMA NFIP statistics indicate there are more than 18,000 Repetitive Flood Loss and 1,126 Severe Repetitive Flood Loss properties in New York State. The distribution of RFLPs is a clear and very real indicator of the location of the flood hazards. NFIP data in this section indicate the counties most threatened by flood hazard and most vulnerable to damage and loss associated with the flood hazard. *Please Note: New York City includes Bronx, Kings, New York, Queens, and Richmond Counties.*

**Table 3.9g: Repetitive Loss Data**

County	Total Payments	Average Payment	Losses	Properties
Albany	\$ 1,706,600.73	\$ 166,985.09	85	30
Allegany	\$ 1,240,712.58	\$ 123,556.71	274	96
Bronx	\$ 206,710,385.00	\$ 19,458.76	10,623	4,189
Broome	\$ 53,993,227.84	\$ 1,068,535.40	1,241	479
Cattaraugus	\$ 545,286.56	\$ 93,022.20	37	16
Cayuga	\$ 202,556.12	\$ 49,715.69	29	12
Chautauqua	\$ 5,296,671.81	\$ 77,675.30	698	224
Chemung	\$ 869,936.34	\$ 151,907.94	42	20
Chenango	\$ 5,994,880.01	\$ 400,926.61	189	83
Clinton	\$ 1,038,827.06	\$ 255,392.11	53	23
Columbia	\$ 2,146,567.64	\$ 229,967.60	103	30
Cortland	\$ 420,915.51	\$ 51,611.12	51	22
Delaware	\$ 17,553,082.07	\$ 364,308.49	463	192
Dutchess	\$ 6,547,029.61	\$ 537,212.83	220	86
Erie	\$ 3,026,216.04	\$ 295,281.61	277	112
Essex	\$ 1,918,590.54	\$ 180,540.14	77	32
Fulton	\$ 321,180.00	\$ 51,884.28	20	9
Genesee	\$ 392,590.15	\$ 63,127.17	26	10
Greene	\$ 6,591,163.95	\$ 379,704.99	150	52
Hamilton	\$ 77,417.03	\$ 12,902.84	6	3
Herkimer	\$ 632,433.63	\$ 141,022.72	57	26
Jefferson	\$ 337,161.79	\$ 154,963.46	17	7
Lewis	\$ 59,004.60	\$ 29,502.31	8	4
Livingston	\$ 48,760.53	\$ 16,047.60	9	3



County	Total Payments	Average Payment	Losses	Properties
Madison	\$ 412,217.31	\$ 56,705.10	33	16
Monroe	\$ 1,511,514.44	\$ 245,411.77	82	29
Montgomery	\$ 2,666,468.43	\$ 251,899.18	62	28
Nassau	\$ 657,095,281.74	\$ 950,561.96	17,632	6,546
*New York City	\$ 206,710,385.00	\$ 19,458.76	10,623	4,189
Niagara	\$ 159,122.33	\$ 60,870.97	14	4
Oneida	\$ 3,479,160.72	\$ 208,181.55	177	72
Onondaga	\$ 1,833,388.39	\$ 84,662.59	108	41
Ontario	\$ 505,127.09	\$ 91,290.96	26	10
Orange	\$ 11,622,373	\$ 569,030	514	173
Orleans	\$ 7,193	\$ 3,597	2	1
Oswego	\$ 560,292	\$ 137,651	31	12
Otsego	\$ 2,791,666	\$ 284,542	111	54
Putnam	\$ 2,590,197	\$ 180,477	78	31
Rensselaer	\$ 2,759,148	\$ 338,339	81	30
Rockland	\$ 16,834,893	\$ 577,657	924	321
Saratoga	\$ 3,360,948	\$ 110,931	155	49
Schenectady	\$ 2,834,925	\$ 234,290	108	40
Schoharie	\$ 4,809,259	\$ 377,651	177	68
Seneca	\$ 183,074	\$ 51,447	14	7
St. Lawrence	\$ 34,694	\$ 11,880	8	3
Steuben	\$ 430,784	\$ 113,096	26	12
Suffolk	\$ 369,951,732	\$ 984,676	10,338	3,484
Sullivan	\$ 9,079,180	\$ 320,149	420	145
Tioga	\$ 33,118,937	\$ 275,202	761	305
Tompkins	\$ 290,991	\$ 28,629	33	12
Ulster	\$ 16,080,432	\$ 753,113	488	187
Warren	\$ 76,486	\$ 34,166	8	4
Washington	\$ 23,464	\$ 8,632	8	4
Wayne	\$ 103,651	\$ 30,727	7	3
Westchester	\$ 97,460,873	\$ 844,807	3,777	1,136
Wyoming	\$ 313,106	\$ 33,445	12	6
<b>Total</b>	<b>\$ 1,560,651,775</b>	<b>\$ 13,168,974</b>	<b>50,970</b>	<b>18,593</b>

Source: FEMA, NFIP July 2013 (Please Note: \*New York City includes Bronx, Kings, New York, Queens, and Richmond Counties.)

The Severe Repetitive Loss Program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, which amended the National Flood Insurance Act of



1968 to provide funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss structures insured under the NFIP.

**An SRL property is defined as a residential property that is covered under an NFIP flood insurance policy meeting the following requirements:**

1. Has at least four NFIP claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceeds \$20,000; or
2. At least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.
3. For both (a) and (b) above, at least two of the referenced claims must have occurred within any 10-year period, and must be greater than 10 days apart.

The SRL Program helps homeowners in the NFIP who have suffered repeated flood damage to buy out, elevate, or flood proof the property to eliminate the risk of future damages, protect the lives of local responders, reduce the burden of future response and recovery costs to the State and local government, and eliminate future claims under the NFIP. In New York, the federal cost share for projects approved under the SRL Program is up to 90%. The non-federal cost share falls to the property owner and/or the local government.

New York State uses the following measures to reduce the number of Repetitive Loss and Severe Repetitive Loss properties:

- a) Incorporate acquisition of residential properties in the 100-year floodplain as a State priority in all grant funding cycles;
- b) Promote Hazard Mitigation Assistance and Flood Mitigation Assistance programs at applicant briefings and outreach seminars; with Regional Offices, County Emergency Managers and Mitigation Coordinators; on the DHSES website; and through other agencies.
- c) Implement the State-funded Greater Catskill Flood Remediation Program;
- d) Disseminate repetitive loss and severe repetitive loss property data captured in the State Plan (see Tables 3.9h and 3.9i) to help jurisdictions gauge risks, both in terms of their community and with regard to their neighbors.
- e) Continue to advise FEMA of possible improvement opportunities (e.g., eliminate the Benefit Costs Analysis requirement for those properties at which two NFIP claims totaling the property's value have been made).

**Table 3.9h** Severe Repetitive Loss Data presents a summary listing by county of number of losses, number of properties, and the dollar losses for those properties defined as meeting the SRL Grant Program thresholds. *Please Note: New York City includes Bronx, Kings, New York, Queens, and Richmond Counties.*



Table 3.9h: Severe Repetitive Loss Data

County	Total Payments	Average Payment	Losses	Properties
Albany	\$ 641,824	\$ 37,754	17	3
Allegany	\$ 41,305	\$ 8,261	5	1
Broome	\$ 5,465,979	\$ 267,791	98	24
Chautauqua	\$ 467,971	\$ 12,315	38	6
Chenango	\$ 432,628	\$ 108,157	4	1
Delaware	\$ 476,810	\$ 62,345	23	5
Dutchess	\$ 1,083,181	\$ 153,873	33	8
Erie	\$ 377,283	\$ 72,912	20	4
Essex	\$ 159,532	\$ 31,906	5	1
Greene	\$ 118,120	\$ 23,624	5	1
Monroe	\$ 368,512	\$ 33,501	11	1
Nassau	\$ 93,736,294	\$ 485,852	2,579	459
*New York City	\$ 5,740,752	\$ 25,743	223	42
Oneida	\$ 40,471	\$ 10,118	4	1
Ontario	\$ 217,357	\$ 31,051	7	1
Orange	\$ 3,406,766	\$ 277,507	137	25
Putnam	\$ 111,614	\$ 27,903	8	2
Rensselaer	\$ 60,699	\$ 15,175	4	1
Rockland	\$ 2,190,936	\$ 171,022	99	16
Saratoga	\$ 307,732	\$ 25,644	12	2
Schenectady	\$ 325,845	\$ 41,095	16	3
Schoharie	\$ 106,196	\$ 26,549	4	1
Suffolk	\$ 76,999,107	\$ 689,857	1,972	368
Sullivan	\$ 786,455	\$ 53,472	39	8
Tioga	\$ 1,922,116	\$ 163,879	39	11
Ulster	\$ 3,231,109	\$ 417,556	67	15
Westchester	\$ 23,178,357	\$ 369,611	677	116
<b>Total</b>	<b>\$ 221,994,949</b>	<b>\$ 3,644,474</b>	<b>6,146</b>	<b>1,126</b>

Source: FEMA, NFIP July 2013 (Please Note: \*New York City includes Bronx, Kings, New York, Queens, and Richmond Counties.)

Due to challenges in implementing the RFC and SRL programs, it was difficult to achieve required Benefit-Cost Ratios (BCRs) and document cost effectiveness. The SRL's provision of increasing an owner's NFIP rate if an offer to mitigate was refused was viewed as likely to reduce interest in the program.

Congress passed the Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12) legislation, which was signed into law on July 6, 2012, calling for changes to the NFIP to make it more sustainable. It extends the NFIP five years, while requiring significant



program reform. The law requires changes to all major components of the program, including flood insurance, flood hazard mapping, grants, and the management of floodplains. Many of the changes are designed to make the NFIP more financially stable, and ensure that flood insurance rates more accurately reflect the real risk of flooding. **Section 7** also references BW-12 and the State's strategy to mitigate RL and SRL properties.

Based on NFIP statistics, as of October 17, 2013, there were 191,128 NFIP-insured properties in New York State. Since Hurricane Sandy, there has been a steady growth in the number of policies.

Best estimates are that only between 30% and 50% of at-risk properties are covered by flood insurance. Even if one assumes that the number of current NFIP policies represents only about 50% of properties that should be insured, that means an additional 162,500 properties could be at risk in the State's Special Flood Hazard Areas. On the basis of the current number of properties insured, the annual premium paid amounts to \$191.6 million. If all potentially eligible properties were insured, the premium would be slightly in excess of between \$280,672,000 and \$467,787,000. The corresponding value of coverage for the currently insured properties is approximately \$48 billion, and would potentially increase to somewhere around \$70 billion if all flood-prone properties were insured. More than 162,704 claims have been filed since 1978. Assuming all potentially insurable properties were indeed insured, claims since the same period could have increased to two to three times that number. Finally, the total statewide NFIP claims paid since 1978 was \$4.8 million. Again, assuming that all potentially eligible properties were insured, the total claims paid since 1978 could have risen to between \$1.1 and \$2 billion.

### Local Plan Integration/Risk Assessments

Since August of 2013, 56 FEMA-approved local hazard mitigation plans (LHMPs) have been reviewed for the 2014 Update. The State's planning team had the opportunity to review local county risk assessments to help the State better understand its vulnerability in terms of the jurisdictions most threatened by classified hazards. In its analysis, the State of New York reviewed the processes of local governments and how their hazards were ranked based on their jurisdictions and the potential losses (i.e., people, buildings, and dollar values) associated with the hazards of greatest concern.

Where data was available, the State extracted the ranking impact information from the LHMP hazard analysis. This ranking feature is based on a combination of probability, severity, and extent of the hazard, and was determined to be the best measure of overall risk in the plans. This ranking was either numeric or described in terms of high, moderately high, moderate, or low. In cases where this information was not available, ranking values were not determined, yet were considered if identified in the individual county local plans.



For the sake of the 2014 Update, a proper analysis and summary of the data was required. During the review of the local plan risk assessments, all rankings used were based on the New York HAZNY ranking system, and measured on a scale rating from 44 (low) to 400 (high). This analysis revealed that selected county-level plans included human-caused hazards in their analysis, but the State hazard mitigation plan's 2014 Update is focused solely on natural hazards.

The local risk assessment summary allowed for an analysis of which hazards are of high concern to particular counties. **Table 5e** in **Section 5.0** lists all the hazards and the number of counties that ranked them at each of the scale levels: High, Moderately High, Moderate, Moderately Low, and Low. As indicated previously, 15 of the local plans ranked flood events as a high hazard. In addition, 19 counties ranked it as moderately high, three moderate, six moderately low, and one county ranked it as a low hazard. **Table 3.9i** displays the highest-ranked county hazard impacts and the high and/or moderately high ranked risk assessment scores for flood.

**Tables 3.9i: Summary of Flood Hazard Impacts and Rankings by County**

Local County Flood Hazard Impacts		
Highest Occurrences	Highest Fatalities	Highest Property Damage
Broome	Richmond	Broome
Essex	Delaware	Tioga
Erie	Queens	Delaware
Chenango	Montgomery	Sullivan
Delaware	Broome	Chenango

Source: SHEL DUS as of August 2013

Local County Flood Hazard Rankings	
High	Moderately High
Allegany, Broome, Cayuga, Chautauqua, Delaware, Franklin, Greene, Monroe, Montgomery, Orange, Otsego, Rensselaer, Saratoga, Schuyler, & Tioga	Albany, Cattaraugus, Chenango, Essex, Genesee, Jefferson, Lewis, Nassau, Onondaga, Ontario, Schoharie, Seneca, Sullivan, Ulster, Warren, Wayne, Westchester, Wyoming, & Yates

Source: Local Hazard Mitigation Plan (LHMP) as of October 2013

Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk. The zone reflects the severity or type of flooding in each area.

#### Flood Zone Types:

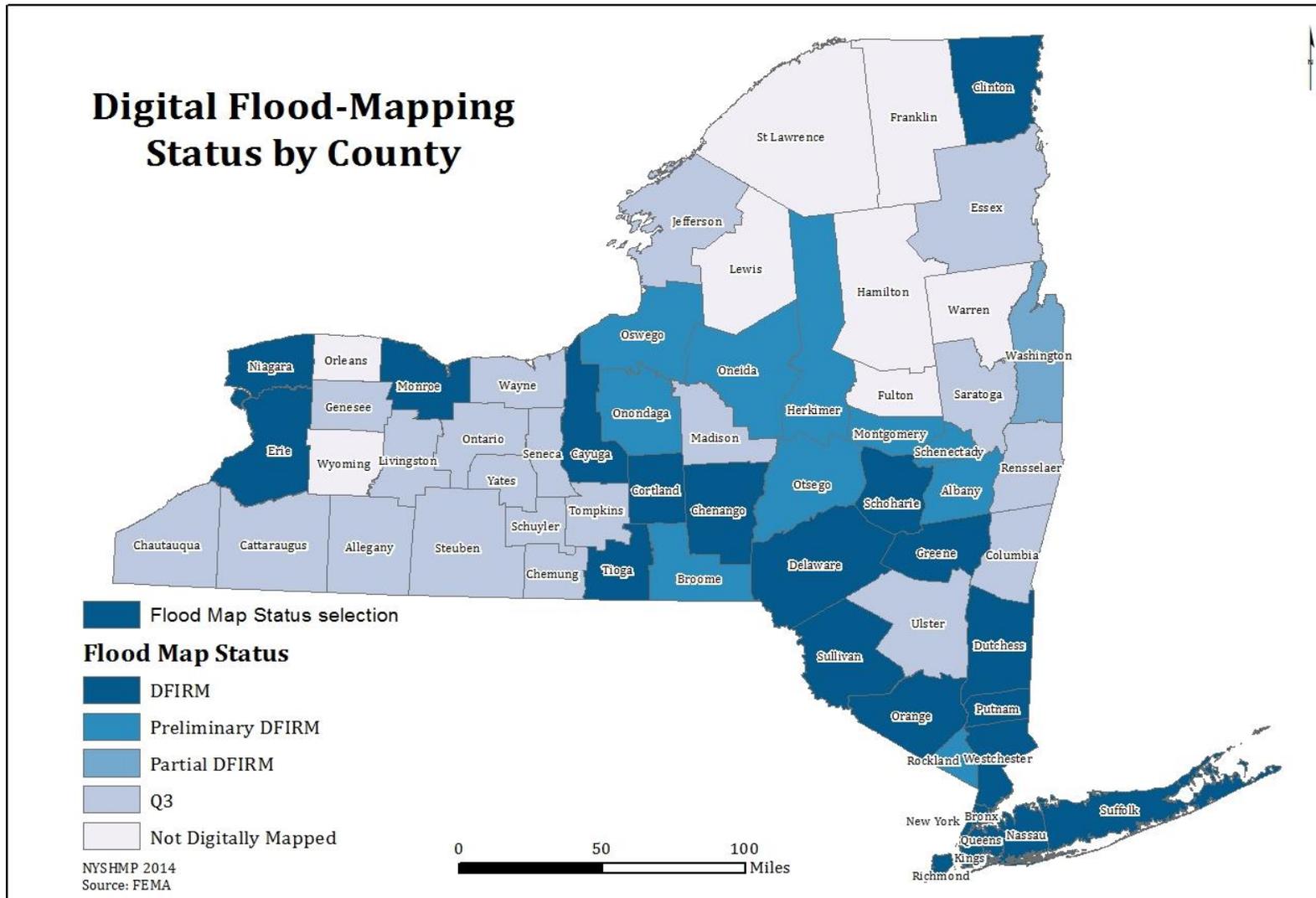
- Zone D – Properties located in an undetermined risk area.
- Zone X, C, and B – Properties located in low to moderate flood areas.



- Zone A, AE, A1-30, AH, AO, AR, A99 – Properties located in high-risk flood areas.
- Zone V, VE, V1-30 – Properties located in high-risk coastal flood areas.

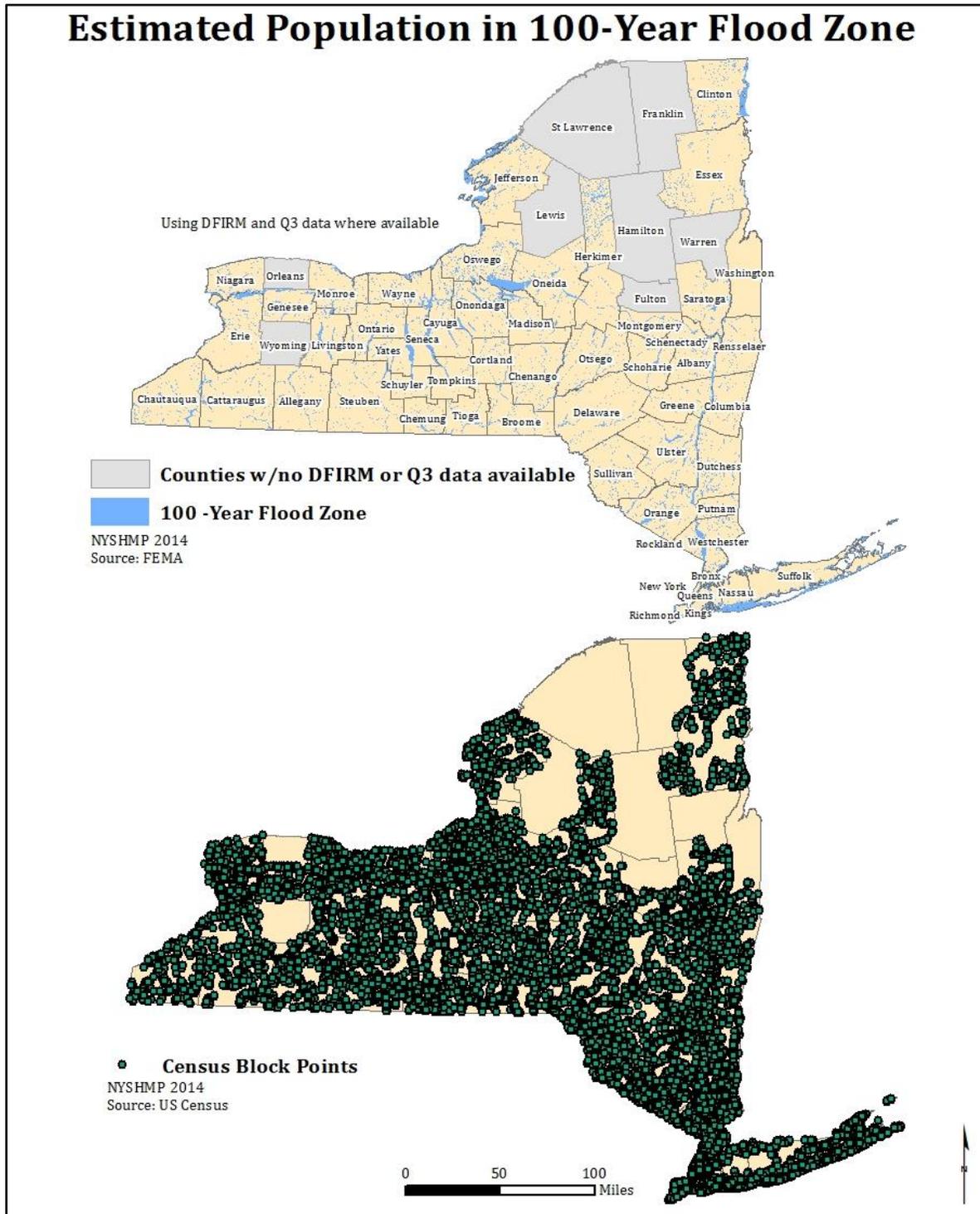


Figure 3.9n: Digital Flood-Mapping Status by County



**Figure 3.9o** shows the methodology for estimating the population in the 100-year flood zones using GIS overlay of population from Census Block Points, DFIRMS, and Q3 data if DFIRMS were not available.

**Figure 3.9o: Methodology for Estimating Population in 100-Year Flood Zone**



Currently, of the 62 New York State counties, 32 have adopted or are in the process of adopting the DFIRM, 20 are using Q3 Flood Data, and 10 are using FIRMs. **Table 3.9j** represents current flood map status and estimated population by county.

**Table 3.9j: NYS Flood Map Status by County**

County	Flood Map Status	Est. Population	County	Flood Map Status	Est. Population
Albany	DFIRM-prelim	7,373	Niagara	DFIRM	11,065
Allegany	Q3	4,593	Oneida	DFIRM-prelim	8,113
Bronx	DFIRM	15,387	Onondaga	DFIRM-prelim	17,836
Broome	DFIRM-prelim	19,725	Ontario	Q3	3,292
Cattaraugus	Q3	6,085	Orange	DFIRM	14,435
Cayuga	DFIRM	3,454	Orleans	N/A	0
Chautauqua	Q3	2,648	Oswego	DFIRM-prelim	8,286
Chemung	Q3	9,483	Otsego	DFIRM-prelim	4,237
Chenango	DFIRM	6,542	Putnam	DFIRM	2,833
Clinton	DFIRM	2,279	Queens	DFIRM	53,536
Columbia	Q3	2,104	Rensselaer	Q3	8,743
Cortland	DFIRM	4,749	Richmond	N/A	21,407
Delaware	DFIRM	5,278	Rockland	DFIRM-prelim	8,083
Dutchess	DFIRM	22,114	Saratoga	Q3	6,551
Erie	DFIRM	28,804	Schenectady	DFIRM-prelim	3,556
Essex	Q3	896	Schoharie	DFIRM	2,638
Franklin	N/A	N/A	Schuyler	Q3	212
Fulton	N/A	30	Seneca	Q3	573
Genesee	Q3	6,149	St Lawrence	N/A	N/A
Greene	DFIRM	1,579	Steuben	Q3	5,606
Hamilton	N/A	N/A	Suffolk	DFIRM	42,501
Herkimer	DFIRM-prelim	2,794	Sullivan	DFIRM	3,317
Jefferson	Q3	2,994	Tioga	DFIRM	5,471
Kings	N/A	63,193	Tompkins	Q3	1,941
Lewis	N/A	N/A	Ulster	Q3	6,906
Livingston	Q3	1,913	Warren	N/A	N/A
Madison	Q3	5,857	Washington	DFIRM-partial	36
Monroe	DFIRM	20,638	Wayne	Q3	5,280
Montgomery	DFIRM-prelim	2,126	Westchester	DFIRM	27,121
Nassau	DFIRM	137,290	Wyoming	N/A	330
New York	DFIRM	72,143	Yates	Q3	774
			<b>Total</b>		<b>732,899</b>

Source: FEMA



**Risk Mapping, Assessment, and Planning (Risk MAP)**

FEMA continues to collaborate with state, local, and tribal entities to enhance their Flood Map Modernization (Map Mod) program to deliver quality data, increase public awareness, and encourage mitigate actions that will reduce risk to life and property. The goal of Map Mod is to deliver reliable digital flood hazard data and maps in Geographic Information Systems (GIS) format for 92% of the nation's population.

FEMA is transforming its traditional flood identification and mapping efforts into a more integrated process of accurately identifying, assessing, communicating, planning, and mitigating flood-related risks. Risk Mapping, Assessment, and Planning (Risk MAP) will address gaps in flood hazard data to form a solid foundation for risk assessment, floodplain management, and provide state, local, and tribal entities with information needed to mitigate flood-related risks. (FEMA, 2013)

Risk MAP is a new FEMA program that provides communities with flood information and tools they can use to enhance their mitigation plans and better protect their citizens. Through more accurate flood maps, risk assessment tools, and outreach support, Risk MAP builds on Map Modernization and strengthens local ability to make informed decisions about reducing risk. Risk MAP's ultimate goal is saving lives and dollars.

Through collaboration with state, local and tribal entities, Risk MAP focuses on products and services beyond the traditional DFIRM, which is primarily used to set flood insurance rates and communicate 1% annual-chance flood risk.

Ultimately Risk MAP will reduce losses of life and property by enabling communities to develop mitigation plans and make informed risk management decisions that maximize loss reduction.

Risk MAP focuses on products and services beyond the traditional Flood Insurance Rate Map (FIRM) and works with officials to help put flood risk data and assessment tools to use, effectively communicating risk to citizens and enabling communities to enhance their mitigation plans and actions.

**Figure 3.9p** demonstrates the vision for the Risk MAP life cycle which begins with Identifying Risk, then Assessing Risk, then Communicating Risk, and finally Mitigating Risk.



Figure 3.9p: Risk MAP Life Cycle

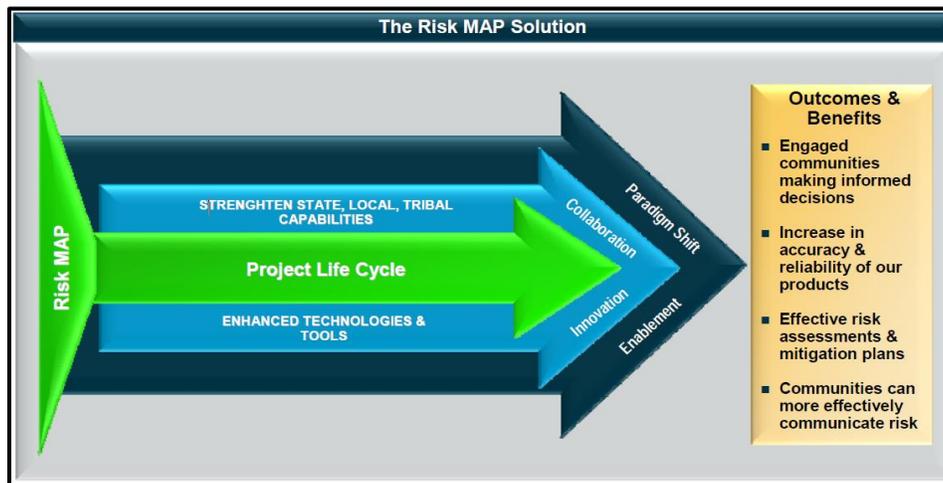


Source: FEMA

Value in Risk MAP

FEMA Risk MAP, new and innovative resources are available to help New York State assess and communicate flood risk in their local communities. Risk MAP Solution will, address gaps in flood hazard data, increase public awareness, support mitigation planning, enhance digital platform, align risk analysis programs, and develop synergies.

Figure 3.9q: Risk Map Solution Process



Source: FEMA



Currently, DEC is leading New York State's Risk-Map Discovery program to develop flood mapping and Risk MAP priorities, as well as local mitigation priorities in the following watersheds: Hudson-Hoosic, Seneca, Irondequoit-Nine Mile, Lower Genesee, Oak Orchard – 12 Mile Creek, Black River, Chaumont – Perch, Oswego, Salmon – Sandy, and Upper St. Lawrence. The watershed study approach will improve engineering credibility and communicate risks comprehensively as it relates to flooding. This approach will also accomplish the following strategies: encourage collaboration between neighboring counties and local communities; increase knowledge of flood hazards as a result of more comprehensive assessments of stream and tributary relations; provide a framework to evaluate flood risk, engineering needs, elevation data, acquisition availability and gaps; and availability of community contribution by watershed.

Additional NYS Risk MAP information by county and Risk MAP Watershed Project is available at <https://www.rampp-team.com/ny.htm>. Risk Assessment, Mapping, and Planning Partners (RAMPP), is a joint venture between Dewberry, URS, and ESP, one of three Production and Technical Services (PTS) contractors under FEMA's Risk MAP phase of the National Flood Insurance Program. RAMPP provides comprehensive floodplain mapping, GIS, and hazard risk mitigation services for FEMA to include specifically serving **FEMA Regions II** (NJ, NY, PR, and VI), **III** (DC, DE, MD, PA, VA, WV), and **VI** (AR, LA, NM, OK, TX)<sup>3</sup>.

NYS primarily focused on defining risk for those areas within the 100-year floodplain (those areas having at least a 1% chance of flooding during any given year). While the Plan focuses on the 100-year floodplain, it is important that communities not dismiss the risk associated with the 500-year floodplain. The probability for flooding to the full extent of the 500-year level is low (0.2% chance of flooding in any given year); however, flooding above the 100-year level is not uncommon, as was shown in certain areas of the State during the June 2006 flooding event where 300-year flood levels were reached. In addition, it must be recognized that much of the flood damage that typically occurs is in areas that are outside a floodplain altogether, particularly in urban and densely populated areas where storm water runoff and ponding conditions are more likely.

While the GIS analysis of property in the 100-year floodplain includes information for all property classifications (agricultural, commercial, vacant, etc.), a primary focus has been on residential property. This is based on the fact that residential properties comprise the greatest number and total value of property within floodplains and that damage to residences has the greatest impact on citizens.

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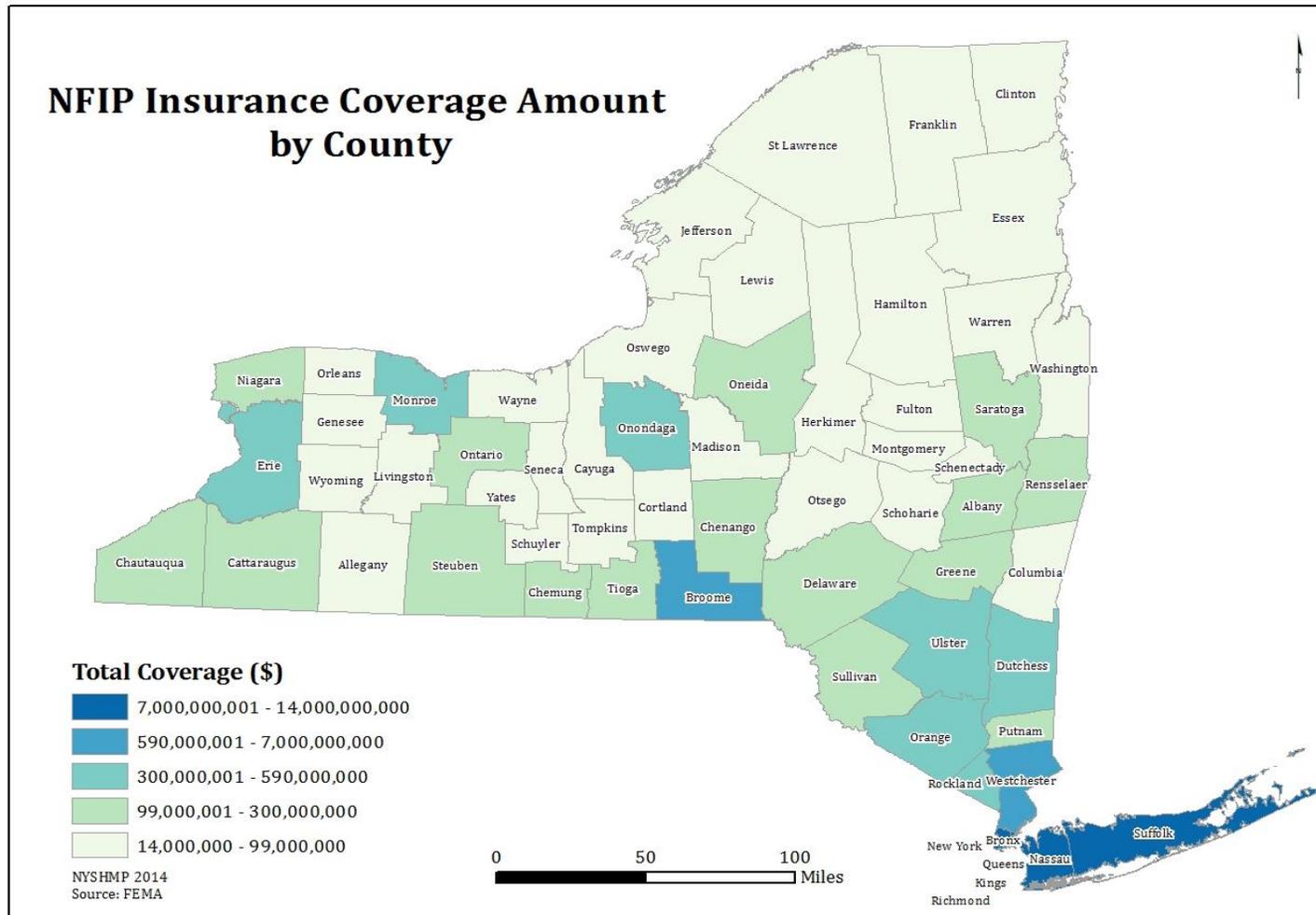
<sup>3</sup> FEMA, Risk Assessment, Mapping, and Planning Partners (RAMPP); <https://www.rampp-team.com/index.htm>





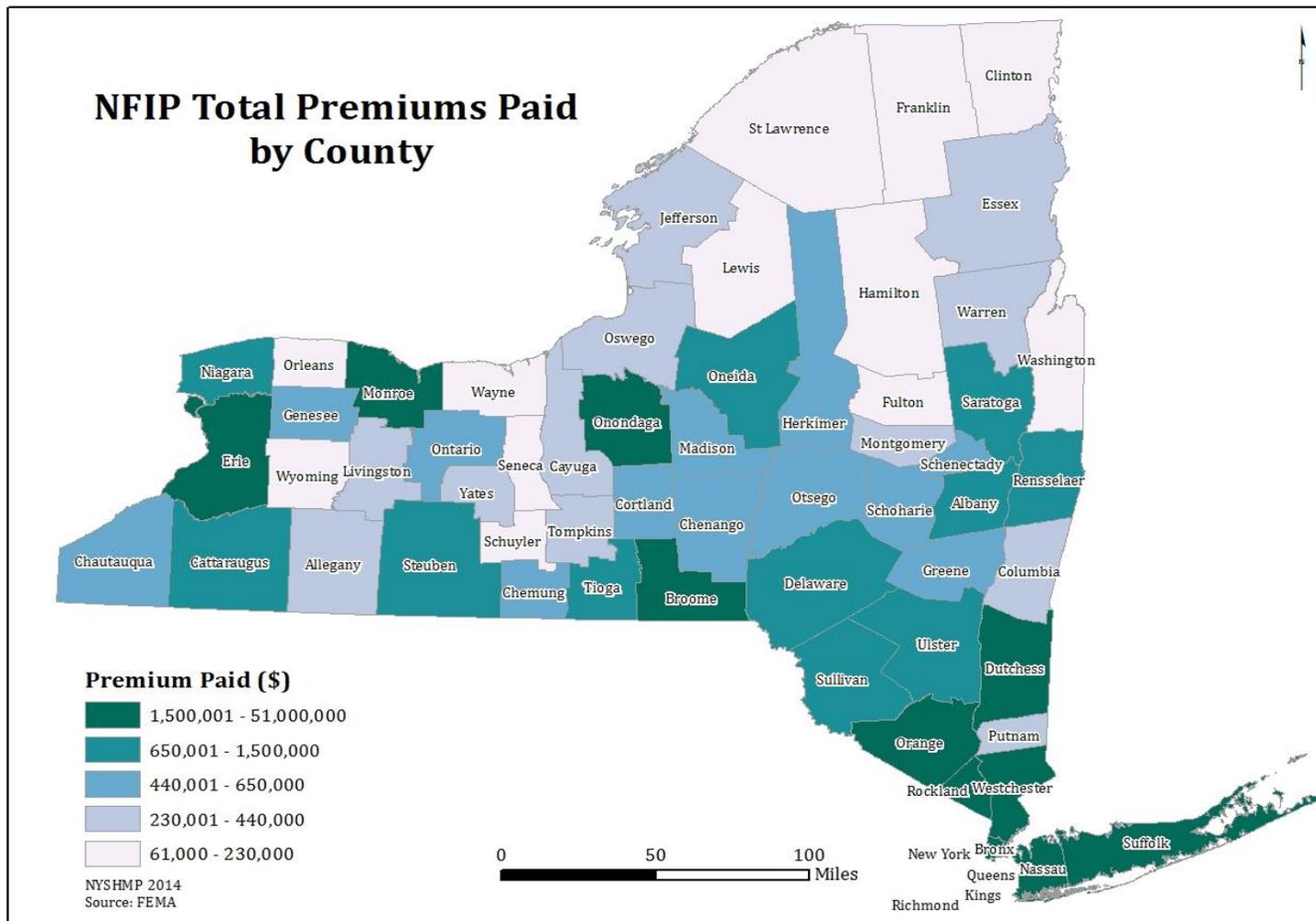
**Figure 3.9s** displays the spatial distribution of total amount of NFIP coverage by county for New York. Nassau, Bronx, and Suffolk counties make up the top three counties with the highest amount of NFIP coverage.

**Figure 3.9s: NFIP Insurance Coverage Amount, by County**



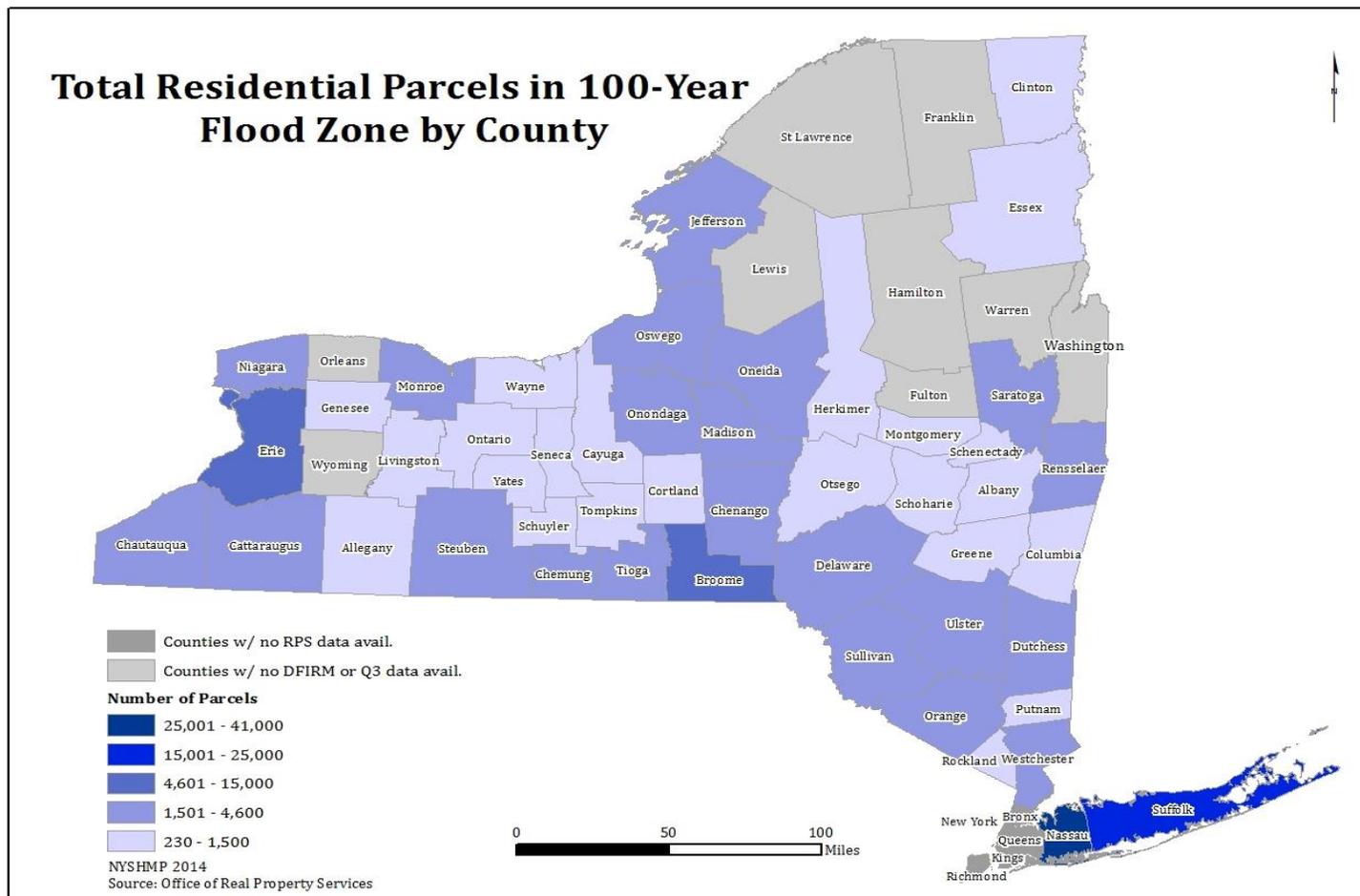
**Figure 3.9t** displays the spatial distribution of NFIP premiums paid by county across New York. Monroe, Putnam, and Madison counties make up the top three counties with have the highest number of NFIP premiums.

**Figure 3.9t: NFIP Total Premiums (by County)**



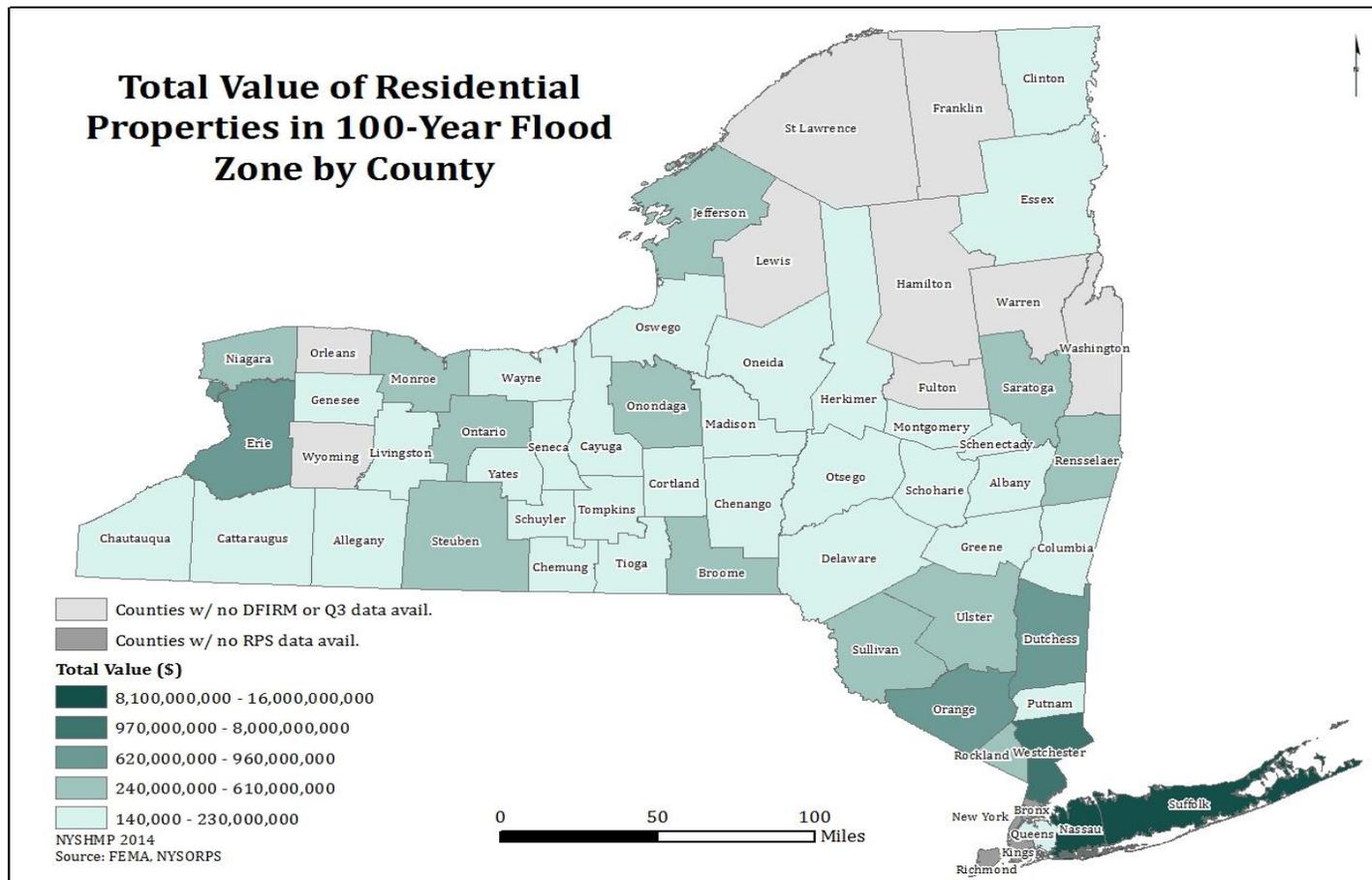
**Figure 3.9u** shows the total number of residential parcels in the 100-year flood zone. Nassau, Suffolk, and Erie counties contain the highest counts, respectively, of total residential parcels at risk from a 100-year flood event, based on available DFIRMs and Q3 data for counties in the state of New York. Of note is Washington County, which only has a partial DFIRM that is small relative to the size of the county, therefore it was removed from the analysis.

**Figure 3.9u: Total Residential Parcels in 100 Year Flood Zone by County**



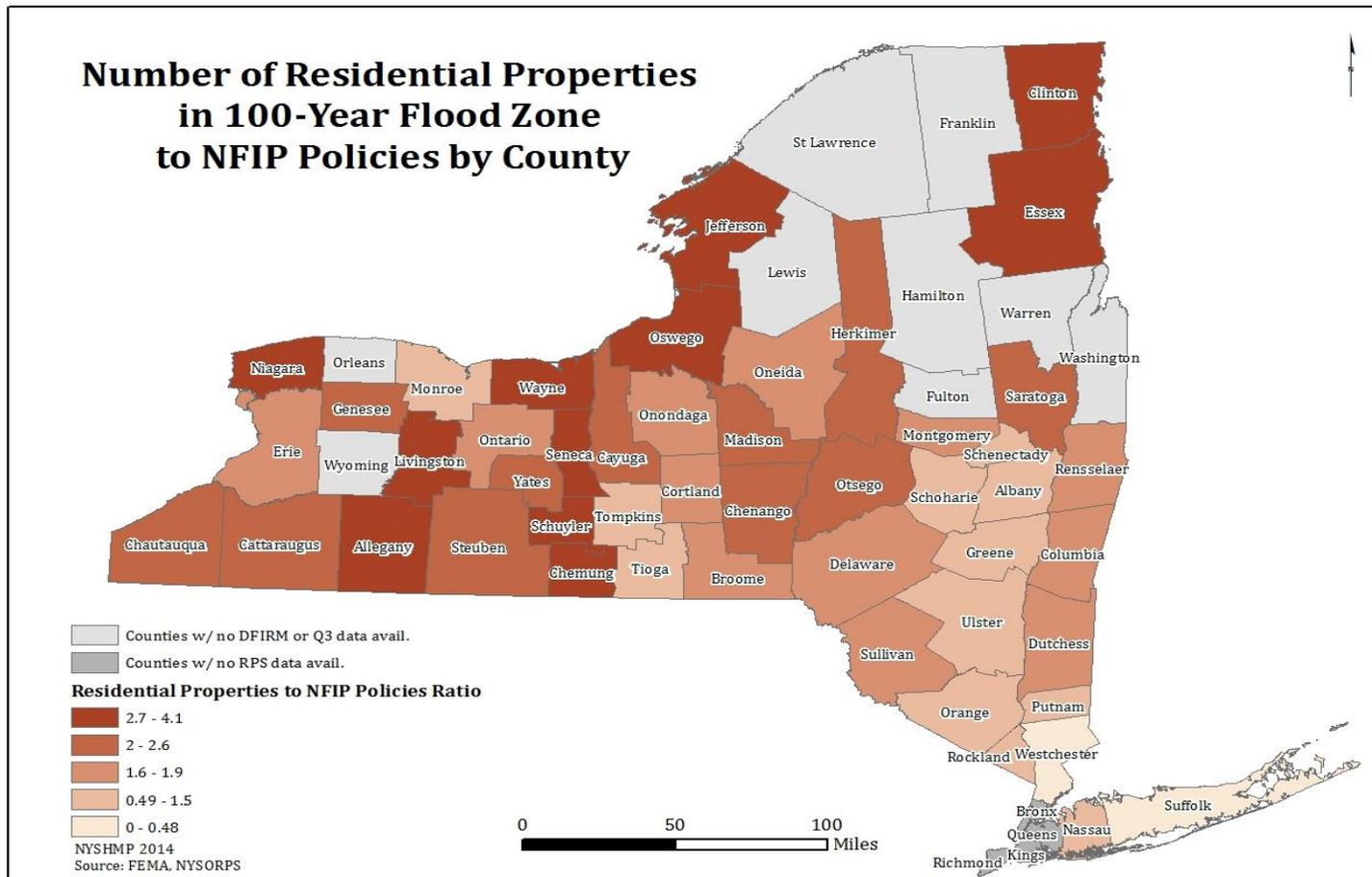
**Figure 3.9v** is a residential property exposure analysis using parcel point data from the New York State Office of Real Property Services and the 100-year flood zone. The residential parcel points' assessed property value is divided by the state equalization rate to derive the market value of the parcel. This provides a snapshot of which counties have the greatest residential property exposure in the 100-year flood plain. Suffolk, Nassau, and Dutchess counties have the greatest total exposed residential property value in the flood zone.

**Figure 3.9v: Total Value of All Residential Properties in 100-Year Flood by County**



**Figure 3.9w** displays the ratio of residential parcels in the 100-year flood zone to the number of NFIP policies by county across New York. This provides an indication of areas that may be underinsured (ratio values greater than 1). Of note is Washington County, which has a partial DFIRM with 27 residential parcels in the partial DFIRM. Because the partial DFIRM is so small relative to the size of the county area, Washington County was removed from this analysis. Generally speaking, the higher the ratio, the more vulnerable the county is to underinsured flooding.

**Figure 3.9w: Number of Residential Properties in 100-Year Flood Zone to NFIP Policies by County**



**Table 3.9k** provides the values and ratio of the total number of residential properties in the 100-year flood zone, NFIP data, and the ratio of residential properties in the 100-year flood zone compared the number of NFIP policies by county.

**Table 3.9k: Residential Properties in 100-Year Flood Zone and NFIP Information**

County	Number of Residential Properties	NFIP Policies	NFIP Coverage (\$)	NFIP Premiums (\$)	Ratio of #Resid/NFIP Policies
Albany	1,177	952	189,972,100	1,062,171	1.24
Allegany	1,316	442	42,266,100	298,231	2.98
Bronx	N/A	48,450	11,997,279,200	45,119,053	N/A
Broome	4,983	3,250	686,007,200	2,427,136	1.53
Cattaraugus	1,860	776	110,483,000	741,256	2.4
Cayuga	1,355	518	73,192,900	438,810	2.62
Chautauqua	1,858	753	118,748,100	569,325	2.47
Chemung	2,164	772	125,731,200	640,592	2.8
Chenango	1,586	759	102,456,900	648,654	2.09
Clinton	850	313	58,135,300	226,974	2.72
Columbia	675	367	84,793,500	343,027	1.84
Cortland	1,071	589	71,934,900	510,395	1.82
Delaware	1,771	1,147	191,836,900	1,163,633	1.54
Dutchess	3,329	2,035	522,235,900	1,703,388	1.64
Erie	5,831	3,117	547,592,600	2,554,068	1.87
Essex	997	303	60,860,200	237,757	3.29
Franklin	N/A	159	26,469,100	122,727	N/A
Fulton	N/A	153	25,139,400	140,893	N/A
Genesee	1,374	567	61,488,000	489,788	2.42
Greene	869	710	118,468,600	634,654	1.22
Hamilton	N/A	78	17,702,500	76,100	N/A
Herkimer	1,334	568	73,711,200	463,024	2.35
Jefferson	2,089	508	88,720,400	413,099	4.11
Kings	N/A	N/A	N/A	N/A	N/A
Lewis	N/A	100	14,936,500	95,901	N/A
Livingston	1,189	372	54,071,500	309,194	3.2
Madison	1,677	657	91,742,900	612,817	2.55
Monroe	3,160	2,175	387,116,200	2,087,805	1.45
Montgomery	494	269	49,472,100	358,820	1.84
Nassau	40,943	50,418	14,045,062,500	51,112,304	0.81
New York	N/A	N/A	N/A	N/A	N/A



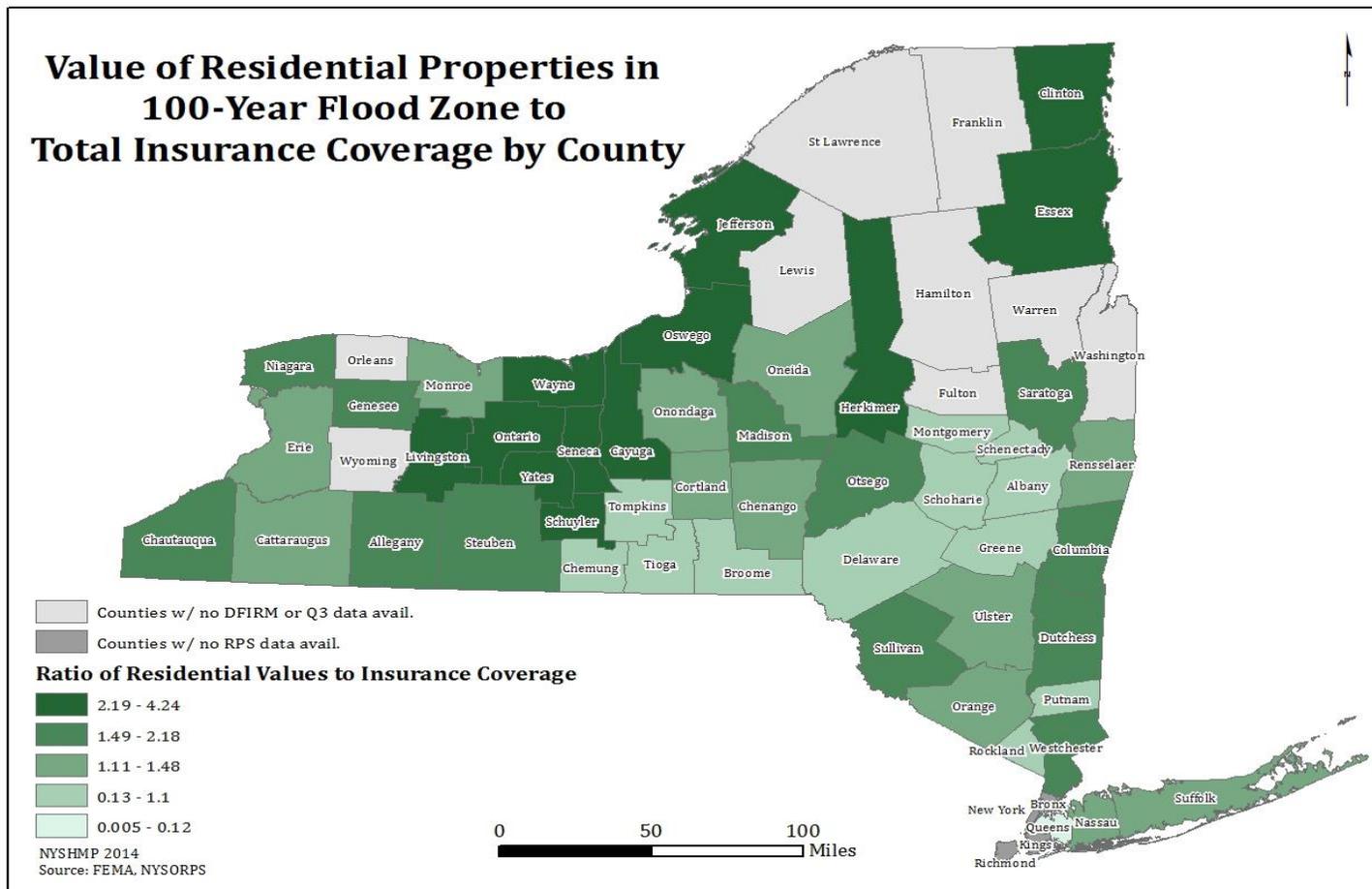
County	Number of Residential Properties	NFIP Policies	NFIP Coverage (\$)	NFIP Premiums (\$)	Ratio of #Resid/NFIP Policies
Niagara	2,351	881	139,623,300	713,299	2.67
Oneida	1,632	910	144,909,800	886,615	1.79
Onondaga	3,503	1,902	337,318,500	1,791,894	1.84
Ontario	1,098	664	104,437,000	489,792	1.65
Orange	3,087	2,044	461,961,200	2,026,965	1.51
Orleans	N/A	112	15,798,400	87,469	0
Oswego	1,767	455	71,970,100	373,882	3.88
Otsego	1,325	517	87,660,700	498,202	2.56
Putnam	228	449	118,152,300	366,304	0.51
Queens	N/A	N/A	N/A	N/A	N/A
Rensselaer	2,213	1,162	196,286,800	1,532,389	1.9
Richmond	N/A	N/A	N/A	N/A	N/A
Rockland	1,090	2,003	490,109,000	1,819,344	0.54
Saratoga	2,021	989	186,561,500	1,088,197	2.04
Schenectady	392	478	84,925,200	469,767	0.82
Schoharie	635	491	98,623,900	546,630	1.29
Schuyler	290	78	14,141,700	61,415	3.72
Seneca	506	169	28,964,700	146,998	2.99
St Lawrence	N/A	229	33,892,900	152,931	N/A
Steuben	2,164	978	151,638,300	885,439	2.21
Suffolk	19,092	39,367	11,304,385,400	43,576,037	0.48
Sullivan	1,603	849	181,619,300	777,449	1.89
Tioga	1,586	1,215	185,085,100	1,321,525	1.31
Tompkins	456	376	76,218,500	370,458	1.21
Ulster	1,879	1,471	325,139,800	1,535,301	1.28
Warren	N/A	268	62,105,200	256,014	N/A
Washington	N/A	201	34,657,000	187,340	N/A
Wayne	1,084	270	46,868,700	219,676	4.01
Westchester	3,744	7,806	2,161,554,900	9,203,052	0.48
Wyoming	59	136	16,189,000	109,024	0.43
Yates	794	300	53,064,200	288,241	2.65
<b>Total</b>	<b>138,551</b>	<b>188,047</b>	<b>\$47,251,489,300</b>	<b>\$187,383,245</b>	

Source: FEMA, NYSORPS October 2013



**Figure 3.9x** shows a comparison of residential property values in the 100-year flood zone to total NFIP insurance coverage. This provides a spatial indication of which counties have more residential properties to insurance coverage in monetary terms; the higher the ratio, the greater the disparity in property value to the amount of insurance coverage. Schuyler, Jefferson, and Wayne counties have the highest ratio values, all being over four. This means that total residential properties in the flood zone are worth four times more than NFIP insurance coverage.

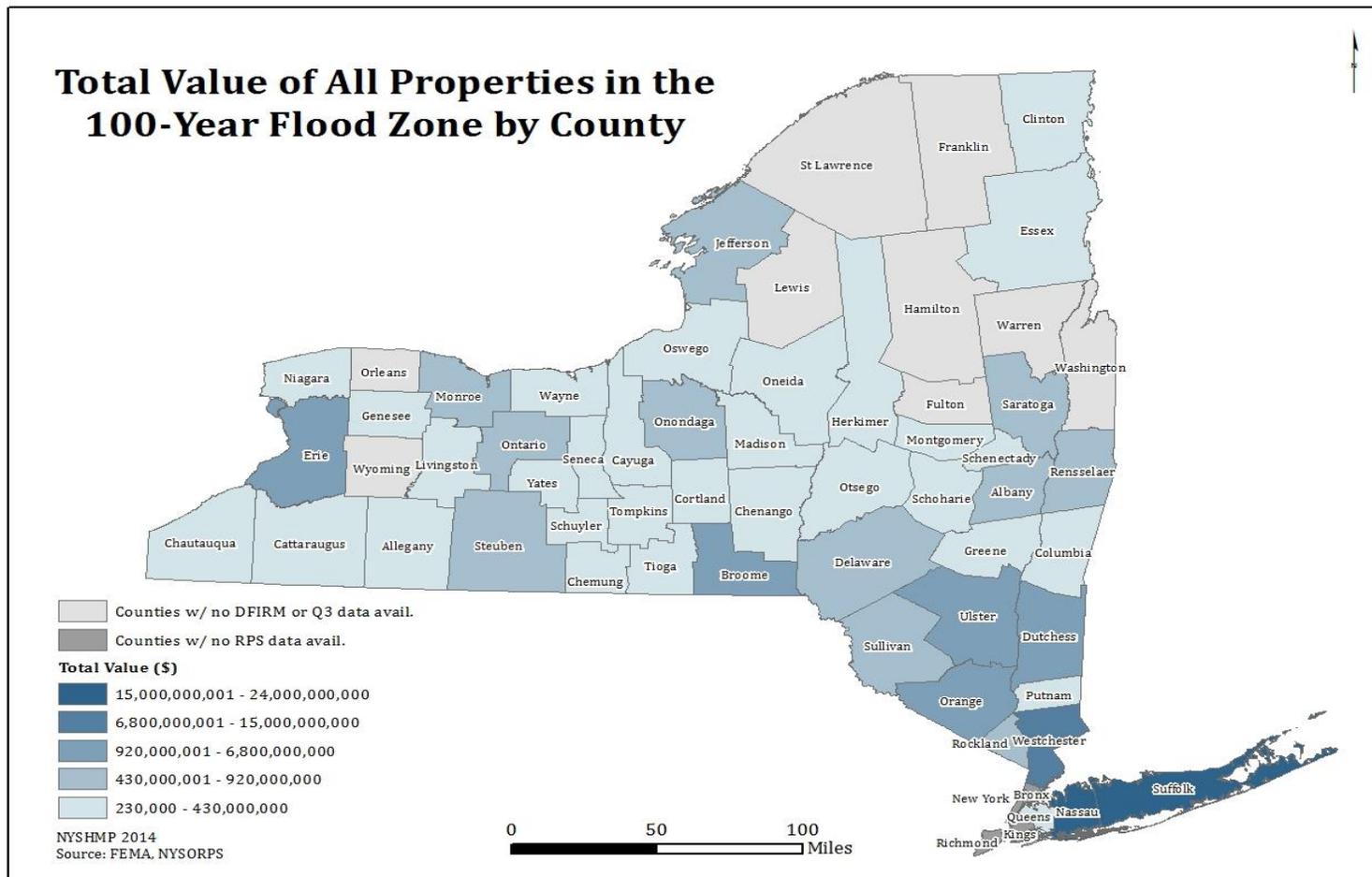
**Figure 3.9x: Value of Residential Property in 100-Year Flood Zone to Total Insurance by County**





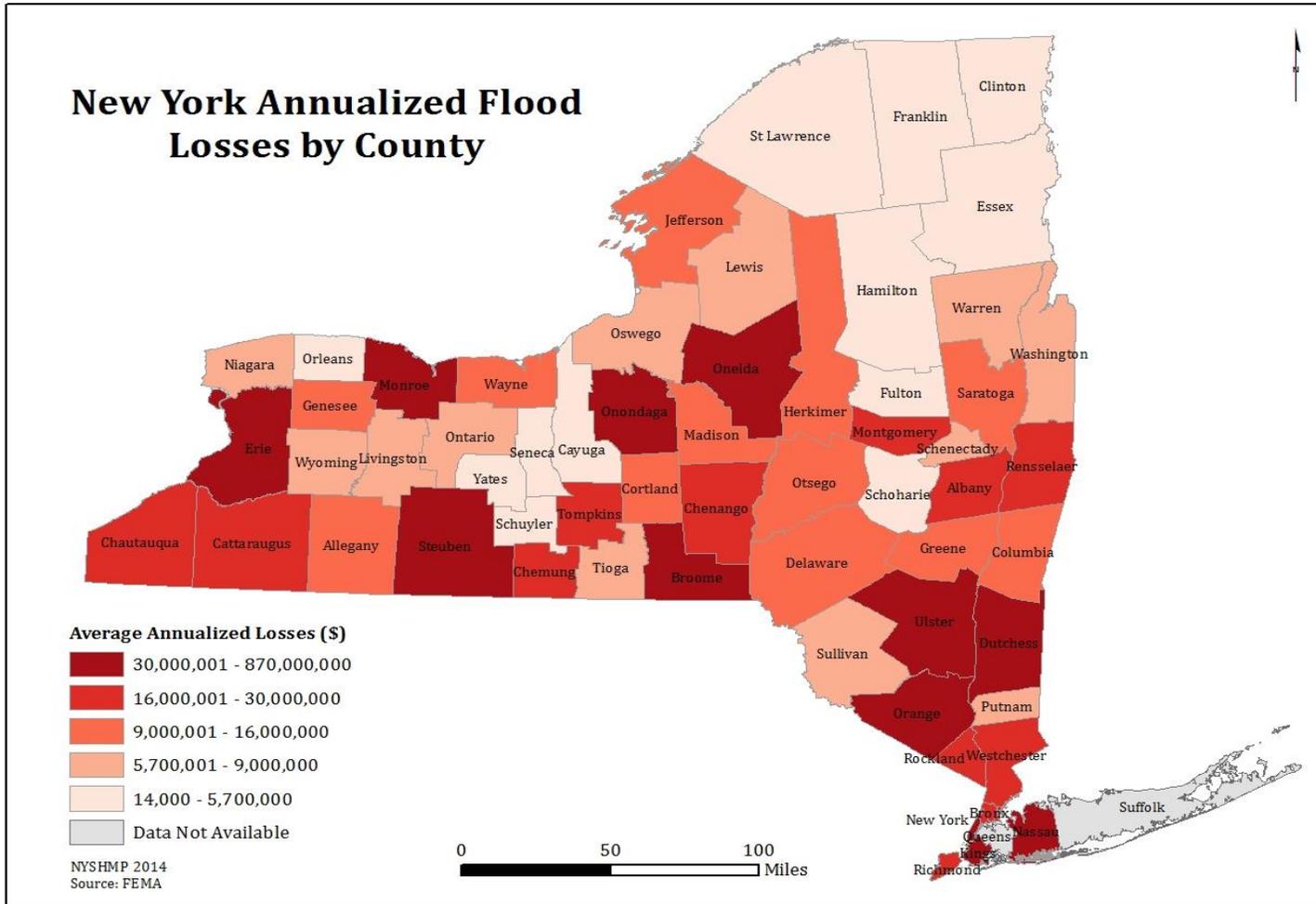
**Figure 3.9z** is a property exposure analysis using parcel point data from the New York State Office of Real Property Services and the 100-year flood zone. The parcel point's assessed property value is divided by the state equalization rate to derive the market value of the parcel. This provides a snapshot of which counties have the greatest property exposure in the 100-year flood plain. Nassau, Suffolk, and Westchester counties have the greatest total exposed property value in the flood zone.

**Figure 3.9z: Total Value of All Properties in the 100-Year Flood Zone by County**



**Figure 3.9aa** displays the spatial distribution of annualized flood losses by county. Nassau (\$866,700,000), Erie (\$670,503,000), and Kings (\$578,316,000) counties have the highest annualized losses. This data comes from FEMA’s Hazus Average Annualized Loss Viewer, which also provides a national dataset.

**Figure 3.9aa: New York Annualized Flood Losses by County**



## Development in hazard-prone areas

The NFIP is an insurance program that requires communities to adopt and enforce floodplain management ordinances in order for property owners to purchase federally backed insurance. These ordinances provide some measure of protection for new construction and significant renovations in the floodplain. Unrestricted development may occur in areas prone to flooding, but not mapped, and in those communities lacking floodplain management ordinances.

Based on the 2010 Census, population increases are being seen or are expected in Albany, Clinton, Cortland, Dutchess, Essex, Franklin, Fulton, Greene, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York City (including Bronx, Kings, New York, Queens, and Richmond Counties), Onondaga, Ontario, Orange, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Seneca, Steuben, Suffolk, Sullivan, Tompkins, Ulster, Warren, Washington, Westchester, and Yates counties. All but Clinton, Cortland, Dutchess, Fulton, Herkimer, Livingston, Madison, Putnam, Rockland, Steuben, Suffolk, Tompkins, and Washington Counties have a high or moderate-high flood hazard rating based on the 56 FEMA Approved LHMPs as of September 2013.

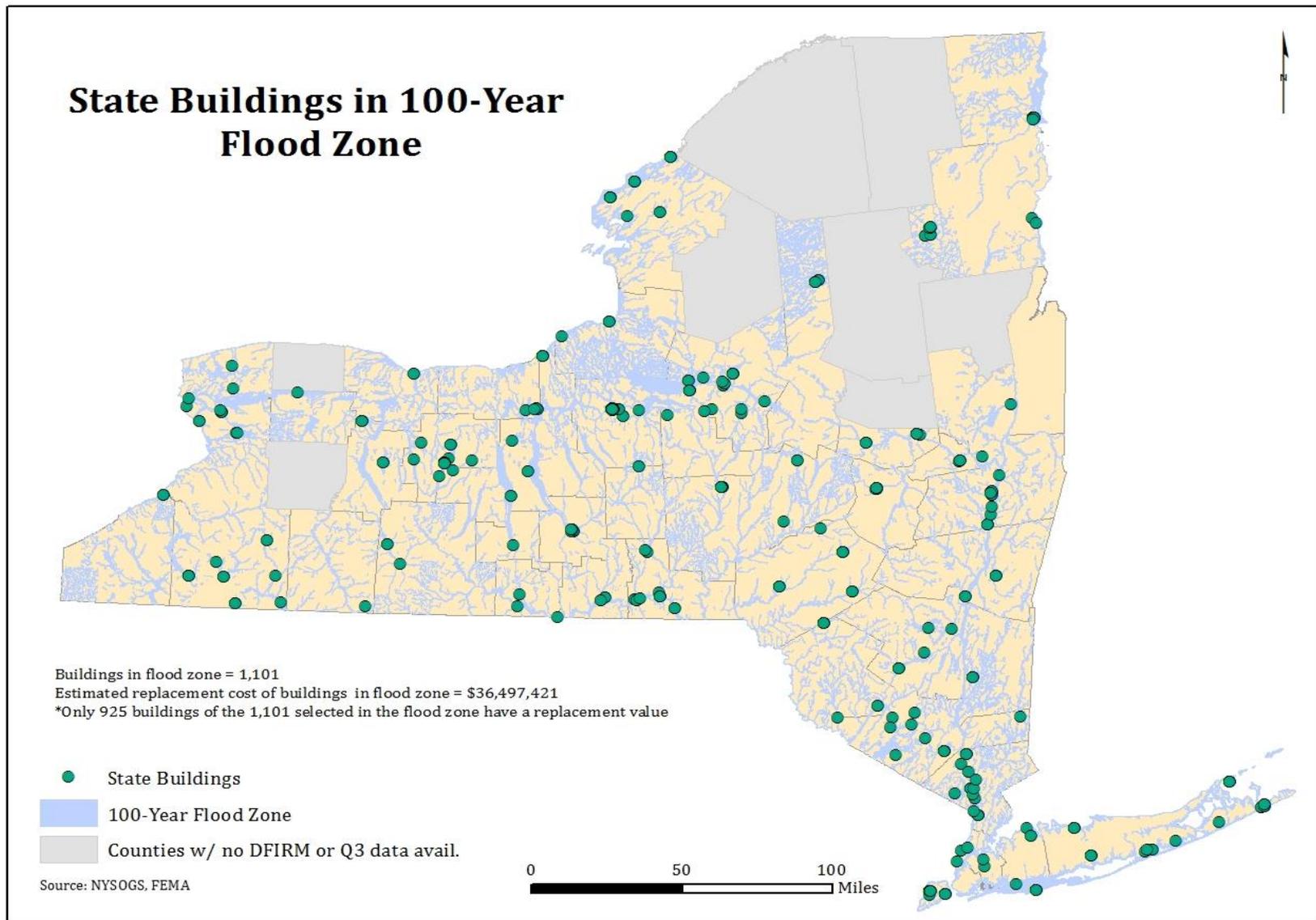
Of the 1,562 New York cities, towns, and villages, less than 2% of the local communities are currently participating in the NFIP Community Rating System (CRS). CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities exceeding minimum NFIP requirements in areas such as public information, mapping and regulations, flood damage reduction, and flood preparedness. In return, the communities receive discounts on their flood insurance premiums. **Table 3.9f** shows the discounted percentage each participating NYS CRS Community is currently receiving.

### 3.9.3 Vulnerability of State Facilities

**Figure 3.9ab** shows state-owned buildings that lie within the 100-year flood zone. A few data gaps exist that render this a working analysis. First, the New York State Office of General Services manages over roughly 56,000 buildings and properties. Secondly, a GIS file exists that has a record of just over 19,000 buildings; this GIS layer is currently in the process of being updated. Finally, not all buildings on record have an associated replacement value. After accounting for these gaps, the flood hazard analysis derived 1,101 buildings in the 100-year flood zone, with 925 buildings having an associated replacement value, to arrive at the total of \$364,974,721. Emphasis is placed on the fact that these datasets are part of an ongoing state inventory and risk assessment project (described in more detail in **Section 3.1.6**).



Figure 3.9ab: State Buildings in 100-Year Flood Zone



**Table 3.9I** details the GIS analysis results from the state-owned buildings in the 100-year flood zone. The table provides the name of the agency that owns the buildings, the total count of buildings, and replacement cost in the 100-year flood zone.

**Table 3.9I: State-Owned Buildings in 100-Year Flood Zone**

State Agency	Number of Buildings	Replacement Cost
Office of General Services (OGS)	5	\$ 52,955,119
Department of Corrections and Community Supervision (DOCCS)	1	\$ 10,167,770
Office of Parks, Recreation and Historic Preservation (OPRHP)	542	\$ 95,357,356
Department of Environmental Conservation (DEC)	140	\$ 12,041,616
Office of Mental Health (OMH)	18	\$ 36,440,505
Office of People with Developmentally Disabilities (OPWDD)	89	\$ 90,525,608
Department of Military and Naval Affairs (DMNA)	1	\$ 11,627,475
Department of Transportation (DOT)	49	\$ 23,936,201
Office of Child and Family Services (OCFS)	11	\$ 2,431,631
Department of Agriculture and Markets (AG&MKTS)	69	\$ 29,491,440
<b>Total</b>	<b>925</b>	<b>\$364,974,721</b>

Source: FEMA, NYSOGS



### 3.9.4 Estimating Potential Losses by Jurisdiction

**Table 3.9m** provides the annualized losses for flood events using Hazus-MH 2.1. The data was based on using a probabilistic run generated to determine the total annual losses for each county found within the State. **Figure 3.9ac**, illustrates the top 10 counties' annualized losses, with a total of \$28,999,613 in flood losses for the entire State of New York.

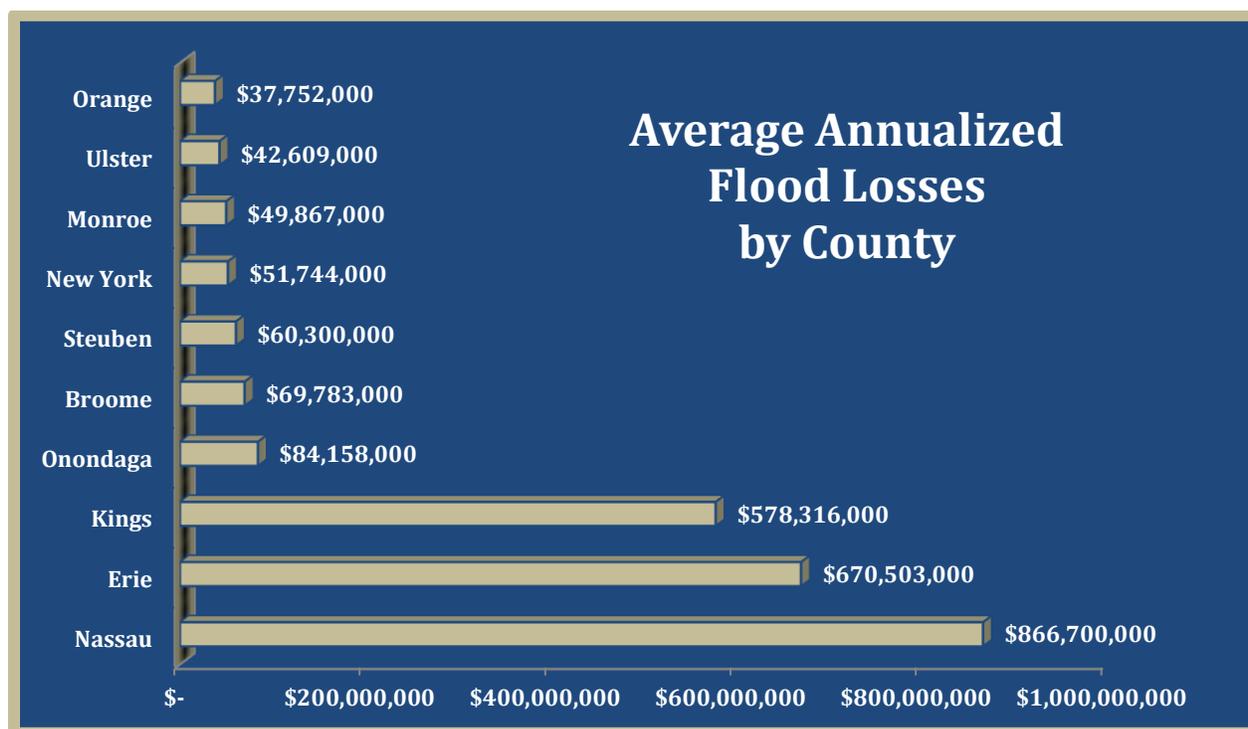
**Table 3.9m: Average Annual Flood Losses by County**

County	Flood	County	Flood	County	Flood
Ulster	\$ 9,725,269	Rensselaer	\$ 277,926	Fulton	\$ 104,955
Onondaga	\$ 1,854,827	Herkimer	\$ 266,671	Chenango	\$ 94,717
Oneida	\$ 1,633,952	Warren	\$ 264,074	Broome	\$ 92,963
Hamilton	\$ 1,505,817	Dutchess	\$ 254,272	Otsego	\$ 92,292
Saratoga	\$ 1,338,414	Chemung	\$ 240,804	Allegany	\$ 90,285
Jefferson	\$ 869,134	Niagara	\$ 207,490	Livingston	\$ 87,368
Cattaraugus	\$ 839,440	Kings	\$ 196,643	Delaware	\$ 84,246
St Lawrence	\$ 754,168	Sullivan	\$ 195,610	Schoharie	\$ 83,449
Erie	\$ 678,365	Washington	\$ 169,633	Richmond	\$ 77,819
Cayuga	\$ 613,634	Schenectady	\$ 150,781	Tioga	\$ 75,167
Wyoming	\$ 600,830	Oswego	\$ 149,782	Cortland	\$ 70,875
Monroe	\$ 592,171	Suffolk	\$ 145,888	Franklin	\$ 63,839
Queens	\$ 393,233	Genesee	\$ 143,103	Steuben	\$ 62,408
Columbia	\$ 377,067	Albany	\$ 140,897	New York	\$ 52,233
Lewis	\$ 375,056	Madison	\$ 139,699	Tompkins	\$ 42,767
Chautauqua	\$ 355,832	Nassau	\$ 137,527	Seneca	\$ 39,764
Greene	\$ 312,832	Clinton	\$ 131,270	Yates	\$ 30,690
Orleans	\$ 308,134	Ontario	\$ 124,745	Bronx	\$ 29,838
Wayne	\$ 292,995	Montgomery	\$ 122,925	Schuyler	\$ 26,510
Westchester	\$ 285,051	Essex	\$ 120,422	Rockland	\$ 20,973
Orange	\$ 278,476	Putnam	\$ 111,596	<b>Total</b>	<b>\$ 28,999,613</b>

Source: SHELDUS, 2013



Figure 3.9ac: Average Annual Flood Losses by County 1960-2012



### Hazus-MH

Hazus is a nationally applicable standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. Hazus uses GIS technology to estimate physical, economic, and social impacts of disasters.

Hazus is used for mitigation, preparedness, and response. Government planners, GIS specialists, and emergency managers use Hazus to determine losses and the most beneficial mitigation approaches to minimize them. Hazus can be used in the assessment step in the mitigation planning process, which is the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repetitive damage.

New York State uses Hazus to determine potential risk and vulnerability in local jurisdictions, support risk assessments, and perform economic loss scenarios for flood, hurricane, and earthquake hazards.

Delaware County's Local Hazard Mitigation Plan (LHMP) is an example of how Hazus is used at the local level to determine flood loss estimations for: impact on life, health and safety; general building stock; critical facilities; the economy; and future growth. The county's vulnerability assessment using Hazus is documented in **Appendix 3 Attachment B**; however, the complete LHMP can be reviewed at [www.dcdes.org](http://www.dcdes.org).



A 100-year flood event was modeled in Hazus to estimate potential losses and damages. **Table 3.9n** shows the results of the Hazus run by county in the following categories: building-related economic loss; building-related business loss; building loss as % of exposure; debris generated; shelter requirements; fire stations, hospitals, police stations, and schools with at least substantial damage. Erie County has the highest building-related economic loss at over \$1 billion dollars, greatest amount of tons of debris generated, number of shelters required, and number of fire stations, police stations, and schools damaged; Oneida County has the highest building-related business loss at over \$1.6 million dollars; Montgomery County has the highest building economic loss as a percentage of exposure; Broome County has the highest number of hospitals damaged.

**Figure 3.9ad** shows the combined total for building-related economic and business loss, by county; Erie County also has the highest estimated total building loss after combining the two categories.



Table 3.9n: Estimated Losses of General Building Stock Located in New York State

County	Building Related Economic Loss	Building Related Business Loss	Building Economic Loss as % of Exposure	Debris (in Tons)	Shelter Requirements	* EF Fire Stations (at least substantial damage)	* EF Hospitals (at least substantial damage)	* EF Police Stations (at least substantial damage)	* EF Schools (at least substantial damage)
Albany	\$ 108,120,000	\$ 1,690,000	0.40%	6,741	552	0	0	0	0
Allegany	\$ 146,440,000	\$ 1,860,000	4.50%	21,451	2,715	3	0	1	4
Bronx	\$ 111,700,000	\$ 11,210,000	0.13%	758	1,069	0	0	0	0
Broome	\$ 453,870,000	\$ 3,080,000	2.90%	73,359	7,395	3	3	1	5
Cattaraugus	\$ 256,960,000	\$ 2,330,000	4.08%	27,063	1,083	4	1	0	1
Cayuga	\$ 90,020,000	\$ 450,000	1.60%	15,761	1,349	3	0	1	0
Chautauqua	\$ 223,570,000	\$ 2,220,000	2.00%	31,378	1,729	2	0	0	0
Chemung	\$ 256,590,000	\$ 4,260,000	4.10%	22,388	6,772	1	0	1	3
Chenango	\$ 270,660,000	\$ 1,350,000	7.90%	42,290	2,711	2	0	1	2
Clinton	\$ 20,450,000	\$ 60,000	0.38%	3,632	113	2	0	0	0
Columbia	\$ 57,180,000	\$ 280,000	1.03%	7,132	408	0	0	0	1
Cortland	\$ 22,468,000	\$ 1,690,000	0.65%	19,158	3,257	2	1	0	3
Delaware	\$ 161,120,000	\$ 990,000	4.10%	22,299	1,702	2	0	1	2
Dutchess	\$ 289,680,000	\$ 1,840,000	8.36%	31,931	5,035	2	0	0	0
Erie	\$ 1,831,030,000	\$ 13,210,000	2.20%	131,591	67,415	10	1	5	18
Essex	\$ 38,370,000	\$ 750,000	1.20%	7,301	373	0	0	0	3
Franklin	\$ 60,970,000	\$ 240,000	1.90%	11,390	554	0	0	0	1
Fulton	\$ 31,680,000	\$ 200,000	0.77%	1,482	447	1	0	0	0
Genesee	\$ 120,870,000	\$ 3,030,000	2.48%	11,722	1,966	1	0	2	0
Greene	\$ 69,910,000	\$ 590,000	1.74%	13,553	744	0	0	0	0
Hamilton	NA	NA	NA	NA	NA	NA	NA	NA	NA
Herkimer	\$ 26,740,000	\$ 130,000	0.60%	3,813	46	0	0	0	0
Jefferson	\$ 31,100,000	\$ 330,000	0.38%	6,643	179	0	0	0	0
Kings	NA	NA	NA	NA		NA	NA	NA	NA
Lewis	\$ 47,380,000	\$ 90,000	2.42%	9,087	499	0	0	0	0



County	Building Related Economic Loss	Building Related Business Loss	Building Economic Loss as % of Exposure	Debris (in Tons)	Shelter Requirements	* EF Fire Stations (at least substantial damage)	* EF Hospitals (at least substantial damage)	* EF Police Stations (at least substantial damage)	* EF Schools (at least substantial damage)
Livingston	\$ 39,420,000	\$ 210,000	0.87%	2,367	220	0	0	0	0
Madison	\$ 22,950,000	\$ 80,000	0.47%	2,459	796	1	0	1	3
Monroe	\$ 260,280,000	\$ 1,740,000	0.41%	11,678	6,076	0	0	0	1
Montgomery	\$ 387,860,000	\$ 2,490,000	11.16%	64,742	2,891	3	0	2	2
Nassau	NA	NA	NA	NA	NA	NA	NA	NA	NA
New York	\$ 121,260,000	\$ 2,440,000	0.06%	4,741	5,331	0	0	0	1
Niagara	\$ 60,000	\$ 60,000	0.33%	14	0	0	0	0	0
Oneida	\$ 168,120,000	\$ 169,500,000	9.76%	16,945	2,766	1	0	1	0
Onondaga	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ontario	\$ 6,040,000	\$ 120,000	0.51%	3,560	692	0	0	0	0
Orange	\$ 278,690,000	\$ 1,820,000	0.93%	22,300	2,031	0	0	0	1
Orleans	\$ 16,400,000	\$ 80,000	0.55%	2,243	74	0	0	0	0
Oswego	\$ 43,920,000	\$ 610,000	0.55%	8,694	612	0	0	0	0
Otsego	\$ 207,190,000	\$ 1,110,000	4.66%	26,740	1,875	0	0	0	0
Putnam	\$ 48,000,000	\$ 160,000	0.52%	2,774	789	0	0	0	0
Queens	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rensselaer	\$ 156,990,000	\$ 770,000	1.34%	14,368	1,720	1	0	0	0
Richmond	\$ 36,880,000	\$ 220,000	0.00%	821	1,585	0	0	0	0
Rockland	\$ 106,950,000	\$ 590,000	0.39%	6,552	2,216	1	0	0	1
Saratoga	NA	NA	NA	NA	NA	NA	NA	NA	NA
Schenectady	\$ 33,120,000	\$ 190,000	2.25%	3,937	510	1	0	0	0
Schoharie	\$ 45,770,000	\$ 500,000	2.77%	11,505	401	0	0	0	0
Schuyler	\$ 35,610,000	\$ 480,000	2.69%	5,648	553	1	0	2	1
Seneca	\$ 10,800,000	\$ 20,000	0.45%	1,749	62	0	0	0	0
St. Lawrence	NA	NA	NA	NA	NA	NA	NA	NA	NA
Steuben	\$ 681,890,000	\$ 8,140,000	9.66%	69,324	11,874	7	0	4	11
Suffolk	NA	NA	NA	NA	NA	NA	NA	NA	NA

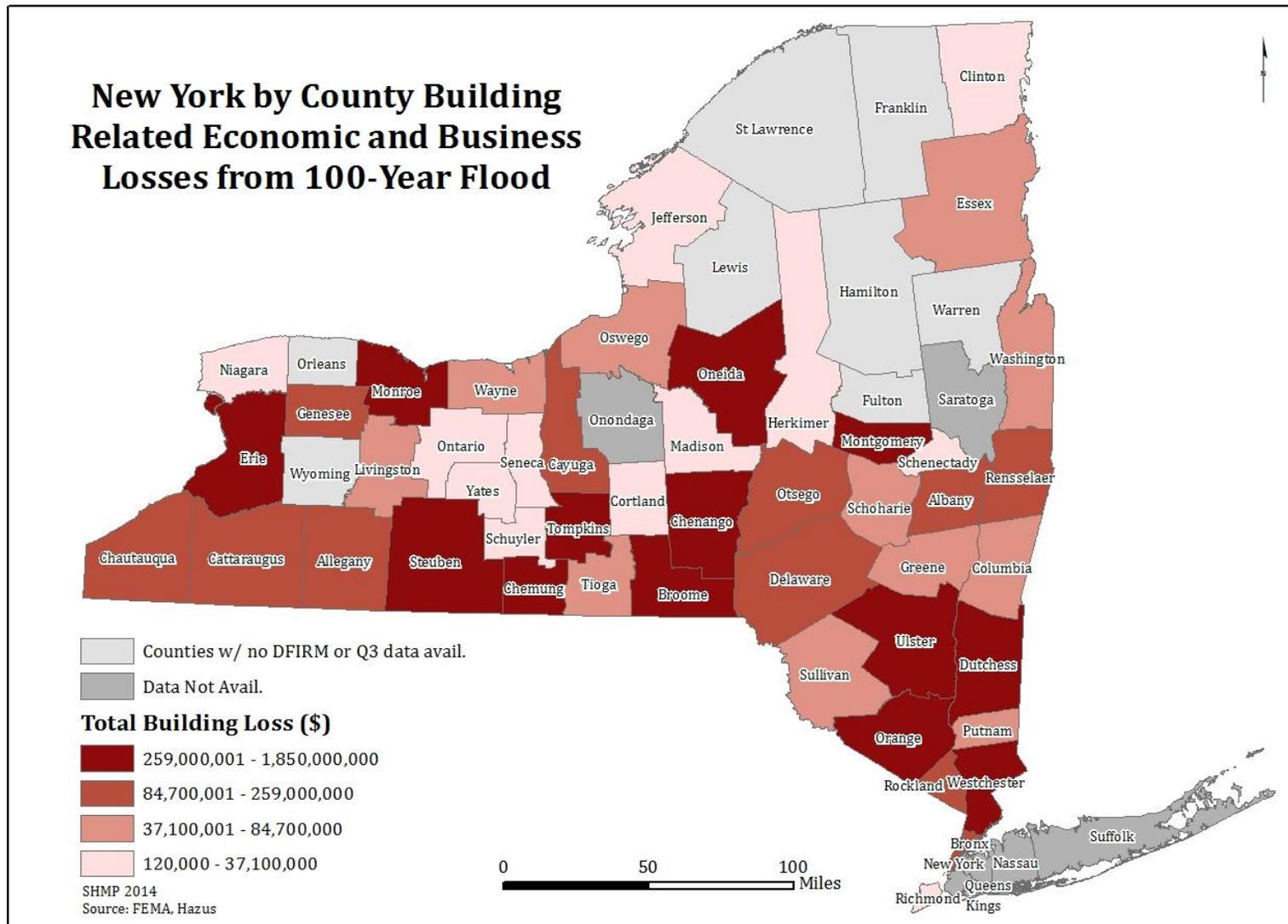


County	Building Related Economic Loss	Building Related Business Loss	Building Economic Loss as % of Exposure	Debris (in Tons)	Shelter Requirements	* EF Fire Stations (at least substantial damage)	* EF Hospitals (at least substantial damage)	* EF Police Stations (at least substantial damage)	* EF Schools (at least substantial damage)
Sullivan	\$ 82,070,000	\$ 270,000	1.07%	17,110	545	1	0	0	0
Tioga	\$ 84,170,000	\$ 520,000	2.60%	17,112	1,580	2	0	0	2
Tompkins	\$ 348,740,000	\$ 6,320,000	4.94%	20,729	5,542	1	1	0	2
Ulster	\$ 295,670,000	\$ 2,480,000	1.92%	62,140	2,465	0	0	1	4
Warren	\$ 98,410,000	\$ 1,240,000	1.65%	11,383	486	0	0	0	0
Washington	\$ 52,490,000	\$ 550,000	1.36%	8,472	822	0	0	0	0
Wayne	\$ 49,000,000	\$ 260,000	0.66%	3,699	471	0	0	0	0
Westchester	\$ 551,960,000	\$ 4,650,000	0.60%	19,673	5,423	0	0	0	0
Wyoming	\$ 81,940,000	\$ 2,160,000	2.68%	8,863	1,072	0	0	0	0
Yates	\$ 10,790,000	\$ 300,000	0.52%	1,580	132	0	0	0	0
<b>Total</b>	<b>\$ 9,090,318,000</b>	<b>\$ 261,960,000</b>		<b>975,845</b>	<b>169,725</b>	<b>58</b>	<b>7</b>	<b>24</b>	<b>72</b>

Source: FEMA as of October 2013; Essential Facilities (EF); Please Note: Data was not available from FEMA for Hamilton, Kings, Nassau, Onondaga, Queens, Saratoga, St. Lawrence, and Suffolk Counties.



**Figure 3.9ad: New York by County Building Related Economic and Business Losses from 100-Year Flood**



### 3.9.5 Estimating Potential Losses of State Facilities

Although data related to potential losses of state facilities has been somewhat limited to the fixed assets dataset currently available in the NYS GIS Clearinghouse, a project has been initiated to develop a comprehensive database of state facilities. The project to produce a statewide inventory was initiated in August 2013, with a projected completion date of the initial pilot for mid-2014. The pilot will identify and assess one category of state critical infrastructure, developing the methodology for what is anticipated to be a multi-year project. The methodology will include analysis of vulnerability and estimated potential losses to state facilities from future hazard events. Additional description of this project is provided in Section 3.0. This project is included in the “roadmap” activities described in **Section 4** that are part of the life-cycle of the 2014 SHMP

### 3.9.6 Data Sources and Limitations

The SHMP Team researched the flood hazard as it affects New York State. Contents of this section result from research and outreach including the following sources:

- The New York State Department of Environmental Conservation, Bureau of Flood Protection and Dam Safety, Division of Water, staff and web site, <http://www.dec.ny.gov/lands/311.html>
- Geoscience News and Information, [www.geology.com](http://www.geology.com)
- The Federal Emergency Management Agency (FEMA) National Flood Insurance Program staff and web site, <http://www.fema.gov/hazard/flood/info.shtm>
- The Federal Emergency Management Agency (FEMA), Risk, Assessment, Mapping, and Planning Partners (RAMPP) Program, <https://www.rampp-team.com/index.htm>
- The US Army Corps of Engineers, Cold Regions Research Laboratory (CRREL)
- National Oceanic and Atmospheric Administration (NOAA), National Weather Service, [www.weather.gov](http://www.weather.gov)
- National Oceanic and Atmospheric Administration (NOAA), National Climate Data Center, [www.ncdc.noaa.gov/oa/ncdc.html](http://www.ncdc.noaa.gov/oa/ncdc.html)
- The United States Geological Survey (USGS) web site, [www.usgs.gov/themes/flood.html](http://www.usgs.gov/themes/flood.html), including the USGS Circular 1245, <http://water.usgs.gov/pubs/circ/2003/circ1245/>
- New York State Climate Office, Department of Earth and Atmospheric Sciences at Cornell University web site, <http://nysc.eas.cornell.edu>, [http://nysc.eas.cornell.edu/climate\\_of\\_ny.html](http://nysc.eas.cornell.edu/climate_of_ny.html)
- American Society of Civil Engineers (ASCE); [www.asce.org](http://www.asce.org)
- New York Times, 2012, [www.newyorktimes.com](http://www.newyorktimes.com)
- Cayuga Lake Watershed Network, [www.cayugalake.org](http://www.cayugalake.org)
- NYS New York Rising Communities, <http://stormrecovery.ny.gov/>



- Delaware County 2013 LHMP, [www.dcdes.org](http://www.dcdes.org)
- Spatial Hazard Events and Losses Databases for the United States (SHELDUS)

**Please Note:** Data obtained from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™). SHELDUS is a county-level hazard data set for the U.S. for 18 different natural hazard event types such as thunderstorms, hurricanes, floods, and tornados. For each event, the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data derives from the national data source, National Climatic Data Center's monthly Storm Data publications. Using the latest release of SHELDUS™ 12.0, the database includes every loss-causing and/or deadly event between 1960 and 1992 and from 1995 onward. Between 1993 and 1995, SHELDUS™ reflects only events that caused at least one fatality or more than \$50,000 in property or crop damages.



## 3.10: HAILSTORM

### 2014 SHMP Updates

- Historical and Recent Hail Events and Losses table was added.
- Hail damage and events figures were added.
- Based on the hazard ranking process initiated for the 2014 update, Hailstorm was ranked as a low hazard.

### 3.10.1 Hailstorm Profile

Hail is considered a low risk hazard in New York State. According to the NOAA National Severe Storms Laboratory hail can be produced from many different storm types, but typically it is a cascading effect of a thunderstorm event.

#### Characteristics

Hazard	Key Terms and Definitions
Hail	<ul style="list-style-type: none"> <li>• <u>Hail</u> – A showery precipitation in the form of irregular pellets or balls of ice more than 5 mm in diameter, falling from a cumulonimbus cloud.</li> <li>• <u>Hail Index</u> – An indication of whether the thunderstorm structure of each storm identified is conducive to the production of hail.</li> <li>• <u>Hail Size</u> – Typically refers to the diameter of the hailstones. Warnings and reports may report hail size through comparisons with real-world objects that correspond to certain diameters.</li> </ul>

There are two ideas about hail formation. In the past, the prevailing thought was that hailstones grow by colliding with supercooled water drops. Supercooled water will freeze on contact with ice crystals, frozen rain drops, dust or some other nuclei. Thunderstorms that have a strong updraft that lifts hailstones to the top of the cloud where they encounter more supercooled water and continue to grow. The hail falls when the thunderstorm's updraft can no longer support the weight of the ice or when the updraft weakens. The stronger the updraft the larger the hailstone can grow.

Recent studies suggest that supercooled water may accumulate on frozen particles near the back-side of the storm as they are pushed forward across and above the updraft by the prevailing winds near the top of the storm. Eventually, the hailstones encounter downdraft air and fall to the ground.



Hailstones grow two ways: by wet growth or dry growth processes. In wet growth, a tiny piece of ice is in an area where the air temperature is below freezing, but not super cold. When the tiny piece of ice collides with a supercooled drop, the water does not freeze on the ice immediately; instead, liquid water spreads across tumbling hailstones and slowly freezes. Since the process is slow, air bubbles can escape, resulting in a layer of clear ice.

Dry growth hailstones grow when the air temperature is well below freezing and the water droplet freezes immediately as it collides with the ice particle. The air bubbles are "frozen" in place, leaving cloudy ice.

Hailstones can have layers like an onion if they travel up and down in an updraft, or they can have few or no layers if they are "balanced" in an updraft. One can tell how many times a hailstone traveled to the top of the storm by counting the layers. Hailstones can begin to melt and then re-freeze together- forming large and very irregularly shaped hail. (NOAA/NSSL)

**Table 3.10a** provides the typical description: diameter ratio regarding hail. Warnings and reports may report hail size through comparisons with real-world objects that correspond to certain diameters.

**Table 3.10a: Hail Diameter Description**

Description	Diameter (inches)
Pea	0.25
Marble or Mothball	0.50
Penny or Dime	0.75
Nickel	0.88
Quarter	1.00
Half Dollar	1.25
Walnut or Ping Pong Ball	1.50
Golf Ball	1.75
Hen's Egg	2.00
Tennis Ball	2.50
Baseball	2.75
Tea Cup	3.00
Grapefruit	4.00
Softball	4.50

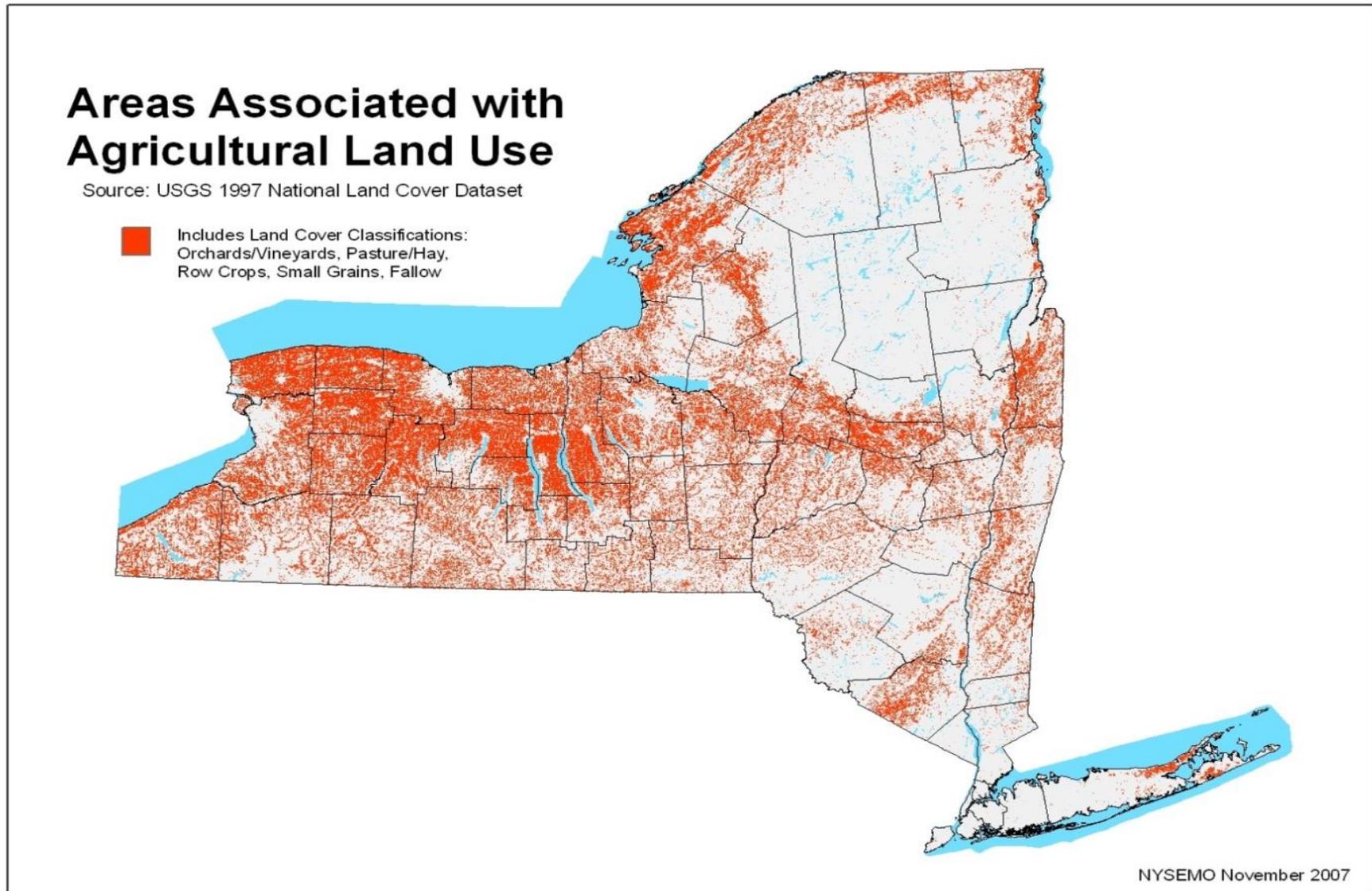
Source: National Weather Service



It is estimated that damage from hail approaches \$1 billion in the U.S. annually. U.S. Agriculture is typically the most affected by such hailstorms because it causes severe crop damage and even a minor storm with relatively small size Hailstones can have a devastating effect. As well, damage to vehicles, roofs (residential/commercial), and landscaping are the other things most commonly damaged by hail. **Figure 3.10a** portrays the agricultural land use across New York State, was developed in 2007; however, the data set used to create the map was determined to still be valid for the 2014 update. It is recommended that jurisdictions that have agricultural markets and industries take into account the vulnerability of the jurisdiction in regards to the effects of hail. Hail has also been known to cause injuries and occasionally has been fatal. The most deadly hailstorm on record occurred in India on April 30, 1988, killing 246 people and 1600 domesticated animals.



Figure 3.10a: Areas Associated with Agricultural Land Use



## Location

Hailstorm events can occur anywhere within New York State independently or during a tornado, thunder or lightning storm event. In comparison to other natural hazards, local jurisdictions ranked hail as a “low” or “moderately low” risk hazard.

## Previous Hailstorm Occurrences

New York State Division of Homeland Security and Emergency Services (DHSES) Mitigation staff researched several data sources for historical hailstorm events. According to Spatial Hazard Events and Losses Databases for the United States (SHELDUS), the State encountered 2,320 hail events between 1960 and 2012, causing an estimated total of \$33 million in property damage and more than \$87 million in crop damage. From 2010-2012 less than half of the counties in NYS were affected by hail events.

Using the historical occurrence, a future probability and average annual losses analysis was determined for hail events. The number of years recorded was divided by the number of occurrences, resulting in a simple past-determined recurrence interval. If the hazard lacked a definitive historical record, the probability was assessed qualitatively based on county history or other supporting data.

Based on a 52 year period historical records found in **Table 3.10b** Historical and Recent Hail Events and Losses, the following can be predicted on average in a typical year in New York State:

- 37 events
- Approximately \$1.9 million in property and crop damage combined
- 4 injuries
- Less than .30 fatalities



Table 3.10b: Historical and Recent Hail Events and Losses

County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Albany	81	1	42	0	1	\$201,565	\$986,301	0	0	0	\$0	\$0
Allegany	62	2	32	0	1	\$118,023	\$39,476	4	0	0	\$30,000	\$25,000
Bronx	50	2	26	0	0	\$54,955	\$11,896	0	0	0	\$0	\$0
Broome	71	1	37	0	3	\$892,115	\$24,987	1	0	0	\$250,000	\$0
Cattaraugus	104	1	54	0	1	\$342,614	\$84,567	2	0	0	\$20,000	\$25,000
Cayuga	77	1	40	0	0	\$286,387	\$1,079,930	1	0	0	\$15,000	\$15,000
Chautauqua	112	1	58	0	1	\$425,947	\$115,234	4	0	0	\$28,000	\$50,000
Chemung	65	2	34	1	1	\$428,532	\$4,562	5	0	0	\$51,000	\$0
Chenango	69	1	36	1	1	\$409,275	\$21,303	0	0	0	\$0	\$0
Clinton	81	1	42	0	0	\$178,344	\$420,813	1	0	0	\$50,000	\$0
Columbia	87	1	45	1	1	\$195,771	\$6,510,765	0	0	0	\$0	\$0
Cortland	56	2	29	0	1	\$391,479	\$5,928	0	0	0	\$0	\$0
Delaware	69	1	36	0	1	\$425,263	\$4,853	0	0	0	\$0	\$0
Dutchess	88	1	46	0	1	\$186,312	\$1,102,046	0	0	0	\$0	\$0
Erie	150	1	78	1	2	\$1,349,914	\$1,811,567	3	0	0	\$20,000	\$10,000
Essex	56	2	29	1	0	\$80,311	\$10,663	0	0	0	\$0	\$0
Franklin	65	2	34	0	0	\$382,591	\$27,855	3	0	0	\$20,000	\$25,000
Fulton	63	2	33	0	0	\$144,508	\$21,730	0	0	0	\$0	\$0
Genesee	71	1	37	0	1	\$650,997	\$10,226,817	0	0	0	\$0	\$0
Greene	77	1	40	0	0	\$255,171	\$575,165	0	0	0	\$0	\$0
Hamilton	54	2	28	0	0	\$413,982	\$2,793	0	0	0	\$0	\$0
Herkimer	65	2	34	0	0	\$513,203	\$55,474	0	0	0	\$0	\$0
Jefferson	65	2	34	0	0	\$408,525	\$29,471	2	0	0	\$25,000	\$0
Kings	50	2	26	0	1	\$38,428	\$4,261	0	0	0	\$0	\$0
Lewis	71	1	37	0	0	\$389,622	\$2,427	2	0	0	\$10,000	\$0
Livingston	63	2	33	0	0	\$153,773	\$11,476	0	0	0	\$0	\$0
Madison	60	2	31	1	0	\$335,471	\$80,560	0	0	0	\$0	\$0
Monroe	110	1	57	0	0	\$487,773	\$960,143	1	0	0	\$5,000	\$0



County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Montgomery	73	1	38	0	1	\$172,027	\$8,951	0	0	0	\$0	\$0
Nassau	50	2	26	0	2	\$179,208	\$4,965	2	0	0	\$115,000	\$0
New York	50	2	26	0	0	\$41,103	\$4,521	0	0	0	\$0	\$0
Niagara	127	1	66	0	1	\$1,517,747	\$2,675,734	0	0	0	\$0	\$0
Oneida	88	1	46	3	5	\$6,277,292	\$257,591	2	0	0	\$6,000	\$0
Onondaga	69	1	36	0	8	\$932,442	\$36,736	0	0	0	\$0	\$0
Ontario	77	1	40	0	0	\$329,714	\$1,277,611	3	0	0	\$18,000	\$10,000
Orange	62	2	32	0	3	\$877,187	\$5,012,446	1	0	0	\$750,000	\$0
Orleans	75	1	39	0	0	\$696,030	\$9,085,984	5	0	0	\$180,000	\$0
Oswego	94	1	49	0	0	\$316,986	\$123,795	7	0	0	\$50,000	\$50,000
Otsego	60	2	31	1	2	\$334,074	\$17,435	0	0	0	\$0	\$0
Putnam	52	2	27	0	1	\$60,520	\$6,446	0	0	0	\$0	\$0
Queens	54	2	28	0	0	\$44,428	\$4,261	3	0	0	\$6,000	\$0
Rensselaer	106	1	55	0	152	\$2,789,115	\$47,351	0	0	0	\$0	\$0
Richmond	46	2	24	0	0	\$34,288	\$1,136	0	0	0	\$0	\$0
Rockland	48	2	25	0	0	\$40,470	\$4,396	0	0	0	\$0	\$0
Saratoga	102	1	53	2	1	\$388,133	\$711,351	0	0	0	\$0	\$0
Schenectady	81	1	42	0	1	\$2,766,321	\$8,301	0	0	0	\$0	\$0
Schoharie	73	1	38	0	1	\$200,993	\$526,671	0	0	0	\$0	\$0
Schuyler	56	2	29	0	4	\$361,955	\$4,874	0	0	0	\$0	\$0
Seneca	52	2	27	0	0	\$68,797	\$2,611	0	0	0	\$0	\$0
St Lawrence	62	2	32	1	0	\$370,207	\$42,971	1	0	0	\$25,000	\$25,000
Steuben	63	2	33	0	1	\$476,854	\$14,739	0	0	0	\$0	\$0
Suffolk	50	2	26	0	3	\$66,223	\$4,965	0	0	0	\$0	\$0
Sullivan	60	2	31	0	10	\$182,801	\$30,132	0	0	0	\$0	\$0
Tioga	60	2	31	0	1	\$412,963	\$35,162	1	0	0	\$10,000	\$0
Tompkins	63	2	33	0	1	\$1,404,863	\$4,562	4	0	0	\$1,070,000	\$0
Ulster	79	1	41	0	1	\$128,378	\$17,111,496	0	0	0	\$0	\$0
Warren	73	1	38	0	1	\$170,171	\$6,301	0	0	0	\$0	\$0

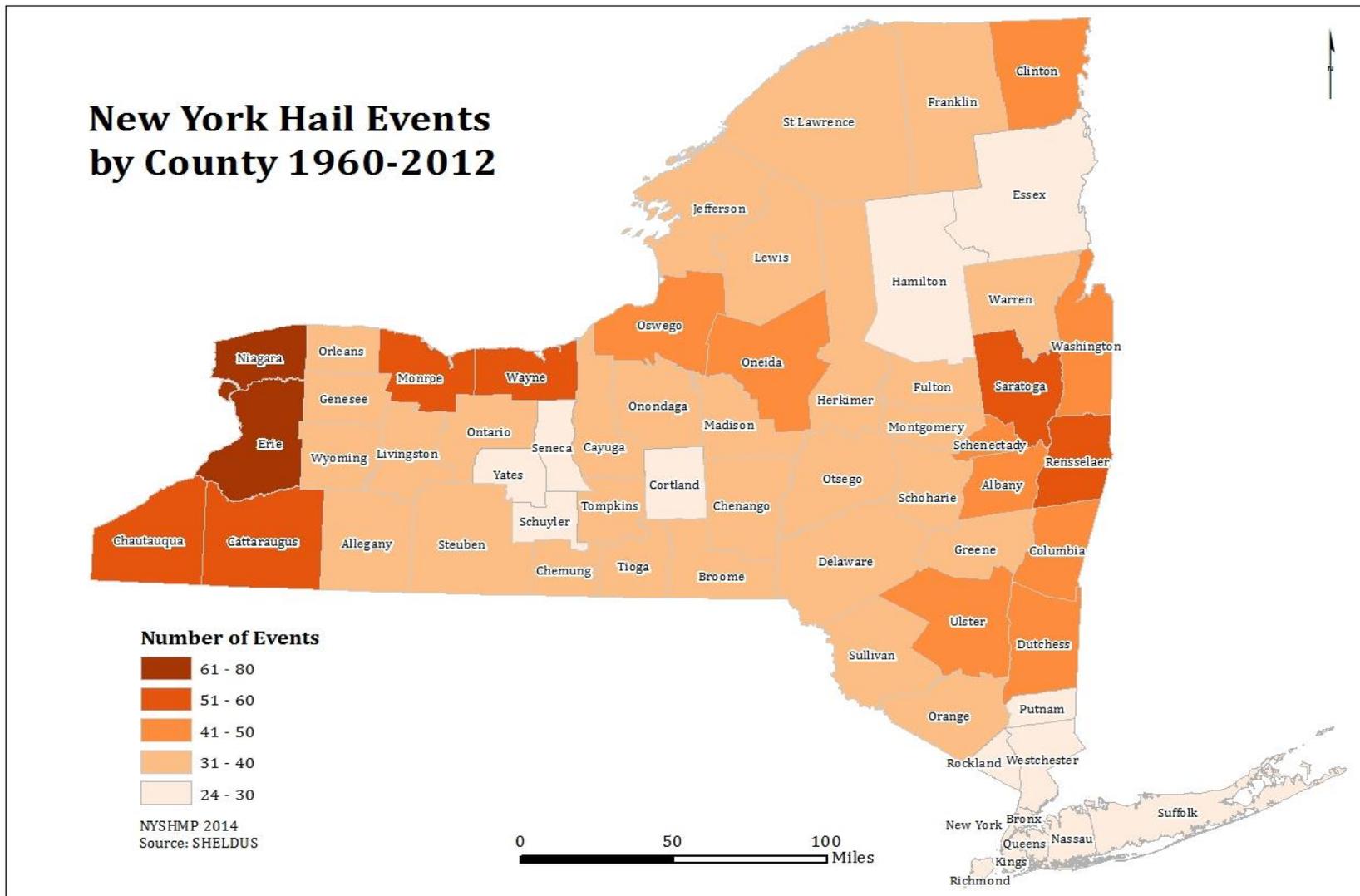


County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Washington	79	1	41	0	0	\$413,454	\$1,415,751	0	0	0	\$0	\$0
Wayne	108	1	56	0	0	\$896,381	\$24,597,611	5	0	0	\$21,000	\$25,000
Westchester	50	2	26	0	0	\$40,720	\$4,646	0	0	0	\$0	\$0
Wyoming	71	1	37	0	0	\$188,614	\$46,567	2	0	0	\$13,000	\$5,000
Yates	58	2	30	0	1	\$350,338	\$55,374	0	0	0	\$0	\$0

Source: Spatial Hazard Events & Losses Database for the U.S. (SHELDUS), 2013 (\*Future Probability equals the number of events divided by the number of years of record [52], expressed as a percentage.)



**Figure 3.10b: New York Hail Events by County 1960-2012**



## Probability of Future Hailstorm Events

Hail is a “low” risk hazard in New York State. States that are most vulnerable to hail events are located in freezing levels in high plain areas closer to the ground than at sea level. Nebraska, Colorado, and Wyoming have the most frequent hail occurrences.

### Justification for Minimal Vulnerability/Loss Assessment

Hailstorm occurrences are typically localized in scale; and, while past occurrences have resulted in loss of life, the severity is not considered likely to cause a life safety threat to large populations. In addition, there is not a cost-effective method to mitigate future property and crop damage caused by hailstorms. Hailstorm was ranked as “low” with a HAZNY-Mitigation score of 16. Consequently, it is determined that there is not sufficient evidence that Hailstorm has a high level of risk to justify further analysis for the 2014 Plan update.

The information provided in the Risk Assessment sections below serves as guidance for impact and consequence analysis and local hazard mitigation planning.

### 3.10.2 Assessing Hailstorm Vulnerability and Estimating Potential Losses by Jurisdiction

**Table 3.10c** provides the annualized losses for hail events. The data used was based on SHELDUS records from 1960-2012, with the exception of hurricane, earthquake, and flood hazards which were derived from Hazus-MH 2.1. For those specific hazards, a probabilistic run was generated to determine the total annual losses for each county found within the State. The information provided by SHELDUS was determined by taking the total economic losses divided by the number of years of record (52) to obtain the losses per year. **Figure 3.10c** illustrates the top ten counties annualized losses with a total of \$2,328,811 in hail losses for the entire State of New York.

**Table 3.10c: Average Annual Hail Losses by County 1960-2012**

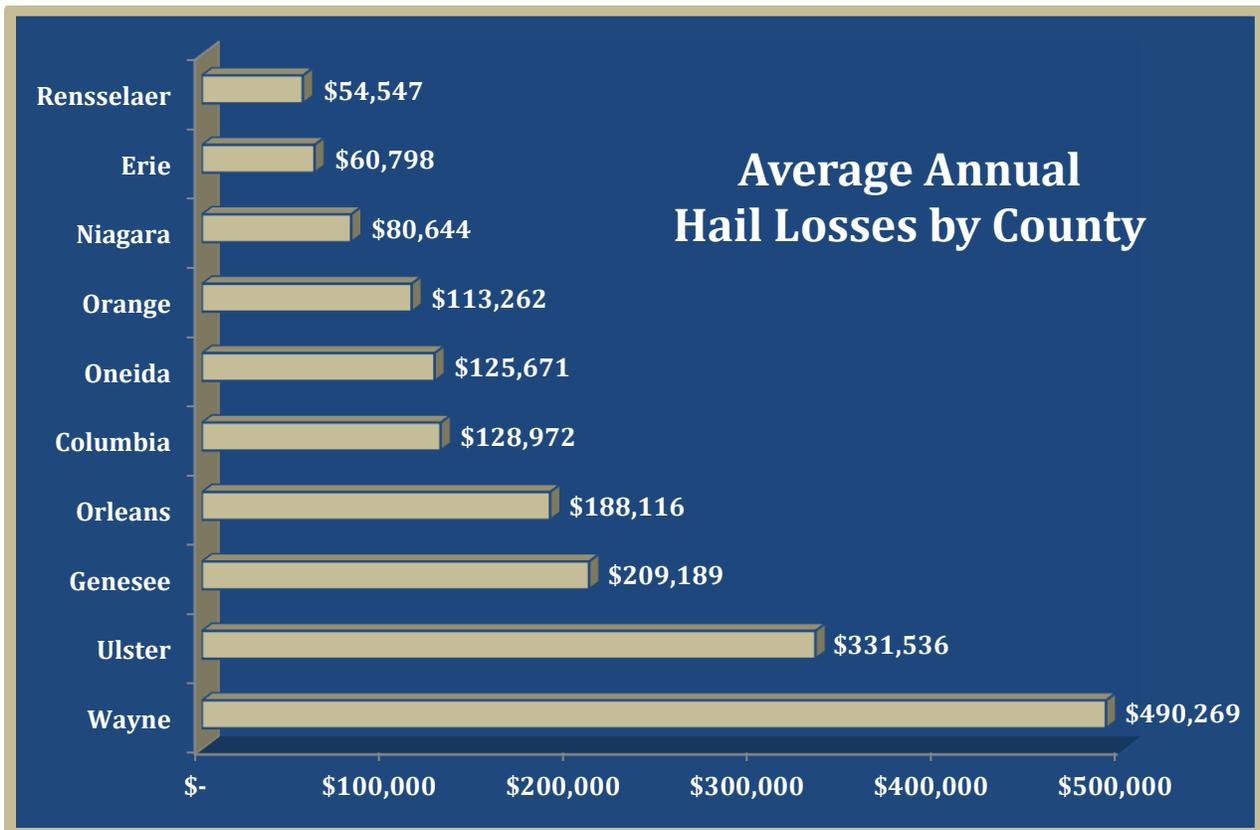
County	Hail	County	Hail	County	Hail
Wayne	\$ 490,269	Greene	\$ 15,968	Otsego	\$ 6,760
Ulster	\$ 331,536	Schoharie	\$ 13,994	Wyoming	\$ 4,523
Genesee	\$ 209,189	Clinton	\$ 11,522	Sullivan	\$ 4,095
Orleans	\$ 188,116	Herkimer	\$ 10,936	Nassau	\$ 3,542
Columbia	\$ 128,972	Chautauqua	\$ 10,407	Montgomery	\$ 3,480
Oneida	\$ 125,671	Steuben	\$ 9,454	Warren	\$ 3,394
Orange	\$ 113,262	Tioga	\$ 8,618	Fulton	\$ 3,197
Niagara	\$ 80,644	Oswego	\$ 8,477	Livingston	\$ 3,178
Erie	\$ 60,798	Jefferson	\$ 8,423	Allegany	\$ 3,029
Rensselaer	\$ 54,547	Chemung	\$ 8,329	Essex	\$ 1,750



County	Hail	County	Hail	County	Hail
Schenectady	\$ 53,358	Chenango	\$ 8,280	Seneca	\$ 1,373
Washington	\$ 35,177	Delaware	\$ 8,271	Suffolk	\$ 1,369
Ontario	\$ 30,910	Cattaraugus	\$ 8,215	Putnam	\$ 1,288
Monroe	\$ 27,845	Hamilton	\$ 8,015	Bronx	\$ 1,286
Tompkins	\$ 27,104	Madison	\$ 8,001	Queens	\$ 936
Cayuga	\$ 26,275	St Lawrence	\$ 7,946	New York	\$ 877
Dutchess	\$ 24,776	Franklin	\$ 7,893	Westchester	\$ 872
Albany	\$ 22,844	Yates	\$ 7,802	Rockland	\$ 863
Saratoga	\$ 21,144	Cortland	\$ 7,642	Kings	\$ 821
Onondaga	\$ 18,638	Lewis	\$ 7,539	Richmond	\$ 681
Broome	\$ 17,637	Schuyler	\$ 7,054	<b>Total</b>	<b>\$ 2,328,811</b>

Source: SHELDUS, 2013

Figure 3.10c: Average Annual Hail Losses by County 1960-2012

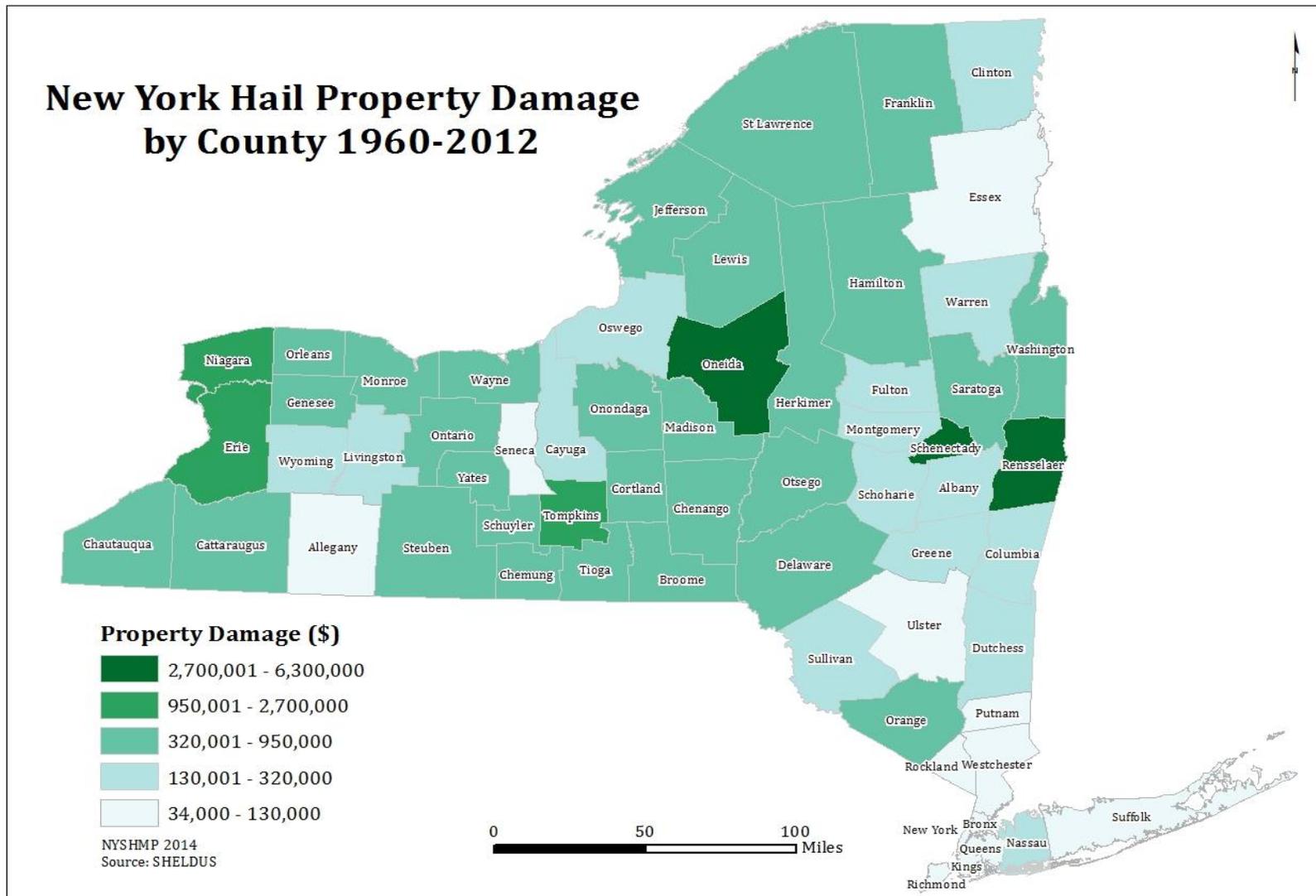


Source: SHELDUS, 2013

Over the past 52 years 2,320 hail events occurred throughout New York State. Erie County reported the highest number of events; however, Oneida, Rensselaer, and Schenectady Counties reported the most property damage ranging from \$1.5 to \$6.2 million in damages according to data provided by SHELDUS. **Figure 3.10d** shows the total cost of property damaged by hail from 1960-2012.



Figure 3.10d: New York Hail Property Damage by County 1960-2012



Based on the historical and recent hail events and losses data assessed by the NYS mitigation planning team all 62 New York State counties have been affected by at least one hail event since 1962. The damage assessment for property and crop is extremely low compared to other natural disaster events that have occurred in the State. The 2014 review of 56 FEMA-approved county hazard mitigation plans indicates that six counties identified hailstorm as a “high” or “moderately high” hazard.

**Tables 3.10d: Summary of Hailstorm Hazard Impacts and Rankings by County**

Local County Hailstorm Hazard Impacts		
Highest Occurrences	Highest Fatalities	Highest Property Damage
Erie	N/A	Oneida
Niagara	N/A	Rensselaer
Chautauqua	N/A	Schenectady
Monroe	N/A	Niagara
Wayne	N/A	Tompkins

Source: *SHELDUS, 2013*

Local County Hailstorm Hazard Rankings	
High	Moderately High
Montgomery, Saratoga, Schuyler, and Suffolk	Oswego, Schenectady, and Sullivan

Source: *LHMP, 2013*

### 3.10.3 Assessing Hailstorm Vulnerability and Estimating Potential Losses of State Facilities

NYS has no recorded incidence of any damages to state buildings or facilities that have been vulnerable to hailstorms, because they are such a low risk hazard.

Although hailstorms can pose a threat to state buildings, the state has no recorded incidences that damage has occurred; therefore, probability for potential losses to state facilities are insignificant.



### 3.10.4 Data Limitations and other Key Documents

The Mitigation Plan Development Team researched the hailstorm risk as it affects the State. The contents of this section result from research and outreach including the following sources:

- Federal Emergency Management Agency (FEMA), [www.fema.org](http://www.fema.org)
- National Oceanic and Atmospheric Administration (NOAA), [www.weather.com](http://www.weather.com)
- National Severe Storms Laboratory (NSSL), [www.nssl.noaa.gov](http://www.nssl.noaa.gov)
- National Weather Service (NWS), [www.weather.gov](http://www.weather.gov)
- Spatial Hazard Events and Losses Databases for the United States (SHELDUS)

**Please Note:** Data obtained from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™). SHELDUS is a county-level hazard data set for the U.S. for 18 different natural hazard event types such as thunderstorms, hurricanes, floods, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data derives from the national data source, National Climatic Data Center's monthly Storm Data publications. Using the latest release of SHELDUS™ 12.0, the database includes every loss causing and/or deadly event between 1960 through 1992 and from 1995 onward. Between 1993 and 1995, SHELDUS™ reflects only events that caused at least one fatality or more than \$50,000 in property or crop damages.



## Section 3.11: HIGH WIND EVENTS

(Tornado and Straight-line Winds)

### 2014 SHMP Updates

- The 2011 Tornado Section has been updated to High Wind Events, which includes tornado and straight-line winds.
- Fujita and Enhanced Fujita Scale comparison table and Enhanced Fujita Damage Scale have been added.
- Historical Tornado Tracks map has been added.
- Historical Tornado Events table by County was consolidated to one table, to capture Historical and Recent High Wind Events and Losses.
- Presidential Declared Tornado Disaster table and map has been added.
- Vulnerability and loss data from local plans have been addressed.

### 3.11.1 High Wind Events Profile

New York State is located in a region highly susceptible to high wind events; this includes tornado and straight-line wind events. These events can cause significant damage to communities and infrastructure which has caused the State millions of dollars in damage.

#### Characteristics

Hazard	Key Terms and Definitions
<p style="text-align: center;"><b>High Wind</b></p>	<ul style="list-style-type: none"> <li>• <u>Tornado</u>- local atmospheric storm, generally of short duration, formed by winds rotating at very high speeds, usually in counterclockwise direction.</li> <li>• <u>Straight-line Winds</u>- wind that comes out of a thunderstorm, but is not associated with rotation like a tornado winds.</li> <li>• <u>Downdraft</u>- is a small-scale column of air that rapidly sinks toward the ground.</li> <li>• <u>Downburst</u>- strong downdraft with horizontal dimensions larger than 4 km (2.5 mi) resulting in an outward burst or damaging winds on or near the ground.</li> <li>• <u>Microburst</u>- small, short lived, concentrated downburst that produces an outward burst of damaging winds at the surface.</li> <li>• <u>Gust Front</u>- a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.</li> <li>• <u>Derecho</u>- widespread wind storm that is associated with a band of rapidly moving showers or thunderstorms, it consists of numerous microbursts, downbursts, and downburst clusters.</li> </ul>



Hazard	Key Terms and Definitions
	<ul style="list-style-type: none"> <li>• <i>Haboob</i>- wall of dust that is pushed out along the ground from a thunderstorm downdraft at high speeds.</li> </ul>

## Tornado

A tornado is a local atmospheric storm, generally of short duration, formed by winds rotating at very high speeds, usually in a counterclockwise direction. The vortex, up to several hundred yards wide, is visible to the observer as a whirlpool-like column of winds rotating about a hollow cavity or funnel, when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. Winds have been estimated to be in excess of 300 miles per hour.

Tornadoes can occur in any state but are more frequent in the Midwest, Southeast, and Southwest. The states of Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Mississippi, Missouri, Nebraska, Oklahoma, South Dakota, and Texas are at greatest risk.

Damage caused by a tornado is a result of the high wind velocity and wind-blown debris. The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction such as residential homes (particularly mobile homes). The Fujita and Enhanced Fujita Scale for Tornadoes were developed to measure tornado strength (i.e., magnitude or intensity) and associated types of damages. **Table 3.11a** show the Fujita Scale Compared to Enhanced Fujita (EF) Scale.



**Table 3.11a: Fujita Scale Compared to Enhanced Fujita (EF) Scale for Tornadoes**

<b>Fujita (F) Scale and Enhanced Fujita (EF) Scale</b>				
<b>F-Scale</b>	<b>3-sec. gust speed (mph)</b>	<b>EF-Scale</b>	<b>3-sec. gust speed (mph)</b>	<b>Typical Damage</b>
F0	45-78	EF0	65-85	Light damage. Some damage to chimneys. Branches broken of trees. Shallow-rooted trees pushed over, signboards damaged.
F1	79-117	EF1	86-109	Moderate damages. Peels surface off roofs. Mobile homes pushed off foundations or overturned. Moving autos blown off roads.
F2	118-161	EF2	110-137	Considerable damage. Roofs torn off frame houses. Mobile homes demolished. Boxcars overturned. Large trees snapped or uprooted. Light-object missiles generated. Cars lifted off ground.
F3	162-209	EF3	138-167	Severe damage. Roofs and some walls torn off-well constructed homes. Trains overturned. Most trees in forest uprooted. Heavy cars lifted off the ground and thrown.
F4	210-261	EF4	168-199	Devastating damage. Well-constructed houses leveled. Structures with weak foundations blown away some distance. Cars thrown and large missiles generated.
F5	262-317	EF5	200-234	Incredible damage. Strong frame houses leveled off foundations and swept away. Automobile-sized missiles fly through the air in excess of 100 meters (109 yards). Trees debarked. Incredible phenomena will occur.

Source: National Weather Services, National Oceanic and Atmospheric Administration, Storm Prediction Center



**Table 3.11b** shows 28 damage indicators (DIs) used in the EF scale to categorize building use and construction type. Building use is grouped by the following: residential, commercial and retail structures, schools, professional buildings, metal buildings and canopies, towers/poles, and vegetation.

**Table 3.11b: Enhanced Fujita Damage Indicator (DI) Scale**

DI No.	Damage Indicator (DI)	Use
1	Small Barns or Farm Outbuildings (SBO)	<b>Residential</b>
2	One to Two Family Residences (FR12)	
3	Manufactured Home - Single Wide (MHSW)	
4	Manufactured Home - Single Double (MHDW)	
5	Apartments, Condos, Townhouses [three stories or less] (ACT)	
6	Motel (M)	<b>Commercial and Retail Structures</b>
7	Masonry Apartment or Motel Building (MAM)	
8	Small Retail Building [fast food restaurant] (SRB)	
9	Small Professional Building [e.g., doctor's office, branch bank] (SPB)	
10	Strip Mall (SM)	
11	Large Shopping Mall (LSM)	
12	Large, Isolated Retail Building [e.g., K-Mart, Wal-Mart] (LIRB)	
13	Automobile Showroom (ASR)	
14	Automobile Service Building (ASB)	<b>Schools</b>
15	Elementary School [single story; interior or exterior hallways] (ES)	
16	Junior or Senior High School (JHSH)	<b>Professional Buildings</b>
17	Low-Rise Building [1-4 stories] (LRB)	
18	Mid-Rise Building [5-20 stories] (MRB)	
19	High-Rise Building [more than 20 stories] (HRB)	
20	Institutional Building [e.g., hospital, government, or university] (IB)	<b>Metal Buildings and Canopies</b>
21	Metal Building Systems (MBS)	
22	Service Station Canopy (SSC)	
23	Warehouse Building [tilt-up walls or heavy timber construction] (WHB)	<b>Towers/Poles</b>
24	Transmission Line Towers (TLT)	
25	Free- Standing Towers (FST)	
26	Free-Standing Light Poles, Luminary Poles, Flag Poles (FSP)	<b>Vegetation</b>
27	Trees: Hardwood (TH)	
28	Trees: Softwood (TS)	

Source: National Weather Services, National Oceanic and Atmospheric Administration, Storm Prediction Center



**Table 3.11c** is an example of the EF Scales Degree of Damage for Damage Indicator No. 2 (One to Two Family Residences). The table shows the DOD number, description, and wind speeds. Please note: the differences between “lower bound,” “upper bound,” and “expected” wind speeds are complex. When assessing DIs a subject matter expert familiar with wind effects on buildings and/or building sciences should be consulted.

**Table 3.11c: Example – EF Scale DOD for DI No. 2 (One to Two Family Residences)**

DOD	Damage Description	Lower & Upper Bound Wind Speed Range (3-second gust in mph)	Expected Wind Speed (3-second gust in mph)
1	Threshold of visible damage	53-80	65
2	Loss of roof covering material (<20%), gutters, and/or awning; loss of vinyl or metal siding	63-97	79
3	Broken glass in doors and windows	79-114	96
4	Uplift of roof deck and loss of significant roof covering material (>20%); collapse of chimney; garage doors collapse inward; failure of porch or carport	81-116	97
5	Entire house shifts off foundation	103-141	121
6	Large sections of roof structure removed; most walls remain standing	104-142	122
7	Exterior walls collapsed	113-153	132
8	Most walls collapsed except small interior rooms	127-178	152
9	All walls collapsed	142-198	170
10	Destruction of engineered and/or well-constructed residence; slab swept clean	165-220	200

Source: National Weather Services, National Oceanic and Atmospheric Administration, Storm Prediction Center

**Figures 3.11a** and **3.11b** are photos provided by the National Weather Service showing damage an EF2 tornado caused to a single family dwelling in Schenectady and Saratoga Counties, on May 29, 2013. No fatalities occurred, but one injury was reported. The tornados estimated path was 1 mile wide and 13 miles in length.



**Figure 3.11a: Single Family Dwelling Schenectady County**



*Source: National Weather Service*

**Figure 3.11b: Single Family Dwelling Saratoga County**



*Source: National Weather Service*

## Straight-Line Winds

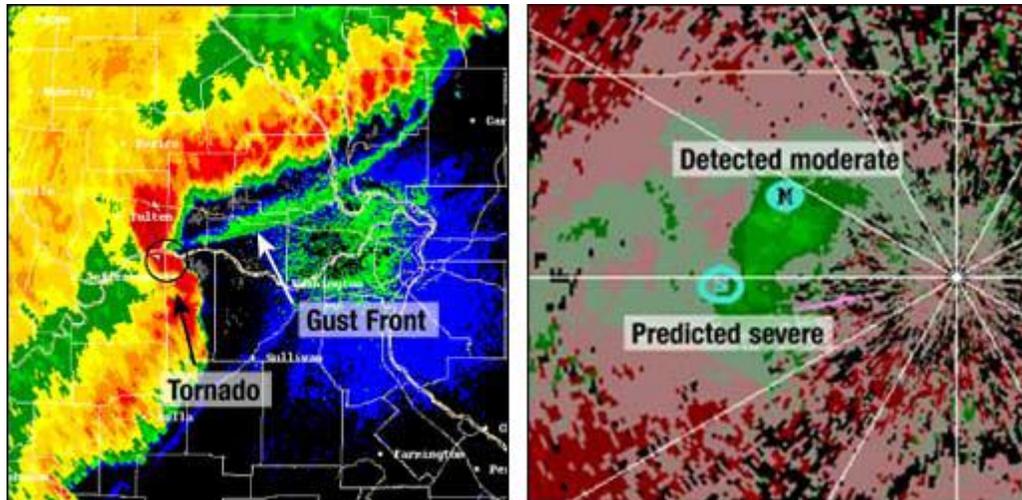
Straight-line winds meet or exceed 58 miles per hour then the storm is classified as severe by the National Weather Service. These winds are produced by the downward momentum in the downdraft region of a thunderstorm. An environment conducive to strong straight-line wind is one in which the updrafts (and downdrafts) are strong, the air is dry in the middle troposphere and the storm has a fast forward motion. Straight-line wind intensity can be as powerful as a tornado. The National Weather Service distinguishes between straight-line wind and wind produced from a tornado when conducting surveys of wind damage. Other types of damaging winds are described below according to the National Oceanic and Atmospheric Administration (NOAA):

- A *downdraft* is a small-scale column of air that rapidly sinks toward the ground.
- A *downburst* is a result of a strong downdraft. A downburst is a strong downdraft with horizontal dimensions larger than 4 km (2.5 mi) resulting in an outward burst or damaging winds on or near the ground. (Imagine the way water comes out of a faucet and hits the bottom of the sink.) Downburst winds may begin as a microburst and spread out over a wider area, sometimes producing damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder.
- A *microburst* is a small concentrated downburst that produces an outward burst of damaging winds at the surface. Microbursts are generally small (less than 4km across) and short-lived, lasting only 5-10 minutes, with maximum wind speeds up to 168 mph. There are two kinds of microbursts: **wet** and **dry**.
  - *Wet microbursts* are accompanied by heavy precipitation at the surface.
  - *Dry microbursts*, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.
- A *gust front* is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.
- A *derecho* is a widespread, long-lived wind storm that is associated with a band of rapidly moving showers or thunderstorms. By definition, if the wind damage swath extends more than 240 miles (about 400 kilometers) and includes wind gusts of at least 58 mph (93 km/h) or greater along most of its length, then the event may be classified as a derecho. (A typical derecho consists of numerous microbursts, downbursts, and downburst clusters.)
- A *haboob* is a wall of dust that is pushed out along the ground from a thunderstorm downdraft at high speeds.



The National Weather Service uses the Doppler radar as a tool to detect damaging wind patterns. **Figure 3.11c** is a visual of a gust front (left) and velocity data (right). Doppler radar velocity data show areas of diverging winds at the surface, and the strength of those winds, indicating a downburst or microburst. Winds coming together at upper levels of the storm (convergence) can also be seen on velocity displays, and can indicate the development of a downburst or microburst.

**Figure 3.11c: Gust Front and Velocity Data**

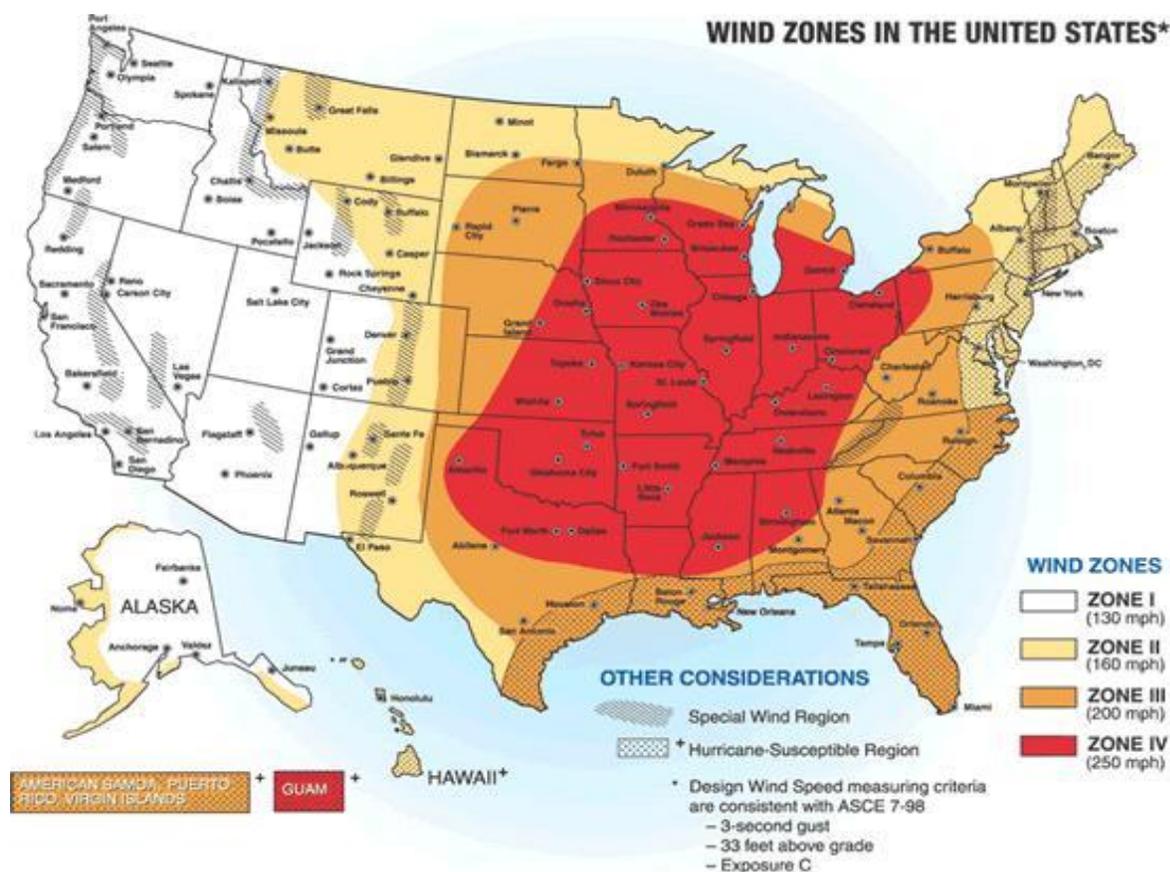


Source: *National Oceanic and Atmospheric Administration (NOAA)*

## Location

The U.S. Wind Zone Map, found below in **Figure 3.11d**, shows the areas affected by extreme windstorms. This map was developed by the U.S. Army Corps of Engineers, which is based on a 40 year history of tornadoes and 100 year history of hurricanes.

**Figure 3.11d: Wind Zones in the United States**



Source: National Weather Service

The State of New York is located in Wind Zones II and III. The Atlantic Coastal Plain, New England Upland, and the Hudson Mohawk Lowland Regions are susceptible to hurricanes. New York State has a definite vulnerability to tornadoes. Research indicates that over 350 tornadoes ranging from F0 to F4 on the Fujita-Pearson Tornado Intensity Scale have occurred in New York State since 1952.

According to statistics, nearly 3 in 4 tornadoes occurring in New York State are classified as magnitude F0 or F1 on the Fujita-Pearson Scale. A significant number, approximately 1 in 3, are classified as F0. Magnitude F0 indicates a tornado wind speed range of 40-72 mph. F0 wind velocity typically produces only minor damage to property. A slim majority of tornadoes occurring in NYS produce winds ranging from 73-112 mph (F1 on Fujita scale), strong enough to move mobile homes from foundations.



## Previous High Wind Event Occurrences

New York State is extremely vulnerable to high wind events according to data researched by the New York State Division of Homeland Security and Emergency Management (DHSES) mitigation staff. Several data sources for historical flood records including DHSES archives, FEMA statistics, Disaster Declaration data, Spatial Hazard Events and Losses Databases for the United States (SHELDUS), and NOAA's National Climatic Data Center (NCDC) storm event database were used to obtain historical data found within the State.

Between 1960 and 2012, NYS was impacted by 10,688 high wind events. These events were either classified as tornado, straight-line wind, or severe thunderstorm activity. Erie, Chautauqua, Oneida, Cattaraugus, and Otsego were the top five counties with the most events totaling 1,464. **Table 3.11d**, Historical and Recent High Wind Events and Losses, documents total events, fatalities, injuries, property damage, and crop damage from 1960-2012, as well as more recent occurrences from 2010-2013.



Table 3.11d Historical and Recent High Wind Events and Losses

County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Albany	306	0.33	159	1	24	\$7,075,672	\$250,966	2	0	0	\$32,000	\$0
Allegany	352	0.28	183	0	3	\$4,603,342	\$91,470	33	0	0	\$764,000	\$0
Bronx	138	0.72	72	4	17	\$1,551,247	\$308	16	1	8	\$675,111	\$0
Broome	485	0.21	252	0	25	\$4,814,655	\$19,416	50	0	0	\$525,000	\$0
Cattaraugus	490	0.2	255	1	8	\$43,503,358	\$147,520	37	0	0	\$10,722,500	\$100,000
Cayuga	398	0.25	207	1	94	\$30,731,695	\$1,177,294	31	0	0	\$496,000	\$20,000
Chautauqua	623	0.16	324	3	29	\$18,336,771	\$166,470	42	0	0	\$5,995,500	\$20,000
Chemung	269	0.37	140	0	6	\$12,507,827	\$13,989	26	0	0	\$10,868,000	\$0
Chenango	452	0.22	235	3	12	\$4,896,135	\$29,141	36	0	0	\$1,021,000	\$0
Clinton	417	0.24	217	1	4	\$6,572,435	\$253,615	42	0	0	\$2,537,000	\$100,000
Columbia	323	0.31	168	0	14	\$19,477,571	\$129,896	1	0	0	\$4,000	\$0
Cortland	356	0.28	185	0	14	\$3,653,421	\$32,064	15	0	0	\$105,000	\$0
Delaware	415	0.24	216	0	2	\$4,334,947	\$45,821	31	0	0	\$475,000	\$0
Dutchess	387	0.26	201	2	8	\$13,041,212	\$180,946	1	0	0	\$40,000	\$0
Erie	631	0.16	328	9	38	\$35,243,508	\$31,470	45	0	4	\$1,270,000	\$0
Essex	373	0.27	194	0	1	\$6,143,993	\$117,970	42	0	0	\$899,000	\$50,000
Franklin	390	0.26	203	0	2	\$3,251,357	\$68,276	32	0	0	\$806,000	\$50,000
Fulton	288	0.35	150	1	11	\$5,371,608	\$86,054	0	0	0	\$0	\$0
Genesee	304	0.33	158	3	8	\$7,394,862	\$46,470	18	0	0	\$493,000	\$0
Greene	240	0.42	125	1	21	\$15,468,697	\$798,546	1	0	0	\$4,000	\$0
Hamilton	204	0.49	106	12	7	\$78,148,859	\$153,615	0	0	0	\$0	\$0
Herkimer	321	0.31	167	3	13	\$13,740,682	\$126,215	0	0	0	\$0	\$0



County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Jefferson	406	0.25	211	1	11	\$45,062,427	\$132,544	37	0	0	\$774,000	\$0
Kings	160	0.63	83	7	26	\$10,225,116	\$308	22	1	1	\$9,536,142	\$0
Lewis	362	0.28	188	1	2	\$19,359,488	\$143,419	36	0	0	\$527,000	\$8,000
Livingston	300	0.33	156	0	5	\$4,501,643	\$41,470	22	0	0	\$510,000	\$15,000
Madison	308	0.33	160	2	9	\$7,170,880	\$93,469	16	0	0	\$137,000	\$0
Monroe	392	0.25	204	6	17	\$28,566,409	\$2,226,470	23	0	0	\$853,000	\$0
Montgomery	300	0.33	156	1	14	\$6,091,053	\$301,054	0	0	0	\$0	\$0
Nassau	258	0.39	134	7	35	\$7,151,101	\$308	56	2	2	\$2,736,111	\$0
New York	181	0.55	94	6	24	\$2,709,801	\$6,331	35	2	1	\$1,632,781	\$0
Niagara	473	0.21	246	4	11	\$8,063,024	\$2,726,470	32	0	0	\$1,548,000	\$0
Oneida	581	0.17	302	6	26	\$84,919,553	\$45,965	34	0	0	\$212,000	\$0
Onondaga	388	0.26	202	11	31	\$96,383,621	\$67,364	29	0	0	\$169,000	\$0
Ontario	298	0.34	155	1	8	\$6,297,295	\$189,470	22	0	0	\$469,000	\$48,000
Orange	329	0.3	171	19	57	\$13,866,429	\$614,346	38	0	1	\$556,000	\$0
Orleans	267	0.37	139	3	3	\$10,446,495	\$5,576,470	9	0	0	\$445,000	\$0
Oswego	460	0.22	239	0	10	\$7,622,384	\$166,294	31	0	0	\$729,000	\$34,000
Otsego	490	0.2	255	5	25	\$4,751,312	\$47,886	25	0	1	\$407,000	\$0
Putnam	167	0.6	87	0	13	\$5,785,291	\$17,696	22	0	0	\$113,750	\$0
Queens	215	0.46	112	16	42	\$20,447,828	\$308	37	5	1	\$19,512,104	\$0
Rensselaer	365	0.27	190	1	25	\$14,242,944	\$209,210	4	0	1	\$75,000	\$0
Richmond	121	0.83	63	2	8	\$4,046,265	\$308	8	1	0	\$2,812,000	\$0
Rockland	142	0.7	74	3	6	\$1,084,047	\$6,563	23	1	1	\$406,750	\$0
Saratoga	437	0.23	227	4	91	\$69,449,234	\$148,284	0	0	0	\$0	\$0
Schenectady	233	0.43	121	0	7	\$7,824,933	\$15,704	1	0	0	\$7,000	\$0



County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Schoharie	258	0.39	134	1	7	\$4,188,496	\$150,852	0	0	0	\$0	\$0
Schuyler	198	0.5	103	1	2	\$1,364,524	\$13,989	5	0	0	\$105,000	\$0
Seneca	215	0.46	112	1	5	\$2,053,485	\$14,239	9	0	1	\$108,000	\$0
St Lawrence	456	0.22	237	1	10	\$39,153,494	\$63,240	47	0	0	\$1,173,000	\$0
Steuben	356	0.28	185	1	12	\$3,226,238	\$18,970	33	0	0	\$737,000	\$0
Suffolk	290	0.34	151	9	25	\$7,585,868	\$308	67	4	1	\$5,362,650	\$0
Sullivan	344	0.29	179	1	15	\$10,102,481	\$69,263	15	0	0	\$1,438,000	\$0
Tioga	290	0.34	151	1	13	\$3,882,999	\$25,689	22	0	0	\$246,000	\$0
Tompkins	281	0.36	146	1	1	\$2,208,909	\$14,989	9	0	0	\$305,000	\$0
Ulster	363	0.28	189	5	5	\$505,686,535	\$27,446	2	1	0	\$2,000	\$0
Warren	260	0.39	135	3	17	\$13,663,270	\$68,556	2	0	2	\$1,000	\$0
Washington	315	0.32	164	0	4	\$3,801,624	\$5,019,281	0	0	0	\$0	\$0
Wayne	344	0.29	179	0	8	\$14,606,026	\$629,739	38	0	0	\$944,000	\$68,000
Westchester	288	0.35	150	16	49	\$14,816,093	\$6,563	49	4	2	\$2,271,250	\$0
Wyoming	300	0.33	156	0	2	\$31,191,705	\$51,470	17	0	0	\$457,000	\$10,000
Yates	198	0.5	103	0	2	\$1,561,910	\$33,970	13	0	0	\$95,000	\$0

Source: SHEL DUS



**Figure 3.11e** show historical straight-path tornado tracks for the State of New York from 1960 to 2012. Albany, Schoharie, Green, Chautauqua, Montgomery, and Columbia Counties have all encountered F4 wind speeds of 210-261 mph, causing devastating damage to any area the tornado travels through. Please note: NYS has never been impacted by F5 wind speeds.

**Figure 3.11f** references New York State's wind events by county from 1960-2012. The highest number of events occurred in Chautauqua, Cattaraugus, Erie, Niagara, Broome, Chenango, Otsego, Oneida, Oswego, Delaware, and Saratoga Counties with an average of 221-328 events reported. Yates, Schuyler, Seneca, Hamilton, Schenectady, Greene, Putnam, Rockland, Bronx, Kings, Queens, and Richmond reported the least number of severe wind events that averaged 60-89 occurrences over a 52 year period.



Figure 3.11e: Historical Tornado Tracks 1960-2012

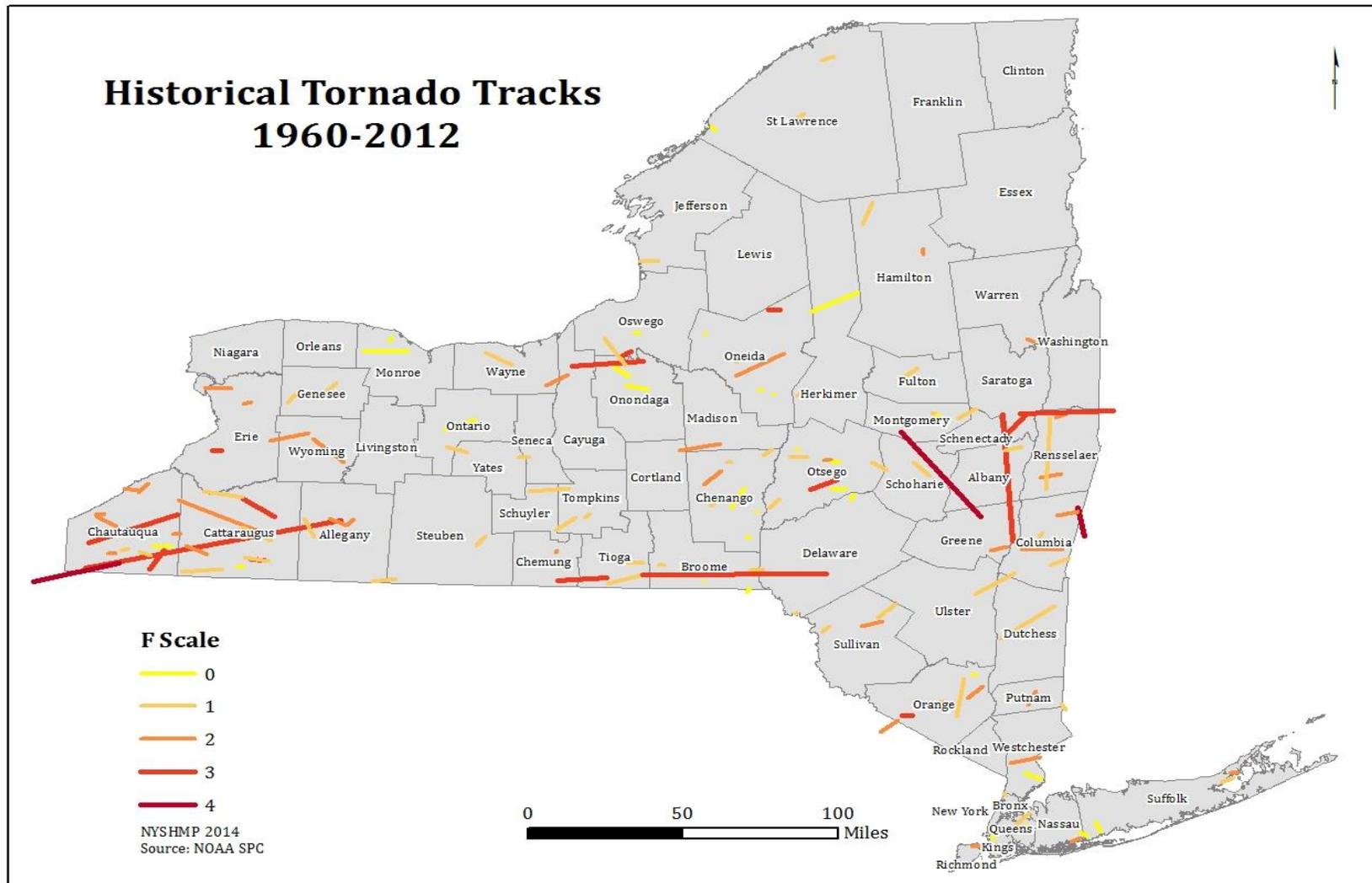
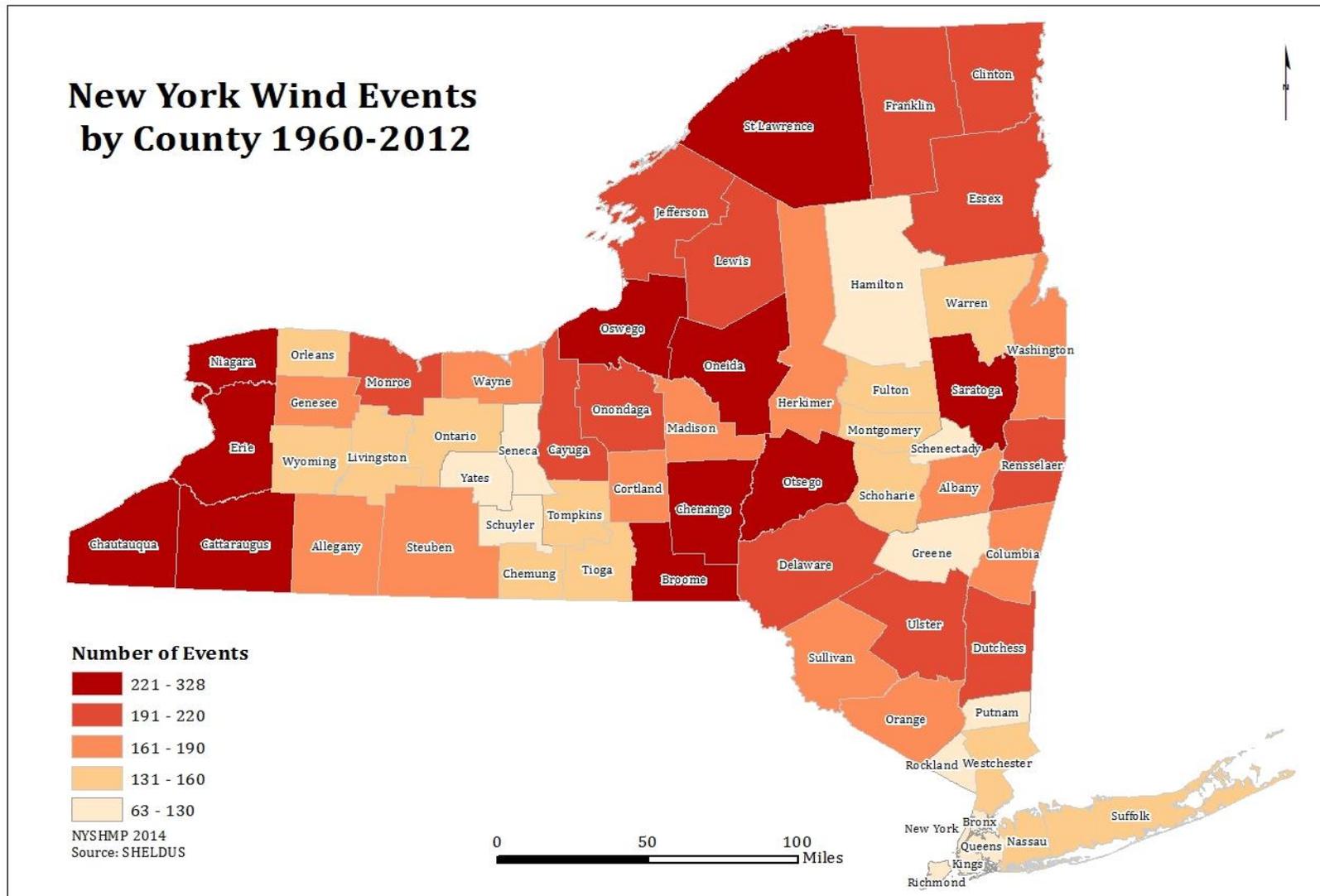


Figure 3.11f: New York Wind Events by County 1960-2012



Data found in the table and figure below was derived from a FEMA data source that examines Presidential Declarations from 1954 to 2013. **Table 3.11e** and **Figure 3.11d** illustrates the affected counties from high wind events. Although the data dates back to 1954, New York State's first Presidential Declaration was in June 1998.

**Table 3.11e: Major Tornado Presidential Declared Disasters**

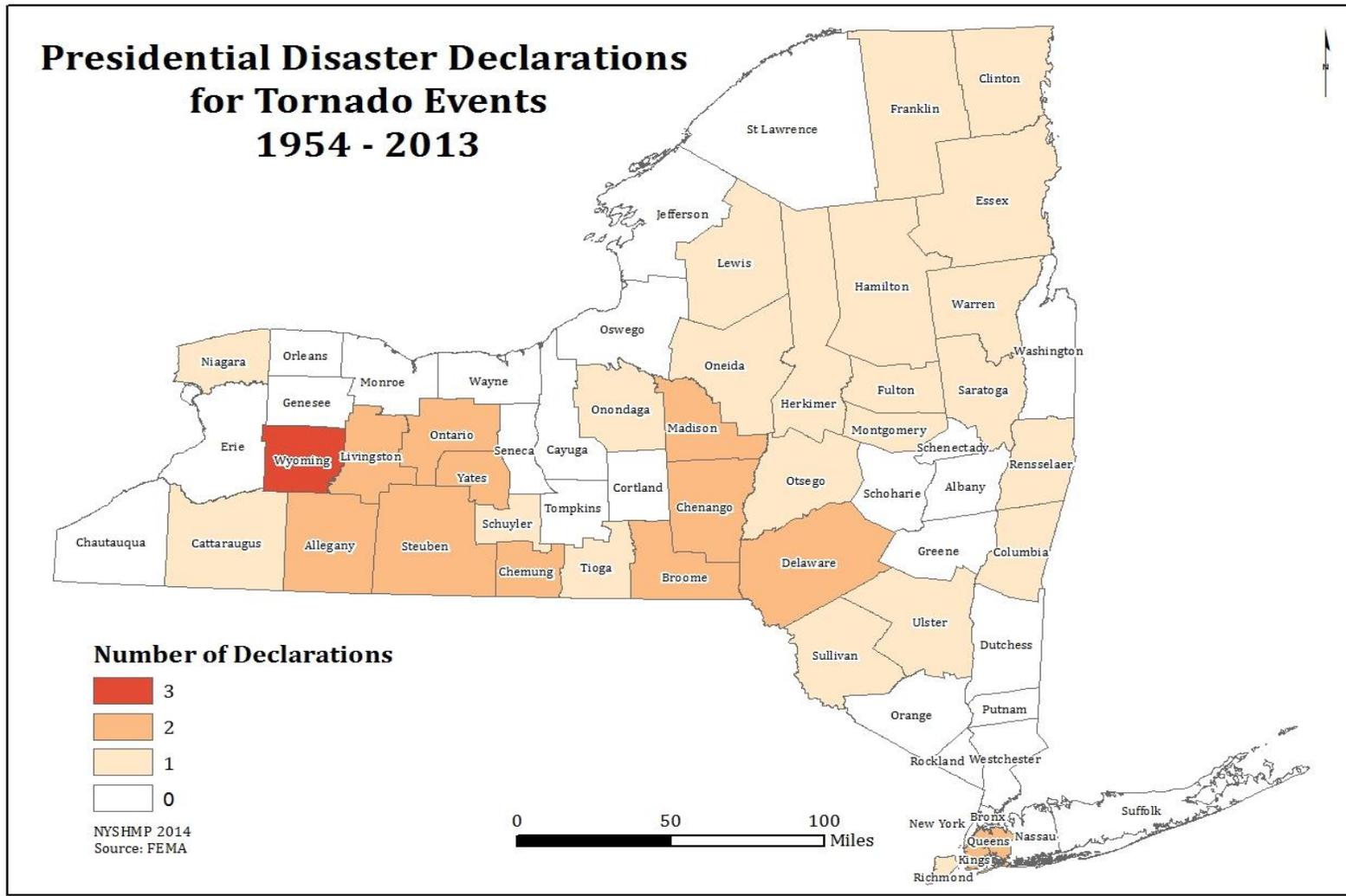
Disaster Number	Date Declared	Affected Locations
DR-1993	6/10/2011	Allegany, Broome, Chemung, Chenango, Clinton, Delaware, Essex, Franklin, Hamilton, Herkimer, Lewis, Livingston, Madison, Niagara, Oneida, Onondaga, Ontario, Steuben, Tioga, Ulster, Warren, Wyoming, and Yates Counties
DR-1943	10/14/2010	Kings, Queens, and Richmond Counties
DR-1724	8/31/2007	Kings and Queens Counties
DR-1486	8/29/2003	Allegany, Cattaraugus, Chemung, Columbia, Delaware, Fulton, Livingston, Madison, Montgomery, Ontario, Schuyler, Steuben, Sullivan, Wyoming and Yates Counties
DR-1222	6/16/1998	Broome, Chenango, Otsego, Rensselaer, Saratoga, and Wyoming Counties

Source: FEMA

**Figure 3.6g** displays the Presidential Declared Disaster totals by county for tornado events for the period of 1954 through July 2013. Damages caused by tornado events are over \$51.8 million with Wyoming County having the highest number of Presidential Declarations recorded.



**Figure 3.11g: Presidential Disaster Declarations for Tornado Events**



**Table 3.11f** displays undeclared historical tornadoes from 1857-1993. The seven counties affected during this time frame were: Genesee (1993), Orange (1989), Chautauqua (1983), Jefferson (1935), Onondaga (1912), Allegany (1884), and Oneida (1857). As a result of these tornadoes there were 23 deaths and 94 injuries.

**Table 3.11f: Undeclared Historical Tornadoes Events from 1857 – 1993 in New York State Causing Two or More Deaths**

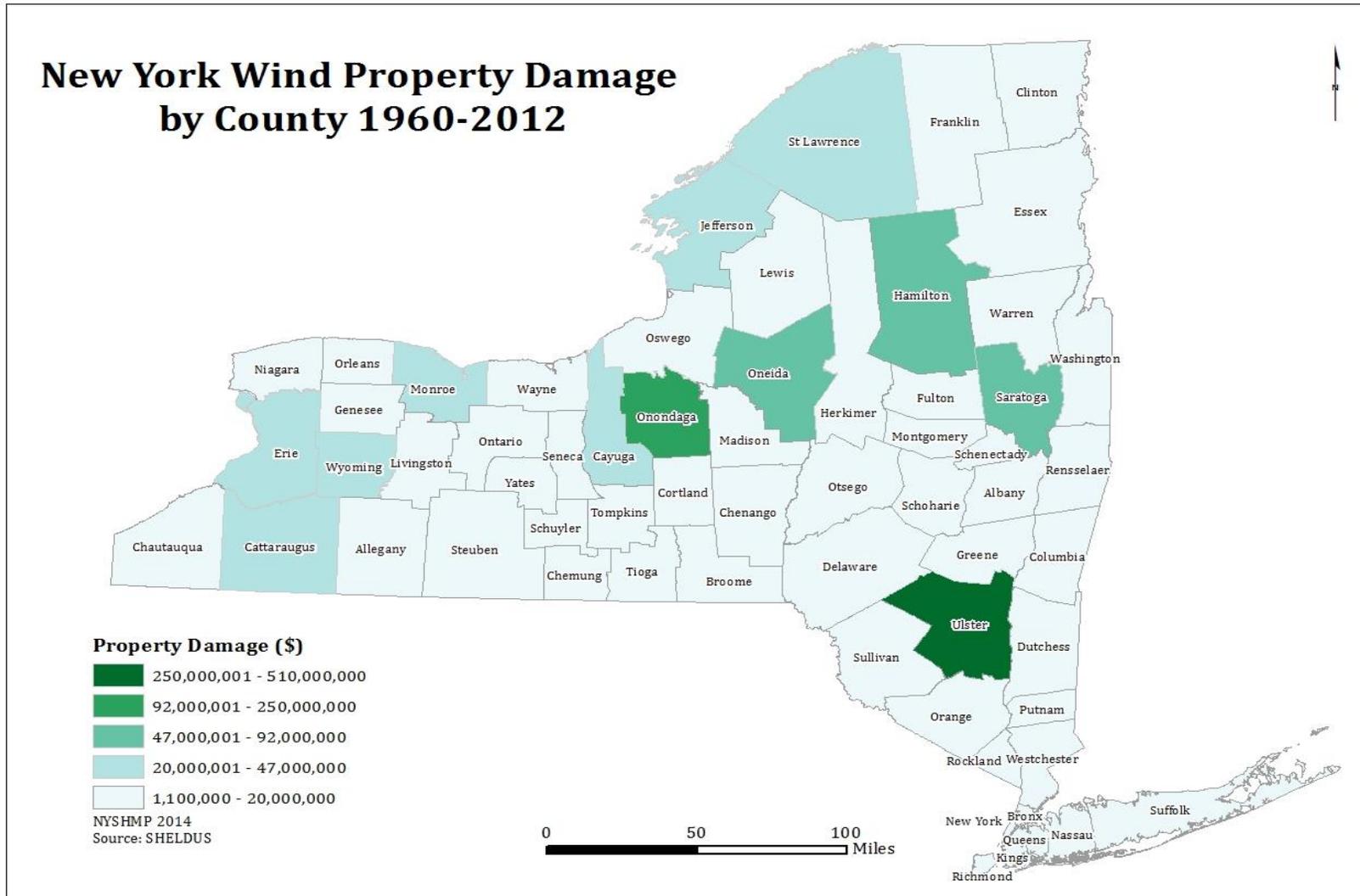
Date/Time	Results
<b>SEPT 03, 1993/1:15pm</b>	2 dead, 0 injured Near Batavia, a delivery van was dropped onto an oncoming tractor trailer. Both drivers were killed. The following event was called a tornado by the NWS. However, experts in severe storm analysis later concluded that it was a microburst, not a tornado. The event continues to be erroneously listed as a tornado by the NWS.
<b>NOV 16, 1989/ 12:05 pm</b>	9 dead; 18 injured 9 children were killed at the Coldenham School in Orange County when a cafeteria wall was blown over.
<b>MAY 2, 1983/ 4:05 pm</b>	2 dead; 2 injured A tornado destroyed 100 buildings after moving over Chautauqua Lake.
<b>JULY 19, 1935 3:30 pm</b>	2 dead; 2 injured A mother and daughter were killed as their farmhouse was destroyed near Philadelphia, Jefferson County.
<b>SEPT 15, 1912 /5:25 pm</b>	3 dead; 40 injured This tornado moved from the outlet of Onondaga Lake, and passed just north of the Syracuse City limits.
<b>SEPT 28, 1884/ 5:20 pm</b>	3 dead; 31 injured A balloon-shaped tornado ripped apart the east half of Shongo, Allegany County.
<b>JUN 13, 1857/ 4:00 pm</b>	2 dead; 1 injured What was called a "funnel-shaped black moving body of nebulous character" hit the edge of Utica.

Source: NOAA, NCDC

From 1960-2012 every county in New York State has been affected by a high wind event. **Figure 3.11h** illustrates the property loss of each county within the State of New York. Property damage exceeded \$1.4 billion over this particular 52 year period. The agriculture industry also experienced damage with approximately \$23 million crop loss during the 52 year period. The State lost 197 lives and 1,047 people were injured. Additionally, 55 of the 62 NYS counties have encountered at least one event from 2010-2012.



Figure 3.11h: New York Wind Property Damage 1960-2012



## Probability of Future High Wind Events

Using the historical occurrence, or more specific documentation if available, a *future probability and average annual losses* analysis was performed for high wind events. The number of years recorded was divided by the number of occurrences, resulting in a simple past-determined recurrence interval. If the hazard lacked a definitive historical record, the probability was assessed qualitatively based on county history or other supporting data.

Based on the historical record from 1960-2012 found in **Table 3.11d**, the following can be expected on average in a typical year in New York State:

- 172 high wind events
- \$24 million in property and crop damage
- 17 injuries
- 3 fatalities

The historical data collected displays that in Erie, Chautauqua, Oneida, Cattaraugus, and Otsego Counties are most vulnerable to high wind occurrences. The data provided by SHELUDS shows these counties having high future probability of future wind events.

**Table 3.11g: Percentage Probability\* of Future Occurrences, by County**

County	Future Probability %
Cattaraugus	490
Chautauqua	623
Erie	631
Oneida	581
Otsego	490

Source: SHELUDS (\*Future Probability equals the number of events divided by the number of years of record [52], expressed as a percentage.)

Climate change is a major factor when it comes to forecasting potential natural disasters. As New York State continues to become more vulnerable to severe thunderstorms and tornados it will continue to be impacted by high wind events. Local counties are taking the following measures to mitigate wind events: enforcing building codes and instituting new measures that would call for the use of high wind-resistant materials, hurricane clips, and wind shutters.



### 3.11.2 Assessing High Wind Vulnerability and Losses by Jurisdiction

Local jurisdictions have recognized their susceptibility to high wind events and although tornados have occurred throughout the region; NYS has been affected more by derecho's straight-line winds. Several counties seem to have higher occurrences than others from 1962-2012; after reviewing several local mitigation plans, Otsego, Ulster, Jefferson, Lewis, Suffolk and Orange Counties reported severe wind events as a high risk disaster. Delaware, Schenectady, Westchester, and Genesee Counties reported medium risk to wind disasters.

**Table 3.11h** provides the annualized losses for high wind events. The data used was based on SHELDUS records from 1960-2012, with the exception of hurricane, earthquake, and flood hazards which were derived from Hazus-MH 2.1. For those specific hazards, a probabilistic run was generated to determine the total annual losses for each county found within the State. The information provided by SHELDUS was determined by taking the total economic losses divided by the number of years of record (52) to obtain the losses per year. **Figure 3.11i**, illustrates the top ten counties annualized losses with a total of \$28,999,613 in high wind losses for the entire State of New York.

**Table 3.11h: Average Annual High Wind Losses by County 1960-2012**

County	High Wind	County	High Wind	County	High Wind
Ulster	\$ 9,725,269	Rensselaer	\$ 277,926	Fulton	\$ 104,955
Onondaga	\$ 1,854,827	Herkimer	\$ 266,671	Chenango	\$ 94,717
Oneida	\$ 1,633,952	Warren	\$ 264,074	Broome	\$ 92,963
Hamilton	\$ 1,505,817	Dutchess	\$ 254,272	Otsego	\$ 92,292
Saratoga	\$ 1,338,414	Chemung	\$ 240,804	Allegany	\$ 90,285
Jefferson	\$ 869,134	Niagara	\$ 207,490	Livingston	\$ 87,368
Cattaraugus	\$ 839,440	Kings	\$ 196,643	Delaware	\$ 84,246
St Lawrence	\$ 754,168	Sullivan	\$ 195,610	Schoharie	\$ 83,449
Erie	\$ 678,365	Washington	\$ 169,633	Richmond	\$ 77,819
Cayuga	\$ 613,634	Schenectady	\$ 150,781	Tioga	\$ 75,167
Wyoming	\$ 600,830	Oswego	\$ 149,782	Cortland	\$ 70,875
Monroe	\$ 592,171	Suffolk	\$ 145,888	Franklin	\$ 63,839
Queens	\$ 393,233	Genesee	\$ 143,103	Steuben	\$ 62,408
Columbia	\$ 377,067	Albany	\$ 140,897	New York	\$ 52,233
Lewis	\$ 375,056	Madison	\$ 139,699	Tompkins	\$ 42,767
Chautauqua	\$ 355,832	Nassau	\$ 137,527	Seneca	\$ 39,764
Greene	\$ 312,832	Clinton	\$ 131,270	Yates	\$ 30,690
Orleans	\$ 308,134	Ontario	\$ 124,745	Bronx	\$ 29,838
Wayne	\$ 292,995	Montgomery	\$ 122,925	Schuyler	\$ 26,510
Westchester	\$ 285,051	Essex	\$ 120,422	Rockland	\$ 20,973
Orange	\$ 278,476	Putnam	\$ 111,596	<b>Total</b>	<b>\$ 28,999,613</b>

Source: SHELDUS, 2013



Figure 3.11i: Average Annual High Wind Losses by County 1960-2012



Source: SHELDUS, 2013

### Local Plan Integration/Risk Assessment

Since August of 2013, 56 FEMA-approved local hazard mitigation plans (LHMP) have been reviewed for the 2014 Update. The State's planning team had the opportunity to review local county risk assessments to help the State better understand its vulnerability in terms of the jurisdictions most threatened by classified hazards. In its analysis, the State of New York reviewed the processes of local governments and how their hazards were ranked based on their jurisdictions and the potential losses (i.e., people, buildings, and dollar values) associated with the hazards of greatest concern.

Where data was available, the State extracted the ranking impact information from the LHMP hazard analysis. This ranking feature is based on a combination of probability, severity, and extent of the hazard and was determined to be the best measure of overall risk in the plans. This ranking was either numeric or described in terms of high, moderately high, moderate, or low. In cases where this information was not available, ranking values were not determined yet considered if identified in the individual county local plans.

For the sake of the 2014 Update, a proper analysis and summary of the data was required. During the review of the local plan risk assessments, all rankings used were based on the New York HAZNY ranking system, and measured on a scale rating from 44 (low) to 400 (high). This analysis revealed that selected county-level plans did include manmade hazards in their analysis, but the State hazard mitigation plan's 2014 Update focused solely on natural hazards.



The local risk assessment summary allowed for an analysis of which hazards are of high concern to particular counties. **Table 3.2a** in **Section 3.2** lists all the hazards and the number of counties that ranked them at each of the scale levels: High, Moderately High, Moderate, and Low. As indicated previously, five of the local plans ranked high wind events as a high hazard. In addition, eighteen counties ranked it as moderately high, four moderate, fourteen moderately low, and none ranked it as a low hazard. **Table 3.11i** displays the highest ranked county hazard impacts and the high and / or moderately high ranked risk assessment scores for high wind.

**Table 3.11i: Summary of High Wind Hazard Impacts and Rankings by County**

Local County High Wind Hazard Impacts		
Highest Occurrences	Highest Fatalities	Highest Property Damage
Erie	Orange	Ulster
Chautauqua	Queens	Onondaga
Oneida	Westchester	Oneida
Cattaraugus	Hamilton	Hamilton
Otsego	Onondaga	Saratoga

Source: SHEL DUS

Local County High Wind Hazard Rankings	
High	Moderately High
Fulton, Montgomery, Otsego, Saratoga, and Suffolk	Albany, Allegany, Chenango, Delaware, Nassau, Niagara, Ontario, Orange, Oswego, Rensselaer, Schenectady, Ulster, and Westchester

Source: LHMP

## Hazus-MH 2.0

Hazus is used for mitigation, preparedness, and response. Government planners, GIS specialists, and emergency managers use Hazus to determine losses and the most beneficial mitigation approaches to minimize them. Hazus can be used in the assessment step in the mitigation planning process, which is the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repetitive damage.

New York State uses Hazus to determine potential risk and vulnerability in local jurisdictions, support risk assessments and perform economic loss scenarios for flood, hurricane, and earthquake hazards.

Fulton County's LHMP is an example of how Hazus is used to determine high wind impact on life, health and safety; general building stock; critical facilities; the economy; and future growth. The county's vulnerability assessment using Hazus is documented below; however, the complete LHMP can be reviewed at Fulton County's website.<sup>1</sup>

<sup>1</sup> <http://www.fultoncountynyny.gov/hazard/hazmit.html>.



**Fulton County's HAZUS Vulnerability Assessment**

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For severe storms, the entire County has been identified as the hazard area. Therefore, all assets in Fulton County (population, structures, critical facilities and lifelines), as described in the County Profile section (Section 4), are vulnerable. The following text evaluates and estimates the potential impact of severe storms on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact, including: (1) impact on life, safety and health of County residents, (2) general building stock, (3) critical facilities, (4) economy and (5) future growth and development
- Further data collections that will assist understanding of this hazard over time
- Overall vulnerability conclusion

*Overview of Vulnerability*

Severe storms include high winds and air speeds that result in power outages, disruptions to transportation corridors and equipment, loss of workplace access, significant property damage, injuries and loss of life, and the need to shelter and care for individuals impacted by the events.

A large amount of damage can be inflicted by trees, branches, and other objects that fall onto power lines, buildings, roads, vehicles, and, in some cases, people. The risk assessment for severe storm evaluates available data for a range of storms included in this hazard category.

Due to the County's inland location, the loss associated with hurricanes is primarily associated with severe thunderstorm or tropical storm/hurricane-related severe winds and rain (see flooding discussion in Section 5.4.3 Flood). Secondary flooding associated with the torrential downpours during severe storms is also a primary concern in the County. The County has experienced flooding in association with numerous severe storms in the past.

In the study area, winds associated with a tropical/hurricane storm event are similar to a severe wind storm and therefore, can support analysis of the severe storm event for this study area. The entire inventory of the County is at risk of being damaged or lost due to impacts of severe wind. Certain areas, infrastructure, and types of building are at greater risk than others due to proximity to falling hazards and/or their manner of construction.

*Fulton County's Hazus-MH MR4 most recent hazard mitigation plan is available for review at <http://www.fultoncountyny.gov/hazard/hazmit.html>*



Potential losses associated with high wind events were calculated for the County for two probabilistic wind events, the 100-year and 500-year mean return period (MRP) wind events. The impacts on population, existing structures and critical facilities are presented below, following a summary of the data and methodology used.

### *Data and Methodology*

After reviewing historic data, the Hazus-MH methodology and model were used to analyze the wind (severe storm) hazard for Fulton County. Data used to assess this hazard include data available in the Hazus-MH MR4 hurricane model, NOAA NCDC data, professional knowledge, and information provided by the Planning Committee.

A probabilistic scenario was run for Fulton County for annualized losses and the 100- and 500-year MRPs were examined for the wind/severe storm hazard. Figures 5.4.1-1 and 5.4.1-2, earlier in this section, show the Hazus-MH MR4 maximum peak gust wind speeds that can be anticipated in the study area associated with the 100- and 500-year MRP hurricane events. The estimated hurricane track for the 100- and 500-year events is also shown.

Hazus-MH contains data on historic hurricane events and wind speeds. It also includes surface roughness and vegetation (tree coverage) maps for the area. Surface roughness and vegetation data support the modeling of wind force across various types of land surfaces. Hurricane and inventory data available in Hazus-MH were used to evaluate potential losses from the 100- and 500-year MRP events (severe wind impacts). Locally available inventory data were reviewed to determine their appropriateness for inclusion. Other than data for critical facilities, the default data in Hazus-MH MR4 was the best available for use in this evaluation. The 11 residential and 10 commercial occupancy classes available in Hazus-MH were condensed into the following occupancy classes (residential, commercial, industrial, agricultural, religious, government, and educational) to facilitate the analysis and the presentation of results. Residential loss estimates address both multi-family and single family dwellings. In addition, impacts to critical facilities were evaluated for the 100-year and 500-year MRP events.

### *Impact on Life, Health and Safety*

The impact of severe storms on life, health and safety is dependent upon the severity of the storm event. Residents may be displaced or require temporary to long-term sheltering. In addition, downed trees, damaged buildings and debris carried by high winds can lead to injury or loss of life. It is assumed that the entire County population is exposed to the severe storm hazard. Socially vulnerable populations are most susceptible, based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. **Table 3.12j** summarizes the population over the age of 65 and individuals living below the Census poverty threshold. Additionally, residents living in mobile homes are particularly vulnerable to



wind events due to the construction of their housing. The Impact on General Building Stock subsection below discusses mobile homes in the County further.

**Table 3.11j: Vulnerable Population Exposed to the Sever Storm Hazard in Fulton County**

Population Category	Number of Persons Exposed**	Percent of Total Population**
Elderly (Over 65 years of age) (1)	9,729	17.0
Persons living below Census poverty threshold* (2)	6,235	10.9
Elderly (Over 65 years of age) living below Census poverty threshold (2)***	638	1.2
Population Category	Number of Persons Exposed	Percent of Total County Population
Elderly (Over 65 years of age) (1)	8,900	16.2
Persons living below Census poverty threshold* (2)	6,686	12.1
Elderly (Over 65 years of age) living below Census poverty threshold (2)	638	1.2

Source(s): (1) HAZUS-MH MR4; U.S. Census 2000

\*The Census poverty threshold for a three person family unit is approximately \$15,000.

\*\*These values represent Fulton County and the entire Village of Dolgeville.

\*\*\*This value only represents the population within the Fulton County boundary and does not include the portion of the Village of Dolgeville located in Herkimer County.

For a 100-year and 500-year MRP events, Hazus-MH MR4 estimates that no households will be displaced and zero households will require temporary shelter. For the 100-year event, Hazus-MH MR4 estimates no debris will be generated. For a 500-year MRP event, Hazus-MH MR4 estimates 225 tons of brick and wood debris and a total of 27,277 tons of tree debris will be generated. **Table 3.12k** estimates the debris produced for the 500-year MRP event per municipality.

Please note that the Hazus-MH Hurricane Model Technical Manual and User Manual recommend that the estimated debris volume be treated as a low estimate. There may be other sources of vegetative and non-vegetative debris (i.e., flooding) not being modeled in Hazus-MH in combination with the wind. Therefore, this is likely a conservative estimate and may be higher if multiple impacts occur.



**Table 3.11k: Debris Production for 500-Year MRP Event Winds**

Municipality	Brick and Wood (tons)	Concrete (tons)	Tree (tons)
Bleecker (T)	0	0	0
Broadalbin (T)	8	0	1,969
Broadalbin (V)	4	0	62
Caroga (T)	1	0	0
Dolgeville (V)*	6	0	27
Ephratah (T)	0	0	3,757
Gloversville (C)	115	0	22
Johnstown (C)	70	0	54
Johnstown (T)	0	0	4,483
Mayfield (T)	9	0	1,313
Mayfield (V)	0	0	6
Northampton (T)	3	0	1,270
Northville (V)	2	0	62
Oppenheim (T)	0	0	5,377
Perth (T)	7	0	1,665
Stratford (T)	0	0	7,210
<b>Fulton County</b>	<b>225</b>	<b>0</b>	<b>27,277</b>

Source: Hazus-MH MR4. Note: \* These values represent the entire Village of Dolgeville (both portions in Fulton and Herkimer Counties).

### *Impact on General Building Stock*

After considering the population exposed to the severe storm hazard, the value of general building stock exposed to and damaged by 100- and 500-year MRP events was evaluated. Potential damage is the modeled loss that could occur to the exposed inventory. Hazus-MH MR4 estimates there is a total building replacement value (structure only) of greater than \$4 billion in Fulton County. Greater than 75-percent of the building stock value is associated with residential housing. The analysis below uses the replacement value (building structure and does not include building contents) with the valuation of general building stock and the loss estimates determined in Fulton County based on the default general building stock database provided in Hazus-MH MR4. The general building stock valuations provided in Hazus-MH MR4 are Replacement Cost Value from RSMMeans as of 2006.



**Table 3.111** presents the total exposure value for general building stock by occupancy class for the County.

**Table 3.121: Building Stock Replacement Value (Structure Only) by Occupancy Class**

Municipality	Total Replacement Value	Residential Replacement Value	Commercial Replacement Value	Industrial Replacement Value
Bleecker (T)	\$56,230,000	\$53,315,000	\$2,010,000	\$508,000
Broadalbin (T)	\$256,461,000	\$226,108,000	\$14,830,000	\$3,500,000
Broadalbin (V)	\$90,402,000	\$58,644,000	\$14,958,000	\$5,649,000
Caroga (T)	\$234,377,000	\$219,551,000	\$8,990,000	\$1,273,000
Dolgeville (V)	\$149,722,000	\$108,123,000	\$22,202,000	\$10,818,000
Ephratah (T)	\$78,484,000	\$72,610,000	\$3,946,000	\$1,738,000
Gloversville (C)	\$1,105,210,000	\$807,907,000	\$174,348,000	\$81,231,000
Johnstown (C)	\$776,521,000	\$471,419,000	\$174,731,000	\$86,356,000
Johnstown (T)	\$479,387,000	\$361,025,000	\$60,335,000	\$19,783,000
Mayfield (T)	\$353,165,000	\$295,984,000	\$40,031,000	\$8,052,000
Mayfield (V)	\$57,057,000	\$43,949,000	\$5,349,000	\$1,163,000
Northampton (T)	\$168,935,000	\$157,963,000	\$8,998,000	\$1,053,000
Northville (V)	\$92,066,000	\$74,175,000	\$11,183,000	\$1,202,000
Oppenheim (T)	\$87,130,000	\$65,088,000	\$7,338,000	\$10,003,000
Perth (T)	\$206,155,000	\$176,770,000	\$19,140,000	\$8,210,000
Stratford (T)	\$51,148,000	\$47,348,000	\$1,570,000	\$122,000
<b>Fulton County</b>	<b>\$4,242,450,000</b>	<b>\$3,239,979,000</b>	<b>\$569,959,000</b>	<b>\$240,661,000</b>

Source: Hazus-MH MR4

Notes:

1. Replacement value reflects the building structure and does not include building contents. The valuation of general building stock and the loss estimates determined in Fulton County were based on the default general building stock database provided in Hazus-MH MR4. The general building stock valuations provided in Hazus-MH MR4 are Replacement Cost Value from RSMeans as of 2006
2. Total RV is the sum of all building classes (Residential, Commercial, Industrial, Agricultural, Religious, Government and Education)
3. The total RV for the agricultural occupancy class is \$10,979,000, the total RV for the religious occupancy class is \$68,539,000, the total RV for the government occupancy class is \$52,742,000, and the total RV for the education occupancy class \$59,591,000.
4. The building stock replacement value represents the entire Village of Dolgeville (portions in both Fulton and Herkimer Counties).

The Hazus-MH hurricane analysis considers damage associated with significant winds. Such wind impacts also could occur as a result of the severe wind storms or tornadoes and therefore, are considered relevant to the severe storm hazard. Rain often is associated with severe storms and heavy rains could result in flooding. Flooding is addressed under the flood hazard (Section 5.4.3).

The entire study area is considered at risk for the severe storm wind hazard. Expected building damage was evaluated by Hazus-MH across the following damage categories: no damage/very minor damage, minor damage, moderate damage, severe damage, and total destruction. **Table 3.11m** summarizes the definition of the damage categories.



Table 3.11m: Description of Damage Categories

Qualitative Damage Description	Roof Cover Failure	Window Door Failures	Roof Deck	Missile Impacts on Walls	Roof Structure Failure	Wall Structure Failure
<b>1. No Damage or Very Minor Damage</b> Little or no visible damage from the outside. No broken windows, or failed roof deck. Minimal loss of roof over, with no or very limited water penetration.	≤2%	No	No	No	No	No
<b>2. Minor Damage</b> Maximum of one broken window, door or garage door. Moderate roof cover loss that can be Covered to prevent additional water Entering the building. Marks or dents on walls requiring painting or patching for repair.	>2% and ≤15%	One window, door, or garage door failure	No	<5 impacts	No	No
<b>3. Moderate Damage</b> Major roof cover damage, moderate window breakage. Minor roof sheathing failure. Some resulting damage to interior of building from water.	>15% and ≤50%	> one and ≤ the larger of 20% & 3	1 to 3 panels	Typically 5 to 10 impacts	No	No
<b>4. Severe Damage</b> Major window damage or roof sheathing loss. Major roof cover loss. Extensive damage to interior from water.	>50%	> the larger of 20% & 3 and ≤50%	>3 and ≤25%	Typically 10 to 20 impacts	No	No
<b>5. Destruction</b> Complete roof failure and/or, failure of wall frame. Loss of more than 50% of roof sheathing.	Typically >50%	>50%	>25%	Typically >20 impacts	Yes	Yes

Source Hazus-MH Hurricane Technical Manual

As noted earlier in this profile, wind speeds associated with the 100-year MRP event are less than 50 mph, characteristic of a tropical cyclone or tropical storm. Peak gust wind speeds for the 500-year MRP range from 67 to 71 mph; wind speeds characteristic of a tropical storm and nearly a Category 1 hurricane. Because the estimated wind risk is low, there are mainly minor structural damages estimated.

In summary, Hazus-MH MR4 does not estimate any structural damage as a result of the 100-year MRP event. Hazus-MH MR4 only estimates minor building damage to the residential occupancy class as a result of the 500-year event. Because of differences in building construction, residential structures are generally more susceptible to wind damage than commercial and industrial structures. Mobile homes are particularly vulnerable to severe storms and wind damage. According to Hazus-MH MR4, there are a total of 3,126 mobile homes in the study area with a structural replacement value of approximately \$37,000 each. Of the nearly \$2.5 million in structural damage estimated as a result of the 500-year event, approximately \$120,561 is estimated damage to manufactured homes (mobile homes) in Fulton County.

**Table 3.11n** summarizes the general building stock damage estimated by Hazus-MH MR4 for the 100- and 500-year MRP hurricane events for the County as a whole. **Table 3.11o** summarizes the general building stock damage estimated for the 100- and 500-year MRP



hurricane events for each participating municipality. The data shown in both tables indicate total losses associated with wind damage to building structure only. The damage estimates include buildings damaged at all severity levels from minor damage to total destruction and the total dollar damage reflects the overall impact to buildings at an aggregate level. In addition, the annualized losses were examined for Fulton County; see **Table 3.11p**. Please note that annualized loss does not predict what losses will occur in any particular year.

**Table 3.11n: Estimated Fulton County Building Replacement Value (Structure Only) Damaged by the 100-Year and 500-Year MRP Winds**

Occupancy Category	Building Value Damage (Structure Only)	
	100-Year	500-Year
Residential	\$0	\$2,287,762
Commercial	\$0	\$56,996
Industrial	\$0	\$24,066
Agricultural, Religious Government, Education	\$0	\$24,941

Source: Hazus-MH MR4/ Note: These totals include Fulton County and the entire Village of Dolgeville

**Table 3.11o: Estimated Building Value (Structure Only) Damaged by the 100-Year and 500-Year MRP Winds**

Municipality	Total (All Occupancy Classes)		Percentage of Total Building Value		Residential Buildings		Commercial Buildings		Industrial Buildings	
	100 Yr	500 Yr	100 Yr	500 Yr	100 Yr	500 Yr	100 Yr	500 Yr	100 Yr	500 Yr
Bleecker (T)	\$0	\$32,793	0	0.1	\$0	\$32,501	\$0	\$201	\$0	\$51
Broadalbin (T)	\$0	\$161,007	0	0.1	\$0	\$157,972	\$0	\$1,483	\$0	\$350
Broadalbin (V)	\$0	\$40,379	0	0.0	\$0	\$37,203	\$0	\$1,496	\$0	\$565
Caroga (T)	\$0	\$130,892	0	0.1	\$0	\$129,431	\$0	\$899	\$0	\$127
Dolgeville (V) <sup>(1)</sup>	\$0	\$73,082	0	0.0	\$0	\$68,922	\$0	\$2,220	\$0	\$1,082
Ephratah (T)	\$0	\$51,763	0	0.1	\$0	\$51,194	\$0	\$395	\$0	\$174
Gloversville (C)	\$0	\$561,542	0	0.1	\$0	\$531,812	\$0	\$17,435	\$0	\$8,123
Johnstown (C)	\$0	\$411,809	0	0.1	\$0	\$381,299	\$0	\$17,473	\$0	\$8,636
Johnstown (T)	\$0	\$309,665	0	0.1	\$0	\$298,035	\$0	\$6,034	\$0	\$1,978
Mayfield (T)	\$0	\$223,123	0	0.1	\$0	\$217,506	\$0	\$4,003	\$0	\$805
Mayfield (V)	\$0	\$26,211	0	0.0	\$0	\$24,912	\$0	\$535	\$0	\$116
Northampton (T)	\$0	\$109,185	0	0.1	\$0	\$108,088	\$0	\$900	\$0	\$105
Northville (V)	\$0	\$50,115	0	0.1	\$0	\$48,326	\$0	\$1,118	\$0	\$120
Oppenheim (T)	\$0	\$47,425	0	0.1	\$0	\$45,321	\$0	\$734	\$0	\$1,000
Perth (T)	\$0	\$125,317	0	0.1	\$0	\$122,379	\$0	\$1,914	\$0	\$821
Stratford (T)	\$0	\$33,222	0	0.1	\$0	\$32,860	\$0	\$157	\$0	\$12
<b>Fulton County</b>	<b>\$0</b>	<b>\$2,387,530</b>	<b>0</b>	<b>0.1</b>	<b>\$0</b>	<b>\$2,287,762</b>	<b>\$0</b>	<b>\$56,996</b>	<b>\$0</b>	<b>\$24,066</b>

Source: Hazus-MH MR4

Notes:

1. Values represent values (RV) for building structure only (does not include contents).
2. The valuation of general building stock and the loss estimates determined in Fulton County were based on the default general building stock database provided in Hazus-MH MR4. The general building stock valuations provide in HAZUS-MH MR4 are Replacement Cost Value from RSMMeans as of 2006.
3. These values represent the entire Village of Dolgeville.



**Table 3.11p: Summary of Estimated Annualized Wind General Building Stock Losses for Fulton County**

Municipality	Total (Buildings + Contents)	Buildings	Contents
Bleecker (T)	\$341	\$297	\$22
Broadalbin (T)	\$2,699	\$2,356	\$146
Broadalbin (V)	\$783	\$633	\$54
Caroga (T)	\$1,381	\$1,197	\$89
Dolgeville (V) <sup>(2)</sup>	\$650	\$520	\$60
Ephratah (T)	\$410	\$347	\$31
Gloversville (C)	\$9,559	\$7,349	\$1,025
Johnstown (C)	\$6,608	\$4,951	\$824
Johnstown (T)	\$3,750	\$3,037	\$381
Mayfield (T)	\$3,117	\$2,668	\$207
Mayfield (V)	\$364	\$309	\$22
Northampton (T)	\$1,699	\$1,467	\$109
Northville (V)	\$828	\$699	\$59
Oppenheim (T)	\$417	\$336	\$40
Perth (T)	\$2,045	\$1,752	\$130
Stratford (T)	\$266	\$223	\$20
<b>Fulton County</b>	<b>\$34,917</b>	<b>\$28,141</b>	<b>\$3,217</b>

Source: Hazus-MH MR4

Notes:

(1) The valuation of general building stock and the loss estimates determined in Fulton County were based on the default general building stock database provided in Hazus-MH MR4. The general building stock valuations provided in Hazus-MH MR4 are Replacement Cost Value from RSMeans as of 2006.

(2) These values represent the entire Village of Dolgeville.

Residential buildings account for a majority of the building stock damage and also comprise the majority of the building inventory. Because of differences in building construction, residential structures are generally more susceptible to wind damage than commercial and industrial structures. **Figure 3.11j** shows the density of damage estimated for residential structures for the 500-year MRP event. As anticipated, Hazus estimates the most damage within the populated and built environments in the County.

Based on historical events and damages to Fulton County, Hazus appears to be underestimating the damages the County and its municipalities incur as a result of severe storm events.



*Impact on Critical Facilities*

**100-Year MRP Event** – Hazus-MH estimates the hospital, police departments, fire stations and schools will not suffer damage during a 100-year event. All facilities are estimated to be fully functional (no loss of use). Hazus-MH MR4 does not estimate damages to utilities or transportation features. **500-Year MRP Event** – Hazus-MH estimates the hospital, police departments, fire stations and schools have less than one-percent chance of suffering minor damage during a 500-year event. All facilities are estimated to be fully functional (no loss of use). Hazus-MH MR4 does not estimate damages to utilities or transportation features.

*Impact on Economy*

Severe storms also have impacts on the economy, including: loss of business function, damage to inventory, relocation costs, wage loss and rental loss due to the repair/replacement of buildings. Hazus-MH estimates the total economic loss associated with each storm scenario (direct building losses and business interruption losses). Direct building losses are the estimated costs to repair or replace the damage caused to the building. This is reported in the Impact on General Building Stock sub-section discussed earlier (\$2,387,530). Business interruption losses are the losses associated with the inability to operate a business because of the damage sustained during the storm.

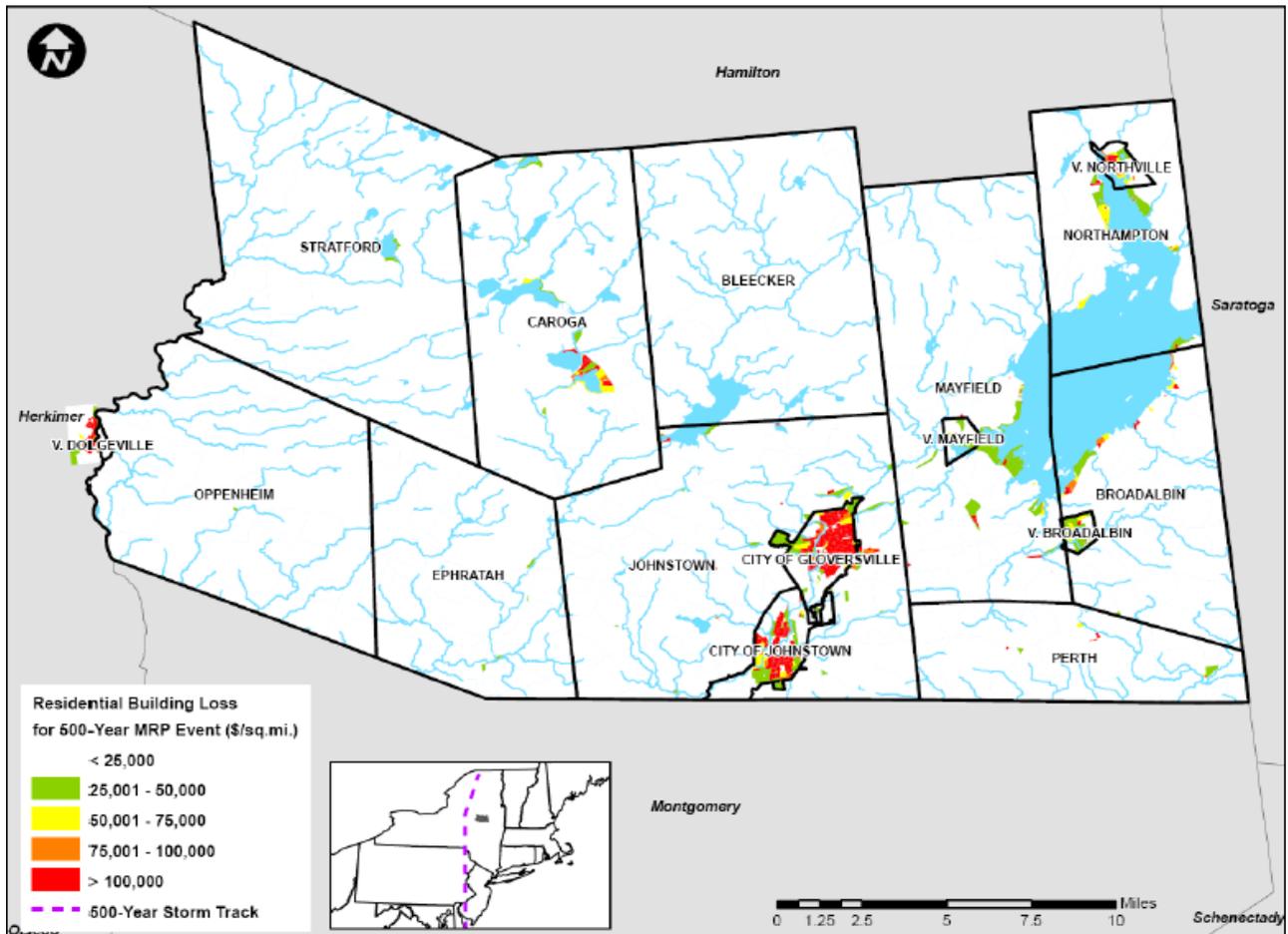
Hazus-MH MR4 does not estimate that any commercial or industrial business interruption loss will occur for the 100-year MRP event. For the 500-year MRP event, Hazus-MH estimates a loss of approximately \$24,380 for the study area as a whole; associated with relocation and rental costs for residential and commercial occupancy classes. Therefore, the total building related economic losses to Fulton County is estimated at nearly \$2.5 million (\$2,387,530 in direct building losses and \$24,380 in business interruption losses).

Transportation lifelines are not considered particularly vulnerable to the 100- and 500-year MRP severe storm wind hazard. However, utility structures could suffer damage associated with falling tree limbs or other debris. Such impacts can result in the loss of power, which can impact business operations and can impact heating or cooling provision to citizens (including the young and elderly, who are particularly vulnerable to temperature-related health impacts).

It is estimated that the impact to the economy, as a result of a severe storm event, would be considered “low” in accordance with the risk ranking shown in Section 5.3.



**Figure 3.11j: Density of Losses for Residential Structures (Structure Only) for the 500-Year MRP Wind Event**



Source: HAZUS-MH MR4

*Future Growth and Development*

As discussed in Section 4, areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by the severe storm hazard because the entire planning area is exposed and vulnerable. For the severe storm hazard, the entire County has been identified as the hazard area. Please refer to Section 4 (County Profile) and each municipality’s annex (Section 9) for maps that illustrate where potential new development is located in relation to Fulton County’s hazard areas.



## Development in hazard prone areas

At the local level, jurisdictions have recognized their susceptibility of the occurrence of a high wind event. Although some counties seem to have higher occurrences than others the mitigating trend appears to be strictly enforcing building codes and instituting new measures that would call for the use of high wind resistant materials, hurricane clips, and wind shutters. For Instance, Nassau County has assessed their risk and exposure and although the likelihood of a tornado hitting Nassau is low their exposure is very high. They plan to limit their exposure to wind damage by strictly enforcing their building codes. Another step they are considering is requiring safe rooms in mobile home parks.

*Found below is a sampling from Nassau County's future developments trends-overview from their current risk assessment. As well as an analysis that includes specific details on severe wind events and the future developments for this county.*

### Future Development Trends - Overview

The future land use plan for Nassau County is based on the County's existing and established downtowns and Centers, preferred development patterns, existing and proposed transportation systems and environmental features in the County. For the future, the County Comprehensive Plan recommends, in general:

- Higher intensity development generally located in areas which currently have a more dense or suburbanized character and contain adequate infrastructure, especially where such areas have access to mass transit, major roads, public sanitary sewers and water supply.
- Lower intensity development is recommended for those areas of the County which presently have a low or very low density character and more limited infrastructure capacity.
- Development of vacant parcels
- Redevelopment of currently developed parcels (wherein a site with existing buildings and/or other infrastructure is developed with new uses, new buildings, new infrastructure, or new activities)
- Redevelopment of Brownfields sites
- Transit Oriented Development
- Increased retail development. Households in Nassau County have higher than average disposable incomes, and market research generally supports the need for and sustainability of additional retail development.
- Increased office development. The Comprehensive plan notes a growth in the

County's employment combined with the further expansion of service industries in the economy and relocations of companies from New York City to the suburbs will continue to drive the need for new office space in the future. Demand is expected to be modest and not likely to increase until existing vacant office space has been more fully utilized.



### Future Development Trends – Extreme Winds

The wind hazard area encompasses the entire County and is uniform from one jurisdiction to the next. Therefore, future development trends for the wind hazard area would be the same as those county-wide, as discussed under “Overview” earlier in this section.

Maximum sustained wind speeds are estimated to be approximately 10-20 miles per hour higher in southern Nassau County than in northern Nassau County. While northern areas of the county have more vacant land, development pressures have tended to be higher along southern areas of the County so it is likely that future development in the wind hazard area will increase, and will increase to the greatest extent in areas in southern Nassau County. However, new development will be built to a code which provides some degree of protection from the effects of high winds.

#### 3.11.3 Assessing Vulnerability and Losses of State Facilities

Although state agencies maintain internal databases that identify location and value of properties within their areas of responsibility, New York State does not currently have a comprehensive data set of state-owned and operated assets that can be integrated into the GIS methodology for analysis. However, a state facilities inventory project was initiated in August 2013, which will gather information that can be used to building a comprehensive data set. The pilot phase, which will look at a specific critical facility category and develop the methodology for the project, is expected to be complete in mid-2014. At that time, the next phase of the project will be developed for what is anticipated to be a multi-year project. Found in **Section 3.1.6** is a full description of the current status and data limitations to state-owned facilities and critical infrastructures for New York State.

**Tables 3.11q** and **3.11r** presents the result of the wind hazard vulnerability assessment and loss analysis for State facilities. The results present a gross estimate of potential wind losses to those identified vulnerable State facilities in terms of dollar value of exposed property. The wind hazard vulnerability analysis and loss estimation methodology was supported by GIS technology and involved collaboration with key State agencies that resulted in the identification of two State databases that provide key facility information. The NYS Offices of General Services (OGS) fixed asset database and Office of Cyber Security (OCS) database included fields that provide coordinate location information and building replacement value in dollars.

The analysis process involved creation of a GIS mapping layer showing facility location using the coordinate information and overlaid on a wind hazard layer developed using the FEMA Wind-Zone map data. The Mitigation Planning Committee acknowledges its applicability may not be appropriate beyond a general indication and believes the analysis results may best be used to help target those facilities that might benefit from further analysis. Future analysis may include expressing potential loss based on historical wind loss events; continued application of GIS technology; use of Hazus-MH 2.0 wind loss estimation software created by FEMA; and continued collaboration among state agency



representatives in order to collect site and facility specific information that may improve the integrity of the wind vulnerability analysis.

**Table 3.11q: Wind Hazard Exposure – FEMA Wind Zone 2 (up to 160mph) New York**

<b>Zone 2 (up to 160 mph)</b>		
<b>State Agency</b>	<b>No. of Buildings</b>	<b>Replacement Cost</b>
<b>Office of General Services (OGS)</b>	168	\$3,056,099,149
<b>Department of Health (DOH)</b>	61	\$132,907,384
<b>Department of Corrections and Community Supervision (DOCCS)</b>	2,875	\$1,671,012,105
<b>Office of Parks, Recreation and Historic Preservation (OPRHP)</b>	3,188	\$727,259,801
<b>Department of Environmental Conservation (DEC)</b>	1,630	\$141,507,005
<b>Office of Mental Health (OMH)</b>	543	\$1,198,167,513
<b>Office of People with Developmentally Disabilities (OPWDD)</b>	839	\$571,205,643
<b>Division of State Police (DSP)</b>	28	\$40,112,676
<b>Department of Military and Naval Affairs (DMNA)</b>	79	\$166,232,880
<b>Department of Transportation (DOT)</b>	627	\$188,791,740
<b>Office of Child and Family Services (OCFS)</b>	162	\$85,210,294
<b>Dormitory Authority DASAS</b>	4	\$9,663,947
<b>New York State Unified Court System (COURTS)</b>	1	\$5,132,214
<b>Department of Labor (DOL)</b>	3	\$42,742,595
<b>Department of Education (EDU)</b>	11	\$220,871,235
<b>Adirondack Park Agency (APA)</b>	1	\$550,696
<b>Total</b>	<b>10,220</b>	<b>\$8,257,466,877</b>

Source: FEMA, OGS



**Table 3.11r: Wind Hazard Exposure – FEMA wind Zone 3 (up to 200mph) New York State Agency Facilities**

<b>Zone 3 (up to 200 mph)</b>		
<b>State Agency</b>	<b>No. of Buildings</b>	<b>Replacement Cost</b>
<b>Office of General Services (OGS)</b>	7	\$47,515,267
<b>Department of Health (DOH)</b>	2	\$4,018,999
<b>Department of Corrections and Community Supervision (DOCCS)</b>	1,287	\$943,517,798
<b>Office of Parks, Recreation and Historic Preservation (OPRHP)</b>	1,884	\$183,611,265
<b>Department of Environmental Conservation (DEC)</b>	247	\$24,896,945
<b>Office of Mental Health (OMH)</b>	82	\$200,251,446
<b>Office of People with Developmentally Disabilities (OPWDD)</b>	605	\$304,824,365
<b>Division of State Police (DSP)</b>	10	\$7,037,269
<b>Department of Military and Naval Affairs (DMNA)</b>	36	\$62,667,227
<b>Department of Transportation (DOT)</b>	322	\$138,353,454
<b>Office of Child and Family Services (OCFS)</b>	81	\$47,866,025
<b>Other Agencies*</b>	1	\$1,308,551
<b>Department of Education (EDU)</b>	9	\$15,740,648
<b>Department of Agriculture and Markets (AG&amp;MKTS)</b>	94	\$70,624,039
<b>Department of State (DOS)</b>	4	\$6,308,976
<b>Total</b>	<b>4,671</b>	<b>\$2,058,542,274</b>

Source: FEMA, OGS



### 3.11.4 Data Limitations and Other Key Documents

The Mitigation Planning Team researched the tornado hazard and its effects on New York State. Contents of this section resulted from research and outreach including the following sources:

- The National Oceanic and Atmospheric Administration (NOAA), National Climatic Data Center, <http://www.outlook.noaa.gov/tornadoes/>
- The National Climatic Data Center, Storm Events Database, <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>
- TornadoProject.com, <http://www.tornadoproject.com/>
- Spatial Hazard Events and Losses Database for the United States (SHELDUS™)
- Fulton County Local Hazard Mitigation Plan <http://www.fultoncountyny.gov/hazard/hazmit.html>

**Please note:** data obtained from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™) is a county-level hazard data set for the U.S. for 18 different natural hazard event types such as thunderstorms, hurricanes, floods, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data derives from the national data source, National Climatic Data Center's monthly Storm Data publications. Using the latest release of SHELDUS™ 12.0, the database includes every loss causing and/or deadly event between 1960 through 1992 and from 1995 onward. Between 1993 and 1995, SHELDUS™ reflects only events that caused at least one fatality or more than \$50,000 in property or crop damages.

#### Additional Data and Next Steps for Fulton County

Over time, Fulton County will obtain additional data to support the analysis of this hazard. Data that will support the analysis would include additional detail on past hazard events and impacts, additional information on estimated frequency of these events, and future data regarding events and damages as they occur. In addition, information on particular buildings or infrastructure and their value will support updates regarding the particular assets in the County that are most vulnerable to severe storm (wind related) events. Additional utility data would support an improved assessment of potential damage for this infrastructure category.

For the severe storm events that cannot currently be directly modeled in Hazus-MH (tornado, thunderstorm, etc.), additional detailed loss data from past and future events will assist in assessing potential future losses. Based on these values and a sufficient number of data points, future losses could be modeled. Alternately, percent of damage estimates could be made and multiplied by the inventory value to estimate potential losses. This methodology is based on FEMA's How To Series (FEMA 386-2), Understanding Your Risks, Identifying and Estimating Losses (FEMA, 2001) and FEMA's Using Hazus-MH for Risk Assessment (FEMA 433) (FEMA, 2004). Finally, with time, Hazus-MH will be released with modules that address hurricane wind and associated flooding as one model and will include a tornado module. As this version of Hazus-MH is released, the County can run



analyses for the tornado hazard and re-run an analysis for an overall picture of the hurricane-associated wind and flood damages.<sup>2</sup>



## Section 3.12: HURRICANE

*(Tropical/ Coastal Storms/ Nor'easter)*

### 2014 SHMP Update

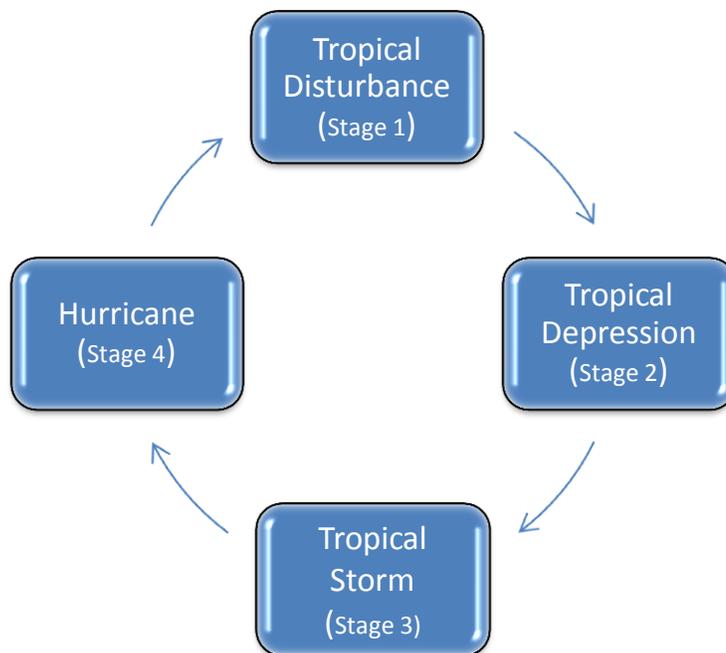
- Reformatted 2011 Mitigation Plan into 2014 Update outline
- Added Tropical Storms, Coastal Storms, & Nor'easter hazards to Hurricane Profile
- Added new key terms to 2011 Mitigation Plan's list of terms
- Updated past hurricane occurrences section
- Inserted Events and Losses table
- Inserted new Hurricane Events and Property Losses maps
- Added information on New York Bight
- Added active State development projects

### 3.12.1 Hurricane (Tropical/ Coastal Storms/ Nor'easters) Profile

Coastal storms, including Nor'easters, tropical storms, and hurricanes can, either directly or indirectly, impact all of New York State. More densely populated and developed coastal areas, such as New York City, are the most vulnerable to hurricane-related damages.

Before a storm is classified a hurricane, it must pass through four distinct stages: tropical disturbance, tropical depression, tropical storm and lastly a hurricane.

**Figure 3.12a: Four Stages of a Hurricane**



**Characteristics**

Below are some key terms to review relating to hurricanes, tropical storms, coastal storms and nor'easters:

Hazard	Key Terms and Definition
<b>Hurricane</b>	<ul style="list-style-type: none"> <li>• <u>Nor'easter</u>- An intense storm that can cause heavy rain and snow, strong winds, and coastal flooding. Nor'easters have cold, low barometric cores</li> <li>• <u>Tropical Storm</u>- An organized system of strong thunderstorms with a defined surface circulation and maximum sustained winds of 39-73mph</li> <li>• <u>Tropical Cyclone</u>- An organized, rotating, low-pressure weather system of clouds and thunderstorms that develops in the tropics</li> <li>• <u>Tropical Depression</u>- A tropical cyclone with sustained winds of 38 mph or less</li> <li>• <u>Hurricane</u>- Tropical cyclones, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74mph or more and blow in a large spiral around a relatively calm center or "eye". Circulation is counterclockwise in the Northern Hemisphere</li> <li>• <u>Storm Surge</u>- A dome of water pushed on shore by hurricane and tropical storm winds Storm surges can reach 25 feet high and be 50-100 miles wide</li> <li>• <u>Storm Watch</u>- A warning issued by the National Weather Service indicating that Hurricane/ Tropical Storm are possible in the specified area, usually within 36 hours</li> <li>• <u>Storm Warning</u>- A warning issued by the National Weather Service indicating that Hurricane/ Tropical Storm conditions are expected in the specified area usually within 24 hours</li> </ul>

**Nor'easters**

Nor'easter storms usually form off the East Coast near the Carolinas then follow a track northward along the coast until they blow out to sea, hence the term "Northeaster." Consequently, extreme cold and heavy snowfall can immobilize the entire state causing road closures, power outages, disruption in communication services, and no heat for several days.

Occasionally these storms are large enough to cover almost the entire State. One such storm was the Blizzard of 1993. Most often, however, Nor'easters affect primarily eastern and southern New York. Nor'easters are most notable for snow accumulations in excess of nine (9) inches, accompanied by high, sometimes gale force, winds, and storm surges which cause severe flooding along the Long Island coastline. Bronx, Kings, Nassau, New York, Queens, Richmond and Suffolk Counties (Region I) were all severely impacted by Hurricane Sandy, the second costliest impacted by one of the largest Nor'easters in 2012.



Nor'easters can cause beach erosion and structural damage as a result of heavy snow, rain and enormous waves that come along with these intense storms. Wind gusts associated with nor'easters can exceed hurricane strength in intensity. Unlike tropical cyclones (including tropical depressions, tropical storms and hurricanes), nor'easters encompass a cold core of low barometric pressure. Their strongest winds are close to the earth's surface and they often measure several hundred miles across. Additionally, nor'easters can produce low-level storm surges, which place the areas along the immediate coastline at a greater risk of coastal flooding.

### **Tropical Cyclones**

A tropical cyclone, developed in the tropics, is an organized rotating weather system. They begin as a tropical depression with sustained winds below 38 mph, they can potentially develop into a tropical storm (with sustained winds of 39 to 73 mph) or a hurricane (with winds of 74 mph and higher).

Tropical cyclones contain a warm core of low barometric pressure and can produce heavy rainfall, powerful winds, and storm surge. While generally these cyclones are less dangerous than hurricanes, tropical depressions, and tropical storms they can still be deadly. Heavy rains, coastal flooding, and severe weather, such as tornadoes, pose the most significant threat.

### **Hurricanes**

One of the most destructive types of storms is a hurricane which can last for extended time periods, vary in size, and carry wind speeds that can rip through trees, demolish homes and make loose objects deadly. Storm surges are the most serious hurricane-related hazard. Storm surges combined with normal high tides can create hurricane storm tides, in excess of 25 feet above the average water level. In addition, wind driven waves are superimposed on the storm tide. The rise in water level can cause severe inundation in coastal areas, particularly when storm tides coincide with normal high tides. The typical hurricane season begins in the summer during the month of June and last until November. Hurricanes form in the warm tropical waters of the Atlantic Ocean, Caribbean Sea, or Gulf of Mexico, and make their presences at any point of an active hurricane season.

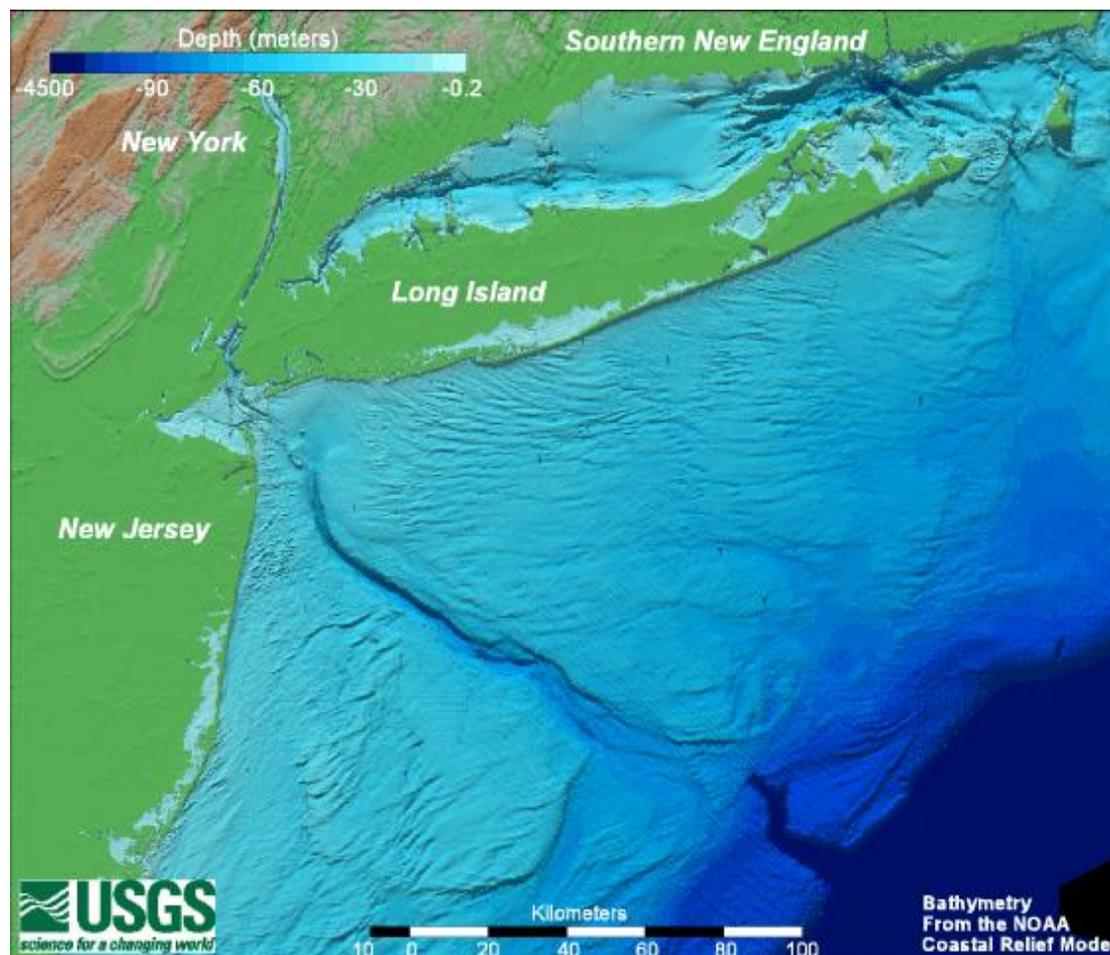
### **Coastal Storms**

Coastal Storms can take form and occur over the course of an entire year. All coastal regions experience coastal storms of some sort and are likely susceptible to storm-related damages and/ or losses. On average during an active hurricane season there are approximately 11 named storms, including six hurricanes, two of which are major events. The coastal regions of the State are more susceptible to hurricanes largely due to their geographical location. New York City, in particular, is vulnerable to storm surges because of a physical characteristic referred to as the *New York Bight*. A bight is a curve in the



shoreline of an open coast that funnels and increases the speed and intensity of storm surge. The Bight is found at the point where the States of New York and New Jersey meet, forming a right angle along the coastline (Shown below in **Figure 3.12b**).

**Figure 3.12b: New York State Bight**



Source: USGS, NOAA

Hurricane classifications are determined by the Saffir-Simpson Scale. The National Hurricane Center (NHC) defines the Saffir-Simpson Hurricane Scale as a 1-5 rating based on a hurricane's present intensity (See **Table 3.12a** below). This is used to give an estimate of the potential property damage and flooding expected along the coast upon a hurricane's landfall. Wind speed is the determining factor in this scale, as storm surge values are highly dependent on the slope of the continental shelf and the shape of the coastline, in the landfall region.

**Table 3-12a: Saffir- Simpson Hurricane Scale**

<b>Saffir-Simpson Hurricane Scale</b>				
<b>Category</b>	<b>Storm Surge (ft.)</b>	<b>Winds (mph)</b>	<b>Damage</b>	<b>Damage Description</b>
1	6.1-10.5	74-95	Moderate	<ul style="list-style-type: none"> <li>• Damage primarily to trees and unanchored homes</li> <li>• Some damage to poorly constructed signs</li> <li>• Coastal road flooding</li> </ul>
2	13.0- 16.6	96-110	Moderate-Severe	<ul style="list-style-type: none"> <li>• Some roofing material, door, and window damage to buildings</li> <li>• Considerable damage to shrubbery and trees</li> <li>• Flooding of low-lying areas</li> </ul>
3	14.8-25	111-130	Extensive	<ul style="list-style-type: none"> <li>• Some structural damage to residences and utility buildings</li> <li>• Foliage blown off trees and large trees blown down</li> <li>• Structures close to the coast will have structural damage by floating debris</li> </ul>
4	24.6-31.3	131-155	Extreme	<ul style="list-style-type: none"> <li>• Curtainwall failures with utilities and roof structures on residential buildings</li> <li>• Shrubs, trees, and signs all blown down</li> <li>• Extensive damage to doors and windows</li> <li>• Major damage to lower floors of structures near the shore</li> </ul>
5	Not predicted	>155	Catastrophic	<ul style="list-style-type: none"> <li>• Complete roof failure on many residences and industrial buildings</li> <li>• Some complete building and utility failures</li> <li>• Severe, extensive window and door damage</li> <li>• Major damage to lower floors of all structures close to shore</li> </ul>



## Location

Hurricane risk in the United States extends along the entire east coast from Maine to Florida, the Gulf Coast (including Florida, Alabama, Louisiana, and Texas), and Hawaii. Hurricanes and tropical storms are the two major types of storm events that generally impact the State's marine coastline and adjacent inland areas. According to the NCH the United States is currently in a period of heightened hurricane activity which began around 1995 and is expected to last for at least another decade.

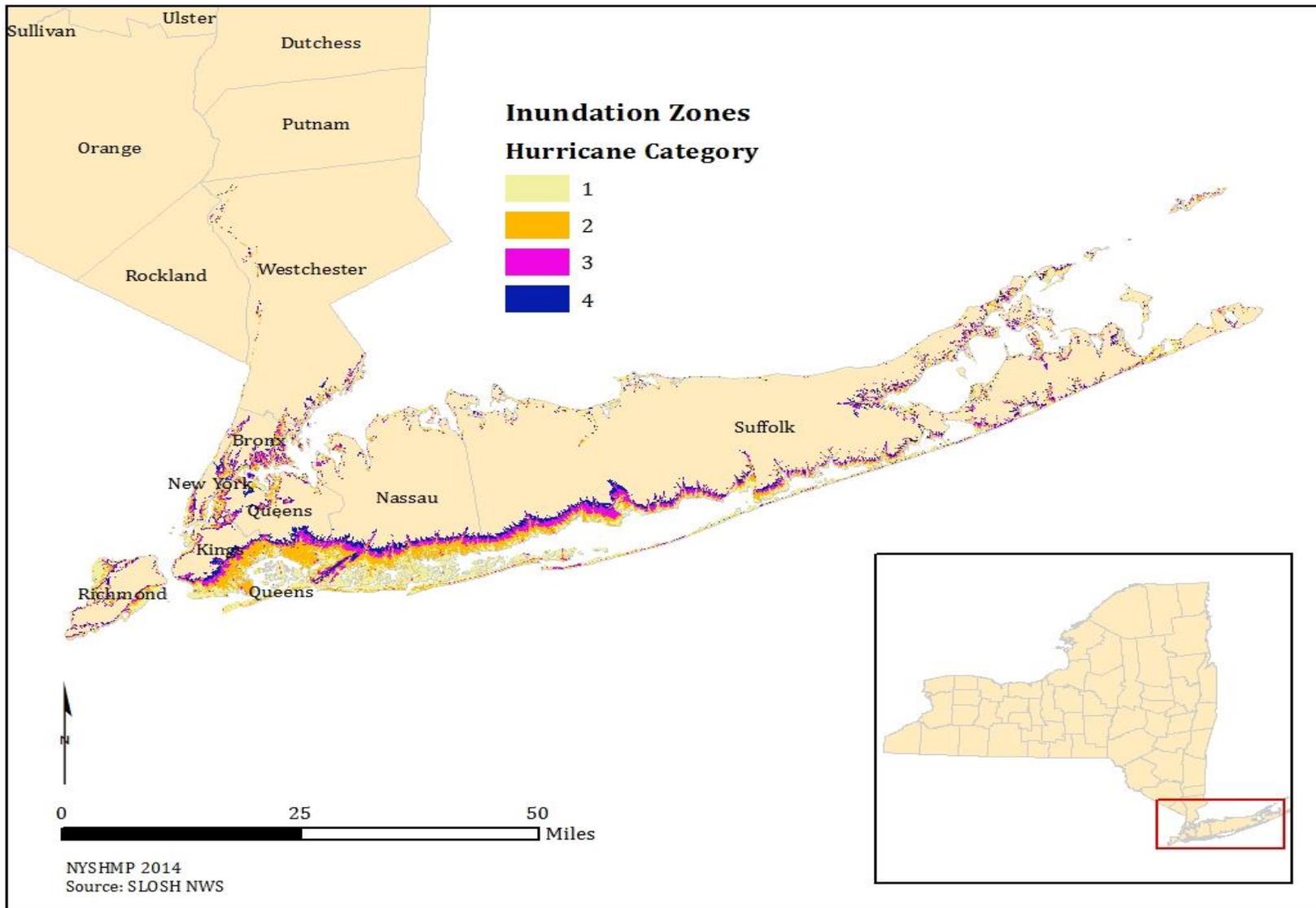
The Office of Emergency Management (OEM) utilizes a computer based model that hypothetically generates the effects of storm surges, as well as assist with planning efforts for coastal storms that is known as SLOSH (Sea, Lake, and Overland Surges from Hurricanes). This model computes storm surges based on storm movement in varying directions and strengths. SLOSH models analyze storms moving northeast, northwest, and changing in strength from Category 1 to Category 4.

SLOSH calculations are based on storm surges reaching above average tides and strong potential winds for each category storm. The error of this model ranges between plus or minus three feet. Furthermore, the SLOSH model can compute inundation levels for specific locations as if a hurricane hit head-on. These findings from the SLOSH model are based on a "worst-case" scenario for storm surge.

**Figure 3.12c** shows hurricane storm surge zones for the southern coast of New York. Inundation zones were developed using NOAA's Sea, Lake and Overland Surge from Hurricanes (SLOSH) model projections to show what areas would be inundated for specific hurricane categories.



Figure 3.12c: Storm Surge in Coastal New York

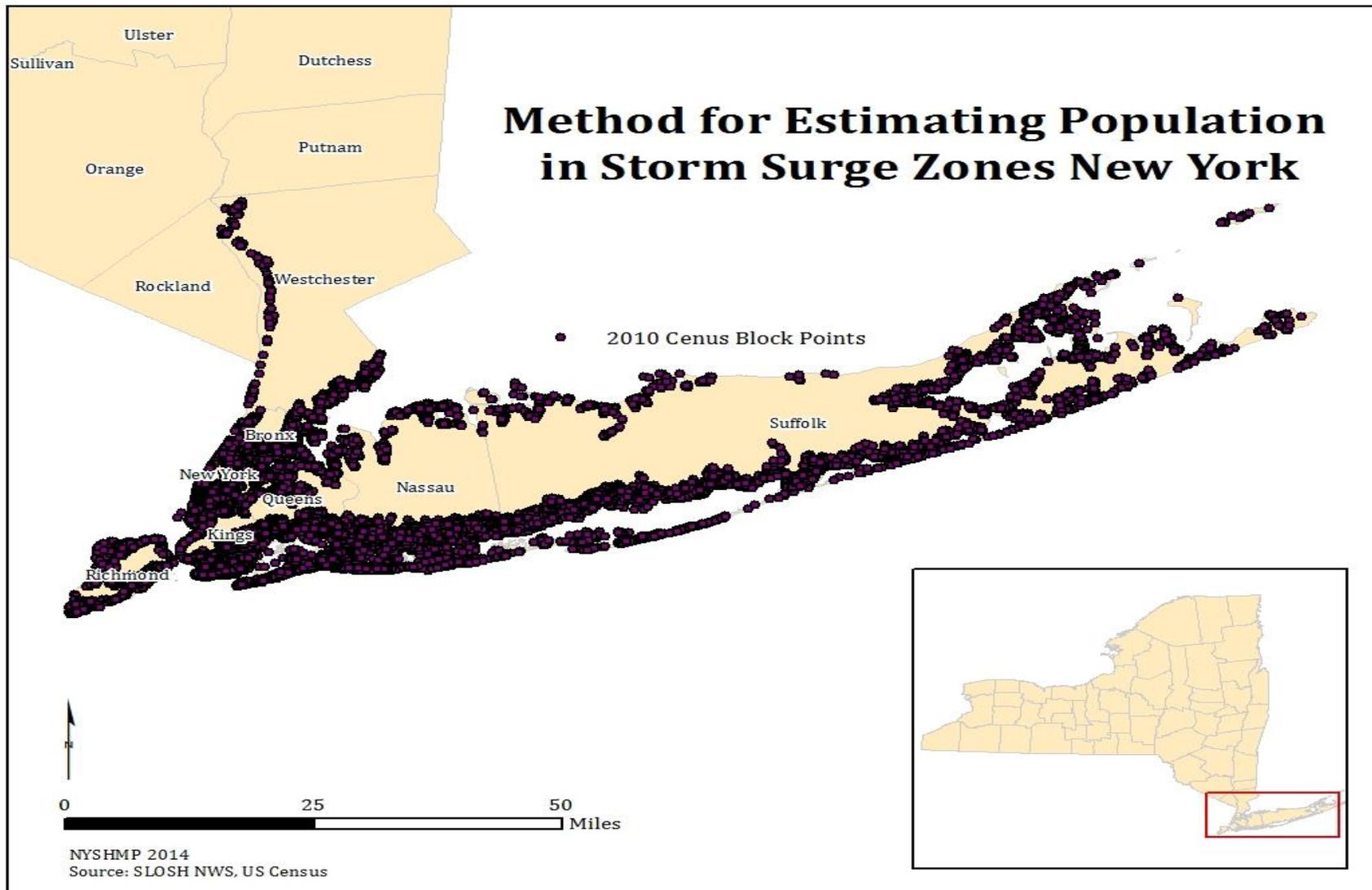


The data generated through SLOSH illustrates that the five boroughs of New York City, Nassau, and Suffolk Counties were the primary areas affected; however, areas north of Rockland and Westchester Counties have not been mapped for SLOSH surge zones. The map provides a visual representation of New York State's physical vulnerabilities. It is important to note that upstate counties found along the Hudson River including Rockland, Westchester, Orange, Putnam, Dutchess, Ulster, and Albany also experienced storm surge inundations as a result of Hurricane Sandy.

**Figure 3.12d** show the methodology to estimate population in storm surge zones, based on a GIS overlay analysis of US Census Block Points and the SLOSH model.



Figure 3.12d: New York State Coastal Storm Surge



**Table 3.12b** provides the result of the analysis shown above, with estimated population that would be affected by hurricane storm surge for particular hurricane category events.

**Table 3.12b: Estimated Population in Storm Surge Zones**

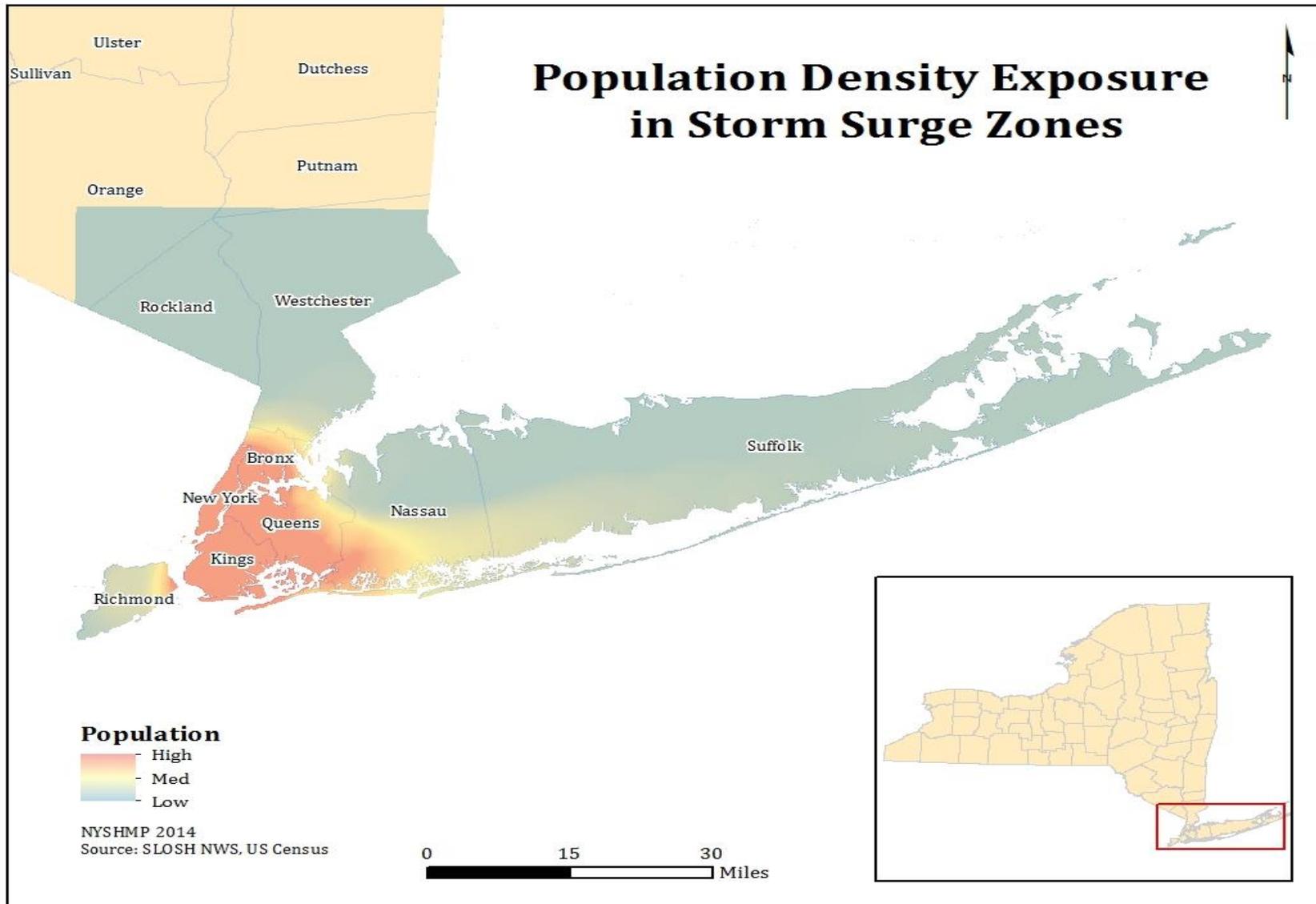
Storm Zone	Population
Category 1	517,940
Category 2	1,549,103
Category 3	2,429,424
Category 4	3,225,374

(Category 2-4 Inclusive of Proceeding Storm Surge)

**Figure 3.12e** and **Table 3.12b** also provide the result of the GIS analysis shown above, but show population in surge zones by county as a population density analysis from the block points.



Figure 3.12e: Population Density Exposure in Storm Surge Zones



## Previous Hurricane (Tropical/ Coastal Storms/ Nor'easter) Occurrences

Since 2011, the State of New York has experienced a tropical storm, two hurricanes, two mandatory evacuation ordinances, and billions of dollars in damages. Considering Hurricane Sandy alone, the governor's office estimates that 305,000 homes have been destroyed primarily from storm surges. New York City's Office of Management and Budget, appraises the total damage including private, public, and indirect cost to be \$19 billion (\$4.5 billion to city agencies; \$5 billion to New York City Metropolitan Transit Authority (MTA), and \$2.5 billion in supplementary transportation infrastructure). In addition, the New York Stock Exchange experienced the longest shutdown since the Blizzard of 1888, closing for two consecutive days. Flood waters reached several feet high in areas of Manhattan, Brooklyn, and Long Island. The data expounded in this section was gathered from a compilation of sources deriving from FEMA, SHELUS, and Hazus-MH 2.1

Represented below in **Table 3.12c** are hurricane, tropical storm, and severe wind events previously declared as major disaster actions in the State of New York between 1954 and 2013. The damages consist of coastal and riverine flooding, as well as wind damage primarily affecting trees and electric power lines. Note that a number of the following Federal Disaster Declaration requests were denied; one withdrawn, and one received SBA/USDA disaster declarations.



Table 3.12c: Historical Major Disaster Declarations from 1954 – 2012

Disaster Number	Date Declared	Incident Type	Location Affected
4085	10/30/2012	Hurricane Sandy	Bronx County, Greene County, Kings County, Nassau County, New York County, Orange County, Putnam County, Queens County, Richmond County, Rockland County, Suffolk County, Sullivan County, Ulster County and Westchester County.
4031	9/13/2011	Remnants of Tropical Storm Lee	Broome County, Chemung County, Chenango County, Delaware County, Herkimer County, Montgomery County, Oneida County, Orange County, Otsego County, Schenectady County, Schoharie County, Tioga County, Tompkins County and Ulster County.
4020	8/31/2011	Hurricane Irene	Albany County, Bronx County, Clinton County, Columbia County, Delaware County, Dutchess County, Essex County, Franklin County, Fulton County, Greene County, Hamilton County, Herkimer County, Kings County, Montgomery County, Nassau County, New York County, Orange County, Otsego County, Putnam County, Queens County, Rensselaer County, Richmond County, Rockland County, Saratoga County, Schenectady County, Schoharie County, Suffolk County, Sullivan County, Ulster County, Warren County, Washington County and Westchester County.
1869	12/31/2009	Severe Storms and Flooding Associated with Tropical Depression Ida and a Nor'easter	Nassau & Suffolk
1565	10/1/2004	Tropical Depression Ivan	Broome, Chenango, Delaware, Orange, Schoharie, Steuben, Sullivan, Tioga, & Ulster
1296	9/16/1999	Tropical Storm Floyd	Albany County, Essex County, Greene County, Nassau County, Orange County, Putnam County, Rockland County, Schoharie County, Suffolk County, Ulster County, Warren County and Westchester County
918	9/16/1991	Hurricane Bob	Suffolk County



Disaster Number	Date Declared	Incident Type	Location Affected
750	10/18/1985	Hurricane Gloria	Nassau, Suffolk
520	9/3/1976	Hurricane Belle	Nassau, Rensselaer, Suffolk
338	6/23/1972	Tropical Storm Agnes	Allegany County, Broome County, Cattaraugus County, Cayuga County, Chautauqua County, Chemung County, Chenango County, Livingston County, Madison County, Monroe County, Oneida County, Onondaga County, Ontario County, Orange County, Oswego County, Rockland County, Schuyler County, Seneca County, Steuben County, Tioga County, Tompkins County, Ulster County, Wayne County, Westchester County, Wyoming County and Yates County.
45	8/22/1955	Hurricane, Floods	None
26	10/7/1954	Hurricane	None

Source: FEMA





Found in **Table 3.12d**, **Figure 3.12g** and **Figure 3.12h** is a list of historical events and recent losses organized by county. In addition to hurricanes, the data displayed in Table 3-12d includes Tropical, Coastal Storms and Nor'easter occurrences from 1960 to 2012 that was extracted from SHELUDS, the Spatial Hazard Events and Loss Database for the United States. Suffolk County has had the greatest amount of losses in terms of property damage since 1960. Based on historical frequency, Suffolk County has also had the highest number of hurricane events to occur in the State.

**Table 3-12d: Hurricane Events and Losses by County**

Historical Record (1960-2012)							
County	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Albany	8	13	4	0	2	\$193,835	\$3,914
Allegany	2	52	1	0	0	\$8,065	\$0
Bronx	17	6	9	1	2	\$5,525,611	\$4,002,632
Broome	4	26	2	0	1	\$136,270	\$1,282
Cattaraugus	2	52	1	0	0	\$8,065	\$0
Cayuga	4	26	2	0	1	\$136,270	\$1,282
Chautauqua	2	52	1	0	0	\$8,065	\$0
Chemung	4	26	2	0	1	\$136,270	\$1,282
Chenango	4	26	2	0	1	\$136,270	\$1,282
Clinton	2	52	1	0	0	\$8,065	\$0
Columbia	8	13	4	0	2	\$193,835	\$3,914
Cortland	4	26	2	0	1	\$136,270	\$1,282
Delaware	4	26	2	0	1	\$136,270	\$1,282
Dutchess	10	10	5	0	2	\$193,835	\$3,914
Erie	2	52	1	0	0	\$8,065	\$0
Essex	2	52	1	0	0	\$8,065	\$0
Franklin	2	52	1	0	0	\$8,065	\$0
Fulton	4	26	2	0	1	\$136,270	\$1,282
Genesee	2	52	1	0	0	\$8,065	\$0
Greene	8	13	4	0	2	\$193,835	\$3,914



Historical Record (1960-2012)							
County	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Hamilton	4	26	2	0	1	\$136,270	\$1,282
Herkimer	6	17	3	0	2	\$167,520	\$1,282
Jefferson	4	26	2	0	1	\$136,270	\$1,282
Kings	17	6	9	2	2	\$5,494,361	\$4,002,632
Lewis	4	26	2	0	1	\$136,270	\$1,282
Livingston	2	52	1	0	0	\$8,065	\$0
Madison	4	26	2	0	1	\$136,270	\$1,282
Monroe	2	52	1	0	0	\$8,065	\$0
Montgomery	6	17	3	0	2	\$167,520	\$1,282
Nassau	19	5	10	2	2	\$7,994,361	\$6,502,632
New York	13	7	7	1	2	\$124,295	\$0
Niagara	2	52	1	0	0	\$8,065	\$0
Oneida	4	26	2	0	1	\$136,270	\$1,282
Onondaga	4	26	2	0	1	\$136,270	\$1,282
Ontario	4	26	2	0	1	\$136,270	\$1,282
Orange	12	9	6	2	2	\$200,245	\$3,914
Orleans	2	52	1	0	0	\$8,065	\$0
Oswego	4	26	2	0	1	\$136,270	\$1,282
Otsego	4	26	2	0	1	\$136,270	\$1,282
Putnam	15	7	8	0	2	\$5,825,245	\$4,003,914
Queens	15	7	8	1	2	\$5,494,361	\$4,002,632
Rensselaer	8	13	4	0	2	\$193,835	\$3,914
Richmond	13	7	7	1	2	\$119,361	\$2,632
Rockland	15	7	8	1	2	\$5,697,039	\$4,002,632
Saratoga	8	13	4	0	2	\$193,835	\$3,914
Schenectady	6	17	3	0	2	\$167,520	\$1,282
Schoharie	4	26	2	0	1	\$136,270	\$1,282
Schuyler	4	26	2	0	1	\$136,270	\$1,282
Seneca	4	26	2	0	1	\$136,270	\$1,282

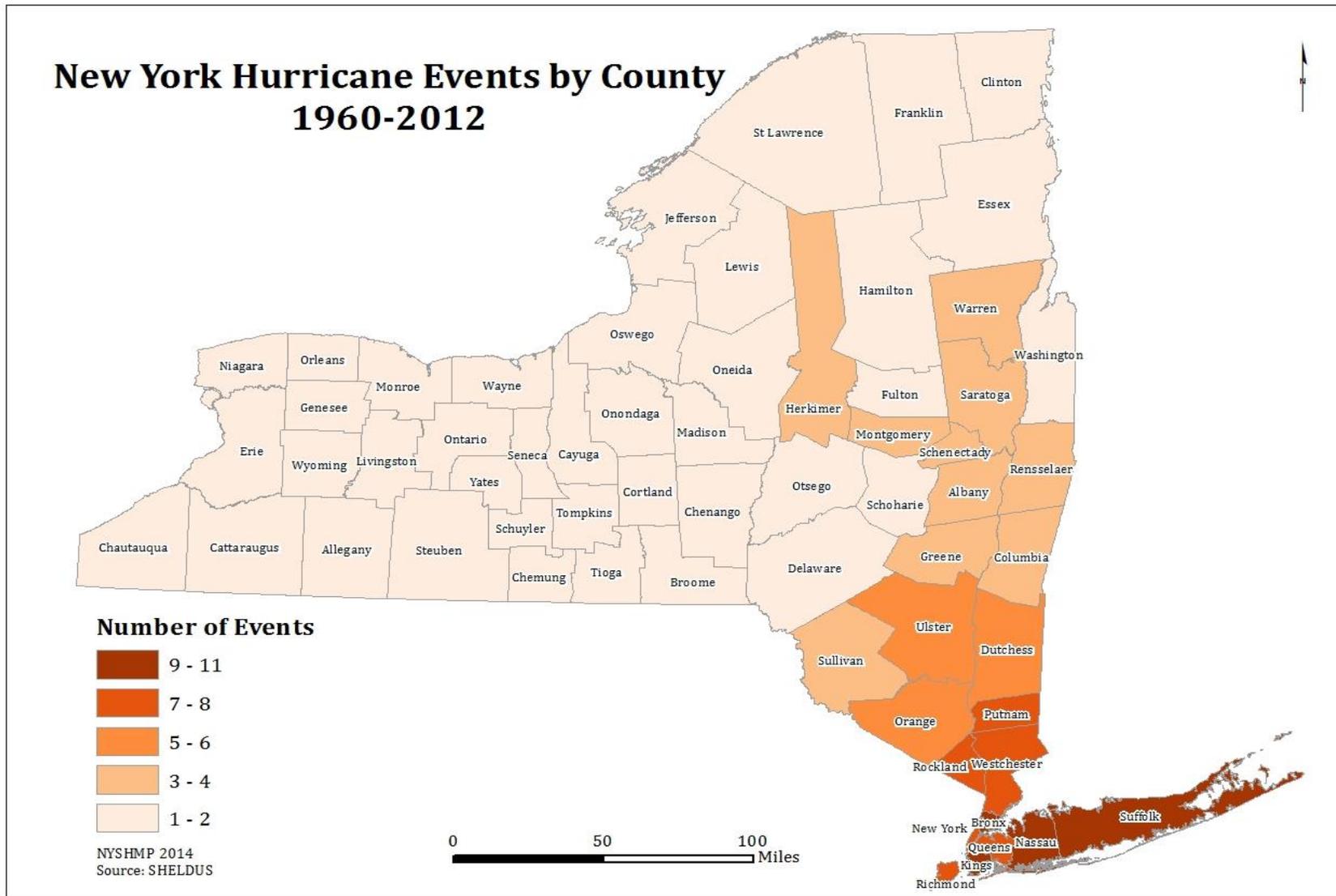


Historical Record (1960-2012)							
County	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
St Lawrence	4	26	2	0	1	\$136,270	\$1,282
Steuben	4	26	2	0	1	\$136,270	\$1,282
Suffolk	21	5	11	4	2	\$7,994,361	\$6,502,632
Sullivan	6	17	3	0	1	\$136,270	\$1,282
Tioga	4	26	2	0	1	\$136,270	\$1,282
Tompkins	4	26	2	0	1	\$136,270	\$1,282
Ulster	10	10	5	0	2	\$193,835	\$3,914
Warren	6	17	3	0	2	\$162,585	\$3,914
Washington	4	26	2	0	0	\$34,380	\$2,632
Wayne	4	26	2	0	1	\$136,270	\$1,282
Westchester	13	7	7	2	2	\$5,447,039	\$4,002,632
Wyoming	2	52	1	0	0	\$8,065	\$0
Yates	4	26	2	0	1	\$136,270	\$1,282

Source: SHELDUS



Figure 3.12g: New York State Storm Events



**Table 3.12d**, the preceding table, list annualized property losses for New York Counties based on data gathered from SHELDUS. Suffolk, Nassau, and Putnam Counties are the top three counties with the highest total property loss. **Figure 3.12g** illustrates New York State’s property damage from 1960-2012, which shows a significant amount of losses concentrated in the southern coastal area of the State.

**Figure 3.12h: New York Hurricane Property Damage 1960-2012**

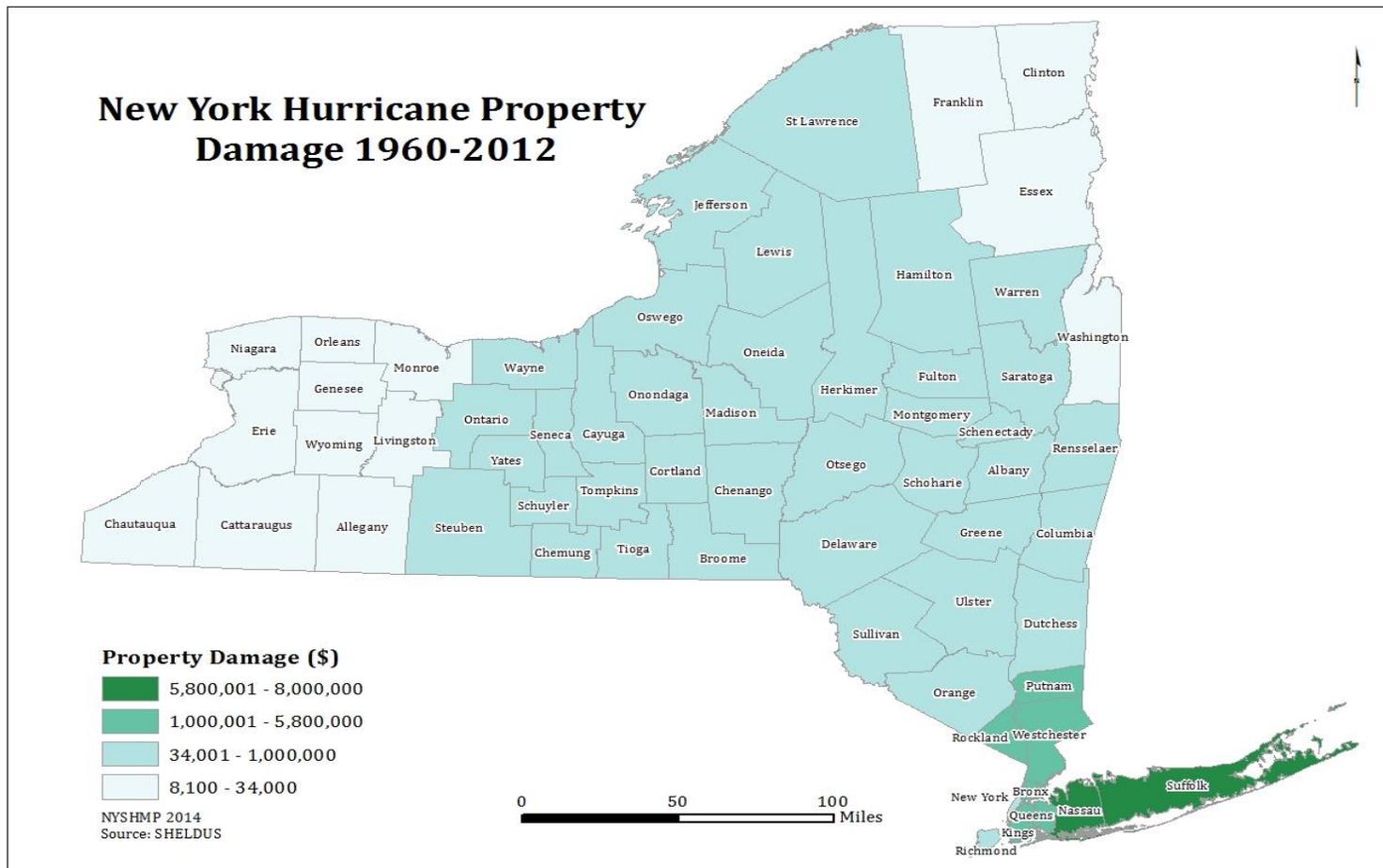
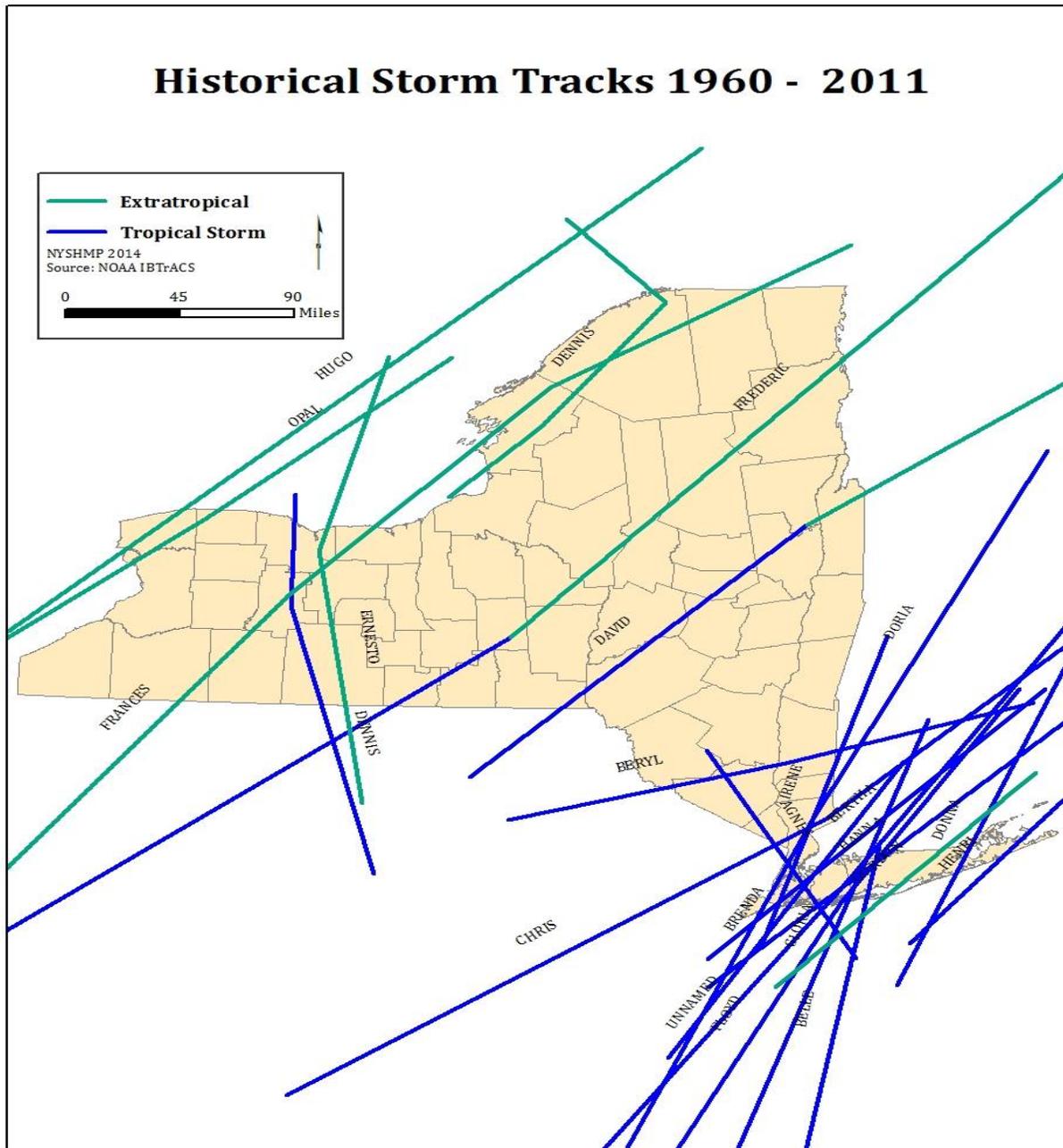


Figure 3.12i show historical storm tracks that have gone through the State of New York for the period of 1960 through 2011, and their associated intensity. Best storm track data goes through the year 2011 from The International Best Track Archive for Climate Stewardship (IBTrACS) from the National Climatic Data Center (NCDC). It is worth noting that by the time some of these systems reached New York, they were downgraded from hurricane status to tropical or extratropical storm, as was the case for Hurricane Irene in 2011.

Figure 3.12i: Historical Storm Tracks



\*The 2012 storm tracks including Hurricane Sandy have not been integrated into this figure.

Storm occurrences in the New York State region date back as far as 1821, yet the first named storm to hit the area were not until Hurricane Carol in 1954. Before Hurricane Irene and Hurricane Sandy there were other notable cyclones such as the 1938 storm commonly referred to as, 'The Long Island Express' or 'The Great New England Hurricane of 1938.' The storm claimed lives and injured hundreds of people, costing millions in sustained damage. The 'Long Island Express' was initially expected to hit the state of Florida, yet took an unexpected detour and plowed directly into Long Island making landfall on September 21 with wind speeds reaching 60 to 70 mph.

Many hurricane experts are observing that the Atlantic Ocean and the Gulf of Mexico are yielding more frequent and destructive hurricanes than in previous decades. In a ten year period from 1995 to 2005 a record of 15 hurricanes made their way into the North Atlantic Ocean alone. The data below was provided by the New York City Office of Emergency Management which gives an overview of historical hurricane occurrences impacting the State<sup>1</sup>.

### 1821 Hurricane

Making landfall on September 3, 1821, it is believed that modern day New York City was directly hit with a single hurricane. With tides rising 13 feet in one hour, the East River met the Hudson River across lower Manhattan reaching as far north as Canal Street. There were minimum deaths attributed to the storm largely due to the sparsely populated neighborhoods of the time.



*Source: NWS, Westhampton, NY; 1938 Hurricane*

### 1938 Hurricane

The most powerful hurricane, a category 3, known to make landfall in the State of New York occurred in 1938. The storm's eye crossed over Long Island and then into New England, killing nearly 200 people. It is reported that the storm killed 10 people in New York City and caused millions of dollars in damage. Its floods knocked out electrical power in Manhattan, the Bronx, and subway lines. In Central Park 100 large trees were destroyed. New York City experienced the weaker "left side" of the 1938 hurricane, fortunately, with 75 miles between the eye and Long Island when the storm passed over.

<sup>1</sup>NYC Hazards: NYC Hurricane History.

[http://www.nyc.gov/html/oem/html/hazards/storms\\_hurricanehistory.shtml](http://www.nyc.gov/html/oem/html/hazards/storms_hurricanehistory.shtml)



### **Carol - 1954**

In 1954, Hurricane Carol the first named storm, made landfall in Eastern Long Island and Southeastern Connecticut. Sustained winds over 100 mph and gusts of 115 to 125 mph, it was the most destructive hurricane to hit the Northeast coast since the Long Island Express in 1938. Fortunately for residents, the storm's track was 40 miles further east resulting in major flooding throughout the City.

### **Connie & Diane - 1955**

Leftover rains from hurricanes Diane and Connie caused significant flooding in the New York City area in August 1955. Although the eye of those two storms did not cross directly over any of the five boroughs, the Rondout Creek and the Walkill River saw record breaking flooding. Diane caused more than 200 deaths in Pennsylvania, New York and New Jersey. Connie dropped more than 12 inches of rain at LaGuardia Airport.

### **Donna - 1960**

On September 12-13 1960, Hurricane Donna created 11-foot storm tides along the New York Harbor causing extensive pier damage.

### **Agnes - 1972**

Tropical Storm Agnes, in June 1972, merged with another storm system in the northeastern region of the United States. Flooding was recorded in areas from Georgia to New York



Fire Island, NY, **Hurricane Gloria** September, 1985

State, causing 122 deaths and more than \$6 billion dollars in damage (when adjusted for inflation).

### **Gloria - 1985**

According to the US Army Corps of Engineers, 1985's Hurricane Gloria could have been catastrophic if it arrived at high tide and just a little closer to New York City. <sup>2</sup>

### **Felix- 1995**

The third named hurricane of the highly active 1995 hurricane season

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<sup>2</sup>(Photo courtesy World Wide) Roof of homes ripped off in 115-mph gusts during Hurricane Gloria on Long Island in September 1985. <http://www.oocities.org/hurricane/hurricanegloria.html>

was Hurricane Felix. High tides caused erosion problems on several beaches along the New York coast line, most notably to the Westhampton Beach on Long Island.

### **Bertha- 1996**

A weakening Tropical Storm Bertha brought heavy rain to New York City in July 1996.

### **Edouard- 1996**

Hurricane Edouard, the second major hurricane classified in the 1996 Atlantic hurricane season, produced storm surges of 1 to 2 feet causing over wash along southern Long Island as a result of high tides.

### **Floyd- 1999**

In September 1999, one of the most powerful tropical storms to affect New York City in a decade was Tropical Storm Floyd. The storm system brought sustained 60 mph winds and dumped 10-15 inches of rain on upstate New Jersey and New York State over a 24-hour period. Flash flooding from this tropical storm forced hundreds of people to leave their homes in counties just outside the five boroughs. Floyd caused New York City's schools to close for the first time since 1996 and led the city to open emergency storm shelters as a precautionary measure.

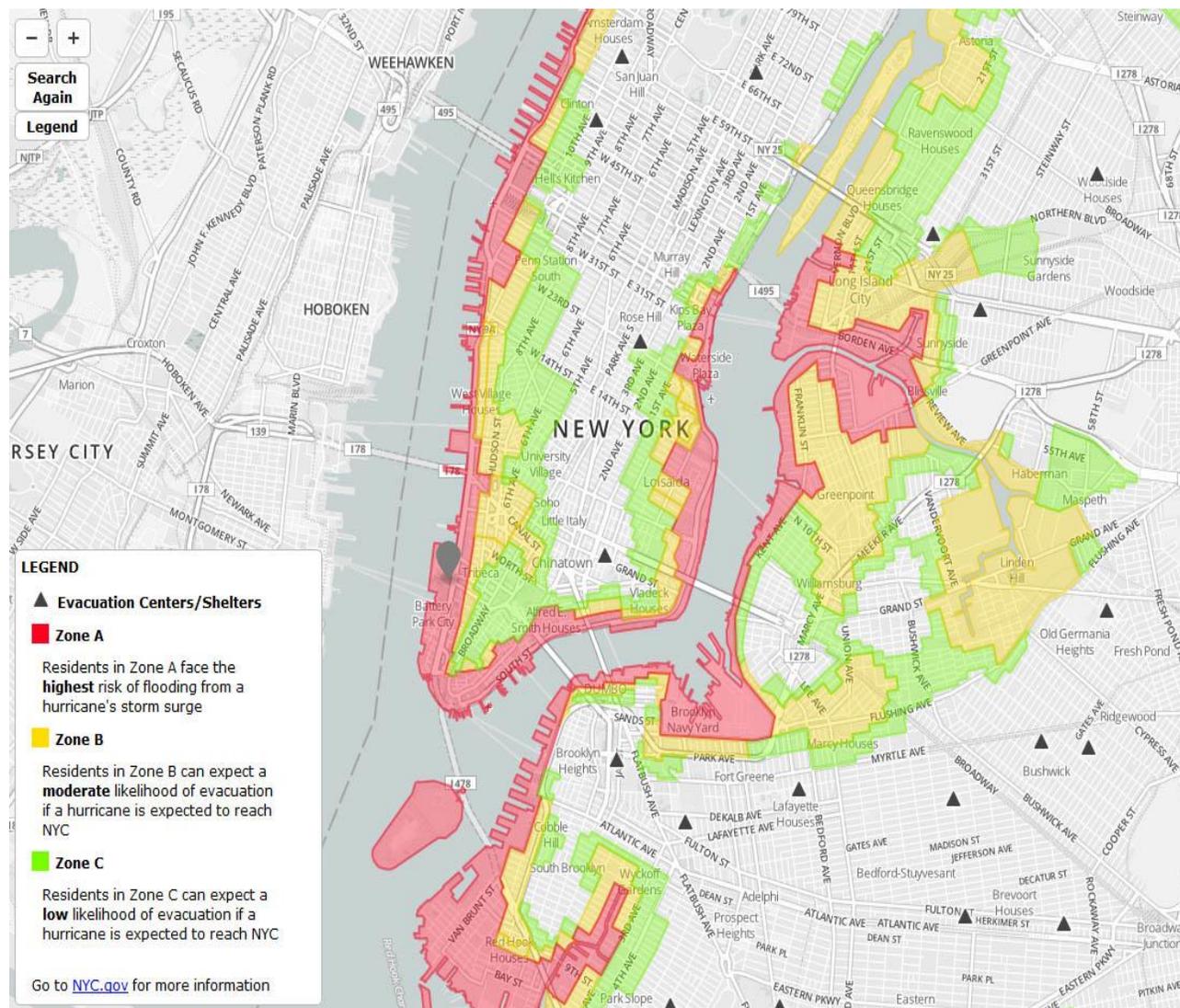
### **Irene- 2011**

August 2011, Hurricane Irene was downgraded to a tropical storm right before making landfall. In preparation the City of New York issued the first-ever mandatory evacuation of coastal areas on August 26, 2011. The evacuation encompassed 375,000 residents living in evacuation Zone A, the entire Rockaway Peninsula, and 34 health care facilities located in evacuation Zone B. The City sheltered 10,000 evacuees at 81 shelters. The rest stayed with family and friends outside the evacuation zones. Irene dropped up to seven inches of rain across the city and brought winds of 65 mph.

Below in **Figure 3.12j** is a map from New York City's hurricane contingency plan that illustrates the three evacuation zones that were in effect during Hurricane Irene, but have since been changed: Zone A, Zone B, Zone C, and the hurricane evacuation centers.

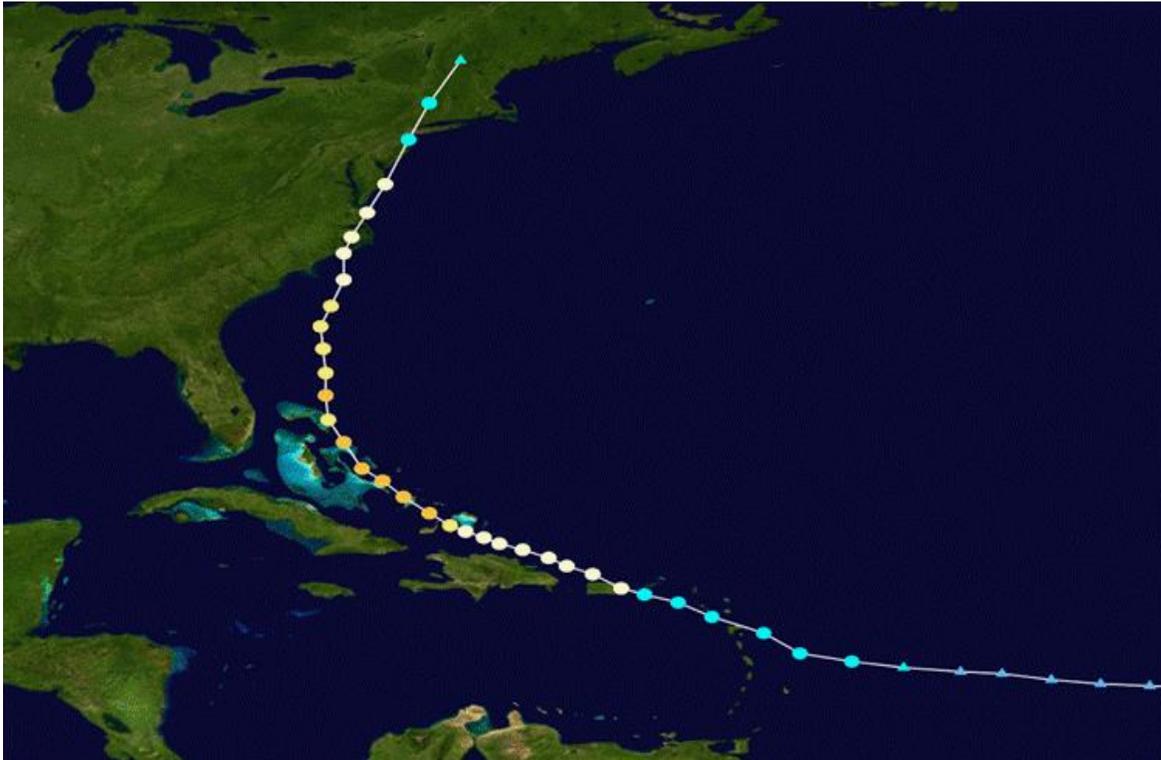


Figure 3.12j: Hurricane Irene Evacuation Zone A, B, and C for New York City



Source: NYC Hurricane

Hurricane Irene was a huge and prevailing Atlantic hurricane leaving extensive flood and wind damages. **Figure 3.12k** displays the storm's path as it plowed along the Caribbean, the United States East Coast, and as far north as Canada. Hurricane Irene cost New York City alone, an estimated \$100 million in damages. More than 8,000 residents were approved for \$13.6 million in federal disaster assistance to help with the recovery.

**Figure 3.12k: Hurricane Irene Storm Track**

Source: National Hurricane Center. Track of Hurricane Irene, August 20 through 29, 2011

### **Sandy- 2012<sup>3</sup>**

Hurricane Sandy made landfall on October 29, 2012, impacting the southeastern region of the State of New York with storm surge, high waves, and wind. By the time Hurricane Sandy had reached the State it had downgraded to a post-tropical cyclone. Water levels rose along the entire east coast with the highest storm surges and greatest inundation levels occurring in New Jersey, New York, and Connecticut greatly affecting the New York metropolitan area.



Source: New York State DHSES, Brooklyn, NY- The Seagate Community Hurricane Sandy damage

In Kings Point, along the western

<sup>3</sup> Source: Tropical Cyclone Report Hurricane Sandy (AL182012). 12 February 2013



end of Long Island Sound, the highest storm surge recorded in New York was 12.65 ft. above the normal tide level. Other recorded storm surges that reached above normal tide levels ranging anywhere from 9.40 ft. to 9.56ft were found on the northern side of Staten Island (Bergen Point West Reach) and the southern tip of Manhattan (the Battery).

Record storm tides (the combination of the storm and astronomical tide) were measured in the New York City area. At the Battery (where water level records go back to 1920), the storm tide reached 14.06 ft. above Mean Lower Low Water (MLLW), which was 4.36 ft. higher than the previous record set in December 1992. This storm tide was also 4.55 ft. higher than what occurred when Tropical Storm Irene affected the region in 2011. The storm tides of 14.58 ft. above MLLW at Bergen Point West Reach and 14.31 ft. above MLLW at Kings Point were 4.37 ft. and 2.00 ft. higher, respectively, than their previous highest levels set in Irene.

**The following inundations, expressed above ground level, were prevalent along the coast due to the storm tide:**

- Staten Island and Manhattan 4-9 ft.
- Brooklyn and Queens 3-6 ft.
- The Bronx and Westchester County 2-4ft.
- Long Island (Nassau and Suffolk Counties) 3-6 ft.
- Hudson River Valley 3-5 ft.

Surveyed high-water marks from USGS indicate that the highest water levels in New York occurred on Staten Island. The highest direct measurement of inundation was 7.9 ft. above ground level, in the Oakwood neighborhood of Staten Island. A direct measurement of 4.7 ft. above ground level was made at One World Trade Center in the Financial District in Lower Manhattan. Higher inundation values likely occurred in other parts of Manhattan that are at lower elevations.

**In preparation the City issued the second-ever mandatory evacuation of coastal areas on October 28, 2012. The evacuation encompassed residents living in Evacuation Zone A, which was updated to include:**

- Coney Island
- Manhattan Beach
- Red Hook and areas along the East River in Brooklyn
- All of the Rockaways
- Hamilton Beach & Broad Channel in Queens
- Nearly all coastal areas of Staten Island
- City Island
- Small areas of Throgs Neck & South Bronx
- Battery Park City
- The West Side waterfront and
- Lower East Side
- East Village in Manhattan.

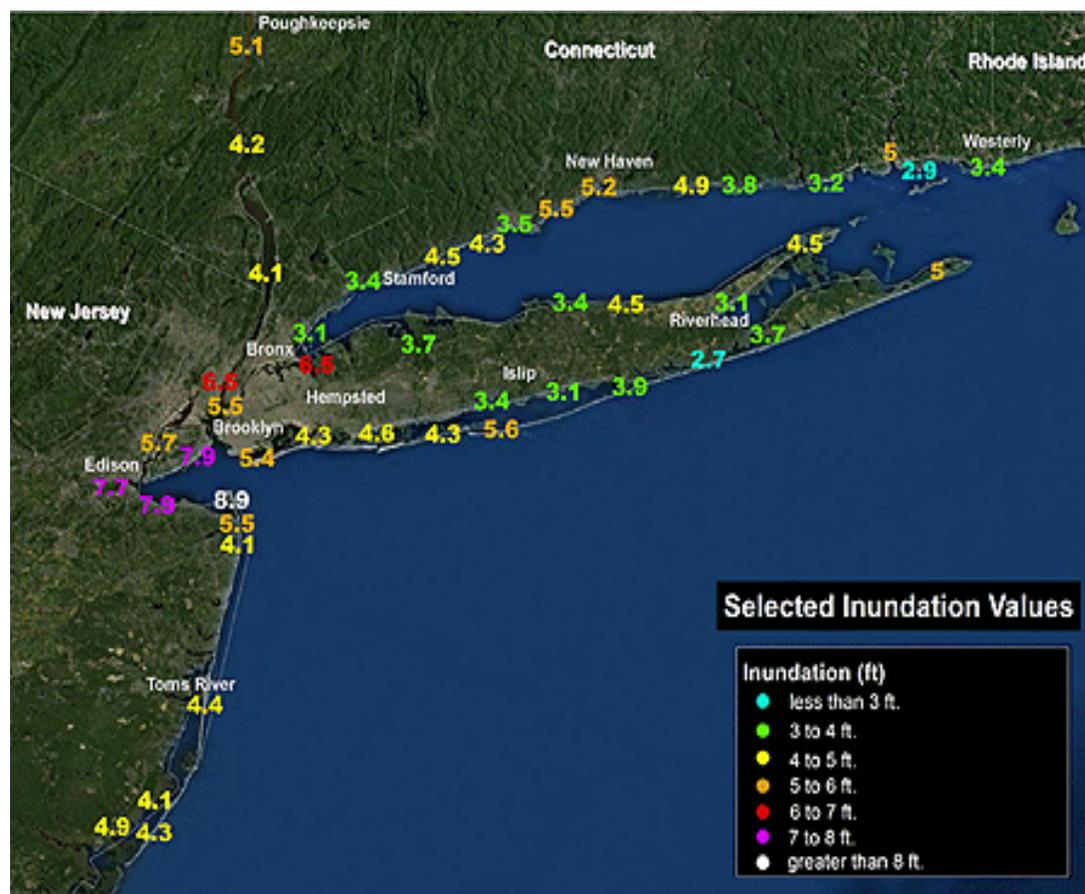
Destruction amongst many communities particularly of those found near the southern shores was widespread after Hurricane Sandy made landfall, effecting residences,



businesses, vehicles, and other property. The fishing industry suffered severe losses with damage caused to their docks, marinas, dining, and fishing plants. Sandy destroyed more than 65,000 boats and about \$650 million in marine-related damages to New York, New Jersey, and Connecticut.

Below **Figure 3.12I** presents the storm inundation values from Hurricane sandy. The inundation levels ranged between four to five feet; however Nassau County reached levels that exceeded six feet.

**Figure 3.12I: Hurricane Sandy Inundation Levels**

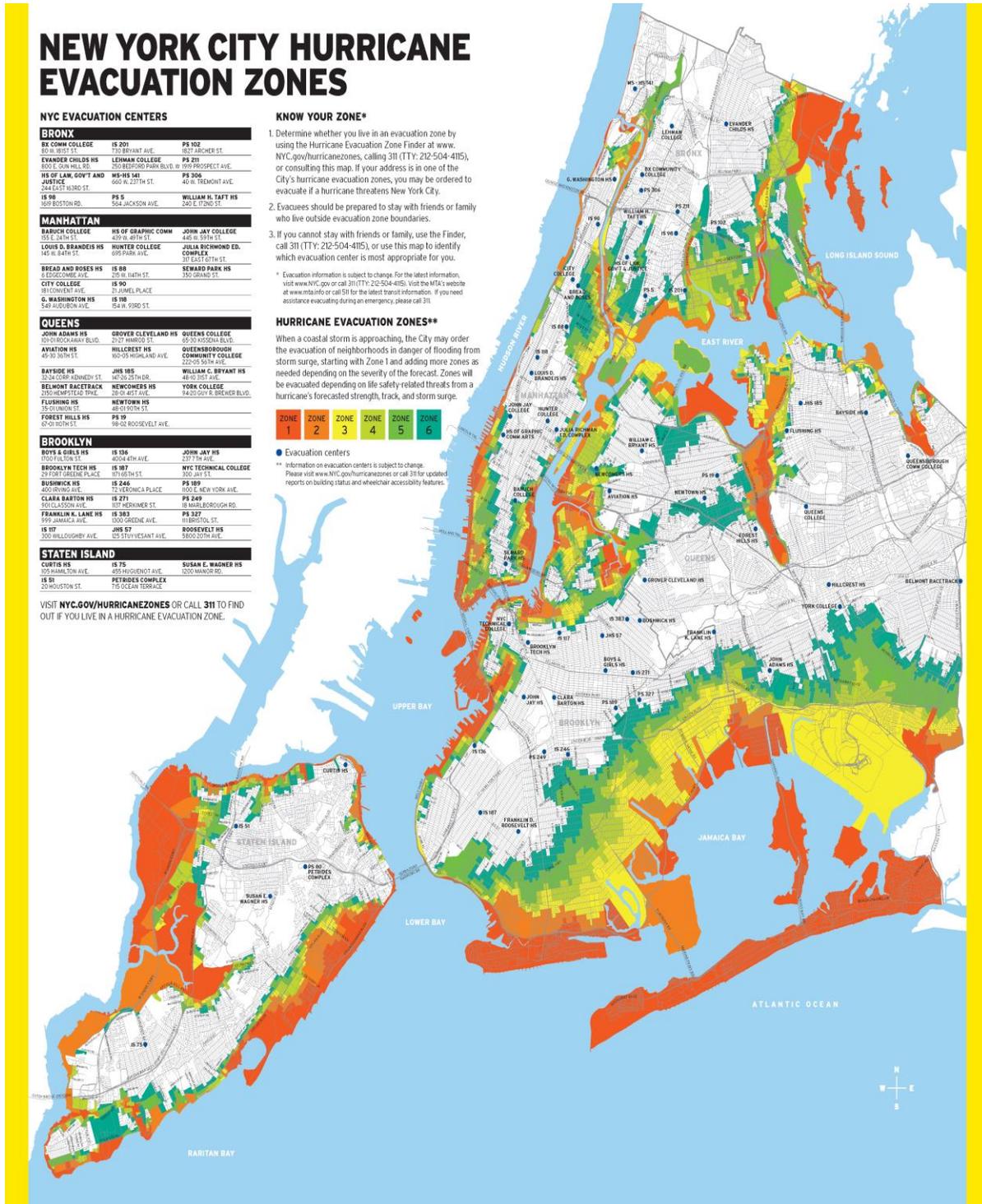


Source: NHC Tropical Cyclone Report—Hurricane Sandy

Since Hurricane Irene and Hurricane Sandy, evacuation zones for the City of New York have been updated. The final updates were made in June of 2013 and announced by the City of New York which included evacuation zones for 600,000 more residents who were not covered in previous zoning systems. According to the City's contingency plan there are now six evacuation zones found in this coastal region. The old alphabetical zoning technique has been replaced with a new numerical system, and will now include emergency evacuation zones for 37 percent of New Yorkers.

Found below in **Figure 3.12m** is a map that displays the new zoning areas and evacuation centers for New York City.

**Figure 3.12m: New York City Hurricane Evacuation Zones**



Source: Metro, September 2013



## Probability of Future Hurricane (Tropical/ Coastal Storms) Events

Using the historical occurrence, or more specific documentation if available, a *future probability and average annual losses* analysis was determined for hurricane events. The number of years recorded was divided by the number of occurrences, resulting in a simple past-determined recurrence interval. If the hazard lacked a definitive historical record, the probability was assessed qualitatively based on county history or other supporting data.

From the historical records found in **Table 3.12d**, the following can be expected on average in a typical year in New York State:

- 3.23 hurricane events
- Nearly \$1.5 million in property and crop damage
- 1 Injuries
- .24 Fatalities

Based on hurricane probability models derived from historical frequency, Suffolk County has the highest chance of being impacted by a hurricane during any given season. The following table illustrates the top three counties with the highest probability for future occurrences. From previous occurrences of hurricane related hazard events (described in **Table 3.12.e**), the counties with the highest probability of future occurrences, based on recurrence interval, are Suffolk (21%), Nassau (19%), and Bronx (17%).

**Table 3.12e: Percentage Probability of Future Occurrences, by County**

County	Future Probability (%)
Suffolk	21
Nassau	19
Bronx	17

Source: SHEL DUS \*Future Probability equals the number of events divided by the number of years of record [52], expressed as a percentage.

Since 1970, records show an escalation in the intensity of tropical cyclone activity in the North Atlantic, which scientist suggests correlates to the increase in sea surface temperatures. This is also true for other regions where increased intensity in tropical cyclone activity is now greater. Intensified storm surges have caused more threats to coastal areas due to increased sea levels producing more substantial storm damage. The change in climatic temperatures has also been associated with heavy rains extending hundreds of miles inland further increasing flood risk. **Section 3.4- Climate Change**, provides more in depth information on the effects that climate change has on hurricanes and other identified hazards within the 2014 update.



### 3.12.2 Assessing Hurricane (Tropical/ Coastal Storms) Vulnerability and Estimating Potential Losses by Jurisdiction

Although the State experiences some economic impacts from hurricane and tropical storms, the greatest vulnerability is found in hazard areas relating to flood, winter weather, and wind events. Throughout the State of New York people, property, and crops are susceptible to storm related damages, loss of lives, as well as injuries.

From 1960 to 2012, based on historical data, the property damage for New York State is estimated at \$55,620,500 and an additional \$37,100,000 in crop damages. According to SHELDUS, the total loss of life was 15 for the State as a result of hurricane events, with an additional 75 persons injured. Suffolk, Orange, and Nassau Counties, were the top three areas affected by fatalities within New York State.

**Table 3.12f** provides the estimated population for individual counties that are most susceptible to hurricane and storm damage based on historical frequency. These estimates were extracted from the most recent data available on SHELDUS (**Table 3.12d**).

**Table 3.12f: Estimated Population for Counties Most Susceptible to Damage**

Estimated Population For Counties Most Susceptible to Damage				
County	2010	2011	2012	Number of Events
Suffolk	1,493,350	1,498,816	1,499,273	11
Nassau	1,339,532	1,344,436	1,349,233	10
Bronx	1,385,108	1,392,002	1,408,473	9
<b>Total</b>	<b>4,220,000</b>	<b>4,237,265</b>	<b>4,258,991</b>	<b>30</b>

Sources: SHELDUS, American Fact Finder

### Local Plan Integration/ Risk Assessments

Since August of 2013, 56 FEMA-approved local hazard mitigation plans (LHMP) have been reviewed for the 2014 Update. The State's planning team had the opportunity to review local county risk assessments to help the State better understand its vulnerability in terms of the jurisdictions most threatened by classified hazards. In its analysis, the State of New York reviewed the processes of local governments and how their hazards were ranked based on their jurisdictions and the potential losses (i.e., people, buildings, and dollar values) associated with the hazards of greatest concern.

Where data was available, the State extracted the ranking impact information from the LHMP hazard analysis. This ranking feature is based on a combination of probability, severity, and extent of the hazard and was determined to be the best measure of overall risk in the plans. This ranking was either numeric or described in terms of high, moderately high, moderate, or low. In cases where this information was not available,



ranking values were not determined yet considered if identified in the individual county local plans.

For the sake of the 2014 Update, a proper analysis and summary of the data was required. During the review of the local plan risk assessments, all rankings used were based on the New York HAZNY ranking system, and measured on a scale rating from 44 (low) to 400 (high). This analysis revealed that selected county-level plans did include manmade hazards in their analysis, but the State hazard mitigation plan's 2014 Update focused solely on natural hazards.

The local risk assessment summary allowed for an analysis of which hazards are of high concern to particular counties. **Table 3.2a** in **Section 3.2** lists all the hazards and the number of counties that ranked them at each of the scale levels: High, Moderately High, Moderate, Moderately Low and Low. As indicated previously, four of the local plans ranked hurricane events as a high hazard. In addition, eight counties ranked it as moderately high, three moderate, twelve moderately low, and two counties ranked it as a low hazard. **Table 3.11g** displays the highest ranked county hazard impacts and the high and / or moderately high ranked risk assessment scores for Hurricane.

**Table 3.12g: Summary of Hurricane Hazard Impacts and Rankings by County**

Local County Hurricane Hazard Impacts		
Highest Occurrences	Highest Fatalities	Highest Property Damage
Suffolk	Suffolk	Suffolk
Nassau	Orange	Nassau
Bronx	Nassau	Putnam
Kings	Kings	Rockland
Putnam	Westchester	Bronx

Source: SHELDUS

Local County Hurricane Hazard Rankings	
High	Moderately High
Fulton, Montgomery, Saratoga, and Suffolk	Delaware, Nassau, Niagara, Orleans, Rensselaer, Schoharie, Ulster, and Westchester

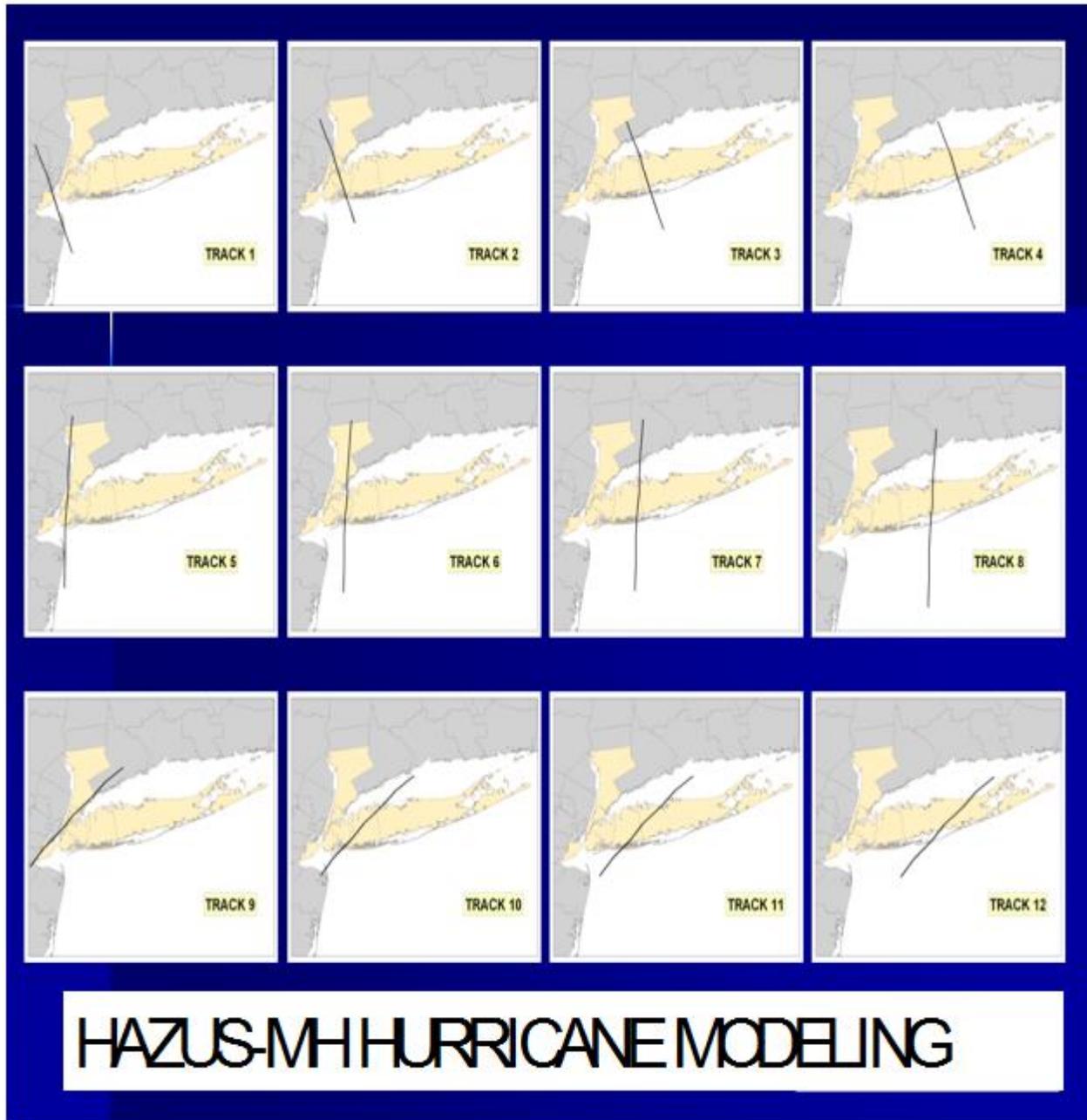
Source: LHMP



**Hazus-MH 2.1- MH2 Analysis**

**Figure 3.12n** demonstrates using Hazus-MH 2.1 the potential Hurricane tracks/paths that could pass through New York State.

**Figure 3.12n: Hurricane Storm Modeling Tracks**



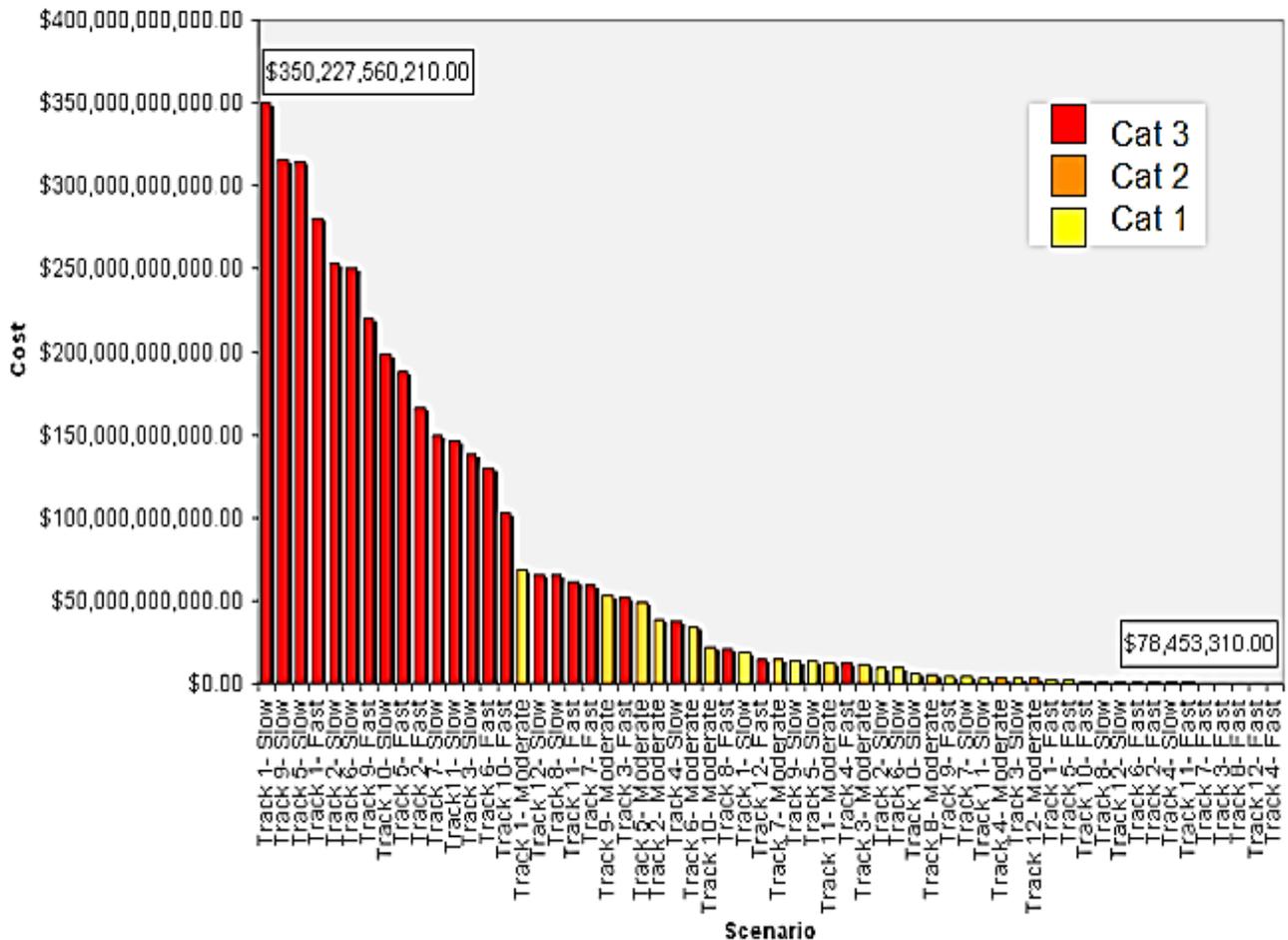
Source: Hazus-MH 2.1



The following **Figures 3.12o** through **3.12r** are indicative of the results of a particular category hurricane relative to a specific hurricane track and speed. These Figures were created using a cumulative numbers generated from Hazus-MH 2.1 runs. Each Figure compliments **Figure 3.12n (Storm Track Models)**. (NOTE: These estimates are based on wind damage.)

**Figure 3.12o** portrays the total economic losses based on various hurricane tracks, category levels and speeds (slow, moderate, or fast). For example, if a Track 1 (refer to **Figure 3.12n**), Category 3 hurricane traveling at a slow speed would result in an estimated 350 billion dollars in economic losses for the affected coastal county areas. This loss estimate does not take into account areas outside the coastal counties and is for wind damage only. This test run accounts for the coastal Counties of Nassau, Suffolk, Westchester, and those comprising New York City.

**Figure 3.12o: Indicating Total Economic Loss per Category, Track, and Speed**

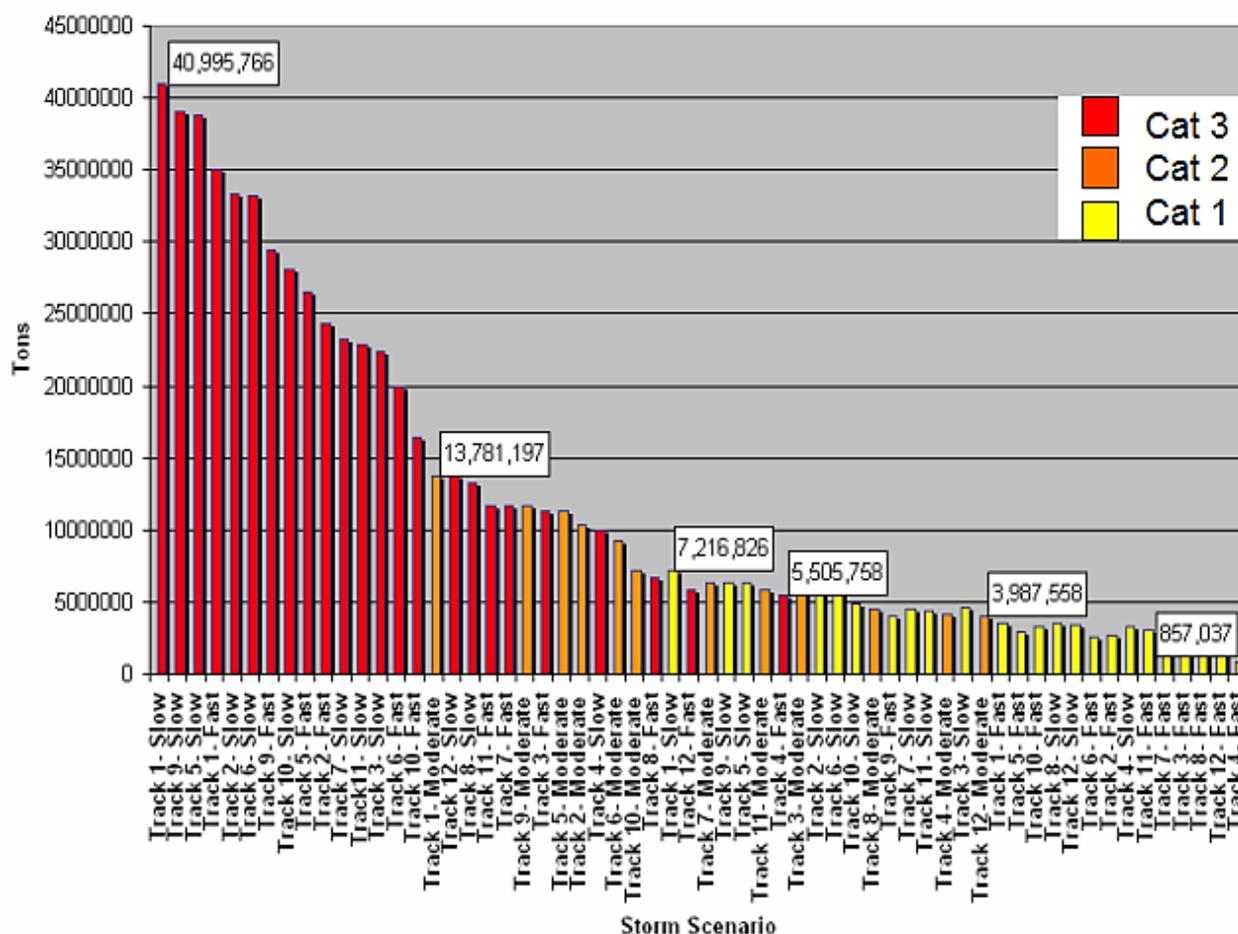


Source: Hazus-MH 2.1



**Figure 3.12p** portrays the total debris in tons that would have to be addressed after a given hurricane event. For this graph debris is broken up into 3 categories: 1) Brick/Wood, 2) Reinforced Concrete/Steel, and 3) Trees. Similar to the pervious example, a track 1 Category 3 hurricane moving slowly would produce an estimated 41 million tons in one storm. Because debris removal plans are pertinent to recovery efforts, many local jurisdictions have emergency debris management plans in place and the State created the Traffic Infrastructure Group (TIG) to bring together those agencies like the State Police, DOT, Thruway Authority and State Parks with resources and expertise in removing vegetative debris from roadways. As well, NYSOEM and FEMA offer Debris Removal Workshops for Local Governments.

**Figure 3.12p: Indicating Total Debris in Tons per Category, Track, and Speed**

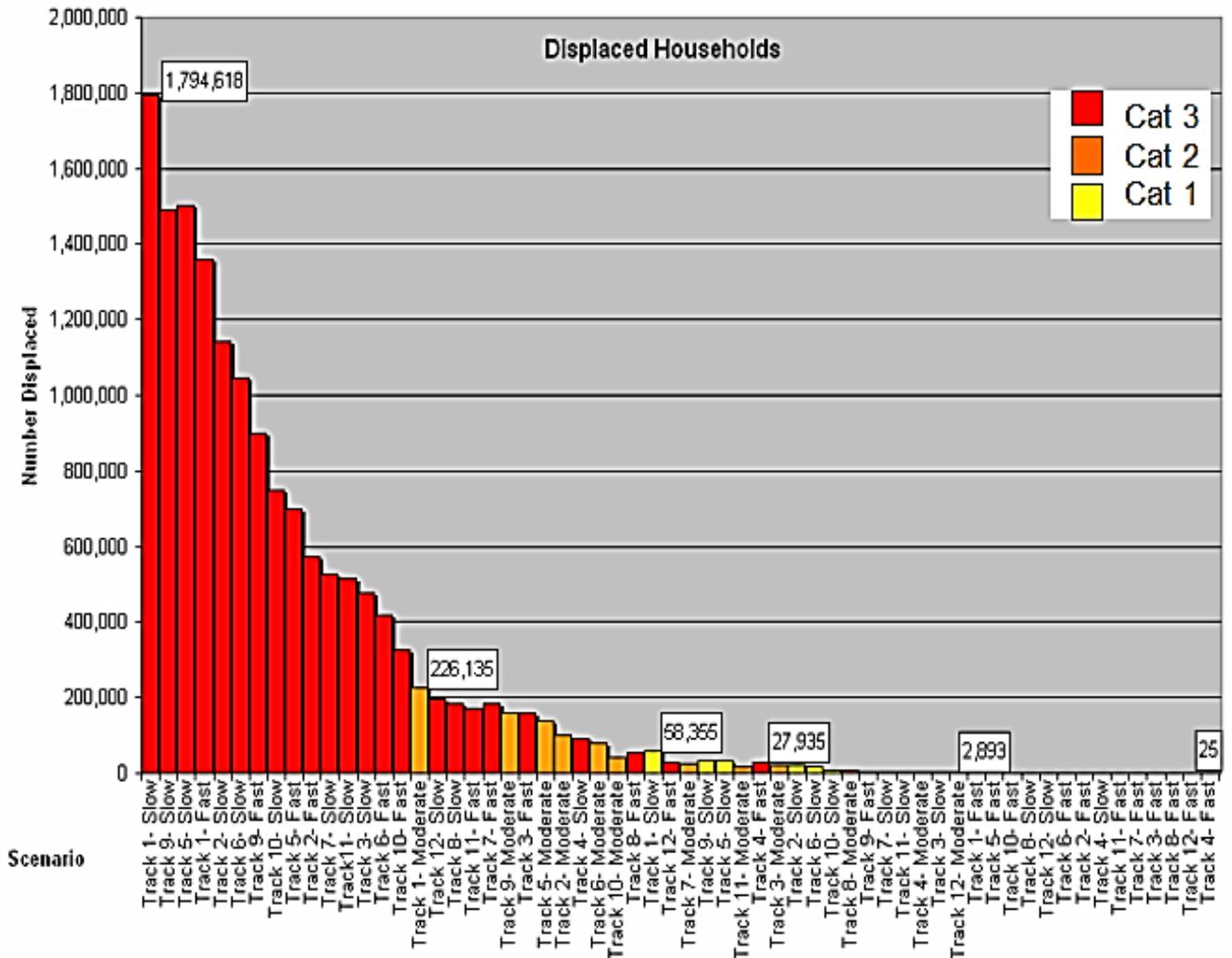


Source: Hazus-MH 2.1



Figure 3.12q illustrates the number of displaced households relative to a particular hurricane event. Per the previous examples, a track 1 Category 3 hurricane moving slowly could affect or displace an estimated 1.8 million households.

Figure 3.12q: Displaced Households

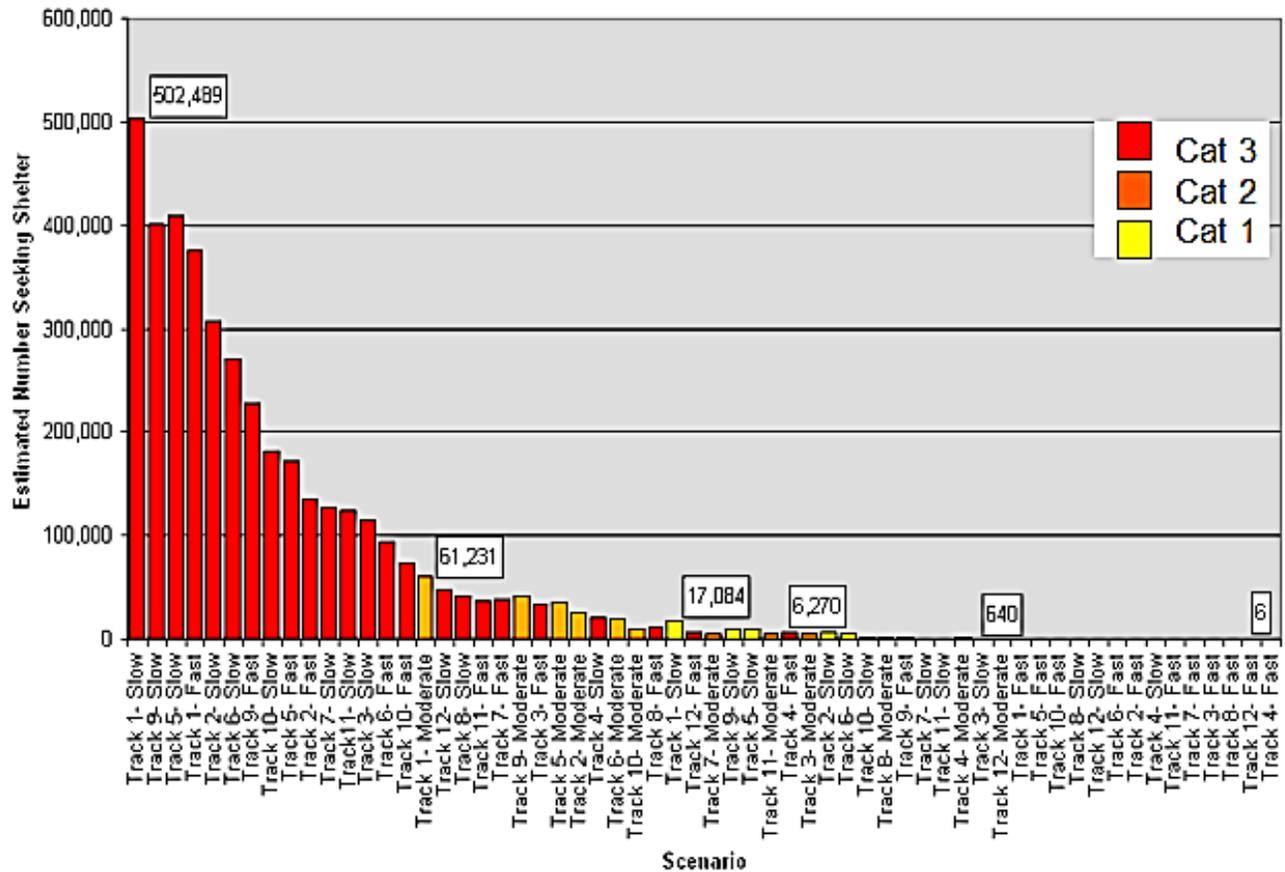


Source: Hazus-MH 2.1



Figure 3.12r portrays the short-term shelter needs for the affected areas. Again, to reference the previous example, a track 1 Category 3 slow-moving hurricane could result in the need for immediate short-term sheltering for roughly 500,000 people.

Figure 3.12r: Total Short-Term Shelter Needs per Category, Track, and Speed

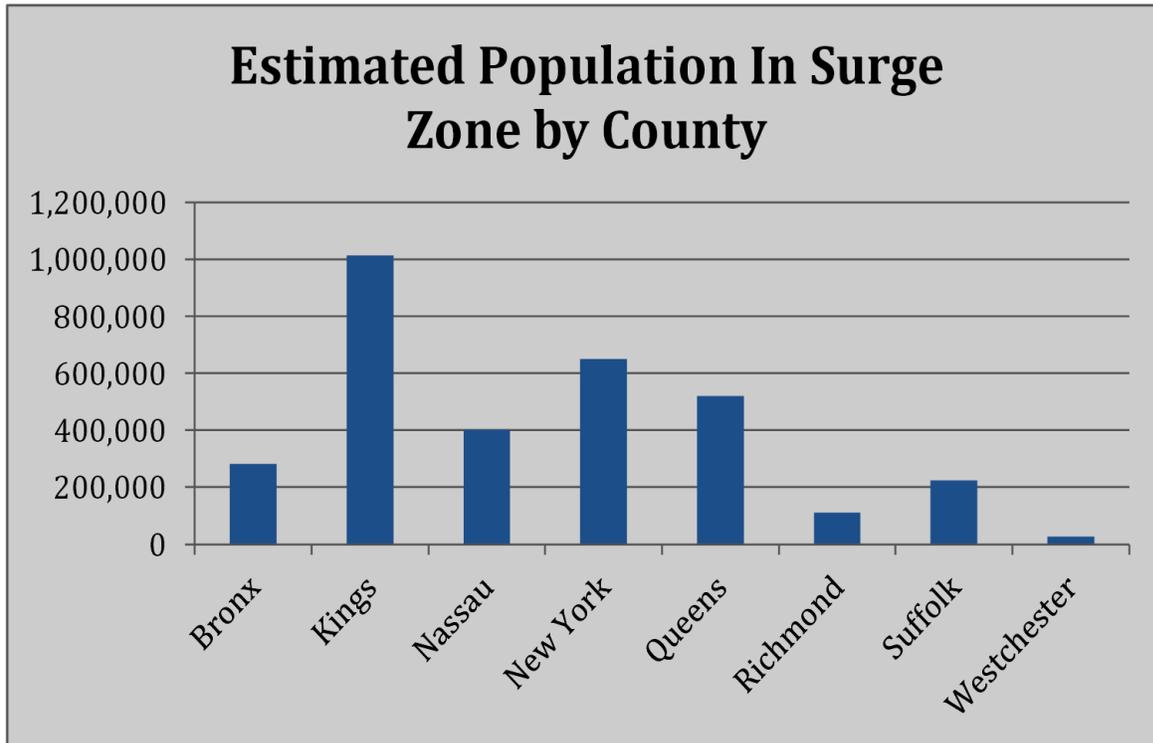


Source: Hazus-MH 2.1



**Figure 3.12s** portrays the population within in a track 1 storm surge inundation area broken up by jurisdiction. The total estimated population is 317,850 people spread throughout 9 coastal jurisdictions.

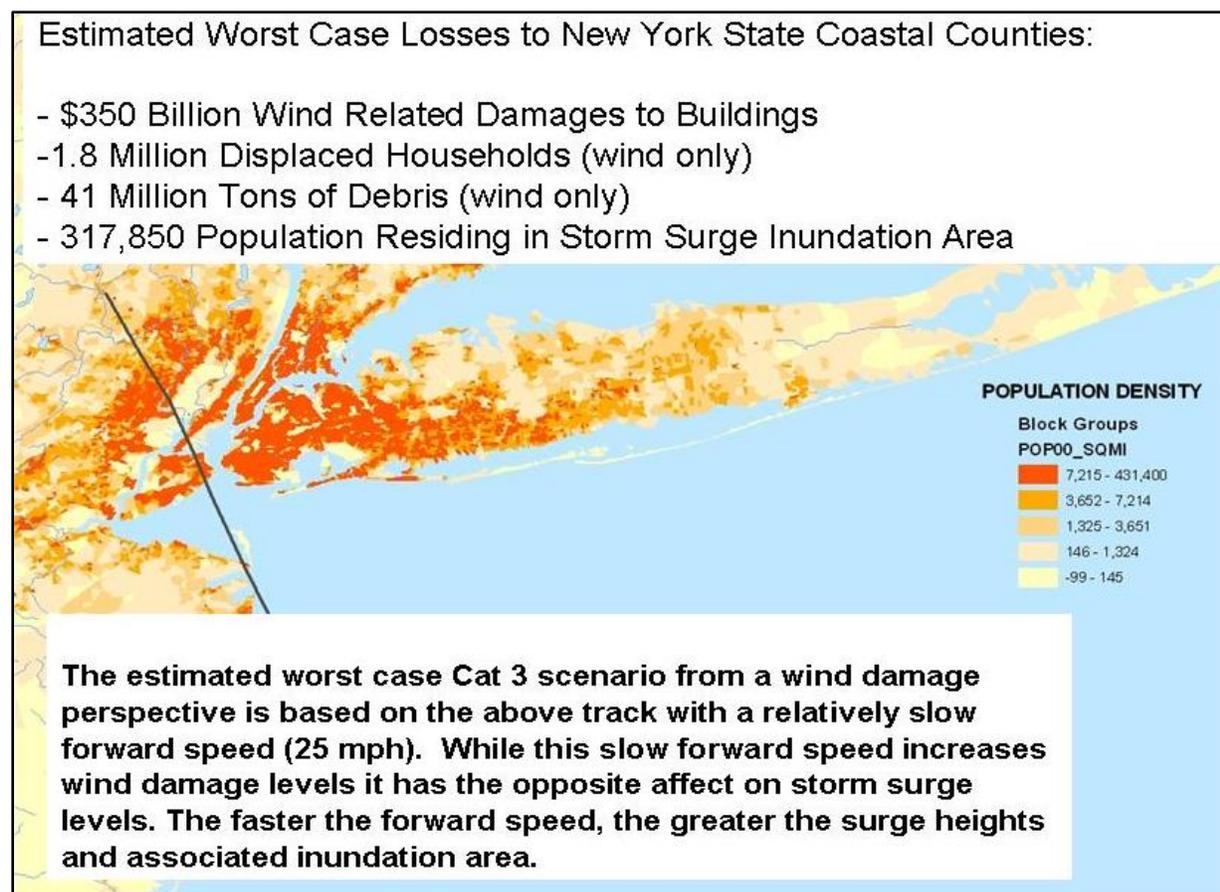
**Figure 3.12s: Population in Storm Surge Zone by County**



Source: Hazus-MH 2.1



Figure 3.12t: Estimated Worst Case Losses to New York State Coastal Counties



Source: Hazus-MH 2.1

A combination of many aspects of predictive measures can be used in the future to determine the multiple needs of affected people during the course of a storm event. Through continuous research and data collection, New York State can prepare in advance to dramatically reduce the risk to its residents.

**Table 3.12h** provides the breakdown of annualized losses, extracted from the Hazus-MH 2.1 probabilistic hurricane run. The top counties with the highest total annualized losses include: New York, Kings, Queens, Nassau, and Suffolk.

**Table 3.12h: Hurricane Annualized Losses by County**

County	Structural Damage	Contents Damage	Inventory Loss	Relocation Loss	Capital Related Loss	Wages Loss	Rental Income Loss	Total Loss
Albany	\$476	\$144	\$1	\$22	\$2	\$6	\$14	\$666
Allegany	\$5	\$2	\$0	\$0	\$0	\$0	\$0	\$7
Bronx	\$22,644	\$4,710	\$32	\$1,391	\$160	\$186	\$1,328	\$30,451
Broome	\$52	\$21	\$0	\$1	\$0	\$0	\$1	\$76
Cattaraugus	\$6	\$1	\$0	\$0	\$0	\$0	\$0	\$8
Cayuga	\$7	\$2	\$0	\$0	\$0	\$0	\$0	\$10
Chautauqua	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemung	\$13	\$5	\$0	\$0	\$0	\$0	\$0	\$18
Chenango	\$13	\$7	\$0	\$0	\$0	\$0	\$0	\$21
Clinton	\$18	\$4	\$0	\$1	\$0	\$0	\$0	\$24
Columbia	\$263	\$84	\$1	\$17	\$1	\$3	\$7	\$376
Cortland	\$5	\$1	\$0	\$0	\$0	\$0	\$0	\$7
Delaware	\$28	\$5	\$0	\$2	\$0	\$0	\$1	\$36
Dutchess	\$1,565	\$345	\$3	\$107	\$10	\$16	\$46	\$2,092
Erie	\$37	\$8	\$0	\$1	\$0	\$0	\$1	\$47
Essex	\$24	\$13	\$0	\$1	\$0	\$0	\$0	\$38
Franklin	\$6	\$3	\$0	\$0	\$0	\$0	\$0	\$9
Fulton	\$39	\$20	\$0	\$1	\$0	\$0	\$1	\$61
Genesee	\$3	\$1	\$0	\$0	\$0	\$0	\$0	\$5
Greene	\$102	\$42	\$0	\$4	\$0	\$1	\$2	\$151
Hamilton	\$5	\$3	\$0	\$0	\$0	\$0	\$0	\$8
Herkimer	\$14	\$5	\$0	\$1	\$0	\$0	\$0	\$20
Jefferson	\$3	\$1	\$0	\$0	\$0	\$0	\$0	\$4
Kings	\$49,019	\$10,807	\$116	\$3,028	\$381	\$517	\$2,871	\$66,738
Lewis	\$2	\$1	\$0	\$0	\$0	\$0	\$0	\$3
Livingston	\$5	\$2	\$0	\$0	\$0	\$0	\$0	\$7
Madison	\$8	\$3	\$0	\$0	\$0	\$0	\$0	\$11
Monroe	\$39	\$13	\$0	\$1	\$0	\$0	\$1	\$54
Montgomery	\$32	\$10	\$0	\$2	\$0	\$0	\$1	\$46
Nassau	\$51,162	\$15,509	\$125	\$3,909	\$614	\$781	\$1,646	\$73,745
New York	\$31,746	\$5,037	\$32	\$1,744	\$349	\$359	\$1,810	\$41,076
Niagara	\$6	\$1	\$0	\$0	\$0	\$0	\$0	\$8
Oneida	\$30	\$9	\$0	\$1	\$0	\$0	\$1	\$40
Onondaga	\$36	\$9	\$0	\$1	\$0	\$0	\$1	\$46



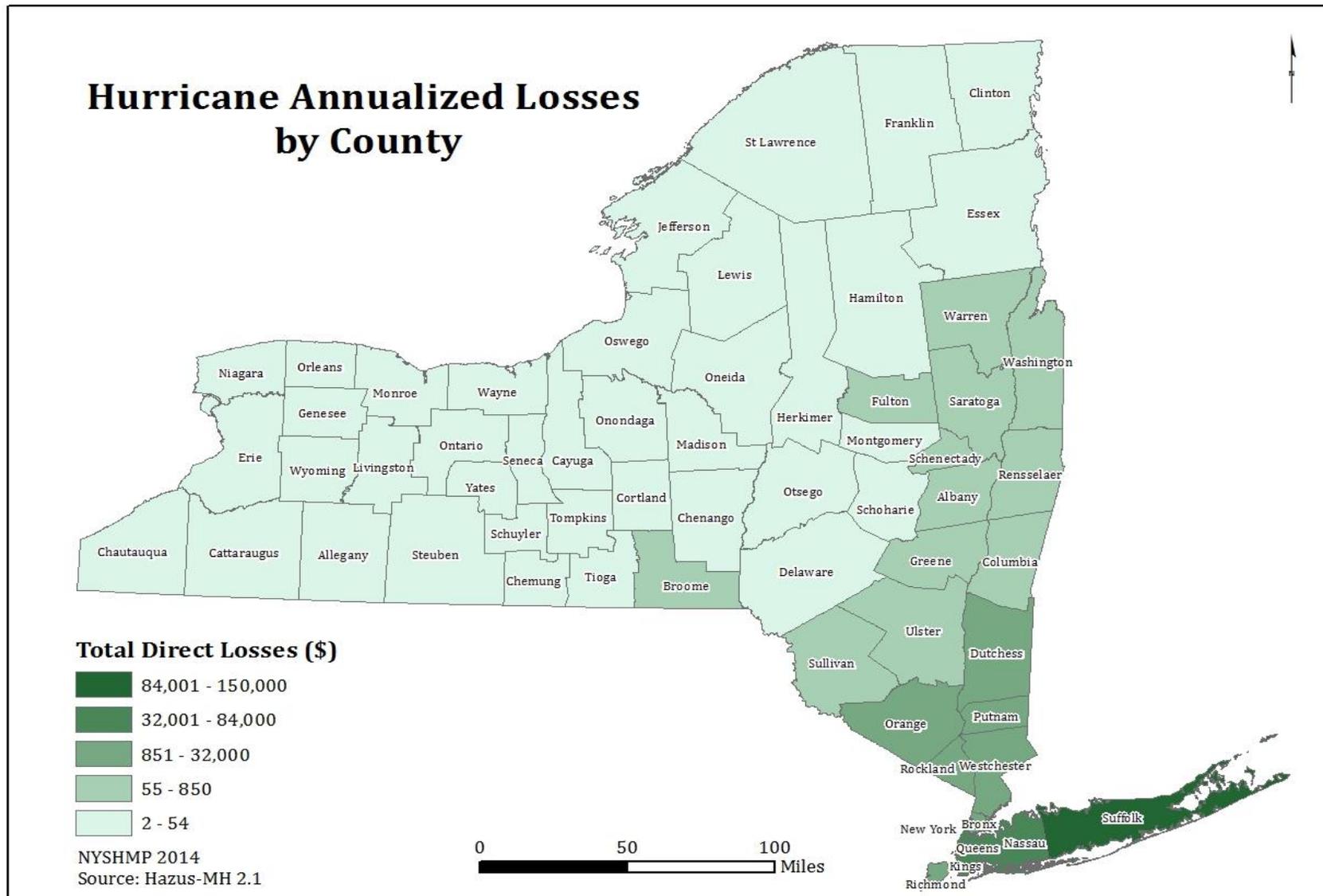
County	Structural Damage	Contents Damage	Inventory Loss	Relocation Loss	Capital Related Loss	Wages Loss	Rental Income Loss	Total Loss
Ontario	\$8	\$2	\$0	\$0	\$0	\$0	\$0	\$11
Orange	\$1,654	\$621	\$3	\$81	\$9	\$15	\$39	\$2,422
Orleans	\$2	\$0	\$0	\$0	\$0	\$0	\$0	\$2
Oswego	\$7	\$4	\$0	\$0	\$0	\$0	\$0	\$11
Otsego	\$27	\$11	\$0	\$1	\$0	\$0	\$0	\$40
Putnam	\$1,010	\$231	\$2	\$66	\$5	\$9	\$25	\$1,348
Queens	\$48,823	\$11,494	\$86	\$3,198	\$319	\$414	\$2,514	\$66,848
Rensselaer	\$320	\$103	\$0	\$17	\$1	\$3	\$9	\$454
Richmond	\$7,810	\$1,865	\$11	\$545	\$60	\$78	\$330	\$10,699
Rockland	\$2,943	\$1,065	\$6	\$164	\$21	\$32	\$74	\$4,305
Saint Lawrence	\$3	\$1	\$0	\$0	\$0	\$0	\$0	\$4
Saratoga	\$289	\$143	\$0	\$9	\$1	\$1	\$5	\$448
Schenectady	\$202	\$82	\$0	\$8	\$1	\$1	\$5	\$298
Schoharie	\$33	\$14	\$0	\$1	\$0	\$0	\$1	\$50
Schuyler	\$3	\$1	\$0	\$0	\$0	\$0	\$0	\$4
Seneca	\$3	\$1	\$0	\$0	\$0	\$0	\$0	\$5
Steuben	\$12	\$5	\$0	\$0	\$0	\$0	\$0	\$18
Suffolk	\$101,475	\$37,701	\$378	\$8,210	\$1,136	\$1,463	\$3,176	\$153,539
Sullivan	\$169	\$81	\$0	\$6	\$0	\$1	\$3	\$260
Tioga	\$11	\$4	\$0	\$0	\$0	\$0	\$0	\$16
Tompkins	\$11	\$4	\$0	\$0	\$0	\$0	\$0	\$16
Ulster	\$571	\$234	\$1	\$25	\$2	\$4	\$13	\$850
Warren	\$75	\$39	\$0	\$2	\$0	\$0	\$1	\$117
Washington	\$92	\$36	\$0	\$5	\$0	\$1	\$2	\$137
Wayne	\$5	\$2	\$0	\$0	\$0	\$0	\$0	\$8
Westchester	\$15,356	\$5,150	\$25	\$917	\$137	\$180	\$584	\$22,350
Wyoming	\$3	\$1	\$0	\$0	\$0	\$0	\$0	\$4
Yates	\$3	\$1	\$0	\$0	\$0	\$0	\$0	\$4

Source: Hazus-MH 2.1, Values are in thousands of dollars

Figure 3.12u shows total annualized losses by county for New York from a Hazus-MH 2.1<sup>®MH</sup> probabilistic hurricane hazard run. The annualized loss total is the sum of direct building losses from capital stock and income losses. Suffolk, Nassau, New York, Kings, and Queens Counties make up the top five counties with the highest annualized losses.



Figure 3.12u: Hurricane Annualized Losses by County



Hazus-MH 2.1 was used to provide hurricane building and transportation loss estimates for the State of New York. **Table 3.12i** provides building inventory value for the counties of New York. The loss estimate results use this default data to generate loss estimates; values are in millions of dollars. **Table 3.12j** list direct economic building losses for a probabilistic 100-year hurricane event; values are represented in thousands of dollars.

**Table 3.12i Building Inventory Value (millions of dollars)**

County	Residential	Non Residential	Total
Albany	\$18,615	\$9,473	\$28,088
Allegany	\$2,508	\$747	\$3,255
Bronx	\$66,088	\$16,837	\$82,925
Broome	\$10,978	\$4,475	\$15,453
Cattaraugus	\$4,580	\$1,711	\$6,292
Cayuga	\$4,286	\$1,386	\$5,672
Chautauqua	\$8,034	\$3,218	\$11,252
Chemung	\$4,352	\$1,918	\$6,271
Chenango	\$2,403	\$1,001	\$3,404
Clinton	\$3,862	\$1,555	\$5,417
Columbia	\$4,269	\$1,254	\$5,523
Cortland	\$2,416	\$1,049	\$3,466
Delaware	\$3,069	\$859	\$3,929
Dutchess	\$18,637	\$5,327	\$23,964
Erie	\$60,331	\$22,488	\$82,819
Essex	\$2,512	\$659	\$3,171
Franklin	\$2,511	\$784	\$3,295
Fulton	\$3,136	\$961	\$4,098
Genesee	\$3,301	\$1,572	\$4,874
Greene	\$3,242	\$776	\$4,019
Hamilton	\$777	\$120	\$897
Herkimer	\$3,411	\$1,085	\$4,496
Jefferson	\$6,251	\$1,976	\$8,228
Kings	\$132,670	\$37,601	\$170,272
Lewis	\$1,576	\$381	\$1,958
Livingston	\$3,338	\$1,183	\$4,521
Madison	\$3,665	\$1,216	\$4,882
Monroe	\$45,990	\$17,076	\$63,067
Montgomery	\$2,470	\$1,004	\$3,475
Nassau	\$111,337	\$36,901	\$148,238
New York	\$114,968	\$83,932	\$198,901
Niagara	\$13,437	\$4,511	\$17,949
Oneida	\$12,862	\$4,368	\$17,230
Onondaga	\$27,936	\$12,253	\$40,190
Ontario	\$6,102	\$2,396	\$8,498
Orange	\$22,097	\$7,794	\$29,892
Orleans	\$2,239	\$751	\$2,990
Oswego	\$5,932	\$2,020	\$7,953
Otsego	\$3,392	\$1,057	\$4,450
Putnam	\$7,746	\$1,499	\$9,246
Queens	\$130,195	\$28,411	\$158,606



County	Residential	Non Residential	Total
Rensselaer	\$8,846	\$2,825	\$11,671
Richmond	\$32,372	\$6,519	\$38,892
Rockland	\$20,466	\$6,625	\$27,091
Saint Lawrence	\$5,390	\$1,606	\$6,996
Saratoga	\$11,741	\$3,408	\$15,149
Schenectady	\$9,138	\$5,606	\$14,745
Schoharie	\$1,814	\$455	\$2,270
Schuyler	\$972	\$352	\$1,325
Seneca	\$1,800	\$583	\$2,383
Steuben	\$5,060	\$1,996	\$7,057
Suffolk	\$118,835	\$39,844	\$158,680
Sullivan	\$6,175	\$1,498	\$7,674
Tioga	\$2,512	\$722	\$3,234
Tompkins	\$5,109	\$1,950	\$7,060
Ulster	\$11,496	\$3,922	\$15,418
Warren	\$4,410	\$1,550	\$5,961
Washington	\$3,048	\$821	\$3,869
Wayne	\$5,272	\$2,177	\$7,449
Westchester	\$67,540	\$23,665	\$91,206
Wyoming	\$2,197	\$831	\$3,028
Yates	\$1,530	\$546	\$2,076
<b>Total</b>	<b>\$1,213,244</b>	<b>\$433,086</b>	<b>\$1,646,360</b>

Source: Hazus-MH 2.1, values are in millions of dollars

Table3.12j: Direct Economic Building Losses for 100- Year Hurricane Events

Direct Economic Building Losses for 100-Year Hurricane Events (value in thousands of dollars)								
County	Building Damage	Contents Damage	Inventory Loss	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
Albany	4,834	1,982	0	8	0	0	0	6,823
Allegany	0	0	0	0	0	0	0	0
Bronx	899,150	95,457	288	46,143	3,707	4,598	54,470	1,103,812
Broome	52	21	0	1	0	0	1	76
Cattaraugus	0	0	0	0	0	0	0	0
Cayuga	0	0	0	0	0	0	0	0
Chautauqua	0	0	0	0	0	0	0	0
Chemung	0	0	0	0	0	0	0	0
Chenango	13	7	0	0	0	0	0	21
Clinton	0	0	0	0	0	0	0	0
Columbia	1,899	555	0	1	0	0	0	2,456
Cortland	5	1	0	0	0	0	0	7
Delaware	28	5	0	2	0	0	1	36
Dutchess	15,654	274	0	23	0	0	13	15,964
Erie	0	0	0	0	0	0	0	0
Essex	0	0	0	0	0	0	0	0
Franklin	0	0	0	0	0	0	0	0
Fulton	0	0	0	0	0	0	0	0
Genesee	0	0	0	0	0	0	0	0
Greene	481	381	0	0	0	0	0	863
Hamilton	0	0	0	0	0	0	0	0
Herkimer	14	5	0	1	0	0	0	20
Jefferson	3	1	0	0	0	0	0	4
Kings	1,595,963	161,897	1,053	79,937	7,664	11,660	96,875	1,955,048
Lewis	2	1	0	0	0	0	0	3



Direct Economic Building Losses for 100-Year Hurricane Events (value in thousands of dollars)								
County	Building Damage	Contents Damage	Inventory Loss	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
Livingston	0	0	0	0	0	0	0	0
Madison	8	3	0	0	0	0	0	11
Monroe	0	0	0	0	0	0	0	0
Montgomery	65	32	0	1	0	0	0	97
Nassau	275,295	13,268	33	4,942	82	29	3,715	297,364
New York	1,642,719	168,206	322	81,424	13,599	10,960	94,421	2,011,652
Niagara	0	0	0	0	0	0	0	0
Oneida	30	9	0	1	0	0	1	40
Onondaga	36	9	0	1	0	0	1	46
Ontario	0	0	0	0	0	0	0	0
Orange	15,620	5,876	0	19	0	0	17	21,532
Orleans	0	0	0	0	0	0	0	0
Oswego	7	4	0	0	0	0	0	11
Otsego	27	11	0	1	0	0	0	40
Putnam	13,233	289	0	44	0	0	49	13,614
Queens	997,657	88,548	463	45,185	2,876	3,454	53,130	1,191,313
Rensselaer	5,065	1,687	0	5	0	0	1	6,758
Richmond	335,440	28,601	194	15,290	1,987	3,012	14,312	398,836
Rockland	47,851	15,049	0	249	0	0	262	63,411
Saint Lawrence	0	0	0	0	0	0	0	0
Saratoga	2,729	2,113	0	1	0	0	0	4,843
Schenectady	1,621	1,204	0	2	0	0	0	2,827
Schoharie	129	124	0	0	0	0	0	253
Schulyer	0	0	0	0	0	0	0	0
Seneca	0	0	0	0	0	0	0	0
Steuben	0	0	0	0	0	0	0	0
Suffolk	93,073	18,662	0	211	0	0	171	112,117
Sullivan	653	626	0	0	0	0	0	1,279
Tioga	11	4	0	0	0	0	0	16
Tompkins	11	4	0	0	0	0	0	16
Ulster	4,428	2,233	0	3	0	0	1	6,666
Warren	387	436	0	0	0	0	0	824
Washington	1,681	730	0	1	0	0	1	2,413
Wayne	0	0	0	0	0	0	0	0
Westchester	272,290	72,282	22	7,810	5	2	7,828	360,240
Wyoming	0	0	0	0	0	0	0	0
Yates	0	0	0	0	0	0	0	0

Source: Hazus-MH 2.1, values are in thousands of dollars



**Table 3.12k** provides estimates for building-related economic loss for property and business interruption. Residential occupancies make up the most significant percentage of losses, at over 96% of total losses. Values are in thousands of dollars.

**Table 3.12k Hurricane Building Loss Estimates by Building Occupancy**

Building Loss Estimates by Occupancy (thousands of dollars)						
Category	Area	Residential	Commercial	Industrial	Other	Total
Property Damage	Building	\$374,398	\$11,127	\$1,673	\$2,144	\$389,343
	Content	\$105,739	\$693	\$63	\$17	\$106,513
	Inventory	\$0	\$8	\$13	\$2	\$23
	<b>Subtotal</b>	<b>\$480,137</b>	<b>\$11,828</b>	<b>\$1,749</b>	<b>\$2,164</b>	<b>\$495,878</b>
Business Loss	Income	\$0	\$5	\$0	\$0	\$5
	Relocation	\$7,971	\$178	\$9	\$11	\$8,169
	Rental	\$8,171	\$2	\$0	\$0	\$8,173
	Wage	\$0	\$2	\$0	\$0	\$2
	<b>Subtotal</b>	<b>\$16,142</b>	<b>\$188</b>	<b>\$9</b>	<b>\$11</b>	<b>\$16,349</b>
<b>Total</b>		<b>\$496,279</b>	<b>\$12,016</b>	<b>\$1,758</b>	<b>\$2,175</b>	<b>\$512,227</b>

Source: Hazus-MH 2.1

Saratoga County's local hazard mitigation plan (LHMP) provides an example of how Hazus-MH 2.0 can be used to determine the impact on general building stock. The county's vulnerability assessment using Hazus is documented in the proceeding pages; however, the complete LHMP can be reviewed at Saratoga County's website<sup>4</sup>

<sup>4</sup> <http://www.saratogacountyny.gov/departments.asp?did=97>



*GENERAL BUILDING STOCK*

The 2000 U.S. Census data identifies 78,165 households in Saratoga County. The U.S. Census data identified 86,701 housing units in Saratoga County in 2000. U.S. Census defines household as all the persons who occupy a housing unit, and a housing unit as a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or if vacant, is intended for occupancy) as separate living quarters. Therefore, you may have more than one household per housing unit. The median price of a single family home in Saratoga County was estimated at \$120,400 in 2000 (U.S. Census, 2000).

*Saratoga County's HAZUS-MH  
MR3 most recent hazard  
mitigation plan is available for  
review at*

*<http://www.saratogacountyny.gov/departments.asp?did=97>*

The data in HAZUS-MH MR3 estimates a total building replacement value (structure and content) of greater than \$24.8 billion for Saratoga County.

Approximately 90.7% of the buildings and 69.5% of the building stock structural value are associated with residential housing. **Table 3.12I** presents Building Stock Statistics by Occupancy Class for Saratoga County, based on HAZUS-MH provided data.



Table 3.12l: Building Stock Replacement Value by Occupancy Class

Location (Municipality)	Total	Residential	Commercial	Industrial
Town of Ballston	\$981,429,000	\$705,548,000	\$154,102,000	\$58,466,000
Village of Ballston Spa	\$670,215,000	\$436,695,000	\$155,816,000	\$29,230,000
Town of Charlton	\$448,009,000	\$394,007,000	\$27,839,000	\$10,014,000
Town of Clifton Park	\$4,633,011,000	\$3,367,323,000	\$1,015,472,000	\$119,530,000
Town of Corinth	\$301,704,000	\$268,066,000	\$18,506,000	\$8,372,000
Village of Corinth	\$280,235,000	\$159,019,000	\$54,396,000	\$25,254,000
Town of Day	\$311,923,000	\$263,208,000	\$17,014,000	\$16,463,000
Town of Edinburg	\$350,033,000	\$322,793,000	\$11,226,000	\$4,773,000
Town of Galway	\$472,152,000	\$420,467,000	\$26,290,000	\$7,989,000
Village of Galway	\$24,657,000	\$18,736,000	\$2,113,000	\$118,000
Town of Greenfield	\$683,176,000	\$549,795,000	\$76,486,000	\$24,553,000
Town of Hadley	\$202,491,000	\$181,094,000	\$12,852,000	\$3,103,000
Town of Halfmoon	\$1,943,765,000	\$1,405,643,000	\$413,701,000	\$79,312,000
Town of Malta	\$1,477,322,000	\$1,132,409,000	\$238,491,000	\$67,653,000
City of Mechanicville	\$487,845,000	\$368,191,000	\$90,735,000	\$9,766,000
Town of Milton	\$1,176,294,000	\$865,010,000	\$162,954,000	\$69,392,000
Town of Moreau	\$993,509,000	\$719,329,000	\$192,946,000	\$36,511,000
Town of Northumberland	\$406,959,000	\$352,122,000	\$34,178,000	\$9,817,000
Town of Providence	\$187,863,000	\$151,942,000	\$13,726,000	\$6,948,000
Village of Round Lake	\$68,688,000	\$44,542,000	\$19,788,000	\$1,422,000
Town of Saratoga	\$397,328,000	\$313,194,000	\$44,499,000	\$16,798,000
City of Saratoga Springs	\$4,825,875,000	\$2,659,812,000	\$1,279,612,000	\$168,138,000
Village of Schuylerville	\$141,009,000	\$88,076,000	\$32,779,000	\$5,073,000
Village of South Glens Falls	\$328,997,000	\$230,861,000	\$75,933,000	\$3,349,000
Town of Stillwater	\$551,522,000	\$423,924,000	\$61,986,000	\$42,977,000
Village of Stillwater	\$147,913,000	\$116,644,000	\$14,529,000	\$4,471,000
Village of Victory	\$48,021,000	\$37,775,000	\$3,410,000	\$1,110,000
Town of Waterford	\$780,046,000	\$560,956,000	\$68,312,000	\$132,677,000
Village of Waterford	\$218,964,000	\$159,687,000	\$32,253,000	\$2,945,000
Town of Wilton	\$1,294,768,000	\$914,295,000	\$292,597,000	\$28,801,000
<b>Saratoga County</b>	<b>\$24,835,723,000</b>	<b>\$17,631,163,000</b>	<b>\$4,644,541,000</b>	<b>\$995,025,000</b>

Source: HAZUS-MH MR3, 2007

Note (1): The valuation of general building stock and the loss estimates determined in Saratoga County were based on the default general building stock database provided in HAZUS-MH MR3. The general building stock valuations provided in HAZUS-MH MR3 are Replacement Cost Value from R.S. Means as of 2006.

Note (2): Value reflects the replacement cost for building structure and contents. Generally, contents for residential structures are valued at about 50 percent of the building's value. For commercial facilities, the value of the content is generally about equal to the building's structural value. Building stock is generated by using 2000 U.S. Census data. Total is total of all building classes (Residential, Commercial, Industrial, Agricultural, Religious, Government and Education).

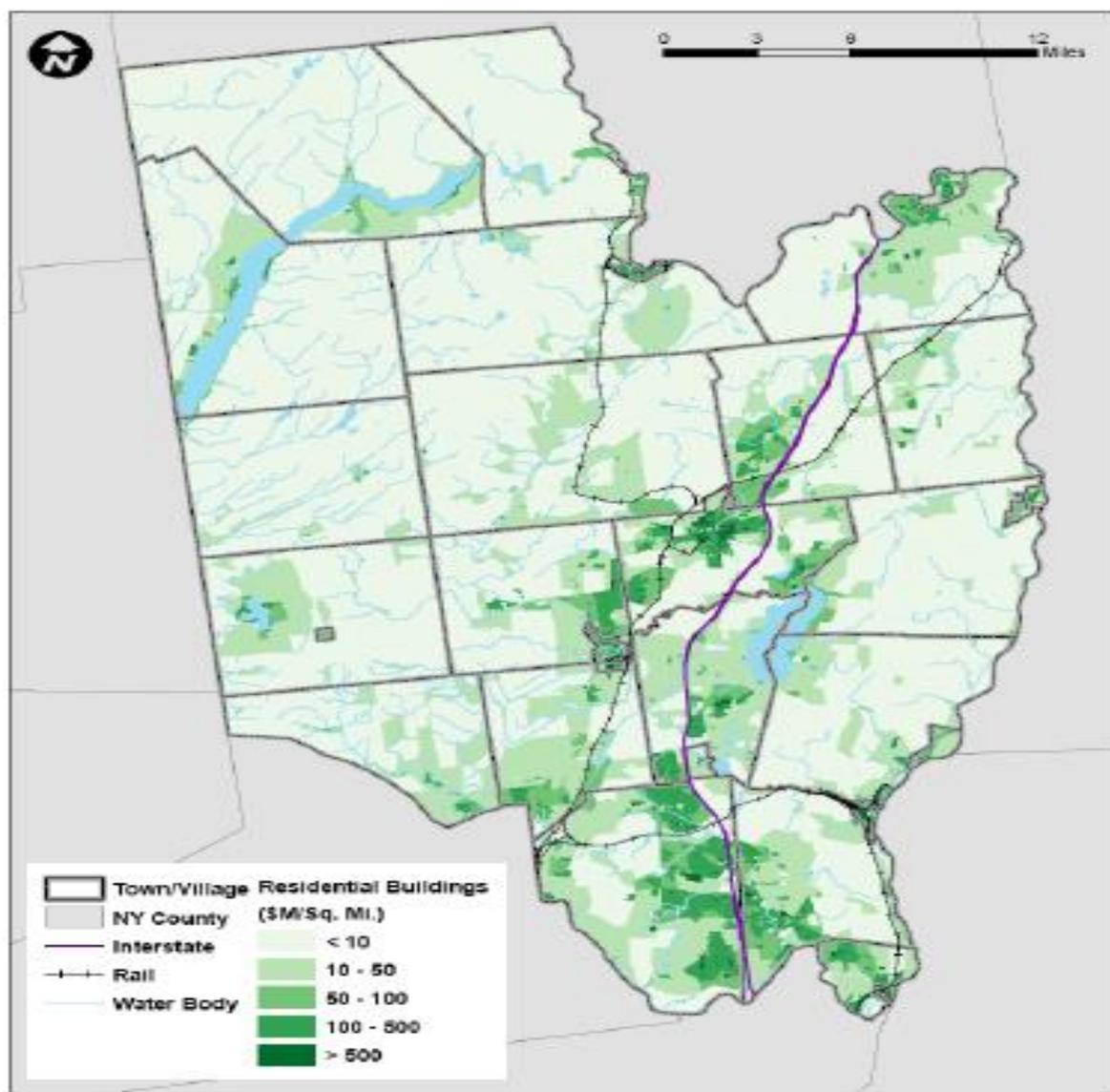
The 2000 Census data identify that the majority of housing units (60.6%) in Saratoga County are single-family detached units. The 2005 U.S. Census Bureau's County Business Patterns data identified 4,864 business establishments employing 63,795 people in Saratoga County. The majority (54.8%) of these establishments employed between one and four employees.



**Figure 3.12v** through **Figure 3.12x** show the distribution and exposure density of residential, commercial and industrial buildings in Saratoga County. Exposure density is the dollar value of structures per unit area, including building content value. Generally, contents for residential structures are valued at about 50 percent of the building's value. For commercial facilities, the value of the content is generally about equal to the building's structural value. The densities are shown in units of \$1,000 (\$K) per square mile.

Viewing exposure distribution maps such as **Figures 3.12v through 3.12x** can assist communities in visualizing areas of high exposure and in evaluating aspects of the study area in relation to the specific hazard risks.

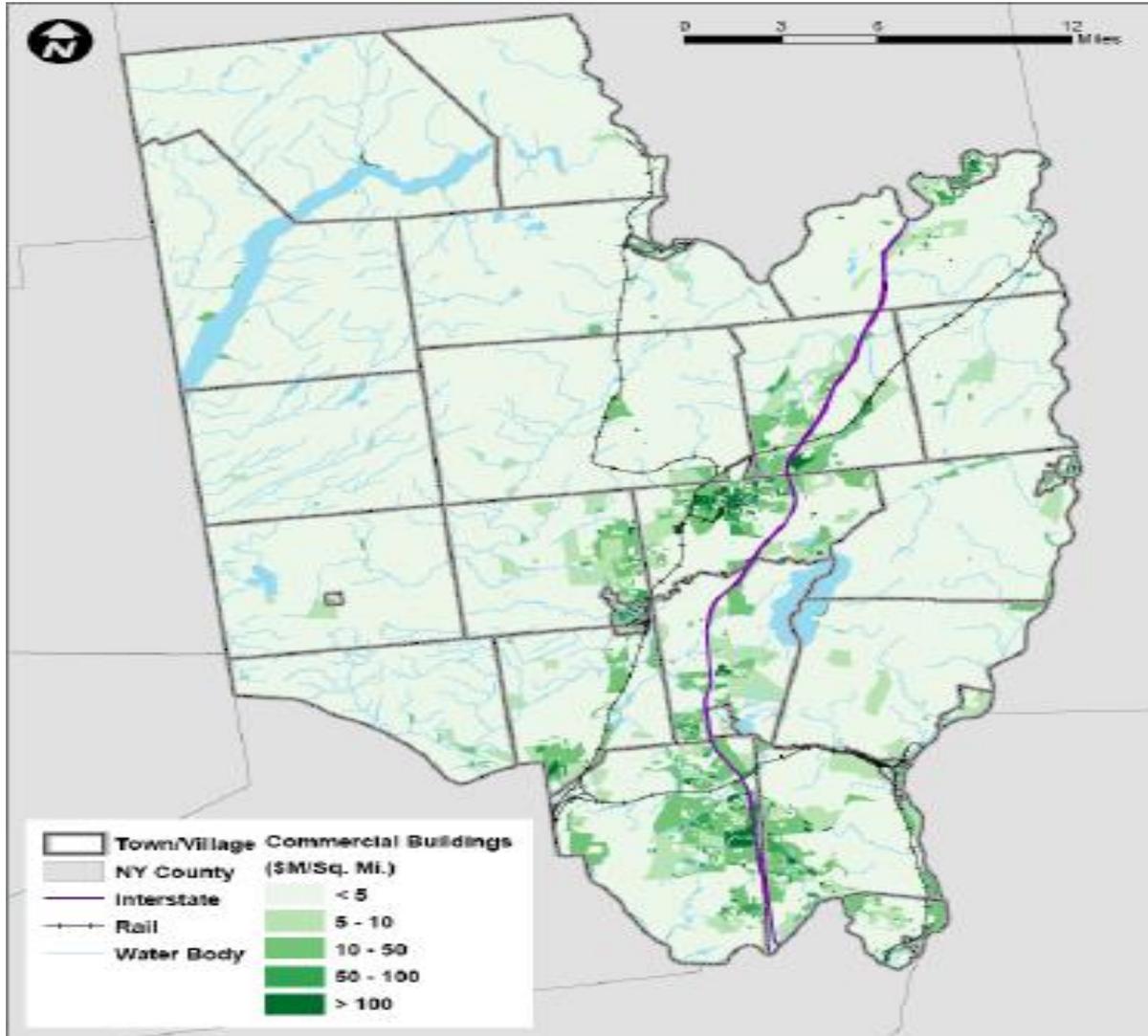
**Figure 3.12v: Distribution of Residential Building Stock Replacement Value in Saratoga County**



Source: HAZUS-MH 2.1, (As of October 2013)



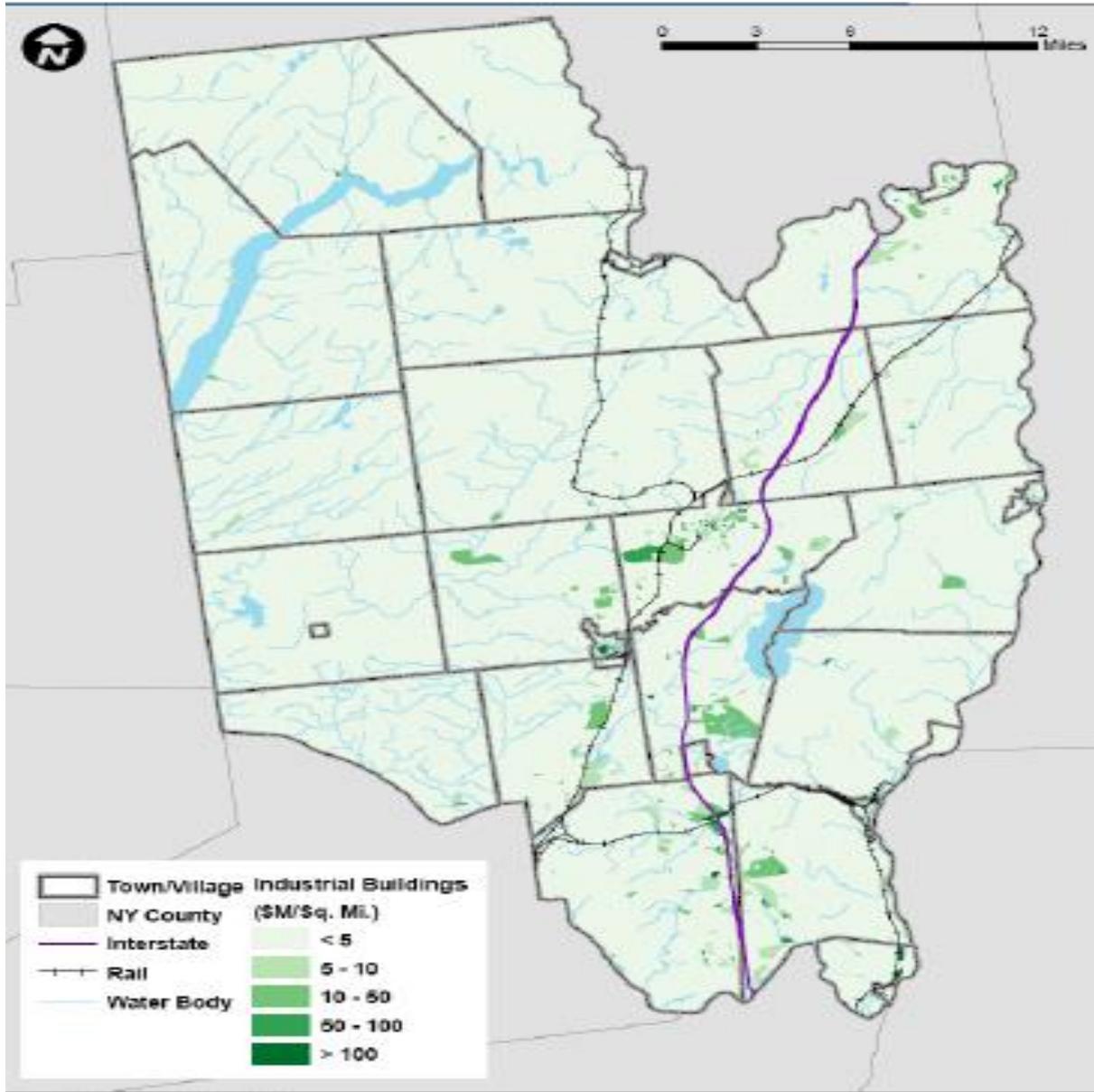
**Figure 3.12w: Distribution of Commercial Building Stock Replacement Value in Saratoga County**



Source: HAZUS-MH MR3, 2007



**Figure 3.12x: Distribution of Industrial Building Stock Replacement Value in Saratoga County**



Source: HAZUS-MH MR3, 2007



## Development in hazard prone areas

The national trend that sees ever-increasing development along the coastline has also been evident in New York State. Accordingly, thousands of New Yorkers and businesses now exist in areas that are vulnerable to hurricanes and tropical storms.

For the State 2014 Update, 2010 Census data was used in the preparation of the risk assessment. The latest Census estimates (July 1, 2009), show that New York State as a whole experienced a 96.6% population growth between the years of 2000 and 2010. Records indicate that although there was a significant increase in population, this was not evenly distributed throughout the State. According to data found in **Table 1a** in **Section 1** of the 2014 Update, Saratoga County, accounted for a 9.5% population gain.

At the local level, jurisdictions have recognized their susceptibility of the occurrence of hurricane events. Although some counties seem to have higher occurrences than others the mitigating trend appears to be strictly enforcing building codes and instituting new measures that would call for the use of hurricane resistant materials, hurricane clips, and wind shutters. For Instance, Westchester County has assessed their risk and exposure and although the likelihood of a hurricane hitting Westchester is moderately high their exposure is very high.

### 3.12.3 Assessing Hurricane (Tropical/ Coastal Storms) Vulnerability and Estimating Potential Losses of State Facilities

A project to produce a statewide inventory of facilities was initiated in August 2013, with a projected completion date for the pilot phase of mid-2014. The pilot will identify and assess one category of state critical infrastructure, developing the methodology for what is anticipated to be a multi-year project. The methodology will include analysis of vulnerability and estimated potential losses to state facilities from future hazard events. **Section 3.1.8** provides a comprehensive description of the status of the statewide facilities inventory project.

**Table 3.12m** exhibit the total number of state buildings and their replacement value as of 2012 based on varying surge zones. According to the SLOSH model, if a category 1 hurricane makes landfall, the State of New York is susceptible to \$346,288,919 in damages. Conversely, a category 4 hurricane will potentially damage 509 State buildings with an estimated cost of \$653,087,513.



**Table 3.12m: State Building Exposure in Hurricane Surge Zones**

State Buildings Exposure		
Surge Zone	No. of Buildings	Replacement Value
Cat 1	263	\$ 346,288,919
Cat 2	350	\$ 396,119,923
Cat 3	463	\$ 530,070,230
Cat 4	509	\$ 653,087,513

Source: SHELDUS/ (Category 2-4 Inclusive of Proceeding Storm Surge)

The data below displays the results of a wind-hazard vulnerability assessment and loss analysis for State facilities. The results present a gross estimate of potential wind losses to those identified vulnerable State facilities in terms of dollar value of exposed property. The wind hazard vulnerability analysis and loss estimation methodology was supported by GIS and Hazus-MH 2.1 technology and involved collaboration with key State agencies that resulted in the identification of two State databases that provide key facility information.

The NYS Offices of General Services (OGS) fixed asset database and Office of Information Technology Services (OITS) database included fields that provide coordinate location information and building replacement value in dollars. The analysis process involved the creation of a GIS mapping layer showing facility location using the coordinate information and overlaid on a wind hazard layer developed using the 100-Year Peak Gust Wind Speed Probability map data.

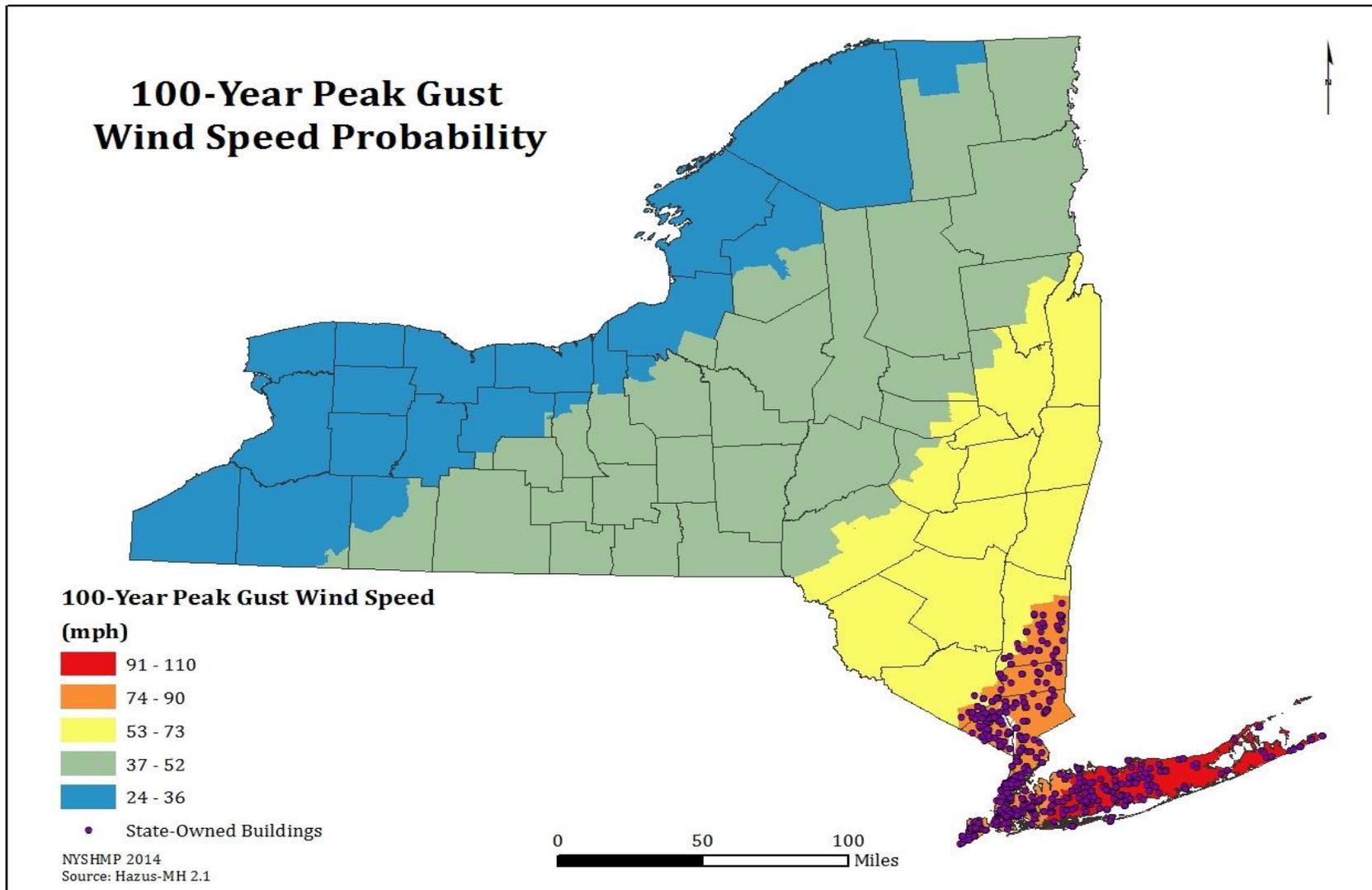
**Figure 3.12y** shows New York's probabilistic 100-year peak gust wind speed from a hurricane event. GIS analysis show that 3,785 buildings are within the high peak gust wind zones (74– 110 miles per hour), with a total replacement cost of \$2,425,867,307 dollars. However, value is reflective of 3,093 buildings, because replacement value data is not available for all buildings. **Table 3.12m** refers to susceptible populations found in the 100-Year Peak Gust Zones found in the map following.

**Table 3.12n: Population in 100-Year Peak Gust Zones**

Population in 100-Year Peak Gust Zones	
Wind Speed Zones (mph)	Population
91-110 (Red)	1,974,031
74-90 (Orange)	10,253,673
53-73 (Yellow)	1,912,605
37-52 (Green)	1,684,894
24-36 (Blue)	2,985,444



Figure 3.12y: 100-Year Peak Gust Wind Probability



**Table 3.12o** details the GIS analysis results from the state-owned buildings in the high peak gust wind zone of 74 to 110 miles per hour categories. The table provides the name of the agency that owns the buildings, the total count of buildings, and replacement cost in the high peak gust wind hazard zones.

**Table 3.12o: State-Owned Buildings and Replacement Cost**

Agency	Number of Buildings	Replacement Cost (\$)
Office of General Services (OGS)	9	\$ 122,193,519.00
Department of Health (DOH)	27	\$ 67,761,389.00
Office of Information Technology Services (OITS)	293	\$ 329,045,358.00
Office of Parks, Recreation and Historic Preservation (OPRHP)	1,840	\$ 504,287,400.00
Department of Environmental Conservation (DEC)	54	\$ 10,534,440.00
Office of Mental Health (OMH)	228	\$ 773,237,304.00
Office For People With Developmental Disabilities (OPWDD)	426	\$ 394,705,144.00
Division of State Police (DSP)	5	\$ 4,874,743.00
Department of Military and Naval Affairs (DMNA)	39	\$ 113,149,168.00
Department of Transportation (DOT)	147	\$ 68,353,325.00
Office of Child and Family Services (OCFS)	21	\$ 24,645,931.00
Dormitory Authority of the State of New York (DASAS)	2	\$ 5,631,127.00
Department of Labor (DOL)	2	\$ 7,448,928.00
<b>Total</b>	<b>3,093</b>	<b>\$ 2,425,867,776.00</b>

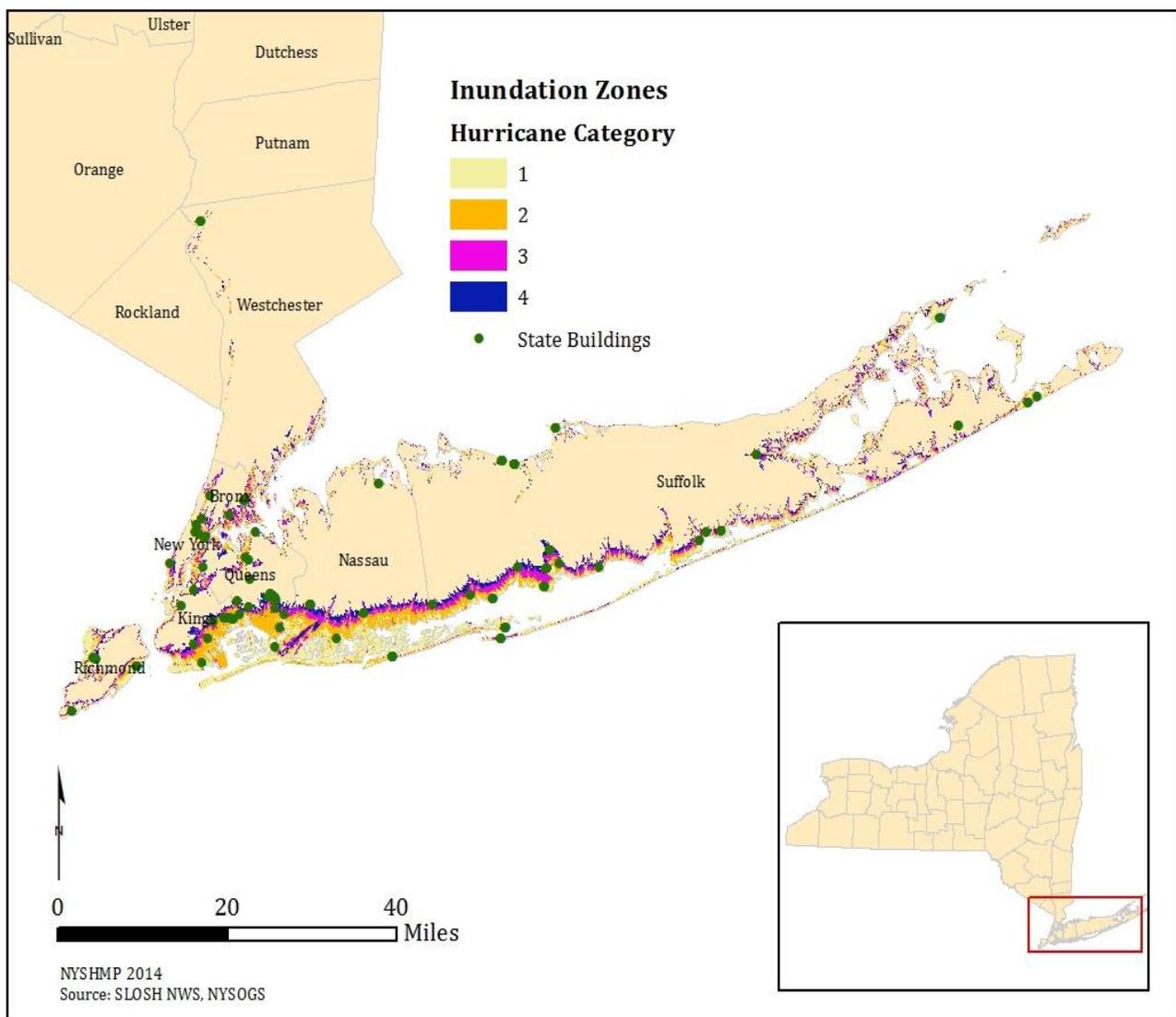
Source: Hazus-MH 2.1, NYSOGS



**Figure 3.12z** shows State buildings that are at risk from hurricane storm surge based on NOAA’s SLOSH inundation model projections. Based on map observations, there are a number of state owned buildings found within the Queens, Kings, Bronx, and New York Counties. There are roughly a total of 349 state owned facilities, Queens- 112, Kings- 102, Bronx- 74, and New York- 61 found amongst the four counties. A vast majority of the state-owned building vulnerabilities occur at category two, three, and four hurricane storm surges.

**Figure 3.12z: State Buildings in Storm Surge Zones**

### State Buildings in Storm Surge Zones



**Table 3.12p** details the GIS analysis results from the state-owned buildings in the storm surge zone. The table provides the name of the agency that owns the buildings, the total count of buildings, and replacement cost in the high peak gust wind hazard zones.

**Table 3.12p: State Building Exposure in Hurricane Surge Zones**

Agency	Number of Buildings	Replacement Cost (\$)
Office of General Services (OGS)	2	\$ 60,024,059.00
Department of Health (DOH)	1	\$ 17,116,294.00
Department of Corrections and Community Supervision (DOCCS)	3	\$ 24,722,629.00
Office of Parks, Recreation and Historic Preservation (OPRHP)	359	\$ 138,643,712.00
Department of Environmental Conservation (DEC)	8	\$ 2,622,073.00
Office of Mental Health (OMH)	47	\$ 254,738,080.00
Office For People With Developmental Disabilities (OPWDD)	69	\$ 126,508,892.00
Division of State Police (DSP)	1	\$ 663,990.00
Department of Military and Naval Affairs (DMNA)	5	\$ 26,178,541.00
Department of Transportation (DOT)	13	\$ 994,864.00
Dormitory Authority of the State of New York (DASAS)	1	\$ 874,379.00
<b>Total</b>	<b>509</b>	<b>\$ 653,087,513.00</b>

Source: HAZUS-MH 2.1, NYSOGS



### 3.12.4 Data Limitations and Other Key Documents

The Mitigation Plan Development Team researched the Wind Event Hazard and its effects on New York State. Contents of this section resulted from research and outreach including, but not limited to, the following sources:

- New York City Office of Emergency Management, [www.nyc.gov/html/oem/html/hazards/storms\\_terms.shtml](http://www.nyc.gov/html/oem/html/hazards/storms_terms.shtml)
- The Federal Emergency Management Agency (FEMA), [www.fema.gov](http://www.fema.gov)
- The National Hurricane Center (NHC), [www.nhc.noaa.gov](http://www.nhc.noaa.gov)
- The National Climatic Data Center (NCDC), [www.ncdc.noaa.gov](http://www.ncdc.noaa.gov)
- CNN; <http://www.cnn.com/2013/07/13/world/americas/hurricane-sandy-fast-facts>
- Daily News; <http://www.nydailynews.com/new-york/great-hurricane-1938-article-1.1194501#ixzz2e1W4Ckuu>
- SHELDUS, the Spatial Hazard Events and Loss Database for the United States
- Metro. Hurricane evacuation maps place 600,000 more New Yorkers in flood Zones. <http://www.metro.us/newyork/news/local/2013/06/18/hurricane-evacuation-maps-place-600000-more-new-york-in-zones/>

**Please note:** data obtained from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™) is a county-level hazard data set for the U.S. for 18 different natural hazard event types such as thunderstorms, hurricanes, floods, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data derives from the national data source, National Climatic Data Center's monthly Storm Data publications. Using the latest release of SHELDUS™ 12.0, the database includes every loss causing and/or deadly event between 1960 through 1992 and from 1995 onward. Between 1993 and 1995, SHELDUS™ reflects only events that caused at least one fatality or more than \$50,000 in property or crop damages.



## Section 3.13: LAND SUBSIDENCE AND EXPANSIVE SOILS

### 2014 SHMP Updates

- Reformatted hazard information from Section 3.14 in the 2011 plan into new section
- Developed new section for Expansive Soils
- Researched and updated data related to occurrence, vulnerability and loss
- Reviewed local hazard mitigation plans and incorporated vulnerability and loss data

### 3.13.1 Land Subsidence and Expansive Soils Profile

Hazard	Definitions and Key Terms
<p><b>Land Subsidence and Expansive Soils</b></p>	<ul style="list-style-type: none"> <li>• <u>Land Subsidence</u> - Depressions, cracks, and sinkholes in the earth's surface which can threaten people and property. Subsidence depressions, which normally occur over many days to a few years, may damage structures with low strain tolerances such as dams, factories, nuclear reactors, and utility lines. The sudden collapse of the ground surface to form sinkholes, many yards wide and deep, within the span of a few minutes to a few hours poses immediate threat to life and property.</li> <li>• <u>Expansive Soils</u> - Any soil that expands when wet and shrinks when dry is an expansive soil. Soils are tested using an accepted standard of measurement to determine swell potential. Expansive soils can exert pressures up to 15,000 lbs. per foot causing the breakdown of building foundations and structural integrity. Roadbeds may also be affected, and could lead to avalanche and collapse when cutting into mountains and hillsides.</li> </ul>

### Characteristics

#### Land Subsidence

Land Subsidence is the sudden sinking or gradual downward settling of land with little or no horizontal motion, caused by a loss of subsurface support which may result from a number of natural and human caused occurrences including subsurface mining, the pumping of oil, or ground water. These events, depending on their location, can pose significant risks to health and safety, interruption to transportation, and other services.



Annually, landslides in the United States cause approximately \$3.5 billion (year 2001 dollars) in damages and between 25 and 50 fatalities.

### Expansive Soils

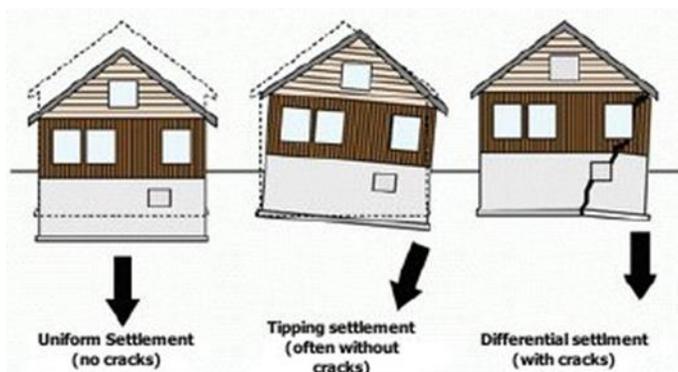
Expansive soils contain minerals such as “smectite” clays that are capable of absorbing water. When they absorb water they increase in volume. The more water they absorb the more their volume increases. Expansions of ten percent or more are not uncommon. This change in volume can exert enough force on a building or other structure to cause damage. Expansive soils will also shrink when they dry out. This shrinkage can remove support from buildings or other structures and result in damaging subsidence. Fissures in the soil can also develop. These fissures can facilitate the deep penetration of water when moist conditions or runoff occurs. This produces a cycle of shrinkage and swelling that places repetitive stress on structures.

The volumetric changes associated with expansive soils comprise one of the most expensive of geologic hazards - resulting in approximately \$300 million in damages to family homes in the U.S. annually<sup>1</sup>.

#### Problems often associated with expansive soils include:

1. Foundation cracks
2. Heaving and cracking of floor slabs and walls
3. Jammed doors and windows
4. Ruptured pipelines
5. Heaving and cracking of sidewalks and roads
6. Damage to the upper floors of the building (when motion in the structure is significant)

**Figure 3.13a: Impacts of expansive soils on buildings**



Expansive soils are present throughout the world and are known in every US state. Every year they cause billions of dollars in damage. The American Society of Civil Engineers

<sup>1</sup> New York Geological Survey



estimates that 1/4 of all homes in the United States have some damage caused by expansive soils. In a typical year in the United States they cause a greater financial loss to property owners than earthquakes, floods, hurricanes and tornadoes combined.

Even though expansive soils cause enormous amounts of damage most people have never heard of them. This is because their damage is done slowly and cannot be attributed to a specific event. The damage done by expansive soils is then attributed to poor construction practices or a misconception that all buildings experience this type of damage as they age.

**Figure 3.13b** illustrates soils that have contracted upon drying out.



Source: [www.geology.com](http://www.geology.com)

The extent to which soil expansion is present in an area or site can be measured using the Soil Expansion Potential standard (ASTM D-4829). An “Expansion Index” associated with the standard provides a range of scores that are used to test soil and determine the extent of expansion.

**Table 3.13a: soils that have contracted upon drying out**

Expansion Index Expansion Potential
0 to 20 Very Low
21 to 50 Low
51 to 90 Medium
91 to 130 High
>130 Very High

Based on the expansion potential rating, mitigation may be required for building construction or repairs. As an example, the Uniform Building Code (UBC) mandates that “special [foundation] design consideration” be employed if the Expansion Index is 20 or



greater. The New York Residential Building Code (Section R403.1.8) addresses consideration of expansive soils. Construction dangers are reduced when engineers incorporate cement, or lime or other salts into expansive soils. These help to lessen the effects of expansion. Other methods of reducing expansive soil danger include replacing the top 3 to 4 feet of expansive soil with non-expansive soils or compacting existing expansive soil.

**Table 13b: Optimal Moisture and Maximum Dry Density Measurement for Types of Soil**

Soil Type	Description	Opt. Moisture	Max. Dry Density lbs./ cu. Ft.
I	Clay, Silty	15	110.4
II	Silty, Sandy	14.6	108.8
III	Silty, Clayey	14.7	110
IV	Sand, Silty	10.8	122.3
V	Sand (?)	13.8	115.7

### Location

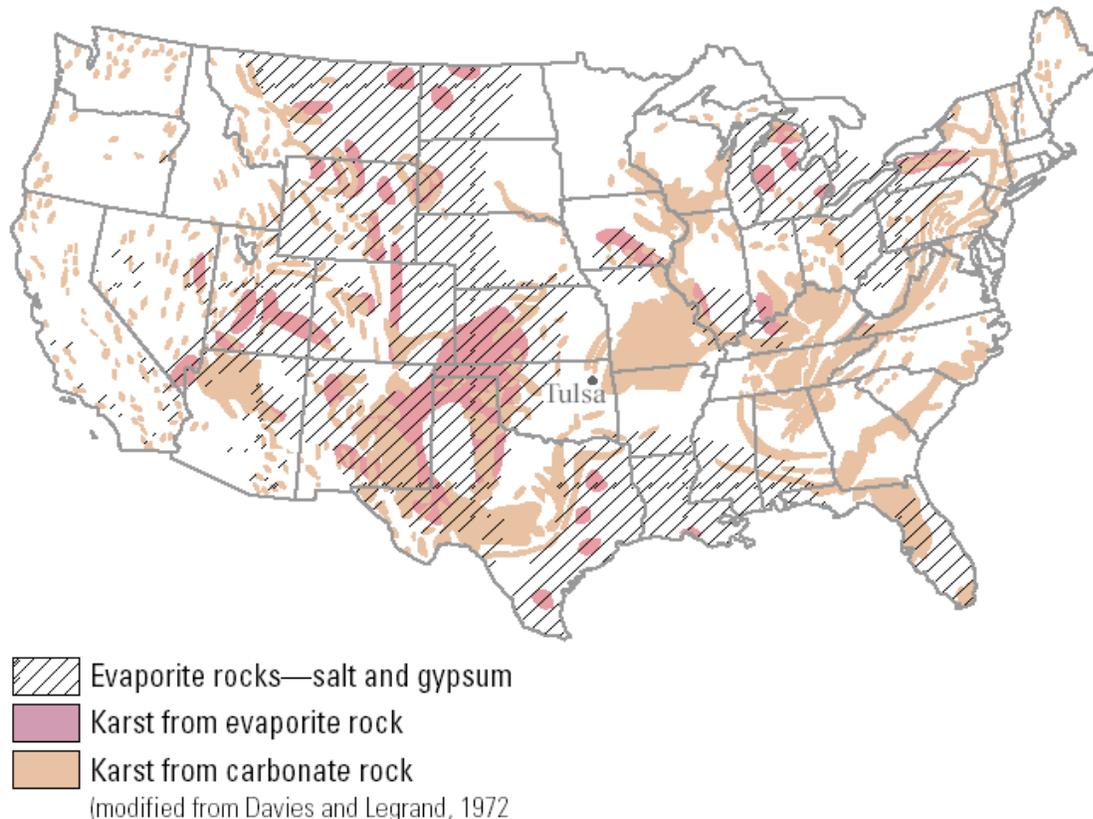
The potential for land subsidence exists across New York State (NYS). In fact, the U.S. Geological Survey (USGS) indicates that there is a national problem affecting an estimated 17,000 square miles in 45 States. As a general rule of thumb, land subsidence occurrence can be expected where it has occurred in the past. Scientific and historical land subsidence incidences, although sparse, exist in areas of the state that have potentially higher risk, such as those reported in the Town of Amherst between the 1980s and early 2000's

### Land Subsidence

Salt and gypsum underlie nearly 40 percent of the United States. According to the USGS website (<http://water.usgs.gov/ogw/pubs/fs00165/>), *karst* is found throughout the nation as illustrated in **Figure 3.13c**. Karst is the landscape of largely shaped dissolving action of water on carbonate bedrock (usually limestone, dolomite, or marble). Carbonate karst landscapes constitute about 40 percent of the United States east of Tulsa, Oklahoma.



Figure 3.13c: Land Subsidence in the United States



Source: USGS Fact Sheet-165-00, December 2000

By definition, karst landscapes imply the existence of land subsidence, generally in the form of sink holes brought on by sinking soils resulting from caves or simply cavities below. In NY, there is karst topography which is nicely developed in a narrow band along the Helderberg Escarpment in Schoharie and Albany counties. These areas are triggered by highly soluble Silurian and Devonian rocks including the upper part of the Rondout Formation and upward to the Onondaga Formation. However, the best expression of karst is in the intervening Coeymans and Manlius Formations.

Reported by miners and drillers, the Onondaga Formation has caverns as far west as Rochester, but are two to three hundred feet below the surface. **Figure 3.13c** also indicates the existence of evaporate rock (salt and gypsum) from western to central New York. According to NYSGS staff, land subsidence, better known as sink holes, have a tendency to occur more often than not due to man-made influences (i.e., mining). These occurrences are found more commonly underground made from evaporate rock. Evaporated rock is soluble in water, and can potentially cause large cavity formations to occur. Sink holes occur when underground holes are created either naturally or artificially, and collapse due to induced force. Carbonate rock (limestone and dolomite) are also prone to void formation, but are less soluble and therefore take much more time, to form all things remaining constant.

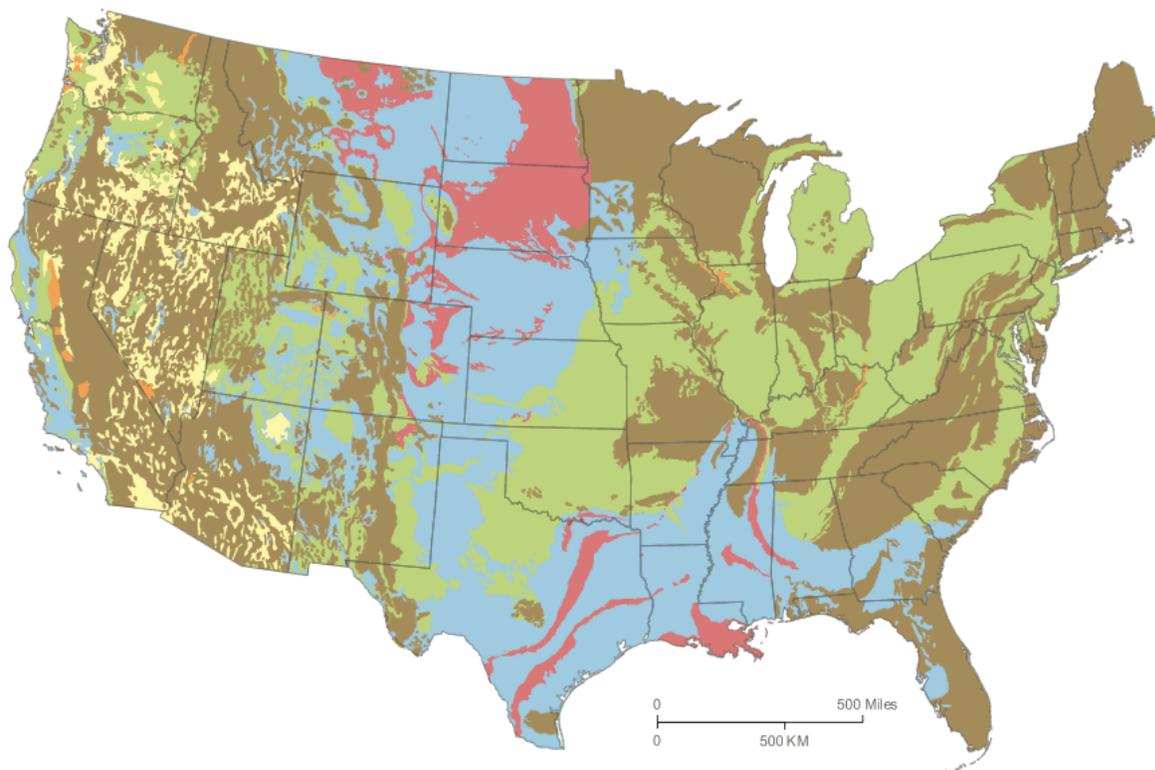


Collapses are relatively rare in NYS where regions of karst topography are found. The last reported occurrence was roughly fifteen years ago in the Cobleskill area. Included below in **Figure 3-21d**, the NYSGS has produced a higher resolution map titled “*Mineral Resources of NY*”. Although the map does not indicate karst landscape, the areas shaded in blue, do emulate the USGS map by showing the location of the varying rock types and minerals that are generally susceptible to natural land subsidence.

### Expansive Soils

The potential for expansive soils is linked to the type of soil as illustrated in **Figure 3.13d**

**Figure 3.13d: Expansive Soils Map**



	Over 50 percent of these areas are underlain by soils with abundant clays of high swelling potential.
	Less than 50 percent of these areas are underlain by soils with clays of high swelling potential.
	Over 50 percent of these areas are underlain by soils with abundant clays of slight to moderate swelling potential.
	Less than 50 percent of these areas are underlain by soils with abundant clays of slight to moderate swelling potential.
	These areas are underlain by soils with little to no clays with swelling potential.
	Data insufficient to indicate the clay content or the swelling potential of soils.



The map above is based upon "Swelling Clays Map of the Conterminous United States" by W. Olive, A. Chleborad, C. Frahme, J. Shlocker, R. Schneider and R. Schuster. It was published in 1989 as Map I-1940 in the USGS Miscellaneous Investigations Series. Land areas were assigned to map soil categories based upon the type of bedrock that exists beneath them as shown on a geologic map. In most areas, where soils are produced "in situ", this method of assignment was reasonable. However, some areas are underlain by soils which have been transported by wind, water or ice. The map soil categories would not apply for these locations.

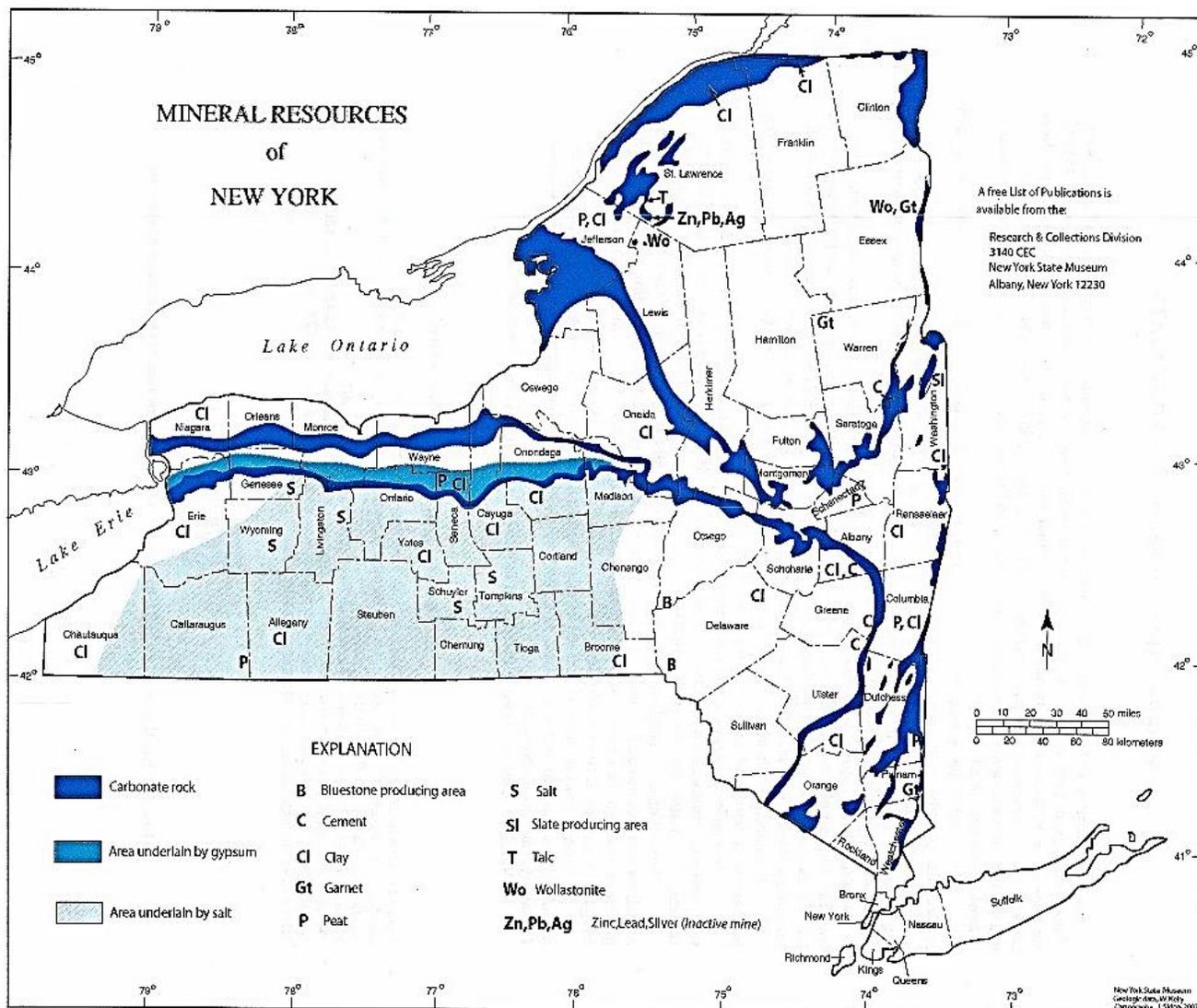
**Based on the map above, the expansive characteristics of New York State's soils are determined to be of two types, both fairly low for swelling potential:**

Soil Type	Region/Area
Less than 50% underlain by soils with clays of high swelling potential	Northeast – Adirondack Mountains Northwest- Lake Plains along the south shore of Lake Ontario
Areas underlain by soils with little to no clays with swelling potential.	All other areas of New York State



Figure 3.13e illustrates the mineral composition of the lands of New York State, which are considered in determining vulnerability to land subsidence.

Figure 3.13e: Mineral Resources of New York



### Previous Occurrences

There are no federally declared disasters on record for landslides and expansive soils. According to New York State Geological Survey (NYSGS) staff, historical records including scientific study data for land subsidence in New York State is either sparse, not readily available, or does not exist in summary form. In fact, this year there has only been one reported occurrence which was in Smithtown, New York. On January 15, 2013, in which a water main broke creating a giant gaping sink hole that damaged a sport utility vehicle in Suffolk County. There were no injuries reported, no State of Emergency declared, and only 26 residences were without water for a few hours (Unknown source, 2013).



The following narrative excerpts are a description of previous occurrences of historical land subsidence events in NYS that demonstrate natural conditions. Beginning with the bank of Claverack Creek in 2006, in the Town of Greenport in Columbia County, and was declared a State of Emergency.

### **Greenport, NY Subsidence - 2006**

On February 2, 2006, New York State Emergency Management Region II was notified by the Columbia County Emergency Management Office that an approximately 675-foot section of the bank of Claverack Creek had subsided into the creek in the area of the Italian American Center in the Town of Greenport. The area of subsidence was estimated to be approximately 30 feet deep. No physical structures were damaged, but a quarter-mile of Bridge Street was closed due to the subsidence.

The Town of Greenport, which surrounds the City of Hudson, declared a State of Emergency in response to the collapse. The Columbia County Emergency Operations Center (EOC) was activated to deal with the emergency. Representatives from Department of Public Works (DPW), power, water, emergency management, and law enforcement were called in, as were representatives from the NYS Departments of Transportation (DOT) and Environmental Conservation (DEC).

The DEC reported that the subsidence resulted in a damming of the creek which threatened the Route 66 Bridge, county jail, and water and sewer systems. The DEC thought the jail would have to be evacuated. Columbia County Emergency Management Office reported that the jail could remain functional for up to 12 hours if the water was shut off.

This never came to pass. Within 24 hours, even though the accident site received over an inch of rain after the collapse, the agencies at the scene declared the situation stable and indicated there was no threat to adjacent properties. Minor damage occurred to recreational facilities and a 20-foot area of a wall collapsed near the Italian American Center. The only flooded area was a farm where the water ponded. The creek has taken a new natural flow and is presently flowing freely. The community has decided to let the creek flow in its new course and remove any trees that are in the way, and the county jail continues to function normally.

### **Hydrogeologic Effects of Flooding in the Partially Collapsed Retsof Salt Mine, Livingston County, New York, February 14-16, 1995**

The Retsof Salt Mine in Livingston County, New York, is nearly 25 mi. southwest of Rochester, New York which is shown in **Figure 3.13f**. This mine has been in operation for 110 years and is about 1,100 ft. below land surface, and supplies road salt to 14 states in the Northeast. The mine is the largest salt mine in the Western Hemisphere and includes an underground area that is roughly the size of Manhattan (6,500 acres).



Figure 3.13f: Retsof Mine Collapse Study Area

U.S. Geological Survey Open-File Report 97-47

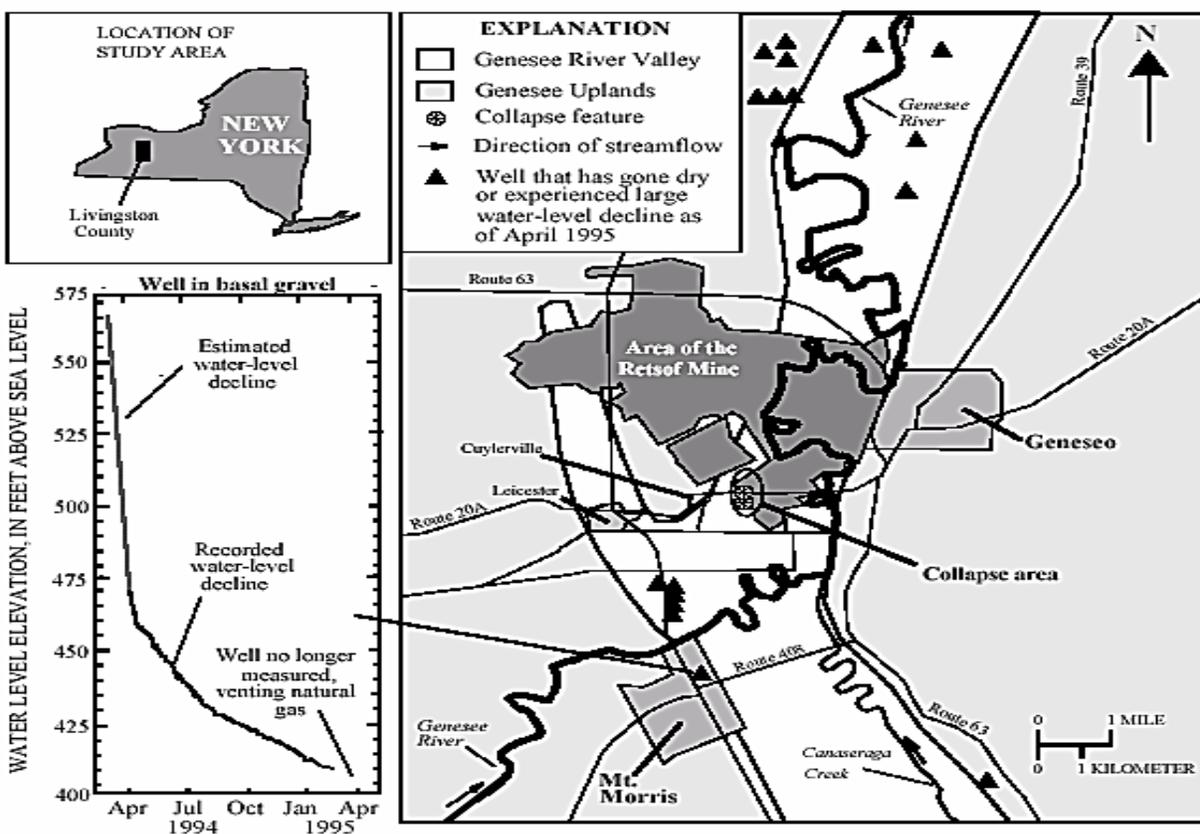


Figure 1. Location of Retsof Salt Mine, area of collapse, and hydrograph of water-level decline in a well 3.5 miles from the mine.

An underground room at the southern end of the mine near Cuylerville collapsed on March 12, 1994, and an adjacent room collapsed in early April. Two large circular collapse features that are several hundred feet apart have developed at land surface above the two collapsed mine rooms. The northernmost feature, which is about 700 ft. in diameter, includes a central area about 200 ft. wide that has subsided about 20 to 30 ft. The southernmost feature, which is about 900 ft. in diameter, includes a central area that is about 700 ft. wide that has subsided about 70 ft. The subsidence resulted in the partial collapse of a DOT bridge and forced the closure of a section of State Route 20A.

During the formation of the collapse features, hydraulic connections formed between aquifers and the mine that had been previously isolated from each other by confining units. These new connections have provided routes for rapid migration of ground water downward to the mine level and since March 12, ground water draining from overlying aquifer systems has been progressively flooding the mine at inflow rates averaging about 18,000 gal/min. This aquifer drainage has caused inadequate water supplies in a number of local wells, and some wells have actually gone dry. The USGS has been working with the

Livingston County Department of Health since March 1994 to provide technical expertise in dealing with this situation.

Evidence of expansive soils was identified in the Town of Amherst, which has over 1,000 homes with foundation problems as early as the 1970s when soil studies were done of areas planned for development. In early 2005, the Buffalo News reported that more than \$2.2 million had been spent on foundation repairs since 1996, and residents also reported that at least another \$2.5 million was needed for outstanding repairs. The U.S. Army Corps of Engineers completed a \$500,000 study (released in May 2005) of the expansive soils for the area, which indicated that the clay soil found throughout north Amherst could have been causing a "dome" effect under some homes, pushing up the centers of basement floors and allowing the walls and edges of foundations to sink<sup>2</sup>. The study found that nearly 1,100 homes had been affected by foundation damage over the previous 20 year period, or about 3 percent of all Amherst homes, according to the preliminary report. But damage rates reportedly could have been 10 times greater in some affected neighborhoods, the study found. About 55 percent of the homes in the study had lateral damage, which causes basement walls to bow or buckle inward. The remaining 45 percent showed signs of sinking.

Four types of pressure on basement walls were believed to be causing the damage, including pressures in expansive soils exerted by frost, soil weight, water in the soils, and soils that swell.

### **Probability of Future Land Subsidence and Expansive Soils Events**

Given that land subsidence is a documented occurrence in New York State, it is certain that future land subsidence will occur. However, the sparse historical record of occurrences and the lack of comprehensive summarized and readily available scientific studies make it difficult to predict probability of future occurrence, only that it is likely.

According to the NYSGS regarding the likelihood of subsidence, "...new sink hole formation in the karst areas is **rare**, the last being 1989 (15 years ago) in a farmer's field....," and "...subsidence occurring in areas that are already subsiding (expanding existing sink holes) are relatively common, occurring every few years...."

Additionally, the NYSGS staff explains that subsidence induced by mine collapse is a different story. Mine collapse and resulting subsidence can be sudden and unpredictable. An iron mine collapse in Mineville, Essex County (approximately 100 miles north of Albany) in April of 2004 is one of an indeterminate number of similar occurrences reported in the last few years. Similarly, the NYS Geologist reports there have been minor incidents of subsidence over the gypsum mines in western and central NY. Again, these occur largely in agricultural fields and are reportedly of the magnitude that can be filled with a couple of truckloads of dirt. Certainly, the subsidence at the Retsof salt mine collapse, as described in

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<sup>2</sup> U.S. Army Corps of Engineers Study of Sinking Homes in Amherst, NY, as reported by the Buffalo News, 2/10/2005



the abstract above, was a surprise but it demonstrates that a collapse of eleven or twelve feet, 1000 feet below the surface, can in fact “chimney” (propagate) all the way to the surface. However, this was the first such incident in 110 years of operation for that mine. Other than the incidence of expansive soils reported in the Town of Amherst in the past 20 years, the incidence and frequency of expansive soils events is largely limited to individual sites and structures.

In summary, it appears that the nature of all forms of land subsidence and expansive soils in New York makes it difficult to determine probability of future events (frequency). The fact that moderate to low land subsidence susceptibility exists (based on land area at risk), as shown on the USGA map figure 3-38, and land subsidence has occurred in the past, suggests that, although very infrequent, land subsidence will occur sooner or later.

#### **Justification for Minimal Vulnerability/Loss Assessment**

Land subsidence and expansive soils occurrences are typically localized in scale; and, while there have been documented land subsidence occurrences, the severity is not considered likely to cause a life safety threat to large populations. This hazard was ranked the lowest of all 15 hazards identified in the 2014 update of the SHMP with a HAZNY-Mitigation score of 12. Consequently, it is determined that there is not sufficient evidence that Land Subsidence and Expansive Soils has a high level of risk to justify further analysis for the 2014 Plan update, but it is recommended that local hazard mitigation plans for areas considering Land Subsidence and Expansive Soil preparedness measures in future plan updates.

The information provided in the Risk Assessment sections below serves as guidance for impact and consequence analysis and local hazard mitigation planning.

### **3.13.2 Assessing Land Subsidence and Expansive Soils Vulnerability by Jurisdiction**

Based on previous occurrences and severity, impacts to population, property and economy are minimal for Land Subsidence and Expansive Soils. There is a slight potential for environmental impacts, but only in a very limited scale. There is little potential for economic impact beyond a localized area.

Review of 56 FEMA-approved local hazard mitigation plans reveals that Erie County identified mine collapse as a hazard; however, only eight counties specifically identified Land Subsidence or Expansive Soils as a hazard. Of the eight counties that identified land subsidence and expansive soils as a hazard only three counties actually ranked the hazard: one moderate and two as a low hazard.



### Development in hazard prone areas

The areas that have previous experienced subsidence are documented and development is unlikely to occur in these areas.

#### **3.13.3 Assessing Land Subsidence and Expansive Soils Vulnerability of State Facilities**

Based on previous occurrences and severity of impact, there are no significant state facilities considered to be vulnerable to subsidence or expansive soils.

#### **3.13.4 Estimating Potential Losses by Jurisdiction**

Based on previous occurrences and severity of impact and review of FEMA-approved local hazard mitigation plans, there are no significant potential losses identified by jurisdictions.

#### **3.13.5 Estimating Potential Losses of State Facilities**

Although research indicates a certain amount of land subsidence hazard in New York State, it also indicates very low risk to population and property. Additionally, the extremely localized and virtually unpredictable nature of land subsidence makes it nearly impossible to estimate potential loss. This said, with the exception of continuing to document land subsidence occurrence, this plan will not include the land subsidence hazard in further analysis or mitigation strategy development.



### 3.13.6 Data Limitations and Other Key Documents

Contents of this section result from research and outreach including, but not limited to, the following sources:

- *United States Geological Survey (USGS* – research and review information located on the web site, <http://water.usgs.gov/ogw/pubs/fs00165/>, including the following;
- U.S. Geological Survey Subsidence Interest Group Conference, Edwards Air Force Base, Antelope Valley, California, November 18-19, 1992;
- Abstracts and Summary edited by Keith R. Prince, Devin L. Galloway, and S.A. Leake, U.S. Geological Survey Open-File Report 94-532;
- U.S. Geological Survey Open-File Report 94-532, SUMMARY OF TALKS, DISCUSSIONS, FIELD TRIP, AND OUTSTANDING ISSUES, Keith R. Prince (U.S. Geological Survey, Menlo Park, California);
- U.S. Geological Survey Open-File Report 94-532, MUDBOILS IN THE TULLY VALLEY, ONONDAGA COUNTY, NEW YORK, William M. Kappel (U. S. Geological Survey, Ithaca, New York);
- U.S. Geological Survey Subsidence Interest Group Conference, Proceedings of the Technical Meeting, Las Vegas, Nevada, February 4-16, 1995, edited by Keith R. Prince and S.A. Leake, U.S. Geological Survey Open-File Report 97-47;
- U.S. Geological Survey Subsidence Interest Group Conference, Proceedings of the Technical Meeting, Las Vegas, Nevada, February 14-16, 1995, HISTORY OF THE SUBSIDENCE INTEREST GROUP, By Keith R. Prince;
- Hydrogeologic effects of flooding in the partially collapsed Retsof Salt Mine, Livingston County, New York, by Dorothy H. Tepper, William M. Kappel, Todd S. Miller, and John H. Williams;
- *New York State Office of Emergency Management* situation report archives for historical events.
- Unknown. (2013, January 17). *Smithtown, New York. January 20th, 2013*. Retrieved August 19, 2013, from thesinkhole.org: <http://thesinkhole.org/?s=New+York>

**Please note:** data obtained from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™) is a county-level hazard data set for the U.S. for 18 different natural hazard event types such as thunderstorms, hurricanes, floods, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data derives from the national data source, National Climatic Data Center's monthly Storm Data publications. Using the latest release of SHELDUS™ 12.0, the database includes every loss causing and/or deadly event between 1960 through 1992 and from 1995 onward. Between 1993 and 1995, SHELDUS™ reflects only events that caused at least one fatality or more than \$50,000 in property or crop damages.



## Section 3.14 LANDSLIDE

### 2014 SHMP Update

- Reformatted document into new outline
- Updated data related to occurrence, vulnerability and loss
- Added information / key terms into the Characteristics Section
- Inserted Historical Landslide Event and Losses Table
- Inserted Historical Landslide Event and Losses Map
- Added Local Plan Integration Table
- Moved pilot study to the appendix

### 3.14.1 Landslide Profile

Hazard	Definitions and Key Terms
Landslide	<ul style="list-style-type: none"> <li>• <u>Rock Fall</u>- Blocks of rock fall away from a bedrock unit <i>without</i> a rotational component.</li> <li>• <u>Rock Topple</u>- Blocks of rock fall away from a bedrock unit <i>with</i> a rotational component.</li> <li>• <u>Rotational Slump</u>- Blocks of fine grained sediment rotate and move down slope.</li> <li>• <u>Translational slide</u>- Sediments move along a flat surface without a rotational component.</li> <li>• <u>Earth flow</u>- Fine grained sediments flow downhill and typically form a fan structure.</li> <li>• <u>Creep</u>- Slow moving landslide often only noticed through crooked trees and disturbed structures.</li> <li>• <u>Block Slide</u>- A block of rock slides along a slip plane as a unit down slope.</li> <li>• <u>Debris Avalanche</u>- Predominately gravel, cobble, boulder sediments and trees move quickly down slope.</li> <li>• <u>Debris Flow</u>- Coarse sediments flow downhill and spread out over relatively flat areas.</li> </ul>

### Characteristics

Another hazard to which New York State is vulnerable to is landslides. Landslide materials may be composed of natural rock, soil, artificial fill, or a combination of these materials. They can be caused by a variety of factors including volcanic eruptions, earthquakes, fire, storms, and by human land modifications. Landslides can transpire quickly oftentimes with little to no warning. Dependent on where they occur, landslides can pose significant risks to health, safety, transportation, as well as other services.



In a landslide, large rock, earth, or debris moves along a downward slope. Mudflow and debris flow are rivers of rock, earth, and other debris that become saturated with water. When water collects in the ground during heavy rains or quick snowmelts, this modifies the earth into flowing rivers of mud in essence creating landslides. They flow rapidly striking at avalanche speeds that can travel several miles growing in size as they pick up trees, boulders, cars and other materials.

This hazard can be initiated particularly in mountain, canyon and coastal regions where areas of burned forest and brush have taken place creating lower thresholds for precipitation. Zoning, professional inspections, and proper designing can assist in minimizing landslides, mudflows, and debris flow problems.

The terms listed below can be used to help describe any type of slide's shape and size. It is important to note that while many of these terms can be used for many types of slides, the geometries and materials of different slides can be very different.

### Location

The potential for landslides exists across the entire State and the entire northeast region of the United States. Scientific and historical landslide data exists which indicates that some areas of the State have a substantial landslide risk. According to information provided by USGS and NYS Geological Survey (NYSGS), it is estimated that 80% of New York State has a low susceptibility to landslide hazard. In general the highest potential for landslides can be found along major rivers and lake valleys that were formerly occupied by glacial lakes resulting in glacial lake deposits (glacial lake clays) and usually associated with steeper slopes. A good example of this is the Hudson and Mohawk River Valleys.

**Table 3.14a** represents populations at risk of landslide incidence determined by susceptibility zones and listed by county generated from USGS data. **Figure 3.14a** created by New York State Department of Homeland Security and Emergency Services (DHSES) (formerly the Office of Emergency Management), displays landslide hazard susceptibility throughout the State of New York according to USGS.



**Table 3.14a: Population at Risk in Landslide Incidence and Susceptibility Zones by County**

County	High Incidence	High Susceptibility/ Moderate Incidence	High Susceptibility/ Low Incidence	Moderate Susceptibility/ Low Incidence	Moderate Incidence	Low Incidence
Albany	197,010					107,194
Allegany				8,125	2,330	38,491
Bronx						1,345,456
Broome				6,923	180,000	13,677
Cattaraugus				2,854		77,463
Cayuga				6,939	2,352	70,575
Chautauqua					41,279	93,447
Chemung						88,830
Chenango					1,395	49,082
Clinton			33,032			49,096
Columbia	15,400					47,696
Cortland					2,812	46,524
Delaware		4,931		8,509		34,540
Dutchess	157,726					139,756
Erie				736,098	16,802	166,113
Essex		10,681				28,689
Franklin		4,495	8,991			37,871
Fulton						55,531
Genesee				9,489		50,590
Greene	15,671	4,788				28,762
Hamilton						4,836
Herkimer						64,519
Jefferson				26,097		89,383



County	High Incidence	High Susceptibility/ Moderate Incidence	High Susceptibility/ Low Incidence	Moderate Susceptibility/ Low Incidence	Moderate Incidence	Low Incidence
Kings						2,445,684
Lewis						27,087
Livingston				202	1,035	64,156
Madison				8,365		65,077
Monroe				316,093	263,031	163,647
Montgomery						50,219
Nassau			153,703			1,154,363
New York						1,546,373
Niagara	16,329			197,444	1,775	809
Oneida				9,163	383	225,332
Onondaga				111,568	1,623	353,835
Ontario					1,963	105,968
Orange	29,914	19,367			1,545	321,982
Orleans				41,587	1,296	
Oswego				85,147	29,826	6,050
Otsego						62,259
Putnam	18,391					81,319
Queens						2,205,988
Rensselaer	98,182	1,016				60,231
Richmond						457,690
Rockland	30,116					281,564
Saratoga	65,947					153,660
Schenectady	22,833					131,894
Schoharie						32,749
Schuyler					1,902	16,441

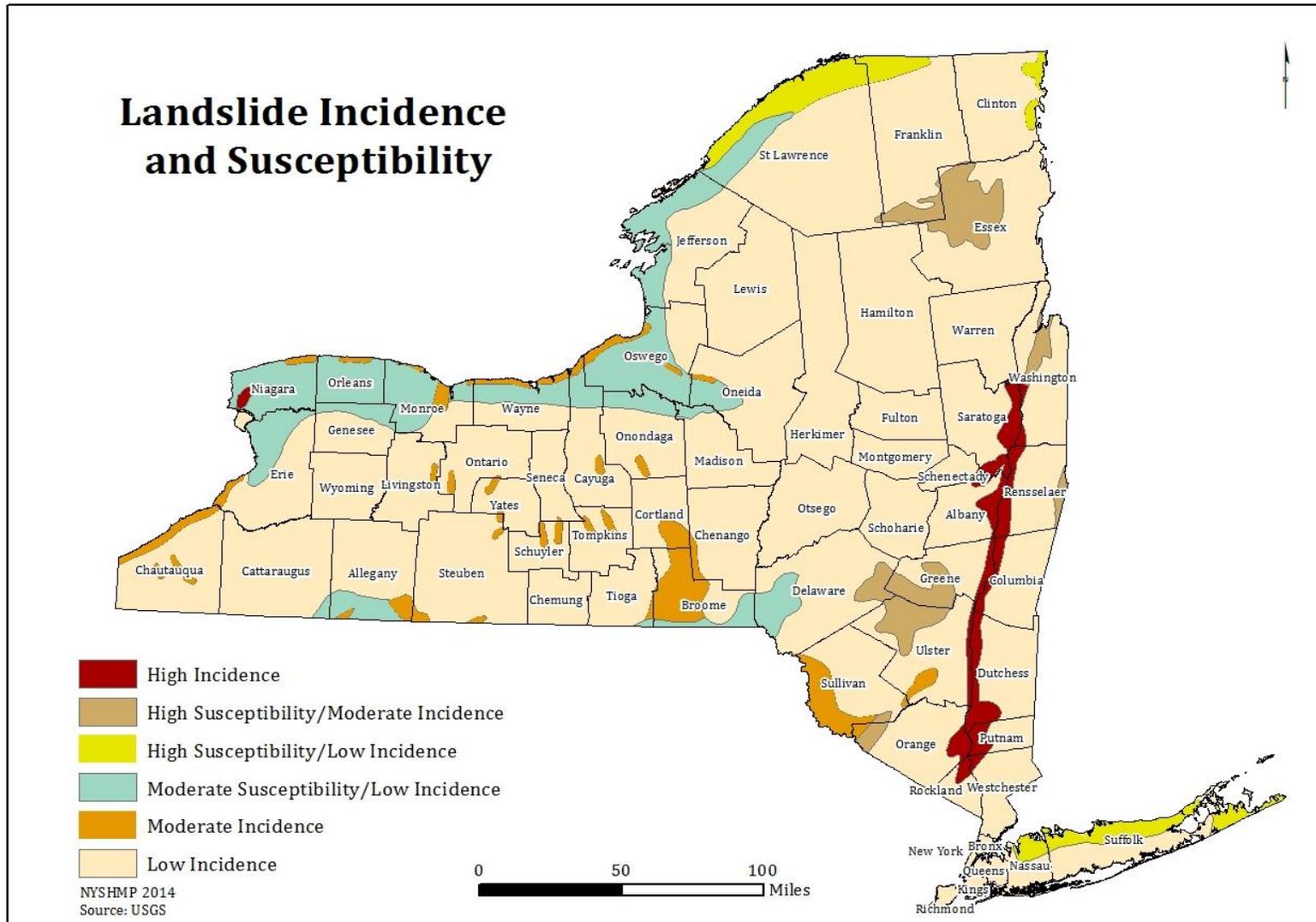


County	High Incidence	High Susceptibility/ Moderate Incidence	High Susceptibility/ Low Incidence	Moderate Susceptibility/ Low Incidence	Moderate Incidence	Low Incidence
Seneca					75	35,176
St Lawrence			46,130	5,689		59,508
Steuben					1,025	97,963
Suffolk			518,910			953,025
Sullivan		721			14,287	62,539
Tioga				1,099	6,578	43,448
Tompkins					5,771	95,793
Ulster	20,345	6,133			3,278	152,737
Warren	250					65,457
Washington	5,039	10,174				48,003
Wayne				32,803	7,424	53,237
Westchester	36,662					910,704
Wyoming						42,155
Yates					1,073	24,275
<b>Totals</b>	<b>729,815</b>	<b>62,306</b>	<b>760,766</b>	<b>1,614,194</b>	<b>590,860</b>	<b>15,386,518</b>

Source: USGS



Figure 3.14a: Landslide Incidence and Susceptibility in New York State



Some natural variables that contribute to determining the overall risk of landslide activity in any particular area include soil properties, topographic position and slope, and lastly historical incidence. **Figure 3.14a**, used previously, categorizes the State using color codes provided by the USGS landslide susceptibility map and the NYSGS landslide incidence map. This map was created comprising two primary characteristics that define landslide potential: terrain slopes, soil makeup, or type.

Most of New York State (NYS) soil consists of dense glacial till that stands up well to landslide tendency. However, certain types of soil exist throughout the State that has higher risks of landslide susceptibility and incidence. More specific, glacial lake clay soils which are abundant throughout NYS have a higher risk for landslide occurrence. Logically, the steeper the slope the higher risk for landslide occurrence assuming other conditions that lead to landslides are present. However, according to the NYSGS, landslides can occur with very little slope, sometimes classified as earth slumping or earth flow. The threshold is estimated at 10 degrees slope or higher (> 10 degrees) when the susceptibility becomes significant. A tall slope or hill, commonly referred as *relief*, could potentially lead to a high risk. Geologists at the NYSGS identify relief (height) greater than 40 ft. as the general threshold where the potential becomes more significant.

Another significant factor in landslide occurrence is what sets off the landslide or the causes (triggers) of the landslide. Causes or triggers of landslides on marginally stable slopes can be both naturally occurring or human induced and include three (3) primary factors: water saturation of the ground; loading, or increased weight at the top or high end of the slope; and taking away soil or removing mass from the bottom.

### Previous Occurrences

On May 6, 2011 the Adirondack Mountains of Keene Valley, New York, recorded potentially the largest, slowest landslide for the State. Geologist state that the 82-acre landmass, found on the Little Porter Mountain, has slow progressive movement downhill at a rate of six inches to two feet per day (Howard, 2001). The unusually slow moving slide was triggered by excessive groundwater stemming from heavy rain and snow of that year. The momentum of the slide has dragged boulders, trees and home foundations along with it (Howard, 2001). It has been reported that one home has been lost with the potential of five others that sit near the edge of a 30-foot drop. Eighty percent of the State has a low susceptibility to landslide hazards. However, the Adirondacks elevations are particularly defenseless to slides due to the loose soil that is piled atop bedrock. There have been no recorded injuries or deaths relating to this slide.

**Table 3.14b** below displays historical and recent loss information listed by county for landslides for the time frame of 1960 – 2012. The data derives primarily from the Spatial Hazard Events and Loss Database for the United States (SHELDUS™). The table accounts for 23 landslides that were reported in NYS between 1960 and 2012. Essex, Montgomery, and Herkimer Counties, specifically, have had the most events since 1960. Based on historical frequency, there have been no fatalities and only one reported injury in



Montgomery County. The State has had more than \$1.8 million in economic losses, majority in property damage. **Figure 3.14b** and **Figure 3.14c** **Figure 3.14d** illustrate previous occurrences of landslide activity, property loss, as well as Presidential Disaster Declarations.

**Table 3.14b: New York State Landslide Events and Losses from 1960-2012**

Historical Record (1960-2012)							
County	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage (\$)	Crop Damage (\$)
Albany	2	52	1	0	0	\$500,000	\$0
Allegany	0	0	0	0	0	\$0	\$0
Bronx	2	52	1	0	0	\$833	\$0
Broome	0	0	0	0	0	\$0	\$0
Cattaraugus	0	0	0	0	0	\$0	\$0
Cayuga	0	0	0	0	0	\$0	\$0
Chautauqua	0	0	0	0	0	\$0	\$0
Chemung	0	0	0	0	0	\$0	\$0
Chenango	0	0	0	0	0	\$0	\$0
Clinton	0	0	0	0	0	\$0	\$0
Columbia	0	0	0	0	0	\$0	\$0
Cortland	0	0	0	0	0	\$0	\$0
Delaware	0	0	0	0	0	\$0	\$0
Dutchess	0	0	0	0	0	\$0	\$0
Erie	0	0	0	0	0	\$0	\$0
Essex	6	17	3	0	0	\$56,000	\$0
Franklin	0	0	0	0	0	\$0	\$0
Fulton	0	0	0	0	0	\$0	\$0
Genesee	0	0	0	0	0	\$0	\$0
Greene	0	0	0	0	0	\$0	\$0
Hamilton	0	0	0	0	0	\$0	\$0
Herkimer	4	26	2	0	0	\$105,000	\$0
Jefferson	0	0	0	0	0	\$0	\$0
Kings	2	52	1	0	0	\$833	\$0
Lewis	0	0	0	0	0	\$0	\$0
Livingston	0	0	0	0	0	\$0	\$0
Madison	0	0	0	0	0	\$0	\$0
Monroe	0	0	0	0	0	\$0	\$0
Montgomery	6	17	3	0	1	\$1,005,500	\$0



Historical Record (1960-2012)							
County	Future Probability %	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage (\$)	Crop Damage (\$)
Nassau	2	52	1	0	0	\$833	\$0
New York	0	0	0	0	0	\$0	\$0
Niagara	0	0	0	0	0	\$0	\$0
Oneida	0	0	0	0	0	\$0	\$0
Onondaga	0	0	0	0	0	\$0	\$0
Ontario	0	0	0	0	0	\$0	\$0
Orange	2	52	1	0	0	\$5,000	\$0
Orleans	0	0	0	0	0	\$0	\$0
Oswego	0	0	0	0	0	\$0	\$0
Otsego	0	0	0	0	0	\$0	\$0
Putnam	4	26	2	0	0	\$1,000	\$0
Queens	2	52	1	0	0	\$833	\$0
Rensselaer	2	52	1	0	0	\$50,000	\$0
Richmond	0	0	0	0	0	\$0	\$0
Rockland	0	0	0	0	0	\$0	\$0
Saratoga	2	52	1	0	0	\$25,000	\$0
Schenectady	2	52	1	0	0	\$5,000	\$0
Schoharie	0	0	0	0	0	\$0	\$0
Schuyler	0	0	0	0	0	\$0	\$0
Seneca	0	0	0	0	0	\$0	\$0
St Lawrence	0	0	0	0	0	\$0	\$0
Steuben	0	0	0	0	0	\$0	\$0
Suffolk	2	52	1	0	0	\$833	\$0
Sullivan	0	0	0	0	0	\$0	\$0
Tioga	0	0	0	0	0	\$0	\$0
Tompkins	0	0	0	0	0	\$0	\$0
Ulster	2	52	1	0	0	\$50,000	\$500
Warren	2	52	1	0	0	\$50,000	\$0
Washington	0	0	0	0	0	\$0	\$0
Wayne	0	0	0	0	0	\$0	\$0
Westchester	2	52	1	0	0	\$833	\$0
Wyoming	0	0	0	0	0	\$0	\$0
Yates	0	0	0	0	0	\$0	\$0

Source: Spatial Hazard Events & Losses Database for the U.S. (SHELDUS) (\*Future Probability equals the number of events divided by the number of years of record [52], expressed as a percentage.)



Figure 3.14b: New York Landslide Events, by County 1960-2012

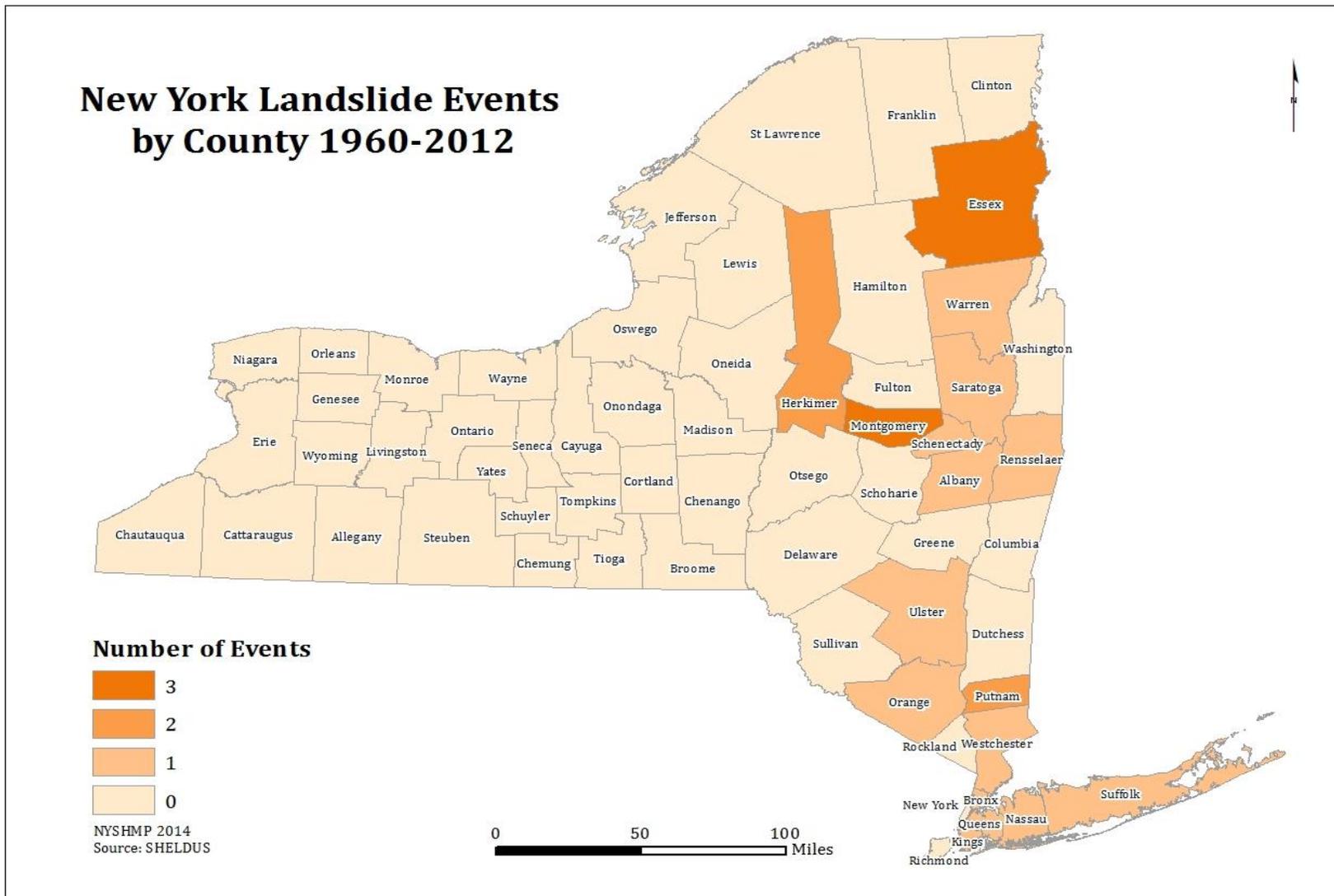


Figure 3.14c: New York Landslide Property Damage, by County 1960-2012

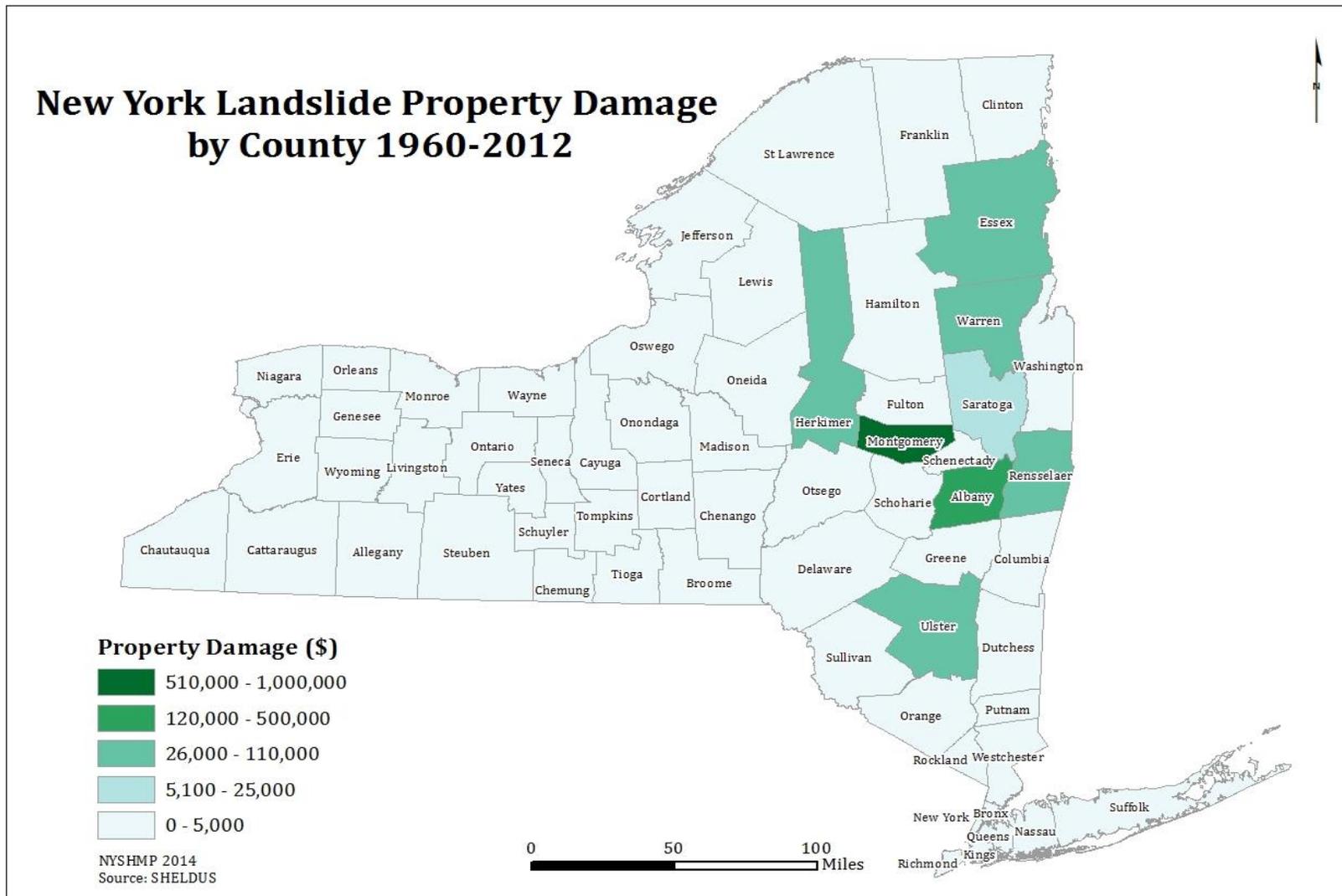
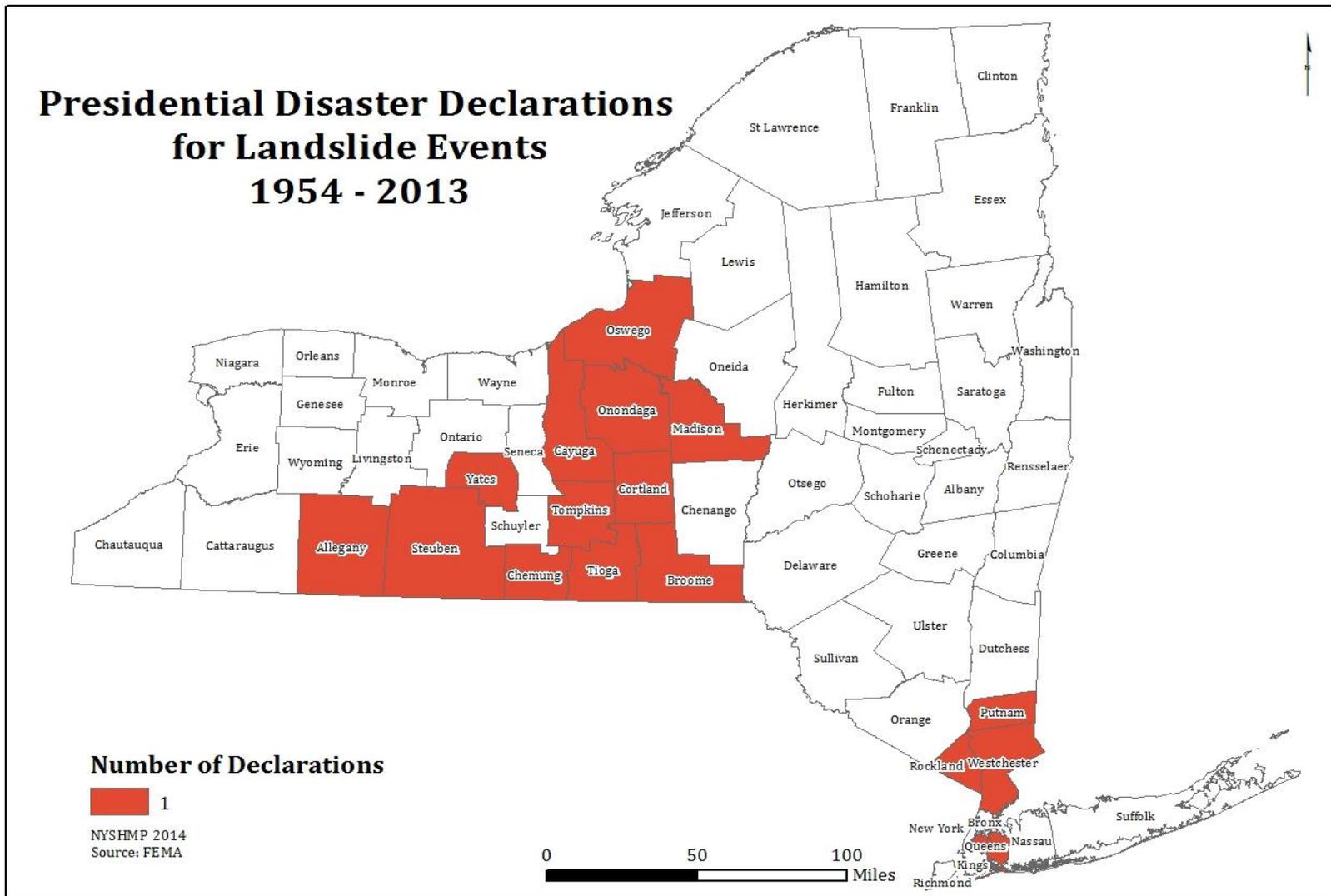


Figure 3.14d: Presidential Disaster Declarations for Landslide Events from 1954-2013



## Probability and Magnitude of Future Events

Given the history of occurrences in NYS, it is certain that future landslides will occur and we can express the probability of future landslides in the State as high. This Plan expresses the probability of future landslides using recognized scientific methods and simple historic landslide event frequency to project potential future occurrences.

Using documented historical occurrences from NYSGS Landslide Inventory Study to estimate the probability of future landslides, NYS can expect on average approximately two (2) major landslides each year, a greater number of smaller but still significant slides/slumps/flows each year, and at least one landslide causing a fatality is expected once every 12 years.

Although historical data indicates a high frequency of landslide occurrence, the NYSGS estimates that 80% of the State has a low susceptibility to landslides. The frequency of damaging landslides within and adjacent to NYS has been and can be classified, relative to other higher risk states, as low. However, the fact that high landslide susceptibility exists and landslides have occurred in the past suggests that the State's infrastructure and many people are at risk from damaging landslide hazards.

### Justification for Minimal Vulnerability/ Loss Assessment

Although landslide received an overall "low" ranking following the HAZNY-Mitigation methodology, it was acknowledged that there are potential cost-effective and technically feasible initiatives and programs that address landslide mitigation. Consequently, it is determined that there is not sufficient evidence based on probability to justify further analysis for the 2014 plan update, but it is recommended that local hazard mitigation plans for areas that will consider addressing landslide preparedness measures in future plan updates.

## 3.14.2 Assessing Landslide Vulnerability by Jurisdiction

### Landslide Impact Analysis

**Table 3.14d** presents the results of New York State's vulnerability assessment indicating counties most vulnerable to a landslide hazard as determined by a final rating score. Each county jurisdiction accumulated points based on the value of each variable indicator; the higher the indication for landslide exposure the more points assigned, resulting in a final rating score (**Table 3.14c**). The rating score's found in this table may not be applicable beyond a general indication, especially at the local level. Activities have been established in this 2014 HMP Update that mitigates strategies that utilizes hazard risk assessments based on local data gathered.



Table 3.14c: Rating Score Table

	Rating Score	*Landslide Susceptibility (Calculated)	Number of Landslide Events**	Number of Structures (HAZUS)
<b>Rating Score - Variables Distributions and Point Values</b>	score value 1	.01-.15	1-5	1-17K
	score value 2	.15-.50	6-10	18-24K
	score value 3	.51-1.0	11-15	25-40K
	score value 4	1-1.5	16-20	41-80K
	score value 5	1.5 - 3 +	21 +	81-462K

The results of New York State's landslide vulnerability assessment present a collective review of counties most threatened by and vulnerable to landslide hazard using readily available information.

Table 3.14d: Jurisdiction Most Threatened by Landslides and Vulnerable to Landslides Loss (Excluding population data)

County	Rating Score	*Landslide Susceptibility	Number of Landslide Events**	Number of Structures (top 3 category areas only)
Rensselaer	13	1.07	22	44,593
Suffolk	13	1.73	14	461,456
Nassau	12	1.14	11	395,748
Albany	11	1.09	6	83,117
Broome	11	1.60	7	60,079
Monroe	11	2.05	1	210,552
Erie	10	0.92	8	277,470
Niagara	10	3.04	5	66,394
Onondaga	10	0.66	10	132,013
Rockland	10	1.03	6	73,767
Wayne	10	1.37	12	30,592
Westchester	10	0.25	11	211,689
Chautauqua	9	0.21	14	45,310
Orange	9	0.58	3	92,068
Oswego	9	2.10	0	40,083



County	Rating Score	*Landslide Susceptibility	Number of Landslide Events**	Number of Structures (top 3 category areas only)
Putnam	9	1.85	3	32,303
Saratoga	9	1.22	5	66,122
Steuben	9	0.07	39	34,710
Ulster	9	1.49	1	58,343
Allegany	8	0.67	12	18,096
Cattaraugus	8	0.07	17	29,499
Columbia	8	0.69	14	23,405
Dutchess	8	1.35	0	79,721
Delaware	7	0.87	6	21,904
Essex	7	1.41	4	17,157
Greene	7	2.27	0	19,884
Jefferson	7	1.16	0	37,938
Schenectady	7	0.39	3	44,729
St. Lawrence	7	1.07	0	36,213
Sullivan	7	0.57	1	33,201
Tompkins	7	0.18	10	24,171
Cayuga	6	0.58	0	26,291
Chemung	6	0.00	15	26,831
Clinton	6	0.34	1	24,229
Oneida	6	0.39	0	69,590
Orleans	6	2.93	0	13,110
Tioga	6	0.13	12	17,232
Bronx	5	0.00	0	89,896
Chenango	5	0.09	6	18,194
Franklin	5	0.81	0	17,453
Genesee	5	0.83	1	17,646
Kings	5	0.00	0	258,603
Madison	5	0.22	2	21,705
New York City	5	0.00	4	56,385
Ontario	5	0.06	1	32,618
Queens	5	0.00	0	343,289
Richmond	5	0.00	0	111,561
Warren	5	0.01	1	26,234
Washington	5	0.92	0	20,361
Livingston	4	0.06	2	18,476
Montgomery	4	0.00	13	14,829
Otsego	4	0.00	7	21,815
Cortland	3	0.35	0	13,599
Fulton	3	0.00	2	20,226



County	Rating Score	*Landslide Susceptibility	Number of Landslide Events**	Number of Structures (top 3 category areas only)
Lewis	3	0.00	7	11,475
Schuylar	3	0.23	0	7,378
Seneca	3	0.01	1	11,423
Yates	3	0.11	1	9,542
Herkimer	2	0.00	0	22,928
Hamilton	1	0.00	0	6,252
Schoharie	1	0.00	0	12,026
Wyoming	1	0.00	0	12,844

Source: USGS

NYS believes the analysis methodology is sound in that it provides a reasonable assessment of vulnerability using key available indicators. NYS acknowledges its limitations for complete accuracy and recognizes some of the reasons why. Many generally recognized indicators for landslide vulnerability are not readily available and are not comprehensive and standardized enough to be easily included into our analysis at this time. Additionally, data may exist but is not practical to apply to a statewide level analysis. Gaps include building attributes and associated level of vulnerability, local or site specific conditions, building positional accuracy, local level accuracy of surficial soils information.

We also included a recent proposal written by USGS Water Science Center in the end of this section of Landslide Hazard Profile. This project of the USGS Water Science Center, if approved, has the potential to greatly advance the accuracy of landslide hazard risk assessment through collection of better data, future more detailed analysis, and continued application of GIS technology.

### Local Plan Integration/ Risk Assessments

Since August 2013, 56 FEMA-approved local hazard mitigation plans (LHMP) have been reviewed for the 2014 Update. The State's planning team had the opportunity to review local county risk assessments to help the State better understand its vulnerability in terms of the jurisdictions most threatened by classified hazards. In its analysis, the State of New York reviewed the processes of local governments and how their hazards were ranked based on their jurisdictions and the potential losses (i.e., people, buildings, and dollar values) associated with the hazards of greatest concern.

Where data was available, the State extracted the ranking impact information from the LHMP hazard analysis. This ranking feature is based on a combination of probability, severity, and extent of the hazard and was determined to be the best measure of overall risk in the plans. This ranking was either numeric or described in terms of high, moderately high, moderate, or low. In cases where this information was not available,



ranking values were not determined yet considered if identified in the individual county local plans.

For the sake of the 2014 Update, a proper analysis and summary of the data was required. During the review of the local plan risk assessments, all rankings used were based on the New York HAZNY ranking system, and measured on a scale rating from 44 (low) to 400 (high). This analysis revealed that selected county-level plans did include manmade hazards in their analysis, but the State hazard mitigation plan's 2014 Update focused solely on natural hazards.

The local risk assessment summary allowed for an analysis of which hazards are of high concern to particular counties. **Table 3.2a** in **Section 3.2** lists all the hazards and the number of counties that ranked them at each of the scale levels: High, Moderately High, Moderate, Moderately Low, and Low. According to the plans reviewed, 34 counties recognized landslide as a hazard. Albany, Allegany "Western & Eastern Region", Essex, and Rensselaer Counties identified landslide as a moderately high hazard, no counties ranked it as a high hazard, two ranked it a moderate hazard, ten ranked it moderately low, and seven considered it a low hazard. **Table 3.14e** displays the highest ranked county hazards. , however due to low ranking there is no data available at the local level.

**Table 3.14e: Summary of Landslide Hazard Impacts and Rankings by County**

Local County Landslide Hazard Impacts		
Highest Occurrences	Highest Fatalities	Highest Property Damage
Montgomery	N/A	Montgomery
Essex	N/A	Albany
Herkimer	N/A	Herkimer
Putnam	N/A	Essex
Albany	N/A	Ulster

Source: SHELDUS

Local County Landslide Hazard Rankings	
High	Moderately High
N/A	Albany, Allegany "Western & Eastern Region", Essex, and Rensselaer

Source: LHMP

A pilot study has been conducted focusing on landslide susceptibility in Schenectady County. The proposal outlined an approach that generated a map demonstrating landslide susceptibility in the State in addition to a fact sheet that targeted government officials.



More information on this study can be found in the data appendix section of this 2014 Update Plan.

### Development in Hazard Prone Areas

The areas that have previous occurrences and severity of impact, there are no significant state facilities considered to be vulnerable to landslides.

#### 3.14.3 Assessing Landslide Vulnerability of State Facilities

The State of New York has an interest in protecting facilities and property owned by the State. Disasters can damage not only personal property, but government property as well, producing a financial and operational liability for the State. Losses range from structures and contents, disruption of services, and possibly the general economy.

The analysis involved creation of a GIS layer for State facilities using the coordinate information and an overlay onto a landslide hazard layer developed using a USGS landslide risk value map. In this plan we acknowledge the limitations of this analysis to provide site specific accuracy and that its applicability may not be appropriate beyond a general indication. Instead the analysis results may be best used as a guide to help target facilities that would benefit from further analysis. We have established activities in our mitigation strategy that will advance the accuracy of the State facilities risk assessment through further analysis. Future analysis may include expressing potential loss based on historical landslide loss information, continued application of GIS technology, and use of site specific data such as percent slope and soil type and building attribute information which will allow targeting of the most vulnerable facilities.

#### 3.14.4 Estimating Potential Losses by Jurisdiction- Overview

This version of the NYS Hazard Mitigation Plan does not include a description of potential dollar loss estimations by jurisdiction for the landslide hazard because of the absence of certain essential information. Additionally, unlike landslide or earthquake hazard, there are not any standard loss estimation models or methodologies for the landslide hazard.

A preliminary dollar loss estimate could have been calculated based on known information such as total structures for general occupancy class, indicated higher landslide hazard areas (USGS landslide hazard susceptibility map) as determined earlier in this plan, and residential structure dollar value estimates. However, many assumptions and generalizations would need to be made for unknowns. Unknowns or available data that has not been gathered or analyzed includes: inventory estimates of the more vulnerable structures such as those near steep slopes, steep slopes prone to erosion, or structures near previous landslide occurrence areas, as well as historical, or critical structures and the type of damage and dollar damage figures. The many generalizations and guess work would result in figures with little accuracy and potentially misleading indications of a



Jurisdiction's vulnerability and potential loss to the landslide hazard. Therefore, this version of the NYS risk assessment will instead include an identification of needed data and establish actions necessary to estimate potential losses.

As local mitigation plans with landslide hazard risk assessments data becomes available, it will be incorporated into a state risk assessment repository for integration into risk assessment. Additionally, application of GIS technology will continue, including exploring the possibility of incorporating certain characteristics that lend to landslide occurrence such as slope, surficial soils, and real property data layers in support of future landslide hazard vulnerability analysis.

### 3.14.5 Estimating Potential Losses of State Facilities

The results depict a gross estimate of potential landslide losses to those identified vulnerable state facilities in terms of dollar value of exposed property. For this plan, landslide hazard vulnerability analysis and loss estimation methodology was supported by GIS technology and involved collaboration with key State agencies. Collaboration resulted in the identification of two State databases that provided key facility information. The NYS Office of General Services (OGS) fixed asset data base and Office of Cyber Security (OCS) database included fields that provide facility location data and replacement value in dollars.

**Table 3.14f** shows the result of the landslide hazard vulnerability assessment and loss analysis for state facilities.



Table 3.14f: Landslide Hazard Exposure (by incidence and susceptibility)

Agency	Total Facilities	Total Replacement Cost	High Incidence	High Susceptibility/Moderate Incidence	High Susceptibility/Low Incidence	Moderate Susceptibility/Low Incidence	Moderate Incidence	Low Incidence	TOTAL
Office of General Services (OGS)	2,046	\$7,269,621,781	\$2,844,403,215			\$9,192,907	\$16,854,179	\$233,164,115	\$3,103,614,416
Department of Health (DOH)	468	\$494,168,461	\$62,073,239					\$74,853,144	\$136,926,383
Department of Corrections and Community Supervision (DOCCS)	19,972	\$9,111,425,045	\$247,697,722	\$146,218,944	\$52,449,873	\$106,412,249	\$41,972,590	\$2,019,781,447	\$2,614,532,825
Office of Parks, Recreation, and Historic Preservation (OPRHP)	10,325	\$2,073,612,475	\$71,318,456	\$390,794	\$251,490,571	\$68,905,464	\$26,612,946	\$514,496,515	\$933,214,746
Department of Environmental Conservation (DEC)	3,144	\$270,643,840	\$3,607,784	\$15,675,159	\$6,690,737	\$10,646,571	\$720,571	\$128,295,863	\$165,636,685
Office of Mental Health (OMH)	4,497	\$6,287,808,931	\$82,963,495		\$103,463,231	\$106,689,034	\$110,904,478	\$854,748,186	\$1,258,768,424
Office For People With Developmental Disabilities (OPWDD)	7,438	\$2,755,709,522	\$31,668,457	\$2,574,099	\$21,445,096	\$94,740,049	\$65,377,576	\$695,486,465	\$911,291,742
Department of State Police (DSP)	267	\$164,142,582	\$7,987,505	\$3,883,722		\$32,486		\$35,246,232	\$47,149,945
Department of Military and Naval Affairs (DMNA)	1,186	\$735,644,622	\$10,140,619	\$1,101,265	\$1,901,681	\$42,466,115	\$5,493,661	\$169,475,180	\$230,578,521



Agency	Total Facilities	Total Replacement Cost	High Incidence	High Susceptibility/Moderate Incidence	High Susceptibility/Low Incidence	Moderate Susceptibility/Low Incidence	Moderate Incidence	Low Incidence	TOTAL
Department of Transportation (DOT)	4,242	\$691,748,381	\$12,122,035	\$3,518,889	\$14,927,757	\$39,346,657	\$18,978,218	\$239,996,128	\$328,889,684
Office of Child and Family Services (OCFS)	1,800	\$424,633,865	\$367,312			\$1,693,676		\$131,015,331	\$133,076,319
Other Agencies	22	\$9,809,970						\$1,308,551	\$1,308,551
Dormitory Authority of the State of New York (DASAS)	46	\$33,880,238						\$9,663,947	\$9,663,947
New York State Unified Court System (COURTS)	42	\$31,856,013	\$5,132,214						\$5,132,214
Department of Labor (DOL)	81	\$146,468,249	\$35,293,667					\$7,448,928	\$42,742,595
New York State Education Department (NYSED)	408	\$530,134,651	\$205,482,067		\$2,051,432			\$29,078,384	\$236,611,883
Adirondack Park Agency (APA)	20	\$4,026,713		\$550,696					\$550,696
Agriculture & Markets (AG&MKTS)	634	\$179,474,412						\$70,624,039	\$70,624,039
Department of State (DOS)	69	\$22,851,819						\$6,308,976	\$6,308,976
<b>TOTAL</b>	<b>56,707</b>	<b>\$31,237,661,570</b>	<b>\$3,620,257,787</b>	<b>\$173,913,568</b>	<b>\$454,420,378</b>	<b>\$480,125,208</b>	<b>\$286,914,219</b>	<b>\$5,220,991,431</b>	<b>\$10,236,622,591</b>

Source: NYS Fixed Asset information – Offices of General Services and USGS Landslide Hazard Susceptibility Map. Analysis supported by GIS technology.



### 3.14.6 Data Limitations and Other Key Documents

The contents of this section result from research and outreach including, but not limited to, the following sources:

- *United States Geological Survey and New York State Geological Survey* – a review of technical information, graphics presenting historical, probability indicators;
- *United States Geological Survey New York Water Science Center Ithaca NY Hydro geologist Bill Kappel* - a review of the landslide profile and possible future program on landslide susceptibility in New York State;
- *New York State Geological Survey* – Outreach to the New York State Geologist Bill Kelly and Glacial Geologist Andy Kozlowski;
- *New York State Emergency Management Office* situation report archives for historical events.
- Howard, Z. (2001, July 1). *Reuters Reprints*. Retrieved August 15, 2013, from Reuters:  
<http://www.reuters.com/assets/print?aid=USTRE7605F320110701>
- Ready.gov. Landslides & Debris Flow. <http://www.ready.gov/landslides-debris-flow>

**Please note:** data obtained from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™) is a county-level hazard data set for the U.S. for 18 different natural hazard event types such as thunderstorms, hurricanes, floods, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data derives from the national data source, National Climatic Data Center's monthly Storm Data publications. Using the latest release of SHELDUS™ 12.0, the database includes every loss causing and/or deadly event between 1960 through 1992 and from 1995 onward. Between 1993 and 1995, SHELDUS™ reflects only events that caused at least one fatality or more than \$50,000 in property or crop damages.

### Case Study

A pilot study in Schenectady County, on July 2007, was presented to find more effective migration strategies in determining landslide susceptibility in that area and potentially for other areas of the State. A major issue with detecting landslide susceptibility is the lack of mapping that identifies slopes most susceptible to this specific hazard. As a result there is a great deal of uncertainty of how to focus on mitigation actions and land use planning for this hazard.

Opportunities to take mitigative action such as slope stabilization are missed as hazardous areas go unidentified. Worsening conditions such as leaking water lines that drain into vulnerable slopes fail to get the appropriate maintenance priority that is necessary and routinely go unchecked. Best practices are rarely presented in clear and consistent messages to the public; as a result property owners are often taken by surprise and commonly find themselves uninsured during times when damaging events occur.



Key developments in the area of GIS have provided an opportunity to use the power of the computer to analyze and map what was previously done by hand. In addition, key datasets critical to landside analysis have been converted into digital formats – particularly slope and soils. These datasets can be overlaid on a GIS with the ability to map locations of areas that have the coinciding soil properties and slope conditions that are most susceptible to sliding.

While the pilot demonstrates that landslide susceptibility maps can be generated in a more cost effective manner than was previously possible, it does not imply that resources will not be needed to expand the work into other Counties and eventually Statewide. Of particular need is staffing. The enhancement of staffing and resources at the NYSGS would enable this agency to better serve its traditional role and responsibilities with landslides and serve as lead for a multi-agency program focusing on landslide evaluation and susceptibility mapping. This program should include at a minimum DOT, DHSES and possibly OITS, which may be in the best position to serve as an interactive clearinghouse for reporting and mapping landslide occurrences.

At this time, the 2014 Hazard Mitigation Plan Update is underway. This plan lays out a strategic direction to mitigating the impacts of natural disasters, including identifying specific activities that are needed to advance understanding of risk and the framework of mitigation. Found within the *Data Appendix* is a more in depth overview of the pilot study in Schenectady County and all of the supporting information.



## Section 3.15: SEVERE WINTER STORM

### 2014 SHMP Updates

- Annual average snowfall map has been added.
- Historical and Recent Events and Losses table added.
- Presidential Declared Disaster table and map has been added.
- Vulnerability and loss data from local plans have been addressed.

### 3.15.1 Winter Storm Profile

New York State is located at relatively high latitude and exposed to large quantities of moisture from the Great Lakes and the Atlantic Ocean; therefore, it is highly susceptible to severe winter storms. Occasionally these storms are large enough to encompass almost the entire state.

Hazard	Terms and Definitions
<p><b>Winter Storm</b></p>	<ul style="list-style-type: none"> <li>• <u>Weather Advisory</u> – this alert may be issued for a variety of severe conditions. Weather advisories may be announced for snow, blowing or drifting snow, freezing drizzle, freezing rain, or a combination of weather events.</li> <li>• <u>Winter Storm Watch</u> – severe winter weather conditions may affect your area (freezing rain, sleet or heavy snow may occur separately or in combination).</li> <li>• <u>Winter Storm Warning</u> – severe winter weather conditions are imminent.</li> <li>• <u>Freezing Rain or Freezing Drizzle</u> – rain or drizzle is likely to freeze upon impact, resulting in a coating of ice glaze on roads and all other exposed objects.</li> <li>• <u>Sleet</u> – small particles of ice usually mixed with rain. If enough sleet accumulates on the ground, it makes travel hazardous.</li> <li>• <u>Blizzard Warning</u> – sustained wind speeds of at least 35 mph are accompanied by considerable falling or blowing snow. This alert is the most perilous winter storm with visibility dangerously restricted.</li> <li>• <u>Frost/Freeze Warning</u> – below freezing temperatures are expected and may cause significant damage to plants, crops and fruit trees.</li> <li>• <u>Wind Chill</u> – a strong wind combined with a temperature slightly below freezing can have the same chilling effect as a temperature nearly 50 degrees lower in a calm atmosphere. The combined cooling power of the wind and temperature on exposed flesh is called the wind-chill factor.</li> </ul>



## Characteristics

Severe Winter Storm is defined as an event that occurs during the winter season that includes one or more of the following conditions: snow, ice, high winds, blizzard conditions, and other wintry conditions; causing physical damage or loss to improved property (NWS, 2013). It can range from a moderate snow over a few hours to a blizzard with blinding wind driven snow that can last for multiple days. During late October through mid-April, temperatures can range between 0 degree Fahrenheit and 32 degree Fahrenheit with February having the greatest average snowfall. Cold moisture combined with high wind and large accumulations of snow cause “Lake Effect” storms. Lake Effect storms leave huge quantities of snow with a few days in its wake. They primarily affect the western and central region of New York, but have been known to affect the eastern portion of the State, if the storm becomes large enough.

Extreme cold and heavy snowfall can immobilize the entire state causing road closures, power outages, disruption in communication services, and no heat for several days, under the most severe circumstances. Severe storms can require persons to abandon their homes and seek shelter.

The severity or magnitude of a severe winter storm depends on several factors including a region’s climatological susceptibility to snowstorms, snowfall amounts and rates, wind speeds, temperatures, visibility, storm duration, topography, time, day of the week, and season.

The extent of a severe winter storm can be classified by meteorological measurements, such as those above, and by evaluating its societal impacts. The Northeast Snowfall Impact Scale (NESIS) categorizes snowstorms, including Nor’easter events, in this manner. Unlike the Fujita Scale, which measures the impact of tornados and Saffir-Simpson Scale, which classify hurricanes, there is no widely used scale to categorize snowstorms. NESIS was developed by Paul Kocin of The Weather Channel and Louis Uccellini of the National Weather Service (NWS) to characterize and rank high impacts of northeastern snowstorms. These storms have large areas of 10 inch snowfall accumulations and greater. NESIS has five ranking categories: Notable (1), Significant (2), Major (3), Crippling (4), and Extreme



*February 8, 2013, Winter Storm Nemo caused New York, Massachusetts, Connecticut, New Hampshire and Rhode Island to declare states of emergency after dumping a massive three feet of snow across the North East Coast.*



(5). **Table 3.15a** identifies and describes each ranking. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus, NESIS gives an indication of a storm's societal impacts. This scale was developed because of the impact northeast snowstorms can have on the rest of the country in terms of transportation and economic impact (Kocin and Uccellini, 2011).

**Table 3.15a: NESIS Ranking Categories**

Category	Description	NESIS Range	Definition
1	Notable	1.0 – 2.49	These storms are notable for their large areas of 4-inch accumulations and small areas of 10-inch snowfall.
2	Significant	2.5 – 3.99	Includes storms that produce significant areas of greater than 10-inch snows while some include small areas of 20-inch snowfalls. A few cases may even include relatively small areas of very heavy snowfall accumulations (greater than 30 inches).
3	Major	4.0 – 5.99	This category encompasses the typical major Northeast snowstorm, with large areas of 10-inch snows (generally between 50 and 150 × 103 mi <sup>2</sup> — roughly one to three times the size of New York State with significant areas of 20-inch accumulations
4	Crippling	6.0 – 9.99	These storms consist of some of the most widespread, heavy snows of the sample and can be best described as crippling to the northeast U.S, with the impact to transportation and the economy felt throughout the United States. These storms encompass huge areas of 10-inch snowfalls, and each case is marked by large areas of 20-inch and greater snowfall accumulations.
5	Extreme	10+	The storms represent those with the most extreme snowfall distributions, blanketing large areas and populations with snowfalls greater than 10, 20, and 30 inches. These are the only storms in which the 10-inch accumulations exceed 200 × 103 mi <sup>2</sup> and affect more than 60 million people.

Source: Kocin and Uccellini, 2004

NESIS scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm. These numbers are calculated into a raw data number ranking from “1” for an insignificant fall to over “10” for a massive



snowstorm. Based on these raw numbers, the storm is placed into its decided category. The largest NESIS values result from storms producing heavy snowfall over large areas that include major metropolitan centers (Enloe, 2011).

While it is almost certain that a number of significant winter storms will occur during the fall and winter seasons, it is difficult to predict how many storms will occur during that time frame. For example, during the calendar year 1997, three (3) significant winter storms occurred. In contrast, during the calendar year 2000, the State encountered sixteen (16) storms.

## Location

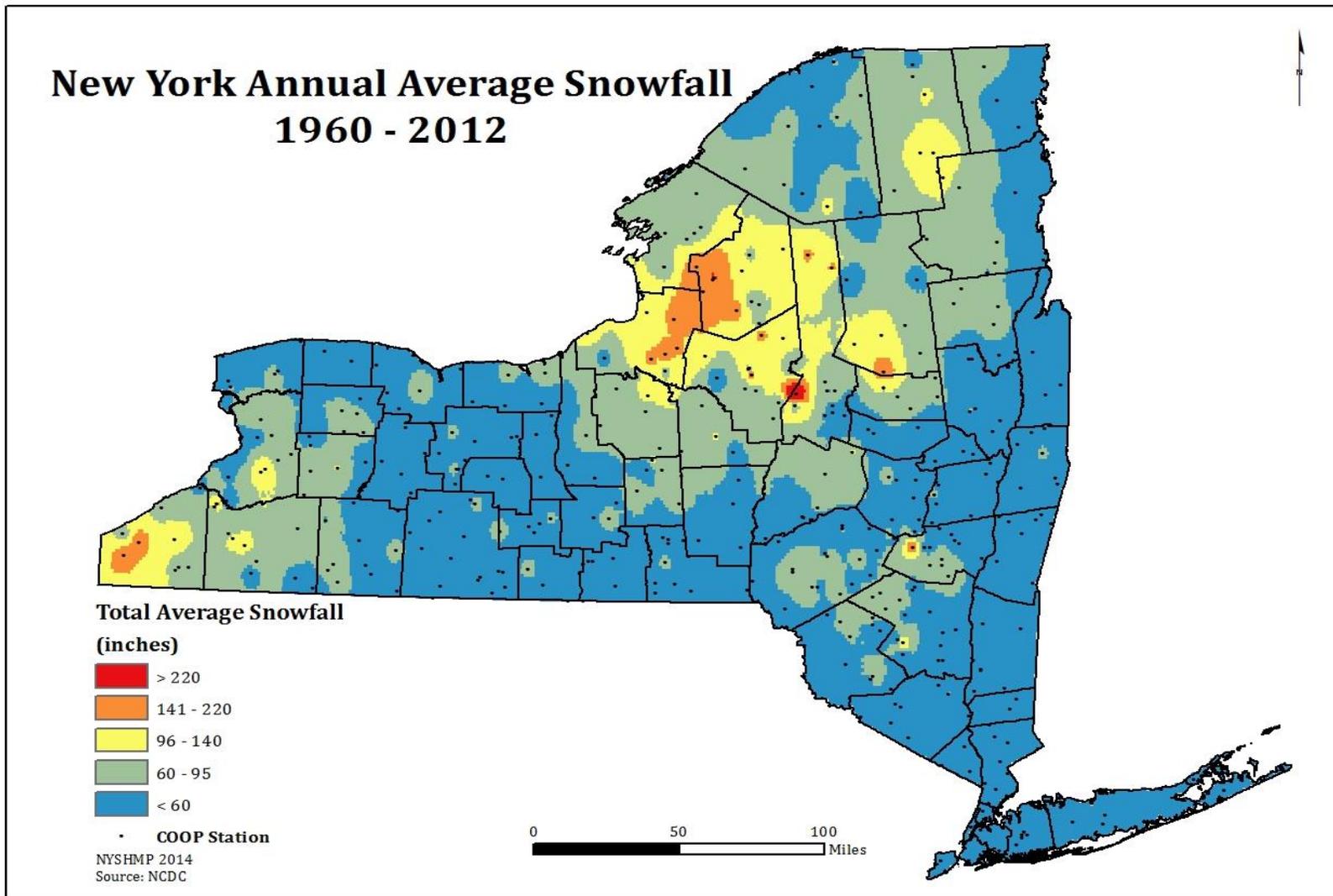
On average, New York receives more snow fall than other states within the United States. Average annual snowfall is about 65 inches, but it varies greatly in different regions of the State. Although the entire State is subject to severe winter storms, the easternmost and west-central portions of the State are more likely to suffer under severe winter storm occurrences than the southern portion.

Albany, Syracuse, Buffalo and Rochester are typically in the top ten cities in the nation in annual snowfall. Hamilton and Essex are rural low populous counties and home to the six (6) million-acre Adirondack Park, which also receive extensive annual snowfall. Parts of Chautauqua, Herkimer, Jefferson, Oswego, and Lewis Counties receive the heaviest snowfall averaging 96-220 inches annually. The coastal region of the State has the lightest annual snowfall, but is extremely vulnerable to Nor'easters if a hurricane or coastal storm occurs.

**Figure 3.15a** is a map of historical average snowfall totals for the State. The National Weather Service's Cooperative Observer Program (COOP) collects daily meteorological data, including snowfall. Monthly totals for the years of 1960-2012 were used to create the annual average surface from the COOP stations. This figure shows a clear visual of areas that are subject to future occurrences and vulnerable to high levels of snowfall.



Figure 3.15a: New York Annual Average Snowfall 1960-2012



### FEMA 9523.1 Snow Assistance Policy

Entities that meet the applicant eligibility, 44 CFR §206.222, and are performing work that meets the requirements of general work eligibility, 44 CFR §206.223, are eligible for snow assistance.

Eligible work, under Category B, emergency protective measures, as described in the [Public Assistance Guide, FEMA 322 \(PDF\)](#), includes snow removal, snow dumps, de-icing, salting, and sanding of roads and other facilities essential to eliminate or lessen immediate threats to life, public health, and safety. In addition, activities related to the snowstorm such as search and rescue, sheltering, and other emergency protective measures are eligible work. Other categories of work may be eligible under a snowstorm declaration where appropriate.

In a major disaster declaration for a Severe Winter Storm, snow removal costs are not eligible for FEMA assistance if the county does not meet the requirements for snow assistance under paragraph (B) of this policy. A limited level of snow removal incidental to disaster response may be eligible for assistance. Generally, snow removal that is necessary to perform otherwise eligible emergency work is eligible. For example, snow removal necessary to access debris or to repair downed power lines is eligible, while normal clearance of snow from roads is not eligible. (FEMA, 2013)

### Previous Winter Storm Occurrences

New York State Department of Homeland Security and Emergency Services (DHSES) Mitigation staff researched several data sources for historical winter storm records including NYS Office of Emergency Management archives, FEMA statistics, Disaster Declaration data, Spatial Hazard Events and Losses Databases for the United States (SHELDUS), and NOAA's National Climatic Data Center (NCDC) storm event database. According to FEMA, 11 major severe winter storm events occurred from 1976 to 2013 causing Presidential Disaster Declarations. **Table 3.15a** documents severe winter storm Presidential declaration events that occurred from 1976-2013 (excluding emergency declarations).



**Table 3.15b: Severe Winter Storm Presidential Declarations 1976-2013**

Disaster Number	Date Declared	Affected Locations
DR-4111	4/23/2013	Suffolk County
DR-1957	2/18/2011	Nassau and Suffolk Counties
DR-1827	3/4/2009	Albany, Columbia, Delaware, Greene, Rensselaer, Saratoga, Schenectady, Schoharie and Washington Counties
DR-1467	5/12/2003	Cayuga, Chenango, Livingston, Madison, Monroe, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Schenectady, Seneca, Wayne, and Yates Counties
DR-1404	3/1/2002	Erie County
DR-1196	1/6/1998	Clinton, Essex, Franklin, Jefferson, Lewis, and Saint Lawrence Counties
DR-1083	1/12/1996	Albany, Bronx, Columbia, Delaware, Dutchess, Greene, Kings, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland County, Suffolk, Sullivan, Ulster, and Westchester Counties
DR-898	3/21/1991	Allegany, Genesee, Jefferson, Lewis, Livingston, Monroe, Ontario, Orleans, Saint Lawrence, Steuben, Wayne, Wyoming, and Yates Counties
DR-801	11/10/1987	Albany, Columbia, Dutchess, Greene, Putnam, Rensselaer, Saratoga, Schenectady, and Washington Counties
DR-527	2/5/1977	Cattaraugus, Chautauqua, Erie, Genesee, Jefferson, Lewis, Niagara, Orleans, and Wyoming Counties
DR-494	3/19/1976	Cattaraugus, Chautauqua, Erie, Genesee, Livingston, Monroe, and Wyoming Counties

**Figure 3.15b** displays the Presidential declared disaster totals by county for winter events for the period of 1954 through July 2013. Monroe and Genesee Counties have the highest number of winter declarations.

**Figure 3.15c** references NYS winter events by county from 1960-2012. The highest number of Severe Winter Storm occurrences from 1960-2012 were in Western, Central and Northern New York State. On average 290-370 events were reported in the following counties: Chautauqua, Erie, Oswego, Oneida, Lewis, St. Lawrence, Franklin, Clinton and Essex. The lowest number of occurrences was along the coastal region of the State in Suffolk, Nassau, Bronx, Queens, Kings, Richmond, Rockland and Westchester Counties with 60-89 events



Figure 3.15b: Presidential Disaster Declarations for Winter Events for 1954- 2013

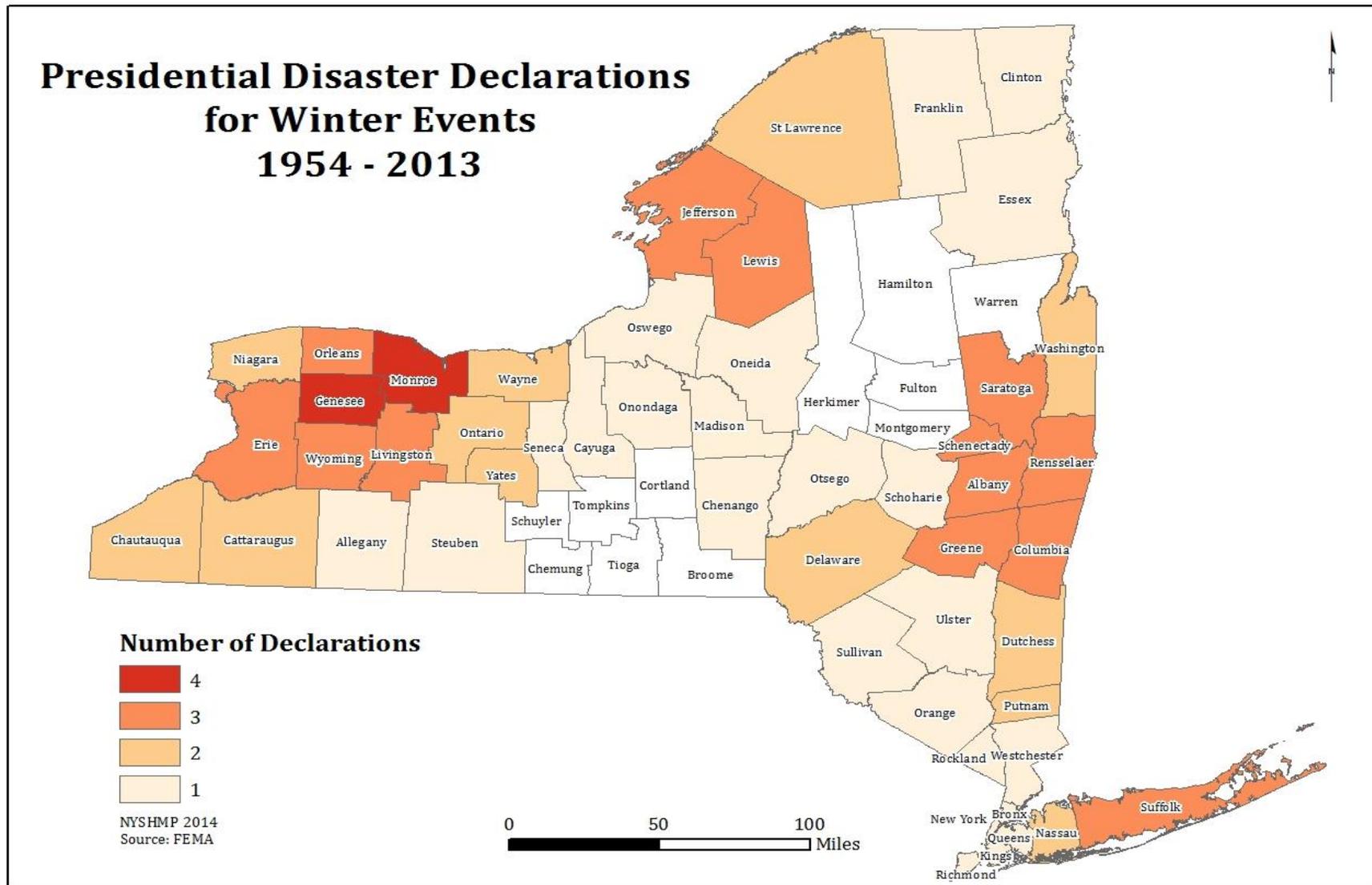
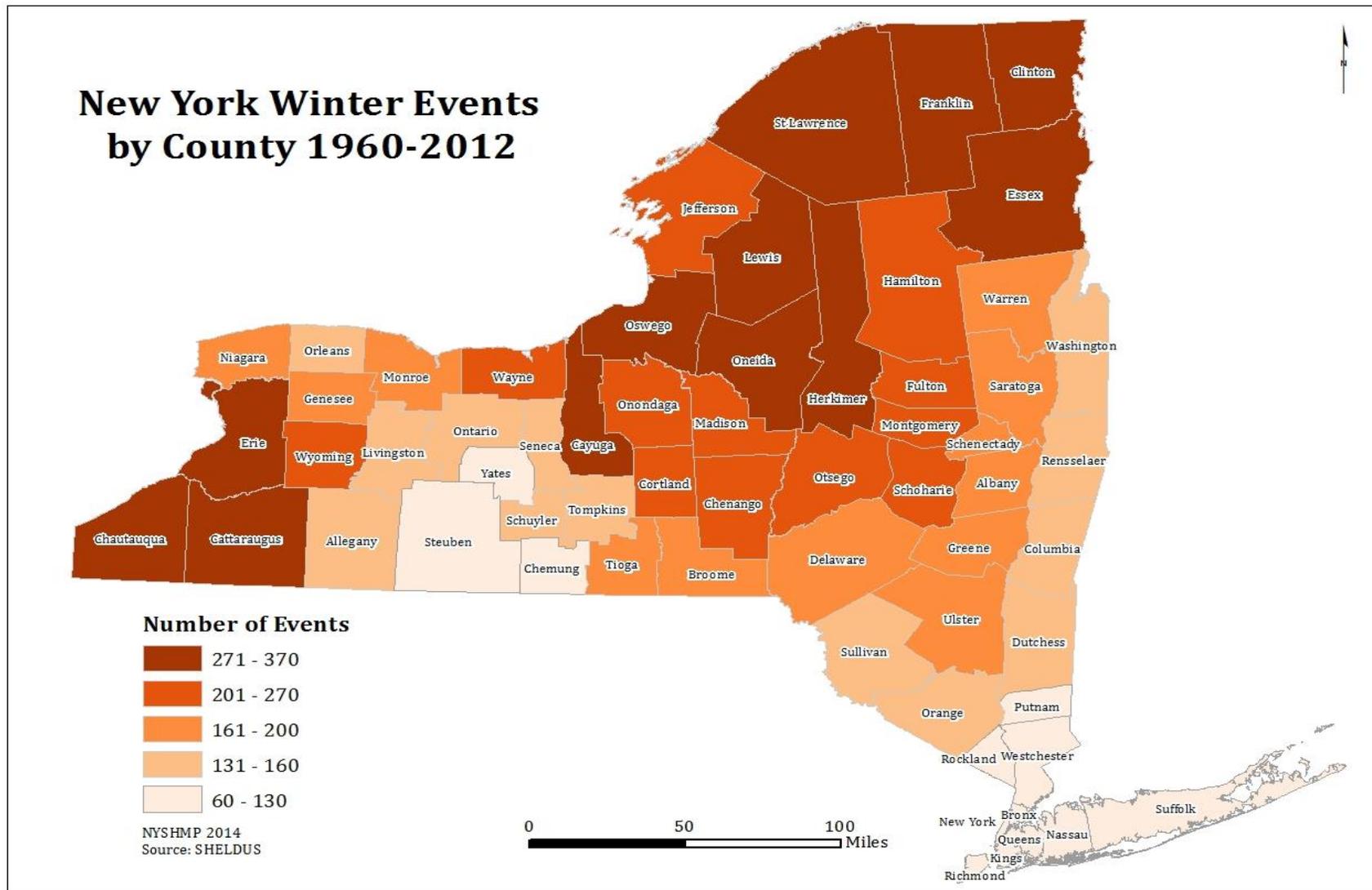


Figure 3.15c: New York Winter Events by County 1960-2012



SHELDUS data reports 11,876 severe winter storm event occurrences throughout New York State from 1960 to 2012; with property damage exceeding \$1.7 billion. Additionally, 327 storm events occurred in 26 out of 62 counties from 2010-2012; property damage was approximately \$4.2 million. From 1960 to 2012, 503 fatalities occurred, 2,560 injuries were reported, and crop damage exceeded \$27 million. **Table 3.15c** represents historical and recent severe winter storm events and losses.

**Table 3.15c: Historical and Recent Severe Winter Storm Events and Losses**

County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability%	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Albany	375	0.27	195	11	60	\$48,308,713	\$222,108	10	0	0	\$165,000	\$40,000
Allegany	290	0.34	151	4	7	\$14,585,332	\$49,259	0	0	0	\$0	\$0
Bronx	125	0.80	65	4	25	\$3,187,310	\$23	1	0	0	\$0	\$0
Broome	335	0.30	174	8	49	\$22,342,815	\$892,969	0	0	0	\$0	\$0
Cattaraugus	538	0.19	280	11	8	\$18,871,011	\$99,259	16	0	0	\$363,000	\$60,000
Cayuga	533	0.19	277	6	21	\$17,199,331	\$964,898	11	0	0	\$153,000	\$0
Chautauqua	581	0.17	302	7	11	\$20,008,714	\$139,259	14	0	0	\$228,000	\$100,000
Chemung	250	0.40	130	4	8	\$3,608,059	\$9,259	0	0	0	\$0	\$0
Chenango	423	0.24	220	6	51	\$24,948,711	\$226,610	0	0	0	\$0	\$0
Clinton	610	0.16	317	5	30	\$24,244,805	\$1,147,345	31	0	0	\$320,000	\$125,000
Columbia	294	0.34	153	10	62	\$50,487,953	\$228,458	0	0	0	\$0	\$0
Cortland	452	0.22	235	8	60	\$24,354,205	\$216,610	0	0	0	\$0	\$0
Delaware	350	0.29	182	8	81	\$50,062,019	\$892,969	0	0	0	\$0	\$0
Dutchess	302	0.33	157	16	67	\$49,255,537	\$892,742	0	0	0	\$0	\$0
Erie	573	0.17	298	11	12	\$57,206,821	\$74,259	18	0	0	\$385,000	\$40,000
Essex	627	0.16	326	3	35	\$24,292,489	\$1,077,901	33	0	0	\$282,000	\$50,000
Franklin	623	0.16	324	4	35	\$24,451,784	\$1,097,345	31	0	0	\$231,000	\$75,000



County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability%	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
<b>Fulton</b>	427	0.23	222	11	76	\$23,434,361	\$221,897	0	0	0	\$0	\$0
<b>Genesee</b>	352	0.28	183	8	6	\$55,135,364	\$964,815	4	0	0	\$60,000	\$0
<b>Greene</b>	342	0.29	178	6	65	\$48,721,694	\$178,708	1	1	1	\$0	\$0
<b>Hamilton</b>	460	0.22	239	8	76	\$24,492,612	\$1,047,751	0	0	0	\$0	\$0
<b>Herkimer</b>	529	0.19	275	14	93	\$53,224,195	\$1,059,923	0	0	0	\$0	\$0
<b>Jefferson</b>	527	0.19	274	5	25	\$23,762,578	\$215,926	14	0	0	\$180,000	\$40,000
<b>Kings</b>	123	0.81	64	4	31	\$3,178,727	\$23	1	0	0	\$0	\$0
<b>Lewis</b>	637	0.16	331	5	16	\$20,118,702	\$251,770	23	0	0	\$326,000	\$38,000
<b>Livingston</b>	296	0.34	154	4	7	\$26,404,955	\$1,114,815	7	0	0	\$115,000	\$50,000
<b>Madison</b>	502	0.20	261	13	95	\$27,409,298	\$226,673	0	0	0	\$0	\$0
<b>Monroe</b>	363	0.28	189	12	8	\$58,982,826	\$1,064,815	7	0	0	\$125,000	\$0
<b>Montgomery</b>	427	0.23	222	11	84	\$51,797,855	\$221,897	0	0	0	\$0	\$0
<b>Nassau</b>	125	0.80	65	6	25	\$3,178,727	\$23	0	0	0	\$0	\$0
<b>New York</b>	117	0.85	61	31	25	\$3,178,227	\$23	2	0	0	\$0	\$0
<b>Niagara</b>	346	0.29	180	9	9	\$52,395,560	\$989,815	6	0	0	\$95,000	\$0
<b>Oneida</b>	610	0.16	317	31	109	\$27,749,142	\$226,589	0	0	0	\$0	\$0
<b>Onondaga</b>	410	0.24	213	7	23	\$9,246,255	\$47,186	0	0	0	\$0	\$0
<b>Ontario</b>	296	0.34	154	5	6	\$18,037,569	\$1,114,815	6	0	0	\$65,000	\$50,000
<b>Orange</b>	260	0.39	135	13	66	\$51,378,251	\$892,994	1	1	1	\$0	\$0
<b>Orleans</b>	319	0.31	166	8	6	\$48,866,215	\$964,815	5	0	0	\$85,000	\$0
<b>Oswego</b>	715	0.14	372	6	13	\$20,448,562	\$1,146,481	21	0	0	\$483,000	\$15,000
<b>Otsego</b>	487	0.21	253	14	87	\$27,456,976	\$231,673	0	0	0	\$0	\$0
<b>Putnam</b>	238	0.42	124	5	63	\$48,963,490	\$892,744	0	0	0	\$0	\$0



County	Historical Record (1960-2012)							Recent Record (2010-2012)				
	Future Probability%	Recurrence Interval	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage	No. of Events	Fatalities	Injuries	Property Damage	Crop Damage
Queens	125	0.80	65	5	40	\$3,178,727	\$23	1	0	0	\$0	\$0
Rensselaer	281	0.36	146	6	52	\$47,911,109	\$184,014	0	0	0	\$0	\$0
Richmond	115	0.87	60	4	26	\$3,173,231	\$23	0	0	0	\$0	\$0
Rockland	160	0.63	83	4	32	\$31,256,617	\$9,284	0	0	0	\$0	\$0
Saratoga	390	0.26	203	8	142	\$49,126,368	\$221,858	0	0	0	\$0	\$0
Schenectady	375	0.27	195	7	60	\$48,351,389	\$221,858	0	0	0	\$0	\$0
Schoharie	437	0.23	227	8	78	\$24,508,827	\$216,592	0	0	0	\$0	\$0
Schuyler	256	0.39	133	4	10	\$8,412,743	\$9,259	0	0	0	\$0	\$0
Seneca	287	0.35	149	4	12	\$8,322,264	\$9,259	0	0	0	\$0	\$0
St Lawrence	719	0.14	374	10	44	\$26,565,519	\$1,272,343	43	0	0	\$297,000	\$250,000
Steuben	225	0.44	117	5	7	\$11,182,784	\$9,259	0	0	0	\$0	\$0
Suffolk	135	0.74	70	12	51	\$3,235,509	\$23	0	0	0	\$0	\$0
Sullivan	273	0.37	142	3	42	\$47,891,131	\$892,969	0	0	0	\$0	\$0
Tioga	354	0.28	184	5	42	\$24,516,058	\$892,969	0	0	0	\$0	\$0
Tompkins	275	0.36	143	7	13	\$5,708,247	\$9,259	0	0	0	\$0	\$0
Ulster	337	0.30	175	12	67	\$49,207,868	\$178,708	0	0	0	\$0	\$0
Warren	365	0.27	190	5	63	\$47,673,307	\$219,684	0	0	0	\$0	\$0
Washington	294	0.34	153	8	55	\$47,331,119	\$181,840	0	0	0	\$0	\$0
Wayne	438	0.23	228	7	11	\$25,269,775	\$1,064,815	8	0	0	\$155,000	\$0
Westchester	171	0.58	89	5	65	\$31,362,912	\$25	0	0	0	\$0	\$0
Wyoming	421	0.24	219	6	7	\$19,629,080	\$59,259	12	0	0	\$167,000	\$50,000
Yates	217	0.46	113	4	7	\$16,085,802	\$109,259	0	0	0	\$0	\$0

Source: SHELDUS, 2013



A significant winter storm generally occurs over more than a single day, with two days being common and three days being rare. They can cause significant damage, for instance, in March 1991, in western New York, a severe winter storm caused heavy ice accumulation on tree branches, bending or breaking limbs and tree boles, or toppling trees. The resulting tree debris disrupted power lines, blocked roads, and damaged residential and commercial property. Subsequent disturbance can also occur when broken limbs or whole trees can suddenly break and fall. These "widow makers" are high priority for removal after the event to prevent personal injury.

Damage from the January 1998 ice storm event was extensive across northern New York, northern New England and Canada. Over 17 million acres were impacted, with 5 million acres experiencing severe damage. The combination of cold surface temperatures, warm air aloft, and several days of rain contributed to the accumulation of more than four inches of ice in some areas. Hardwoods suffered the greatest damage, as was evident in the areas with many sugar maple trees. The magnitude of power disruption, debris removal, emergency tree pruning and removal, and the resulting loss of the resources were unprecedented. Further, the weakening of tree limbs during the storm left open the possibility of similar damage from future weather related events.

## Historical Winter Storm Events

### Winter Storm Nemo – February 8-9, 2013

By February 9, 2013 Winter Storm Nemo dropped more than 12 inches of snow on Suffolk County. Upstate New York encountered 10-12 inches of snow in the Hudson Valley and Adirondacks, 12 inches fell in Rochester, and 8 inches in Buffalo. Approximately 10,000 homes and businesses lost power on Long Island. Several vehicles were stranded on the Long Island Expressway overnight and police had to use snowmobiles to reach fire trucks, ambulances, police vehicles, and some snowplow trucks to rescue passengers. Roofs, weighed down by the snow, collapsed at a bowling alley and a home in Suffolk County; however, no one was injured. Winter Storm Nemo claimed two lives.



*Photo of Central Park New York, Blizzard of Feb. 2010; [www.panoramio.com](http://www.panoramio.com)*



**Blizzard of 2010 – December 26, 2010**

On December 26, 2010, a Nor'easter dropped more than 20 inches of snow on New York City. Strong winds pushed the falling snow into drifts that measured up to four feet. Transportation suffered major delays as airports and rail shut down across the city and Long Island. Travelers driving home from the holidays got stuck in the snow and abandoned their vehicles. These abandoned vehicles made it difficult for the city's plows to clear the accumulating snow. The 2010-2011 winter went on to be one of the snowiest on record, with 56.1 inches falling in January 2011 alone.

After the storm, OEM introduced a Snow Emergency Declaration to caution residents against unnecessary driving during a snowstorm and keep roads clear for plows and emergency vehicles.

**Ice and Snowstorm – December 11-12, 2008**

The precipitation came down heavy December 11<sup>th</sup>. By December 12<sup>th</sup>, ice accumulations ranged from around half of an inch up to an inch across portions of the Capital District and the Berkshires. Snowfall reports ranged from 2 to 4 inches just north and west of the Capital District, where sleet mixed in along with lesser ice accumulations, up to 8 to 12 inches across portions of the southern Adirondacks. Widespread tree and power line damage across the local area causing power outages across East Central New York. More than 60,000 customers were out of power December 15<sup>th</sup> and power was not restored to 10,000+ customers until December 18<sup>th</sup>.

**Snow Storm – February 13, 2007**

A low pressure system developed over the southern plains on February 12<sup>th</sup>, and intensified rapidly as it neared the East Coast on the night of the 13<sup>th</sup>. The storm then continued to strengthen as it moved up the Atlantic Seaboard during the day on February 14<sup>th</sup>. The storm spread snow into central New York beginning the evening of Tuesday, the 13<sup>th</sup>. The snow continued heavy at times through the 14<sup>th</sup> and gradually tapered off to snow showers on the 15<sup>th</sup> as the storm pulled northeast past the Gulf of Maine. Some sleet mixed with the snow for brief periods of time. The snow became heavy with near blizzard conditions at times over the Finger Lakes and central southern tier of New York during the early morning hours of the 14<sup>th</sup>. The heavy snow and near blizzard conditions shifted east to the upper Susquehanna Region of New York and western Mohawk Valley by the afternoon and evening of the 14<sup>th</sup>. Gusty winds to 40 mph developed behind the storm late on the 14<sup>th</sup> and through the 15<sup>th</sup> which led to considerable blowing and drifting snow. This hampered snow plowing and snow cleanup operations. As a result, many roads and highways were closed during the height of the snowstorm. Many counties and municipalities declared snow emergencies. Storm total snowfall amounts across much of central New York ranged between 15 and 30 inches. Less snow fell in Sullivan County, New York where more sleet was reported. This kept snowfall amounts down between 8 and 12 inches in this area. The heaviest snowfall from this storm occurred in Delaware and Otsego



counties where between 2 and 3 feet was common. The highest snowfall was reported in Roseboom where 39 inches of snow occurred and Springfield where 38 inches fell. The weight of the snow caused several roofs to collapse.

### **Snow and Ice Storm – April 4, 2003**

A stationary front was west to east across Pennsylvania during the 3<sup>rd</sup> and 4<sup>th</sup> of April. Areas of low pressure moved along the front bringing precipitation to upstate New York. A large area of high pressure, centered over Hudson Bay Canada helped to keep cold air at the surface. The morning of the 5<sup>th</sup> low pressure moved northeast to Erie, Pennsylvania then to northeast New York that evening. A trailing cold front brought with it an end to the precipitation from west to east. Patchy freezing rain was across these counties first the night of the 3<sup>rd</sup> into the 4<sup>th</sup>. At this time the freezing rain was most widespread in Northern Oneida County. Steady widespread freezing rain started during the day of the 4<sup>th</sup> across Oneida, Onondaga, and Madison Counties. During the evening of the 4<sup>th</sup> colder air spread further south into the Finger Lakes and northern Susquehanna Region. This changed moderate rain to freezing rain in these areas especially at the higher elevations. Across northern Oneida County the freezing rain changed to snow. The snow accumulated up to five inches. Ice accumulations were mostly a quarter to half an inch with a few locations up to an inch. The Schuyler County Emergency Manager reported an inch of ice across most of the county. Tens of thousands of electricity customers were without power, some for up to a week. States of emergencies were declared for most of these counties.

### **Winter Storm – March 6, 1996**

A winter storm formed over the Carolinas and tracked up the coast, bringing heavy snow to central New York. Snowfall accumulations ranged from 6 to 12 inches by the time the snow tapered off on the evening of the 7<sup>th</sup>. During the height of the storm, many accidents were reported due to poor visibility, including one in which an elderly couple was killed and one person injured in a collision in Lansing (Tompkins County). In Onondaga County, one man was killed and one injured in a two-car accident in Marcellus. Two people were injured near Rome in Oneida County when their car drove off the road, and six people were injured in Homer, Cortland County, when a tour bus drove off Interstate 81 in near zero visibility.



### **Blizzard of 1993 – March 14-15, 1993**

This blizzard virtually shut down eastern New York on March 13<sup>th</sup> and 14<sup>th</sup>. Also, record snows fell

*The Blizzard of 1993; <http://photos.syracuse.com/post-standard/2009/03/the-blizzard-of-1993-10.html>*



from the Southern Tier of New York to the Catskills. In addition to the heavy snow, high winds damaged structures and caused almost 200,000 power outages across the state. An avalanche in the Catskills buried a county snow plow.

### **The Downslope Nor'easter – December 10-12, 1992**

This storm produced incredible snowfall totals across many mountainous locations, while barely having any effect on valley locations. Strong east winds caused the air to "downslope" off the Berkshires and Taconics, and "dry it out." Snowfall totals in the Berkshires ranged from 30 to 48 inches with drifts up to 12 feet. Schools were closed for a week and the National Guard had to bring in heavy equipment to remove the snow. The Catskills and Helderbergs also got their share of snow with 18 to 39 inches reported. On Friday, December 11, at the height of the storm, the city of Albany received a half inch of snow with temperatures in the middle 30's. Albany did eventually get 6", but most of that fell toward the end of the storm, on Saturday the 12<sup>th</sup>, after the winds turned more northerly.

### **Surprise October Snowstorm – October 4, 1987**

The highest snowfall that ever fell in Albany in the month of October; heavy, extreme wet snow fell on fully leaved trees. Fallen trees and down power lines blocked roads and damaged homes. The extreme devastation left residents without power for up to two weeks.

### **January Snowstorm of 1983 – January 15-16, 1983**

Eastern New York was severely impacted by this storm. High accumulation of snow halted travel across the area. Several auto accidents with injure were documented. Albany reported 24.5 inches of snow and Saratoga County reported less than 30 inches.

### **Blizzard of 1978 - February 6-7, 1978**

This storm affected Long Island and eastern New York. The storm produced strong wind causing snow drifts; snow was reported up to 25 inches.

### **Thanksgiving Snowstorm of 1971 – November 24, 1971**

Thanksgiving Eve snow fell and continued into the next day. Numerous travelers were stranded on the busiest travel day of the year. The City of Albany picked up 22.5 inches; other areas of New York reported up to 30 inches of snow.

### **Post-Christmas Snowstorm of 1969 – December 25-28-1969**

Christmas night Albany encountered a storm system moving northward along the east coast. The storm moved inland for a short period then headed back to sea December 28<sup>th</sup>



causing heavy, wet snowfall mixed with freezing rain. Snow removal was a challenge; streets were not cleared for up to four weeks. A total of 26.7 inches fell making this the third greatest storm on record.

### **Blizzard of 1966 – January 29-31, 1966**

This storm is known for its blizzard conditions from intense lake squalls that developed as arctic air streamed across Lake Ontario. Oswego County reported 75 inches, with some unofficial reports of around 100 inches in that vicinity. Rome, which is approximately 75 miles from Lake Ontario, received 41 inches and Albany County received a foot of snow over a two day period.

### **Worst Snow Storm on Record – December 4-5, 1964**

Freezing rain caused ice accumulations of up to 1.5 inches paralyzing east central New York. Residents had no power for up to two weeks and schools were shut down for a week. The State incurred damages close to \$5 million.

### **Blizzard of 1958 – February 5-16, 1958**

A Nor'easter blew 30 inches of snow across the Catskills dropping 17.9 inches in Albany. Snow blocked the majority of roadways making travel impossible. Cattle were stranded; helicopters dropped food to them, in Operation "Haylift".

### **Great Appalachian Storm – November 24-25, 1950**

Rain and snow were associated with this storm; however, wind gusts were recorded in Albany up to 83 mph, with sustained winds of 50-60 mph. Two very high pressure centers produced an extremely tight pressure gradient, one east of Labrador and the other over the Mississippi Valley. Wind damage was critical in New York State causing downed power lines and trees throughout the region. The state incurred damage totaling more than 20 million dollars.



*Blizzard of 1888, New York City's 11th Street;*  
<http://myinwood.net/a-buried-city-the-blizzard-of-1888/>

### **Blizzard of 1888 – March 11-14, 1888**

All blizzards are measured by this event. It was considered the "worst storm in living memory in the northeast". The City of Albany was shut down. There was no heat, road closures, and doctors were unable to make house calls. Light snow began mid-afternoon March 11<sup>th</sup> accumulating to 3 inches by midnight. Snow intensified



overnight, accumulating 18 inches of snow by day break. Total snowfall by March 14<sup>th</sup> was 46.7 inches, the drifts were significantly higher.

### Probability of Future Winter Storm Events

Severe winter storm events in New York State are virtually guaranteed yearly since the State is located at relatively high latitudes resulting in winter temperatures that range between 0°F and 32°F for a good deal of the fall through early spring season (late October until mid-April). Additionally, the State is exposed to large quantities of moisture from both the Great Lakes and the Atlantic Ocean. While it is almost certain that a number of significant winter storms will occur during the winter and fall season, what is not easily determined is how many such storms will occur during that time frame.

NYS uses Hazards New York (HAZNY) as its methodology to rank natural and man-made disasters, which focuses on preparedness and response; for the purpose of mitigation NYS uses a modified version of HAZNY to rank hazards in relation to their potential for mitigation. Based on **Table 3.2a in Section 3.2**, the HAZNY-Mitigation hazard ranking table; local jurisdictions rank severe winter storms as a low risk hazard. Mitigation activities such as, plowing snow, salting roadways and maintaining trees for severe winter storms are handled at the local level.

According to the data provided in **Table 3.15b**, Historical and Recent Severe Winter Storm Events and Losses, the counties with the highest probability for future occurrences are noted in **Table 3.15d**.

**Table 3.15d: Future Probability of Severe Winter Storm Events**

County	Future Probability (%)
St. Lawrence	719
Oswego	715
Lewis	637
Essex	627
Franklin	623
Clinton	610
Oneida	610



### Justification for Minimal Vulnerability/Loss Assessment

Severe Winter Storm occurrences in New York State are typically regional in scale; and, while past occurrences have resulted in loss of life, the scale of impacts and consequences are isolated compared to flood and hurricane events, and are typically within the capabilities of the impacted jurisdictions to prepare, respond, and recover. Severe Winter Storm was ranked as “low” with a HAZNY-Mitigation score of 18, based on severity of impact and mitigation potential. (Section 3.0 describes the hazard ranking methodology used to determine this finding.) Therefore, it is determined that there is not sufficient evidence that Severe Winter Storm has a high level of overall risk to population and property that has potential for mitigation to justify further analysis for the 2014 Plan update.

The information provided in the Risk Assessment sections below serves as guidance for impact and consequence analysis and local hazard mitigation planning.

### 3.15.2 Assessing Winter Storm Vulnerability and Estimating Potential Losses by Jurisdiction

According to the NOAA National Severe Storms Laboratory (NSSL); every year, winter weather indirectly and deceptively kills hundreds of people in the U.S., primarily from automobile accidents, overexertion and exposure. Winter storms are often accompanied by strong winds creating blizzard conditions with blinding wind-driven snow, drifting snow and extreme cold temperatures and dangerous wind chill. They are considered deceptive killers because most deaths and other impacts or losses are indirectly related to the storm. People can die in traffic accidents on icy roads, heart attacks while shoveling snow, or of hypothermia from prolonged exposure to cold. Heavy accumulations of ice can bring down trees and power lines, disabling electric power and communications for days or weeks. Heavy snow can immobilize a region and paralyze a city, shutting down all air and rail transportation and disrupting medical and emergency services. Storms near the coast can cause coastal flooding and beach erosion as well as sink ships at sea. The economic impact of winter weather each year is huge, with costs for snow removal, damage and loss of business in the millions (NSSL, 2006).

**Table 3.15e** provides the annualized losses for severe winter storm events. The data used was based on SHELDUS records from 1960-2012, with the exception of hurricane, earthquake, and flood hazards which were derived from HAZUS-MH 2.1. For those specific hazards, a probabilistic run was generated to determine the total annual losses for each county found within the State. The information provided by SHELDUS was determined by taking the total economic losses divided by the number of years of record (52) to obtain the losses per year. **Figure 3.15d**, illustrates the top ten counties annualized losses with a total of \$34,845,157 in severe winter storm losses for the entire State of New York.

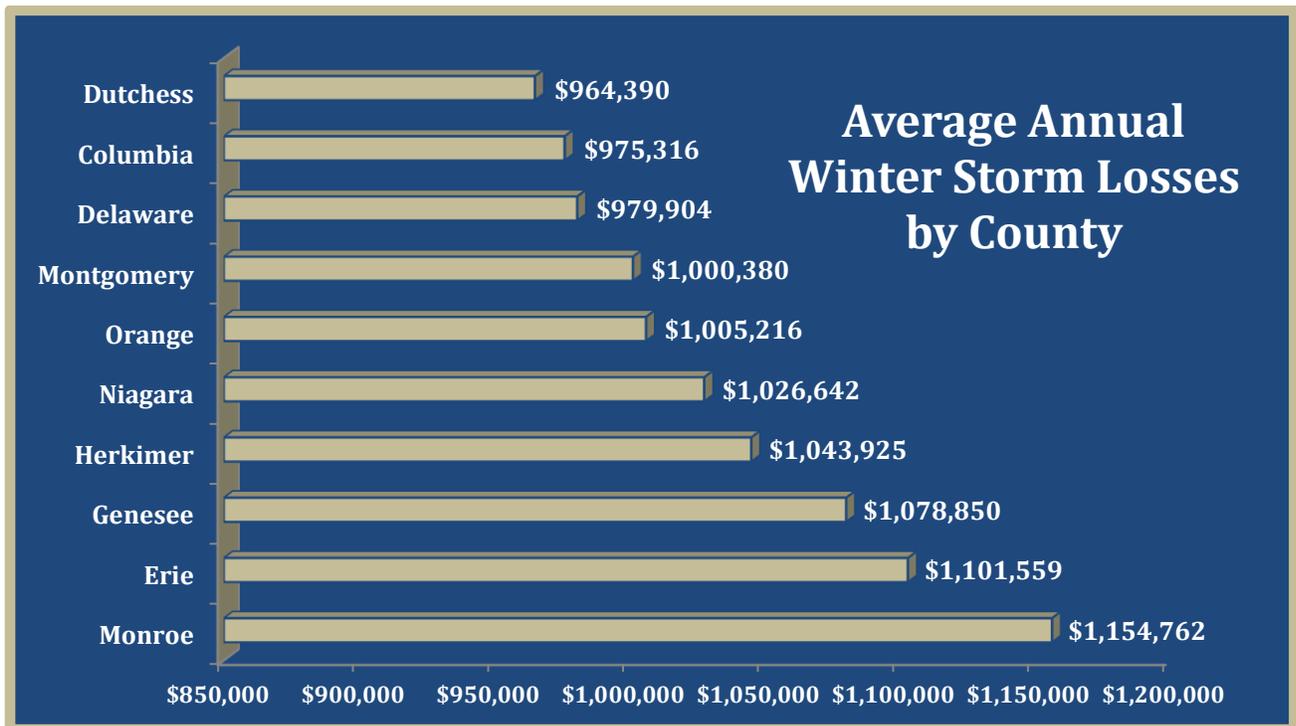


**Table 3.15e: Average Annual Severe Winter Storm Losses by County 1960-2012**

County	Winter Storm	County	Winter Storm	County	Winter Storm
Monroe	\$ 1,154,762	Westchester	\$ 603,133	Chautauqua	\$ 387,461
Erie	\$ 1,101,559	Rockland	\$ 601,267	Wyoming	\$ 378,622
Genesee	\$ 1,078,850	Oneida	\$ 537,995	Ontario	\$ 368,315
Herkimer	\$ 1,043,925	St Lawrence	\$ 535,344	Cattaraugus	\$ 364,813
Niagara	\$ 1,026,642	Otsego	\$ 532,474	Cayuga	\$ 349,312
Orange	\$ 1,005,216	Madison	\$ 531,461	Yates	\$ 311,443
Montgomery	\$ 1,000,380	Livingston	\$ 529,226	Allegany	\$ 281,434
Delaware	\$ 979,904	Wayne	\$ 506,434	Steuben	\$ 215,232
Columbia	\$ 975,316	Franklin	\$ 491,329	Onondaga	\$ 178,720
Dutchess	\$ 964,390	Hamilton	\$ 491,161	Schuyler	\$ 161,962
Putnam	\$ 958,774	Tioga	\$ 488,635	Seneca	\$ 160,222
Orleans	\$ 958,289	Clinton	\$ 488,311	Tompkins	\$ 109,952
Ulster	\$ 949,742	Essex	\$ 487,892	Chemung	\$ 69,564
Saratoga	\$ 949,004	Chenango	\$ 484,141	Suffolk	\$ 62,222
Greene	\$ 940,392	Schoharie	\$ 475,489	Bronx	\$ 61,295
Sullivan	\$ 938,156	Cortland	\$ 472,516	Kings	\$ 61,130
Schenectady	\$ 934,101	Jefferson	\$ 461,125	Nassau	\$ 61,130
Albany	\$ 933,285	Fulton	\$ 454,928	Queens	\$ 61,130
Rensselaer	\$ 924,906	Broome	\$ 446,842	New York	\$ 61,120
Warren	\$ 921,019	Oswego	\$ 415,289	Richmond	\$ 61,024
Washington	\$ 913,711	Lewis	\$ 391,740	<b>Total</b>	<b>\$34,845,157</b>

Source: SHELDUS, 2013



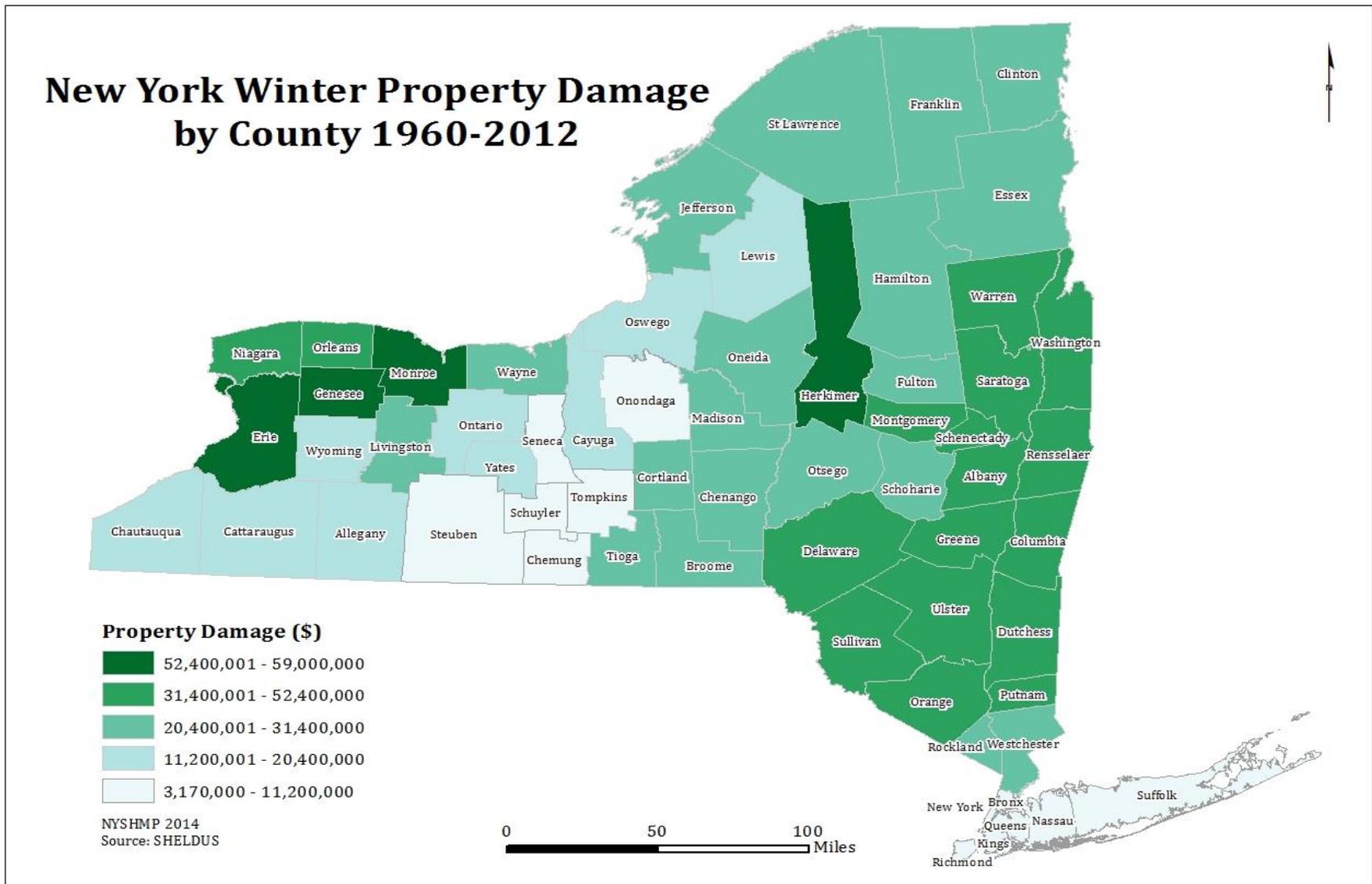
**Figure 3.15d: Average Annual Severe Winter Storm Losses by County 1960-2012**

Source: *SHELDUS*, 2013

Over the past 52 years 11,876 severe winter storm events occurred throughout NYS. Counties reporting the highest amount of property damage were Monroe, Erie, Genesee, Herkimer, and Niagara collectively exceeding more than \$276 million in property damage. **Figure 3.15e** shows the total cost of property damage caused by severe winter storm events from 1960-2012.



Figure 3.15e: New York Winter Property Damage by County 1960-2012



Based on the historical and recent severe winter storm events and loss data assessed by the NYS mitigation team all 62 New York State counties have been affected by severe winter storm events over the past 52 years.

**Tables 3.15f: Summary of Winter Storm Hazard Impacts and Rankings by County**

Local County Winter Storm Hazard Impacts		
Highest Occurrences	Highest Fatalities	Highest Property Damage
St. Lawrence	Oneida	Monroe
Oswego	New York	Erie
Lewis	Dutchess	Genesee
Essex	Otsego	Herkimer
Franklin	Herkimer	Niagara

Source: SHEL DUS

Local County Winter Storm Hazard Rankings	
High	Moderately High
Broome, Cayuga, Franklin, Fulton, Greene, Montgomery, Orleans, Saratoga, Suffolk, and Tioga	Albany, Allegany, Cattaraugus, Delaware, Essex, Jefferson, Lewis, Madison, Monroe, Onondaga, Ontario, Oswego, Otsego, Rensselaer, Schenectady, Seneca, Sullivan, Ulster, Warren, Wayne, and Wyoming

Source: LHMP

## Development in hazard prone areas

NYS will always be vulnerable to severe winter events; because of its geographic location. Leading up to the winter months, the State does focus on preparedness and response, but mitigation strategies and measures are developed and executed by each local jurisdiction.

On the local level, economic impact may be felt by increased consumption of heating fuel, which can lead to energy shortages and higher prices. House fires and resulting deaths tend to occur more frequently from increased and improper use of alternate heating sources. Fires during these events also present a greater danger because water supplies may freeze and impede firefighting efforts.

Additional, heavy snow can immobilize a region and paralyze a city, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse buildings and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. In the mountains, heavy snow can lead to avalanches. The cost of snow removal, repairing damages, and loss of business can have large economic impacts on cities and towns. Heavy accumulations of ice can bring down trees, electrical wires, telephone poles



and lines, and communication towers. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces (NSSL, 2006).

Because severe winter storms are not limited to geographic boundaries or population groups, it is difficult to identify development and population trends that impact this hazard. Current NYS land use and building codes incorporate standards that address and mitigate snow accumulation. Several local jurisdictions have implemented the following activities to eliminate loss of life and damage to property and infrastructure during the severe winter events:

- Remove snow from roadways.
- Remove dead trees and trim trees/brush from road ways to lessen falling limbs and trees.
- Ensure proper road signage is visible and installed properly.
- Bury electrical and telephone utility lines to minimize downed lines.
- Remove debris/obstructions in waterways and develop routine inspections/maintenance plans to reduce potential flooding.
- Replace substandard roofs of critical facilities (such as hospitals) to reduce exposure to airborne germs resulting from leakage.
- Purchase and install backup generators in evacuation facilities and critical facilities to essential services to residents.
- Install cell towers in areas where limited telecommunication is available to increase emergency response efforts and cell phone coverage.

### **Statewide Winter Storm Preparedness Maintenance Program**

NYS does maintain State highways for accessibility during winter events. The New York State Thruway Authority (Authority) implements its aggressive winter maintenance program. During periods of inclement winter weather the program's goal is to provide customers a roadway that is safely drivable at reasonable speeds, with the ultimate goal of



Source: New York State Thruway Authority

returning to bare pavement as quickly as possible. Each fall the New York State Thruway Authority (Authority) implements its aggressive winter maintenance program. During periods of inclement winter weather the program's goal is to provide customers a roadway that is safely drivable at reasonable speeds, with the ultimate goal of returning to bare pavement as quickly as possible.

Winter preparations begin in the spring



with the start of the Authority's annual preventive maintenance program on all plow trucks and winter maintenance equipment. Further preparations include renewing or establishing salt contracts, procuring needed equipment and supplies, and ensuring a trained and adequately staffed workforce.

The Authority's four Divisions: New York, Albany, Syracuse and Buffalo are tasked with the operational response to winter weather events. Each of the Authority's 21 maintenance locations is responsible for snow and ice operations over approximately 30 miles of roadway, as well as the accompanying interchanges, service areas and related facilities. Operations are set to achieve approximately one hour cycle times for plowing and spreading the roadway, although this can vary substantially due to traffic, weather and other factors.

The Authority has approximately 200 large plow trucks to plow snow and to disperse salt. In addition, each location also has a complement of smaller plow trucks and other ancillary equipment such as front-end loaders and skid steer mounted snowblowers. Every piece of equipment undergoes a thorough preventive maintenance service between each winter season. These efforts are generally completed by late October. By the start of the winter schedule, all material spreaders are mounted on trucks and calibration for proper salt application rates is complete. Additionally, the Authority owns five large truck mounted snowblowers. These units are stationed strategically across the system and relocated as forecasts and conditions dictate. In addition, there are 15 smaller skid steer mounted snowblowers that are used for more routine snow removal needs.

The Authority's primary weapon to fight roadway icing is rock salt. The average annual usage for the past ten years is approximately 180,000 tons. The Authority's 38 storage locations provide for the secure covered storage of approximately 128,100 tons of salt. Sheds are filled prior to the start of winter and salt is reordered as usage occurs throughout the season. With dedicated Authority salt contracts and timely ordering to replenish stockpiles, adequate salt supplies are guaranteed absent the most severe of winters.

In addition to rock salt, the Authority utilizes straight salt brine and a beet brine mixture in both an anti-icing application and as a pre-treatment for the rock salt. Other liquids such as calcium chloride and magnesium chloride are utilized to improve effectiveness at lower temperatures. This program demonstrates the State's role and capabilities in preparedness and response to winter storm events.

### **3.15.3 Assessing Winter Storm Vulnerability of State Facilities**

Found in **Section 3.1.6** is a full description of the current status and data limitations to state-owned facilities and critical infrastructures for New York State.

A comprehensive analysis of state facilities has not been undertaken for this hazard in the 2014 update; the 2011 plan provides a methodology and data for a gross estimate of



potential snow losses to identified vulnerable State facilities in terms of dollar value of exposed property. While the data in **Table 3.38: State Facilities – Assessing Vulnerability and Estimating Loss for Snow Hazard** (see 2014 Plan Update, **Appendix 3, Attachment A: Data Supplement**) is not current, the process followed to create a GIS layer for State facilities using the coordinate information and overlay onto a snow hazard layer developed using NOAA NCDC annual average snowfall data is still valid. The intention of this analysis was to assess vulnerability and provide an aggregate exposure of State facilities as a proxy for a potential loss estimate. The analysis methodology had limitations for complete accuracy, and applicability of the results was not considered to be highly reliable beyond a general indication. Instead, the analysis results and process may best be used as a guide to help target those facilities that might benefit from further analysis and is, consequently, included in the 2014 update.

Unlike flood or earthquake hazard, there are no standard loss estimation models or methodologies for the snow hazard. A preliminary dollar loss estimate could have been calculated based on known information such as total structures for general occupancy class, indicated higher snow hazard areas (average annual and extreme snowfall potential map and data) as determined earlier in this plan, and use of residential structure dollar value estimates. However, many assumptions and generalizations would need to be made for several unknowns.

Unknowns or data that are available but not prepared or analyzed include: inventory estimates of the more vulnerable structures such as those pre-building code structures, flat roof structures, and historical or critical structures, and the type of damage and dollar damage figures. The many generalizations and guess work would result in figures with little accuracy, and potentially misleading indications of a jurisdiction's vulnerability and potential loss to the snow hazard. Therefore, this version of the NYS risk assessment instead includes an identification of needed data and establishes actions necessary to gather data needed to estimate potential losses. As local mitigation plans with snow hazard risk assessment data become available, this information will be incorporated into a state risk assessment repository for integration into future vulnerability analyses. Additionally, application of GIS technology will continue, including exploring the possibility of obtaining and incorporating certain data that may better define the high hazard area characteristics such as more comprehensive snowfall extremes data, and real property data layers in support of future snow hazard vulnerability analysis.



### 3.15.4 Data Limitations, Sources and Key Documents

The profile outlined in this section has been developed from the following sources:

- Northeast Regional Climate Center (NRCC) based at Cornell University, [http://nysc.eas.cornell.edu/climate\\_of\\_ny.html](http://nysc.eas.cornell.edu/climate_of_ny.html)
- NOAA Satellite and Information Services and National Climate Data Center, <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>
- NYS Emergency Management Office (NYSEMO), [www.dhSES.ny.gov](http://www.dhSES.ny.gov)
- National Weather Service's Cooperative Observer Program (COOP), [www.nws.noaa.gov/om/coop](http://www.nws.noaa.gov/om/coop)
- New York State Thruway Authority, [www.thruway.ny.gov/](http://www.thruway.ny.gov/)
- Federal Emergency Management Agency (FEMA), [www.fema.gov](http://www.fema.gov)
- Kocin, P. J. and L. W. Uccellini, 2004: A Snowfall Impact Scale Derived From Northeast Storm Snowfall Distributions. *Bull. Amer. Meteor. Soc.*, 85, 177-194
- Squires, M. F. and J. H. Lawrimore, 2006: Development of an Operational Snowfall Impact Scale. 22<sup>nd</sup> IIPS, Atlanta, GA.
- Spatial Hazard Events and Losses Databases for the United States (SHELDUS)

**Please Note:** Data obtained from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™). SHELDUS is a county-level hazard data set for the U.S. for 18 different natural hazard event types such as thunderstorms, hurricanes, floods, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data derives from the national data source, National Climatic Data Center's monthly Storm Data publications. Using the latest release of SHELDUS™ 12.0, the database includes every loss causing and/or deadly event between 1960 through 1992 and from 1995 onward. Between 1993 and 1995, SHELDUS™ reflects only events that caused at least one fatality or more than \$50,000 in property or crop damages.



## Section 3.16: Tsunami

### 2014 SHMP Update

Tsunami is addressed in the 2014 update as a new hazard section to:

- Ensure consistency with the mitigation planning requirements detailed in 44 CFR §201.4(c)(2)(i)
- Profile the hazard and address potential risk

### 3.16.1 Tsunami Profile

Tsunamis rank high on the scale of natural disasters. Since 1850 alone, tsunamis have been responsible for the loss of over 420,000 lives and billions of dollars of damage to coastal structures and habitats worldwide. Most of these casualties were caused by local tsunamis that occur about once per year somewhere in the world. For example, the December 26, 2004 Indonesian tsunami killed about 130,000 people close to the earthquake that caused it, and about 58,000 people on distant shores.

Hazard	Definition and Key Terms
<b>Tsunami</b>	A series of ocean waves generated by a rapid large-scale disturbance of the sea water, tsunamis do not have a season and do not occur regularly or frequently. Most tsunamis are generated by earthquakes, but may also be caused by volcanic eruptions, landslides, undersea slumps, or meteor impacts. The word tsunami is a Japanese word, represented by two characters: tsu, meaning, "harbor", and name meaning, "wave".

### Characteristics

Tsunami waves radiate outward in all directions from the disturbance and can move across entire ocean basins. A tsunami typically causes the most severe damage and casualties close to its source, where local populations may have little time to react before the waves arrive<sup>1</sup>. A very large disturbance can cause local devastation and export tsunami destruction thousands of miles away. Predicting when and where the next tsunami will strike is currently impossible. In the deep ocean, a tsunami wave may only be a few inches

<sup>1</sup> Intergovernmental Oceanographic Commission. 2012. Tsunami, The Great Waves, Second Revised Edition. Paris, UNESCO, 16 pp., illus. IOC Brochure 2012-4.



high. A tsunami wave may come gently ashore or may increase in height to become a fast moving wall of turbulent water several meters high.

Although a tsunami cannot be prevented, the impact of a tsunami can be mitigated through community preparedness, timely warnings, and effective response. The National Oceanic and Atmospheric Administration (NOAA) has primary responsibility for providing tsunami warnings in the United States, and a leadership role in worldwide tsunami observations and research.

### **Tsunami Earthquakes**

Tsunami earthquakes are slow earthquakes, with slippage along the fault beneath the sea floor occurring more slowly than it would in a land-based earthquake. Tsunamis such as the 2004 Indonesian and recent Japan catastrophes occur in response to the sudden vertical uplift of tremendous volumes of water by an earthquake where one tectonic plate slides beneath another (subduction). One known method to quickly recognize a tsunami earthquake is to estimate a parameter called the *seismic moment* using very long period seismic waves (more than 50 seconds / cycle). Three deadly tsunamis from tsunami earthquakes have occurred in recent years off Indonesia (June 2, 1994; July 16, 2007; October 25, 2010) and Peru (February 21, 1996)<sup>2</sup>.

Tsunamis occurring in deep ocean waters are small and may frequently not be seen or felt by ships at sea. As the tsunami reaches shallower coastal waters, wave height can increase rapidly. Sometimes, coastal waters are drawn out into the ocean just before the tsunami strikes. When this occurs, more shoreline may be exposed than even at the lowest tide. This major withdrawal of the sea should be taken as a natural warning sign that tsunami waves will follow.

A tsunami threat for many areas, e.g., Caribbean, can be immediate from local tsunamis that take only a few minutes to reach coastal areas, or less urgent from distant tsunamis that can take up to a day to arrive. Scientists can predict when a tsunami will arrive at various places by knowing the source characteristics of the earthquake that generated the tsunami and the characteristics of the seafloor along the paths to those places. Tsunamis travel much slower in shallower coastal waters where their wave heights begin to increase dramatically.

Of particular concern to New York State is the potential for a tsunami generated by a subterranean landslide on the continental shelf. Even small events have the potential to cause significant impact to communities along the Atlantic coastline of the state.

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<sup>2</sup> Intergovernmental Oceanographic Commission. 2012. Tsunami, The Great Waves, Second Revised Edition. Paris, UNESCO, 16 pp., illus. IOC Brochure 2012-4.



## Location

Most large tsunamis occur in the Pacific and originate along the hotbed of seismic activity (earthquakes and volcanism) referred to as the Pacific Ring of Fire. The Atlantic Ocean is home to much less seismic and volcanic activity than the Pacific and, in particular, lacks subduction zones which are the most common source of tsunami-causing earthquakes. All low-lying coastal areas in New York have the potential to be struck by a tsunami.

## Previous Tsunami Occurrences

There is no recent history of a tsunami impacting any area of New York State. The closest occurrence of a tsunami within the past century is the 1929 Grand Banks tsunami in Newfoundland, set in motion by an underwater landslide set off by an earthquake, which killed more than two-dozen people and snapped transatlantic cables.

## Probability of Future Tsunami Events

Based on the fact that there is no history of recent previous occurrences, there is no statistical probability available for future tsunami events in New York State. Since scientists cannot predict when earthquakes will occur, they cannot determine exactly when a tsunami will be generated. However, by looking at past historical tsunamis, scientists know where tsunamis are most likely to be generated. Past tsunami height measurements are useful in predicting future tsunami impact and flooding limits at specific coastal locations and communities.

In the last decade, paleotsunami and tsunami deposit field research has extended the historical tsunami record to improve risk assessments. Some scientific evidence suggests a tsunami of unknown cause may have impacted the New York City area more than 2,300 years ago, or around 300 B.C.<sup>3</sup>. As more studies are conducted and evidence of previous events are found, better estimates of the frequency of occurrence of tsunamis in a region will be obtained.

### Justification for Minimal Vulnerability/Loss Assessment

Tsunami occurrences are rare in the Atlantic Ocean and there are no recorded events in recent history that have impacted New York State. While there is an extremely low probability for future events, the potential severity for the highly-populated urban coastline is high. The primary means to address the risk of tsunami is in the area of preparedness measures coordinated at the local level, such as warning and evacuation plans. Consequently, it is determined that there is not sufficient evidence based on probability to justify further analysis for the 2014 plan update, but it is recommended that local hazard mitigation plans for coastal areas consider addressing tsunamis preparedness measures in future plan updates.

<sup>3</sup> Steven Goodbred, Earth scientist; Vanderbilt University (BBC, May 3, 2009)



### 3.16.2 Assessing Tsunami Vulnerability by Jurisdiction

For the 2014 update, 56 FEMA-approved county mitigation plans were reviewed. The Yates County plan is the only plan that identifies tsunami as a hazard, but ranks it as the lowest hazard based on probability, scope, cascading effects, duration and impact. Although no local plans identify the population and property at risk, storm surge modeling through HAZUS-MH may provide the best current methodology for analysis of these impacts from tsunamis due to the potentially similar areas impacted by storm surge. In addition, the National Tsunami Hazard Mitigation Program (NTHMP) has initiated GIS methodology to develop tsunami inundation mapping; however, this project is still in progress as of the 2014 update.

#### Local Plan Integration/ Risk Assessments

Although the probability of future occurrence is low, as identified in the HAZNY-Mitigation hazard ranking matrix, there are several criteria that should be considered when developing local plans.

- There is a slight risk for impacts in areas along the Atlantic Coast.
- There is some potential for cascading effects such as serious injury or death to large numbers of the coastal population, flooding, power failure, water contamination, property damage or loss, and economic impact.
- Evacuation procedures for local (felt events with minutes to evacuate) versus distant (non-felt events with warning time to evacuate) scenarios should be developed.

#### Development in hazard prone areas

Coastal areas are under constant pressure for residential and commercial development. Although New York State does not currently have a method to assess vulnerability of areas at potential tsunami risk compared to development trends and threats, information developed through the Coastal Erosion Hazard Areas (DEC) and the Community Waterfront Revitalization Program (DOS) should be considered when determining potential development impacts to communities at risk for tsunamis.

Post-tsunami structural studies, together with laboratory wave tank experiments, are helping engineers design tsunami-resistant structures through knowledge of how waves impact coasts and scour and erode building foundations. As a result, tsunami building design provisions will be included in the International Building Code in the next few years. Tsunami inundation models, defining the extent of coastal flooding, are an integral aspect of tsunami hazard and preparedness planning. Using worst-case inundation scenarios, these models are critical to defining evacuation zones and routes so that coastal communities can be evacuated quickly when a tsunami warning is issued.



### 3.16.3 Assessing Tsunami Vulnerability of State Facilities

There is no current information available on vulnerability of state facilities to the impacts of tsunami. If future tsunami inundation models are developed, state facility datasets can be used to assess the potential risk to state facilities and infrastructure.

#### Effects of Changes in development on loss estimates

Increased development in coastal areas will increase potential losses from future tsunami events, if they occur. Currently, New York State regulates development in Coastal Erosion Hazard Areas (CEHA) through permitting. The coastal areas identified for CEHA can serve as the basis for tsunami mapping models to identify coastal areas at risk based on various scenarios. As of the 2014 Plan update, the CEHA maps have been updated using LiDAR; however, the maps have not yet been released for use. Upon their release, GIS data can be used to develop tsunami inundation maps, using tsunami modeling guidance developed by the NTHMP, to estimate potential population, property and infrastructure at risk.

### 3.16.4 Estimating Potential Losses of State Facilities

There is no current information available on estimated values of state facilities in areas that could be impacted by tsunamis. If future tsunami inundation models are developed, the state facility inventory dataset can be used to assess the estimated potential losses to state facilities and infrastructure.

### 3.16.5 Data Limitations and Other Key Documents

Future modeling of tsunami inundation zones can identify potential areas of impact in the coastal areas of New York State. Even though the state is at low risk for tsunami, mapping of inundation zones will identify potential population, property and infrastructure at risk if a tsunami impacts. The NTHMP guidance specifies a set of guidelines and recommended practices to guide the determination of tsunami inundation zones in areas where there is a low hazard – based on historical occurrence of tsunami, a low risk – due to a low population and infrastructure vulnerability, or that may not have modeled inundation and evacuation maps in the near future and wish to initiate planning and prepared efforts. The NTHMP also has Map Modeling Guidelines which can be used to for local plans to tsunami assessment and mapping tools for land-use and evacuation planning.

- There is no confirmed data indicating a history of tsunami impacts in New York State
- There are currently no tsunami inundation maps or models of coastal areas.



## Key Documents

- National Oceanic and Atmospheric Administration- Tsunami; <http://www.tsunami.noaa.gov/>
- Intergovernmental Oceanic Commission [http://www.ioc-tsunami.org/index.php?option=com\\_oe&task=viewDocumentRecord&docID=10237](http://www.ioc-tsunami.org/index.php?option=com_oe&task=viewDocumentRecord&docID=10237)
- International Tsunami Information Center (Located in Honolulu, Hawaii, and staffed by the USA, Chile, and Japan, the ITIC is the oldest information center serving the UNESCO Intergovernmental Oceanographic Commission (IOC)'s Global Tsunami Warning and Mitigation System.)
- National Tsunami Hazard Mitigation Program, (A coordinated national effort to assess tsunami threat, prepare community response, issue timely and effective warnings, and mitigate damage.) <http://nthmp.tsunami.gov/>
  - APPENDIX: Suggested Topics for Mapping and Modeling Report and/or Metadata
- Preparing Your Community for Tsunamis – A Guidebook for Local Advocates, Version 2.1, February 1, 2008, Laura Dwelley Samant, L. Thomas Tobin, Brian Tucker

**Please note:** data obtained from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™) is a county-level hazard data set for the U.S. for 18 different natural hazard event types such as thunderstorms, hurricanes, floods, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data derives from the national data source, National Climatic Data Center's monthly Storm Data publications. Using the latest release of SHELDUS™ 12.0, the database includes every loss causing and/or deadly event between 1960 through 1992 and from 1995 onward. Between 1993 and 1995, SHELDUS™ reflects only events that caused at least one fatality or more than \$50,000 in property or crop damages.



## Section 3.17: WILDFIRE

### 2014 SHMP Updates

- Characteristics revised
- Vulnerability and Loss data from local plans have been integrated.
- Statistical data and figures were updated.

Wildfire in New York State is based on the same science and environmental factors as any wildfire in the world. The State of New York has large tracts of diverse forest lands, many of which are the result of historic destructive wildfires. Although these destructive fires do not occur on an annual basis, New York State's fire history has a cycle of fire occurrences that result in property loss, forest destruction, air pollution, and death of humans and habitats.

Hazard	Definition and Key Terms
Wildfire	<ul style="list-style-type: none"> <li>• <i>Wildfire</i> – an uncontrolled fire in an area of combustible vegetation that occurs in the country or a wilderness area. They often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the area for miles around. Naturally occurring and non-native species of grasses, brush, and tree fuel wildfires.</li> <li>• <i>Wildland</i> – a natural environment that has not be significantly modified by human activity.</li> </ul>

### 3.17.1 Wildfire Profile

#### Characteristics

Wildfire is defined as an uncontrolled fire spreading through natural or unnatural vegetation that often has the potential to threaten lives and property if not contained. Wildfires include common terms such as forest fires, brush fires, grass fires, range fire, ground fires or wildland urban interface fires. Wildland urban interface fires burn in or threaten to burn buildings and other structures. Naturally or purposely ignited fires that are controlled for a defined purpose of managing vegetation for one or more benefits are not considered wildfires.

The Department of Environmental Conservation's Division of Forest Protection ("*Forest Ranger Division*") is designated the State's lead agency for wildfire mitigation in the State's Comprehensive Emergency Management Plan. New York State is a "home-rule" state where local emergency services have primary authority for any and all emergencies. In the



case of wildfire, the local fire department has the primary responsibility (incident command) for the control and containment of wildfires in their jurisdiction.

### **Conditions Affecting the Wildfire Hazard**

A combination of available fuel, weather, and topography, work together to determine when a wildfire will ignite, how quickly it will travel, and the fire's intensity. In general, the vulnerable times of the year for wildfire in New York State are from the end of the snow pack until leaf out in the end of August.

**Fuels:** The two basic fuel types in the wildland/urban interface are vegetation and structures.

**Vegetation:** Fuel in its natural form consists of living and dead trees, bushes, and grasses. Typically, grasses burn more quickly and with less intensity than trees. Any branches or shrubs between 18 inches and 6 feet are considered to be ladder fuels. Ladder fuels help convert a ground fire to a crown fire (tree tops) which moves much more quickly.

**Structural Density:** The closer the homes are together, the easier it is for the flames to spread from one structure to another.

**Weather:** High temperatures, low humidity, and swift winds increase the probability of ignitions and difficulty of control. Short and long-term drought further exacerbates the problem.

**Slope:** Slope is the upward or downward incline or slant of terrain. For example, a completely flat plain represents a 0% slope and a hillside that rises 30 feet for every 100 feet horizontal distance represents a 30% slope. Hot gases rise in front of the fire along the slope face, pre-heating the up-slope vegetation, moving a grass fire up to four times faster with flames twice as high as a fire on level ground.



## Monitoring Fuel Conditions

Dead fuel moisture responds solely to ambient environmental conditions and is critical in determining fire potential. Dead fuel moistures are classed by time lag. A fuel's time lag is proportional to its diameter and is loosely defined as the time it takes a fuel particle to reach two-thirds (2/3) of its way to equilibrium with its local environment. Dead fuels fall into four classes:

- 1-h, less than 1/4" diameter: Fine, flashy fuels that respond quickly to weather changes; computed from observation time temperature, humidity, and cloudiness.
- 10-h, 1/4 to 1" diameter: Computed from observation time temperature, humidity, and cloudiness; or can be an observed value, from a standard set of "10-Hr Fuel Sticks" that are weighed as part of the fire weather observation.
- 100-h, 1 to 3" diameter: Computed from 24-hour average boundary condition composed of day length, hours of rain, and daily temperature/humidity ranges.
- 1000-h, 3 to 8" diameter: Computed from a seven-day average boundary condition composed of day length, hours of rain, and daily temperature/humidity ranges.

## Location

New York State is 30.9 million acres in size with 18.9 million acres of non-federal forested lands. Many areas in New York, particularly those that are heavily forested or contain large tracts of brush and shrubs, are prone to fires. The Adirondacks, Catskills, Hudson Highlands, Shawangunk Ridge, and Long Island Pine Barrens are examples of fire-prone areas.

In addition, there is an undetermined amount of open-space non-forested lands with significant wildfire potential. The wetlands of western New York and lower New York are examples of non-forested lands that can burn as weather conditions allow. These fires are not only spectacular in their intensity but quite often threaten nearby communities, businesses or improvements, becoming wildland-urban interface fires. Smoke and particulate matter from wildfires 500 miles north in Quebec often drifts to the southern tip of the State impacting New York, Bronx, Kings, Queens, Richmond, Nassau and Suffolk counties. Occasionally, the effects of wildfires can cause public officials and the media to initiate dialogue on how fire hazards impact air quality.

The Forest Ranger Division has a statutory requirement to provide a forest fire protection system for 657 of the 932 townships throughout New York. This area excludes cities and villages and covers 23.5 million acres of land including state-owned lands outside the 657 towns. The Lake Ontario Plains and New York City-Long Island areas are the general areas not included in the statutory protection. The Lake Ontario Plains were once New York's most active agricultural lands, but much of the area has reverted to hardwood forests. During some years, the largest and most destructive wildfires occur in the southern portion of the state on Long Island or in New York City. Wildfire occurrences in this area are collected from fire department reports to evaluate any need to expand statutory



responsibilities. Regardless of jurisdiction or location of a wildfire, fire departments and forest rangers have a long history of collaboration to control the most serious wildfires that occur anywhere in the state.

### Previous Wildfire Occurrences

Wildfire occurrence reporting in New York State is based on two data sources; the NYS Forest Ranger Force and NYS Office of Fire Prevention and Control (OFP&C). The NYS Forest Ranger Force has fought fires and retained records for more than 128 years. Over the past 25 years (1988-2012), Division records indicate that rangers suppressed 6,971 wildfires that burned a total of 67,273 acres. This averages 279 fires burning 2,691 acres per year; however, the State does not have a consistent wildfire season. New York State's fire history indicates periods of time when wildfires are much more numerous and destructive than the 25-year average would indicate. 1988, 1989, 1991, 1995, 1998, 1999, 2001 and 2008 were all above average years with 11,730 acres burned in 1989 alone. In 2008, a 2,800 acre wildfire occurred in Minnewaska State Park killing approximately 50% of the old growth forest cover in this very popular and scenic park (DEC, 2013).

New York State encountered its most recent wildfire April 9, 2013 in Suffolk County, burning approximately 1,240 acres in Manorville. Firefighters from about 35 departments battled the fire with 20 brush trucks, 10 tankers, and 10 engines. State fire helicopters dumped water on the flames from above. Flames forced dozens of people to evacuate, three homes were engulfed in flames and six other structures, including one commercial building were damaged or destroyed.

**Table 3.17a: Wildfire Historical Events and Losses 2011-2013**

County	Date	Death	Injured	Property Damage	Crop Damage
Jefferson	7/31/2012	0	0	\$ -	\$ -
Ulster	4/17/2008	0	0	\$ -	\$ -
Albany	7/5/2002	0	0	\$ -	\$ -
Columbia	7/5/2002	0	0	\$ -	\$ -
Dutchess	7/5/2002	0	0	\$ -	\$ -
Greene	7/5/2002	0	0	\$ -	\$ -
Rensselaer	7/5/2002	0	0	\$ -	\$ -
Schenectady	7/5/2002	0	0	\$ -	\$ -
Ulster	7/5/2002	0	0	\$ -	\$ -
Fulton	7/5/2002	0	0	\$ -	\$ -
Hamilton	7/5/2002	0	0	\$ -	\$ -
Montgomery	7/5/2002	0	0	\$ -	\$ -
Herkimer	7/5/2002	0	0	\$ -	\$ -



County	Date	Death	Injured	Property Damage	Crop Damage
Saratoga	7/5/2002	0	0	\$ -	\$ -
Schoharie	7/5/2002	0	0	\$ -	\$ -
Herkimer	7/5/2002	0	0	\$ -	\$ -
Saratoga	7/5/2002	0	0	\$ -	\$ -
Warren	7/5/2002	0	0	\$ -	\$ -
Washington	7/5/2002	0	0	\$ -	\$ -
Albany	7/5/2002	0	0	\$ -	\$ -
Columbia	7/5/2002	0	0	\$ -	\$ -
Dutchess	7/5/2002	0	0	\$ -	\$ -
Greene	7/5/2002	0	0	\$ -	\$ -
Rensselaer	7/5/2002	0	0	\$ -	\$ -
Schenectady	7/5/2002	0	0	\$ -	\$ -
Ulster	7/5/2002	0	0	\$ -	\$ -
Suffolk	5/15/2001	0	2	\$ -	\$ -
Rensselaer	4/19/2001	0	0	\$ 2,000.00	\$ -
Schenectady	4/18/2001	0	0	\$ 5,000.00	\$ -
Washington	4/16/2001	0	0	\$ 95,000.00	\$ -
<b>Totals:</b>		<b>0</b>	<b>2</b>	<b>\$102,000.00</b>	<b>\$ -</b>

Source: NOAA, National Climatic Data Center, 2013

## Historical Wildfire Events in New York State 1903-2013

### Adirondack Fires - Early 1900s

The development of the Adirondacks depended entirely upon the mining, lumbering, and agricultural industries.

Early industry in the region consisted of mining operations and lumber operations. In 1903, the Delaware and Hudson Company, after acquiring the Chateaugay and Lake Placid Railway Company, secured control of the Chateaugay Ore and Iron Company, with the view of increasing the mining and smelting operations at Lyon Mountain and Standish and, subsequently, freight movements on its railroad lines. Shortly after these acquisitions, during the summer and fall of 1903, destructive forest fires burned over approximately three-fourths of the Chateaugay Company's forest. A portion of the acreage, burned clean of timber, was later considered as entirely denuded. The major portion of the burned area was probably affected by serious ground fires, which did not entirely damage the remaining stands of timber, but necessitated placing this timber on an early market.

Forest fires continued burning year after year. These fires, most severe in 1903, 1908, 1911, 1913, and 1915, destroyed practically all timber that was ready for market and



scorched the ground so badly that the humus, needed by the soil to establish another ground-cover of valuable hard and soft woods, was burned down to sand and stones, on which a fire cover of inferior woods began to grow in order to assist nature in enriching the soil cover. The Dock and Coal Company continued cutting in the burned areas from which salvage could be obtained, and from the lands which had not been burned until 1918, when operations ceased as the timber supply was exhausted. There remained only scattered areas of cull hardwoods that had been lumbered once and burned over several times. Other than such hardwoods, nothing remained but undersized swamp balsam and spruce which, because of its location in wet areas, had not been badly burned.

### Sunrise Fires - 1995

August of 1995 will be remembered as a record breaker for the residents of New York and Long Island. Residents suffered through at least 22 consecutive days without measurable precipitation, with only 0.44 inches reported for the entire month at Brookhaven National Weather Service Forecast Office. This drought had been developing throughout the year (see Drought History); with year-to-date precipitation on Long Island reported to be 11.45 inches below normal (18.85 inches compared to a normal of 30.30 inches). Unusual heat accompanied this unpredicted drought for the entire month of August. Long Island was so parched that by August lawns crackled underfoot like hay for harvest and the woods were dry as kindling. Daily mean temperatures were averaging 3.2 degrees above normal for the month. These weather conditions were conducive to extreme fire behavior. The extreme drought and heat conditions caused dead fuel moisture to reach dangerously low levels and live fuel moisture was approaching end of winter levels.

From August 21, 1995 at 11:00 am to September 4, 1995 at 6:00 pm, four wildfires constituting the "Sunrise Fire Complex" burned more than 7,000 acres of brush and forest land in Suffolk County. The fires forming the Sunrise complex included: the Rocky Point, Sunrise, Medford, and Calverton fires, (Figure 3-117).



*Newsday Photo/Bill Davis: Sunrise Highway in August, 1995*

The initial ignition at Rocky Point was detected at approximately 11:00 am, Monday, August 21, 1995. It was quickly attacked and contained shortly thereafter. At approximately 12:00 pm, a second start was detected and attacked by forces still on the scene. The fire quickly escaped control and burned 1800 acres by the evening of August 22, 1995.



On Thursday, August 24, 1995, a second major fire, named the Sunrise Fire (after the interstate it closed down), was ignited in the vicinity of the Suffolk County Community College East Campus, just east of Speonk-Riverhead Road. It was initially attacked by the Eastport Fire Department, but due to extreme fire conditions, quickly escaped control. By Friday afternoon, it had grown to 5,050 acres, damaged or destroyed three structures in the vicinity of the Westhampton Train Station, and brought a mobilization of firefighters never before seen on Long Island.

All incidents of the Complex occurred in the “pine barrens” that dominate the undeveloped portions of Long Island. These areas are dominated by Pitch Pine and a variety of oaks, with an understory of pine, oak, sweet fern, blueberry and grasses, and a thin layer of litter and duff. Successful fire suppression over many years allowed these Pine Barrens to develop dense overstory and understory layers.

The fire complex was the worst to hit the State and the first ever on Long Island. It was also the first major fire in the Wildland/Urban Interface (WUI) in New York State. A large population and a number of structures were at high risk.

The threat from the fires was so great that Governor George E. Pataki requested, and President Clinton approved, a Fire Suppression Assistance Declaration for the impacted area. The declaration was received on August 24, 1995 and various federal resources were provided to help bring the fire under control and extinguish it. Mr. Jim Lyons, United States Undersecretary of Agriculture was assigned to directly manage the federal firefighting effort. Additionally, certain eligible costs incurred by State and Local agencies in the effort were reimbursed.

At the height of the event, hundreds of Local fire companies and scores of State and Federal agencies were involved in suppressing the fires. The United States Forest Service provided comprehensive firefighting assistance, including all necessary equipment and teams of experts. This extraordinary effort by a multi-governmental partnership was a major factor in the successful suppression of these major fires with minimum property losses and without loss of life.

### **Adirondack Fires – 2002**

New York Department of Environmental Conservation (DEC) Forest Rangers, along with the State Police Aviation Unit, Department of Correction Services inmate crews, and Local volunteer fire departments fought more than 36 active forest fires, encompassing more than 320 acres in the Adirondack Mountains during August of 2002. Dry summer conditions made forest fires easy to start, and when coupled with the gusty winds, the fires spread quickly. Certain regions of the Adirondacks received less than two inches of rain in July and less than one inch in the month of August.



DEC banned campfires on all State Forest Preserve lands in the Adirondack Park, except DEC campgrounds. In addition, to prevent additional human-caused wildfires, the DEC suspended all burn permits issued by the Agency in the counties comprising DEC Region's 5 and 6, which include Clinton, Essex, Franklin, Hamilton, Fulton, Saratoga, Warren, Washington, St. Lawrence, Jefferson, Lewis, Herkimer, and Oneida counties.

While the majority of the fires were caused by lightning strikes, unattended campfires were the cause of at least twelve of the fires in the month of August.

The majority (28), and largest (6 fires ranging from 4 to 75 acres in size), of the fires were located in Essex (15) and Warren (13) Counties. Fires also burned in Clinton, Hamilton, Lewis, Saratoga, and Washington Counties.

**The six largest fires were:**

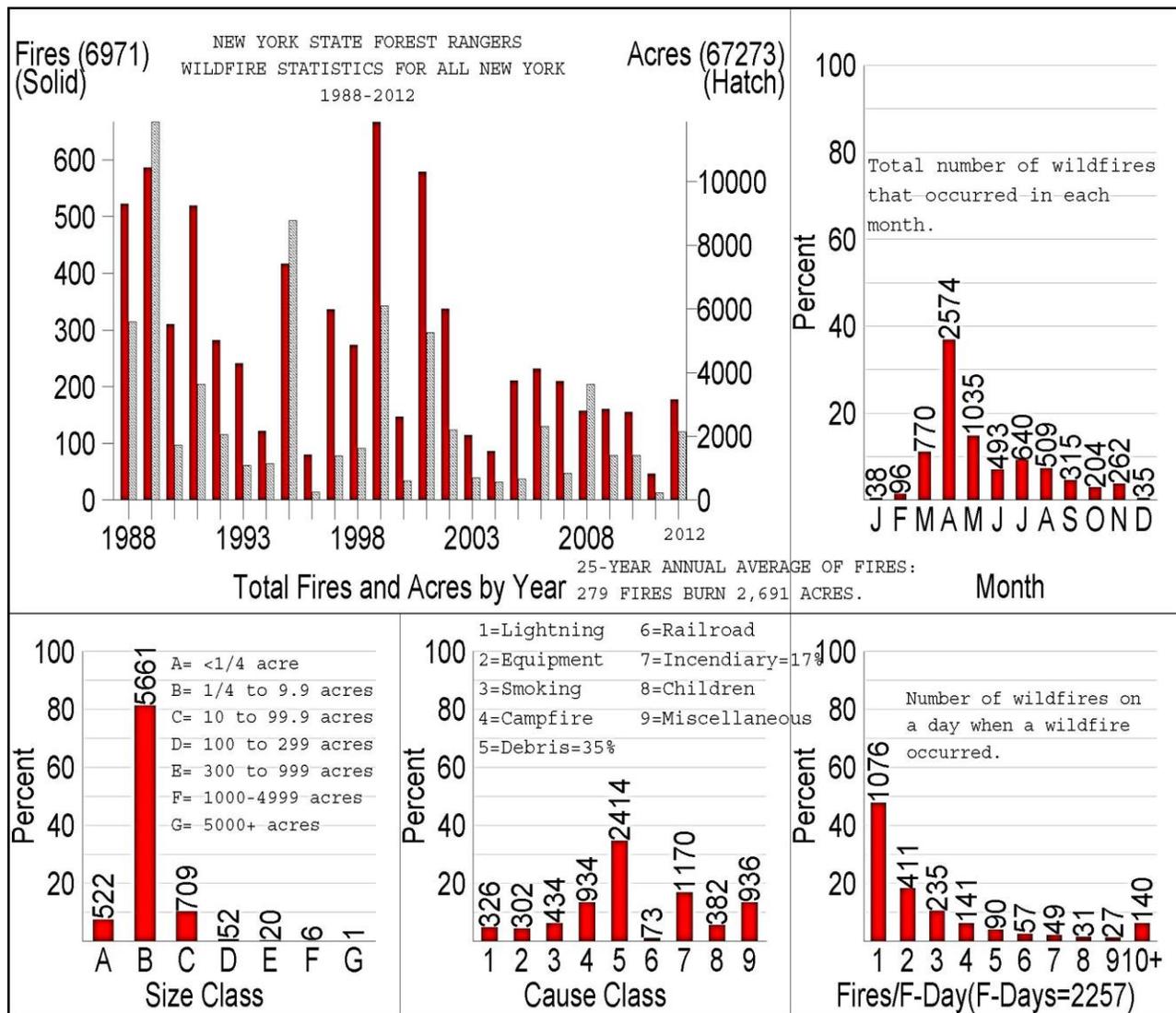
- 75 acres on Huckleberry Mountain, Town of Johnsburg, Warren County;
- 45 acre Gooseneck Fire, Town of Ticonderoga, Essex County;
- 25 acre Ridge Fire on Hail Mountain, Town of Crown Point, Essex County;
- 8 acres on Whiteface Mountain, Town of Wilmington, Essex County;
- 7 acre fire on Hail Mountain, Town of Crown Point, Essex County;
- 4 acres on Beach Mountain, Town of Bolton, Warren County

**Cherrytown Fire – 2006**

The Cherrytown Fire started on April 30, 2006 in the Catskill Park, outside the town of Rochester. The fire consumed 933 acres near the Vernooey Falls Ridge in the Catskill State Park. The Cherrytown Fire was the largest wildfire since 2002. The fire was fought by a dozen Ulster County fire teams led by the Accord Fire Department Firefighters. Firefighters from Orange County and three volunteer departments from Sullivan County also assisted in the fire effort. Two inmate crews, State Department of Environmental Conservation forest rangers and fire teams from two local nature preserves also offered their assistance. The fire was officially extinguished on May 12, 2006.



Figure 3-17a shows the Forest Ranger Division Wildfire occurrence statistics from 1988 through 2012.

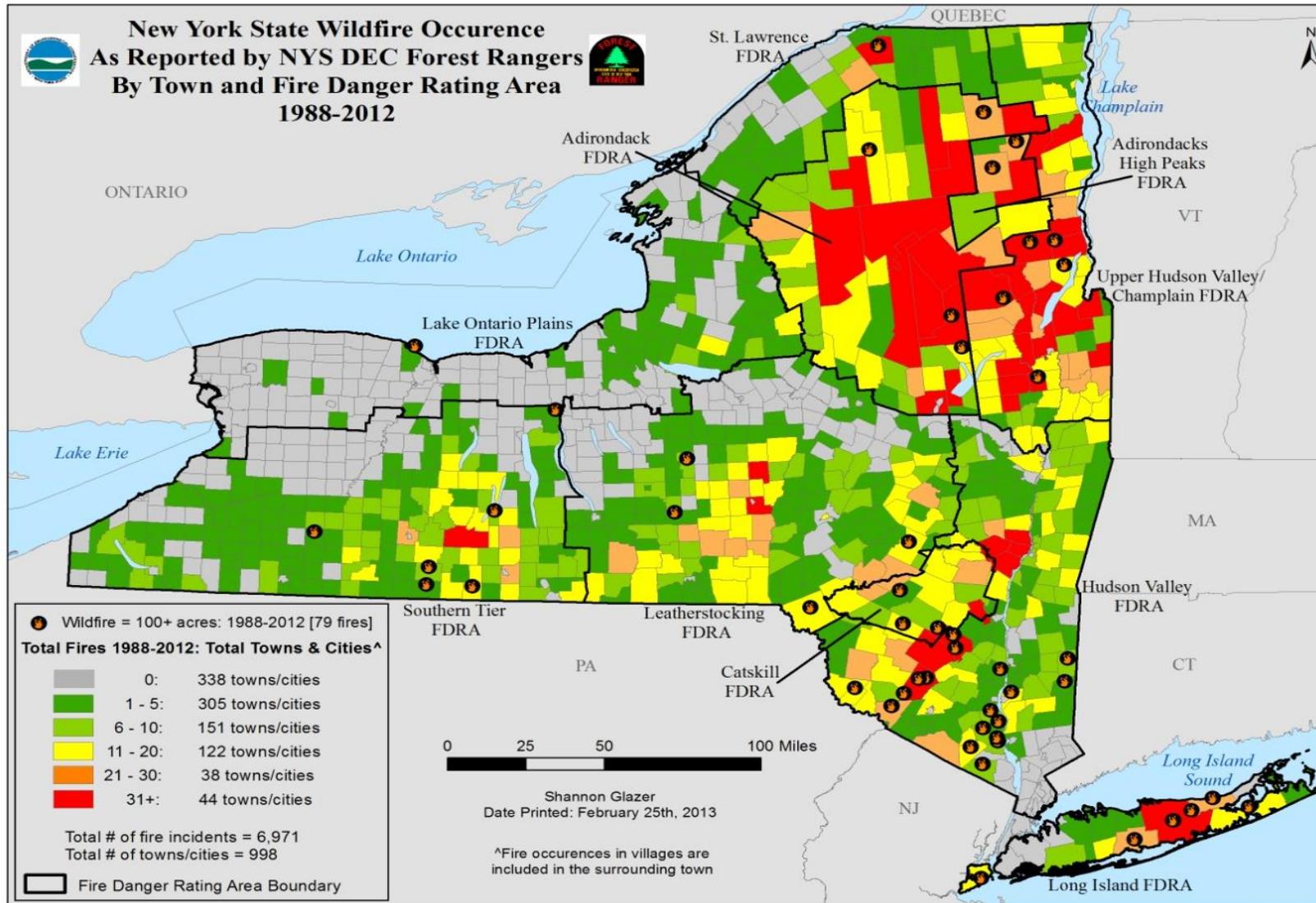


Source: New York State Department of Environmental Conservation Forest Rangers

In addition to Forest Rangers documenting wildfire occurrence, New York’s 1,700 fire departments do the same but in a significantly different format. Data collected by the NYS Office of Fire Prevention and Control (OFP&C) indicates that from 2002 through 2012, fire departments throughout New York responded to 64,208 wildfires, brush fires, grass fires or other outdoor fires (all natural vegetation fires). Approximately 4,900 fires were reported from 2005-2010; 7,698 fires occurred in 2005 alone. Fire department data for 2000 through 2012 has been incorporated into the Department’s geographical information system (GIS) and several statistical occurrence maps and graphs have been produced. Fire departments do not report fire size, but damage assessments may be determined from the data with further GIS applications.



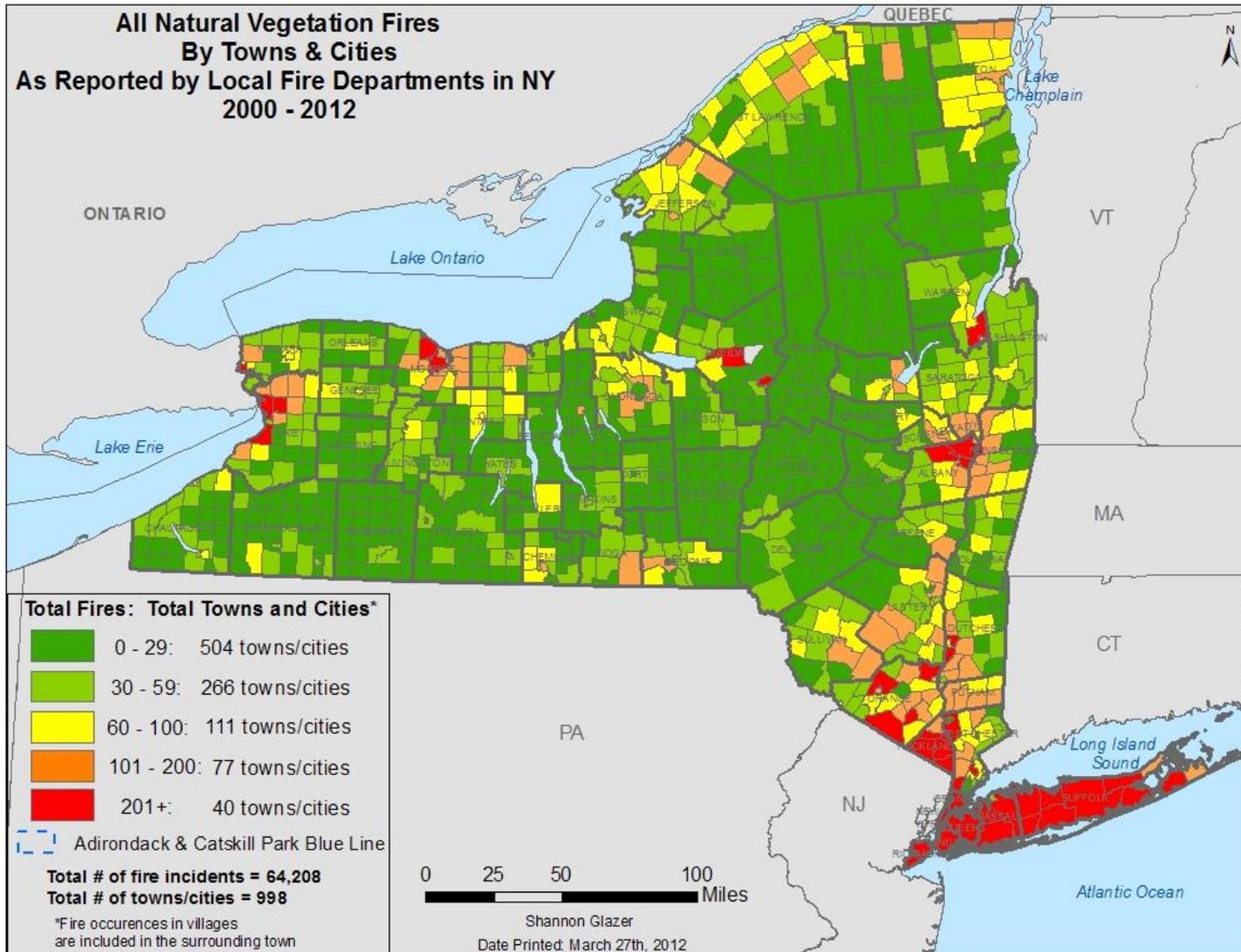
Figure 3.17b shows New York State DEC Forest Rangers Wildfire Occurrence from 1988-2012



Source: New York State Department of Environmental Conservation Forest Rangers



Figure 3.17c references all natural vegetation fires from 2000-2012 reported by local NYS fire departments.



## Probability of Future Wildfire Events

It is hard to predict the likelihood of wildfires as a generic statement of “once every five years” as many factors contribute to the ignition of a wildfire. The likelihood of a fire starting and maintaining itself can be gauged on a daily basis.

### Wildfire experts say there are four reasons why wildfire risks are increasing:

- The way forests were handled in the past allowed fuel in the form of fallen leaves, branches and plant growth, to accumulate. Now this fuel is lying around the forest with potential to “feed” a wildfire.
- Increasingly hot, dry weather in the U.S.
- Changing weather patterns across the country.
- More homes built in the areas called the Wildland/Urban Interface, meaning homes are built closer to wildland areas where wildfires can occur.

Fire has proved to be an essential component to some ecosystems. It is a natural cleaning agent that serves to wipe away unwanted growth, encourage biological diversity, renew soil and allow natural competition for sun and space among species of trees and plants.

With wildfires being snuffed out for decades, species such as the Atlantic white cedar tree have all but disappeared, as have certain flowers, insects, and fauna previously found in local marshes and woods.

According to scientists, when it comes to human safety and property, fire can actually reduce the risks of a devastating wildfire. Periodic fires burn away shrub and underbrush that, if left alone, can collect and become fuel.

Modern scientific thought has led to the emergence of prescribed fires or “controlled burns” in wildfire vulnerable areas. These controlled burns have *reduced* the risk for extreme wildfires, but the risk still exists. We are likely to see small wildfires throughout the State on a yearly basis (as we have regularly experienced in the past), however, advanced methods of fire control and a better understanding of the fire ecosystems, should reduce the number of devastating fires in the future.

According to the Forest Ranger Division wildfire occurrence data from 1988 through 2012; New York State will always be susceptible to wildfires. Ninety-five percent of wildfires in New York are caused by humans, while lightning is responsible for only 5 per cent. Of the human-caused wildfires, debris burning accounts for 35%, incendiary fires account for 17%, campfires cause 13% and children are responsible for 5 per cent. Smoking, equipment, railroads and miscellaneous causes contribute to the remaining 30% of wildfires. Beginning in 2010, New York enacted revised open burning regulations that ban brush burning statewide from March 15 through May 15, a period when 47% of all fire department-response wildfires occur. Forest ranger data indicates that this new statewide ban resulted in 74% fewer wildfires caused by debris burning in upstate New York from



2010-2012 when compared to the previous 10-year average. Debris burning has been prohibited in New York City and Long Island for more than 40 years. Since compliance with this regulation is a continuing objective, forest ranger and fire department historical fire occurrence data will serve as a benchmark for analysis of wildfire occurrence. As wildfires caused by debris burning decline through regulatory enforcement, incendiary or arson fires will likely be the primary cause of wildfires in the future. Addressing this issue will require a greater intensity of enforcement than is realized for all other causes combined.

New York's large size, diverse topography and variety of climates require the state be divided into distinct units for describing wildfire potential and risk. Through research and more than 35 years of wildfire occurrence linked to fire weather indices, New York is divided into 10 fire danger rating areas (FDRAs). FDRAs are defined by areas of similar vegetation, climate and topography in conjunction with agency regional boundaries, National Weather Service fire weather zones, political boundaries, fire occurrence history and other influences. The Forest Ranger Division issues daily fire danger warnings when the fire danger rating is at high or above in one or more FDRAs. A current fire danger rating map is updated daily on NYS Department of Environmental Conservation for the general public to view.

Although fire departments and forest rangers have the most critical roles at controlling wildfires, local communities and residents have the greatest role at preventing fires, loss of life or property damage. Smokey Bear has been a highly successful worldwide symbol of wildfire prevention since 1944. The number of wildfires caused by debris burning, campfires, smoking and children continues to decline due to prevention strategies and behavioral changes. Regardless of prevention strategies, destructive wildfires will continue to occur when weather, fuels and topography support rapid fire spread. Communities-at-risk to wildfire should develop a community wildfire protection plan (CWPP) as a comprehensive means of addressing risk issues and mitigation strategies. In addition, the NYSDEC, Wildland Fire Safety and Prevention program implements the "FIREWISE" mitigation program with participating communities. FIREWISE and Ready, Set, Go! programs provide both general and specific recommendations for communities, homeowners and individuals to protect themselves and their properties from destructive wildfires. Cragmoor, a small historical community in Ulster County adopted the FIREWISE program. They work closely with their local fire department to prevent wild land urban interface fires.



### Justification for Conducting a Full Risk Assessment

Although wildfire received an overall “low” ranking following the HAZNY-Mitigation methodology, it was acknowledged that there are potential cost-effective and technically feasible initiatives and programs that address wildfire mitigation. Consequently, the wildfire hazard was elevated to “moderate” ranking and is addressed within the mitigation strategy, goals and activities for the 2014 update.

### 3.17.2 Assessing Wildfire Vulnerability and Potential Losses by Jurisdiction

As stated previously, any area of the State where the built environment infringes upon or is incorporated within the wildland/urban interface is vulnerable to the damaging effects of wildfire. Areas with high loads of fuel are at increased risk of a wildfire, specifically areas that have experienced a “blowdown” in recent years, allowing for the buildup of fuels. Currently the area of the State that falls into that category is the Adirondack Region, which has increased levels of fuel from recent blowdown events and ice storm damages. Other areas of the State that have a higher level of wildfire hazard include areas with fire-dependent vegetative species. As indicated above, this area encompasses the Pine Barrens region of Suffolk County on Long Island and the Albany Pine Bush. As referenced in **Section 3.4- Climate Change** can impact drought and extreme heat causing drier conditions, which can lead to an increased number of wildfires. For example, in July of 1999, during a drought, all State Department of Environmental Conservation lands in Suffolk County were closed to recreational users. The lands were closed until the fire danger risk was lowered. In 2002, during a drought in the Adirondack Region, concern for the increased fire hazard led officials to ban open-burning and to ban camp fires in State campgrounds.

Since August 2013, 56 FEMA-approved local hazard mitigation plans (LHMP) have been reviewed for the 2014 Update. The State’s planning team had the opportunity to review local county risk assessments to help the State better understand its vulnerability in terms of the jurisdictions most threatened by classified hazards. In its analysis, the State of New York reviewed the processes of local governments and how their hazards were ranked based on their jurisdictions and the potential losses (i.e., people, buildings, and dollar values) associated with the hazards of greatest concern.

Where data was available, the State extracted the ranking impact information from the LHMP hazard analysis. This ranking feature is based on a combination of probability, severity, and extent of the hazard and was determined to be the best measure of overall risk in the plans. This ranking was either numeric or described in terms of high, moderately high, moderate, or low. In cases where this information was not available, ranking values were not determined yet considered if identified in the individual county local plans.

For the sake of the 2014 Update, a proper analysis and summary of the data was required. During the review of the local plan risk assessments, all rankings used were



based on the HAZNY-Mitigation ranking system, and measured on a scale rating from 44 (low) to 400 (high). This analysis revealed that selected county-level plans did include manmade hazards in their analysis, but the State hazard mitigation plan's 2014 Update focused solely on natural hazards.

The local risk assessment summary allowed for an analysis of which hazards are of high concern to particular counties. **Table 3.2a** in **Section 3.2** lists all the hazards and the number of counties that ranked them at each of the scale levels: "High", "Moderately High", "Moderate", "Moderately Low", and "Low". According to the plans reviewed, 33 counties recognized wildfire as a hazard. Allegany "Eastern Region", Essex, Lewis, Orange, Otsego, Rensselaer, Ulster, Warren, Wayne, Westchester, and Wyoming counties identified wildfire as a moderately high hazard, no counties ranked it as a high hazard, three ranked it a moderate hazard, ten ranked it moderately low, and nine considered it a low hazard. **Table 3.17d** displays the highest ranked county hazards.

**Tables 3.17b: Summary of Wildfire Hazard Rankings by County**

Local County Wildfire Hazard Rankings	
High	Moderately High
N/A	Allegany "Western Region", Essex, Lewis, Orange, Otsego, Rensselaer, Ulster, Warren, Wayne, Westchester, and Wyoming

Source: LHMP

### Development in hazard prone areas

Based on the 2010 Census, population increases are being seen or are expected in Albany, Clinton, Cortland, Dutchess, Essex, Franklin, Fulton, Greene, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York City (including Bronx, Kings, New York, Queens, and Richmond Counties), Onondaga, Ontario, Orange, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Seneca, Steuben, Suffolk, Sullivan, Tompkins, Ulster, Warren, Washington, Westchester, and Yates counties.

Essex, Lewis, Orange, Rensselaer, Ulster, and Warren counties had a 1-2% population growth from 2000-2010. They also ranked wildfire as a "moderate high" hazard based on the 56 FEMA Approved LHMPs as of September 2013. As more New Yorkers relocate to rural communities, counties will continue to increase in population, potentially causing more brushfires if residents are not properly educated on fire safety.

NYSDEC Forest Rangers and Fire Departments collaborate with local communities to educate residents living in areas vulnerable to wildfires the value in of fire safety. Section 4 of the plan provides mitigation projects and programs that New York State has currently incorporated or plans to implement in the future.



### 3.17.3 Assessing Wildfire Vulnerability and Potential Losses of State Facilities

Except for recreational and land-management related facilities, state-owned properties are at low risk for impact from wildfires. Although state agencies maintain internal databases that identify location and value of properties within their areas of responsibility, New York State does not currently have a comprehensive data set of state-owned and operated assets that can be integrated into the GIS methodology for analysis. However, a state facilities inventory project was initiated in August 2013, which will gather information that can be used to building a comprehensive data set. The pilot phase, which will look at a specific critical facility category and develop the methodology for the project, is expected to be complete in mid-2014. At that time, the next phase of the project will be developed for what is anticipated to be a multi-year project.

**Table 3.17c: State Owned Buildings and Replacement Cost**

Agency	Number of Buildings	Replacement Cost (\$)
Office of General Services (OGS)	9	\$ 122,193,519
Department of Health (DOH)	27	\$ 67,761,389
Office of Information Technology Services (OITS)	293	\$ 329,045,358
Office of Parks, Recreation and Historic Preservation (OPRHP)	1,840	\$ 504,287,400
Department of Environmental Conservation (DEC)	54	\$ 10,534,440
Office of Mental Health (OMH)	228	\$ 773,237,304
Office For People With Developmental Disabilities (OPWDD)	426	\$ 394,705,144
Division of State Police (DSP)	5	\$ 4,874,743
Department of Military and Naval Affairs (DMNA)	39	\$ 113,149,168
Department of Transportation (DOT)	147	\$ 68,353,325
Office of Child and Family Services (OCFS)	21	\$ 24,645,931
Dormitory Authority of the State of New York (DASAS)	2	\$ 5,631,127
Department of Labor (DOL)	2	\$ 7,448,928
<b>Total</b>	<b>3,093</b>	<b>\$ 2,425,867,776</b>



### 3.17.4 Data Limitations and other Key Documents

The Mitigation Plan Development Team researched the wildfire risk as it affects the State. The contents of this section result from research and outreach including the following sources:

- FireWise Communities; [www.firewise.org](http://www.firewise.org)
- Ready, Set, Go!; [www.iafc.org/ReadySetGo](http://www.iafc.org/ReadySetGo)
- New York's Comprehensive Emergency Management Plan: <http://www.dhss.ny.gov/planning/documents/Emergency-Services-Branch-3.2012.pdf>
- National Association of State Foresters (NASF); [www.stateforesters.org](http://www.stateforesters.org)
- U.S. Forest Service Fire and Aviation Management; [www.fs.fed.us/fire](http://www.fs.fed.us/fire)
- Northeastern Forest Fire Protection Compact; [www.nffpc.org](http://www.nffpc.org)
- National Fire Protection Association; [www.nfpa.org](http://www.nfpa.org)
- NASF Briefing Paper: Identifying Communities at Risk and Prioritizing Risk-Reduction Projects, July 2010; <http://stateforesters.org/node/1952>
- National Cohesive Wildland Fire Management Strategy; [www.forestsandrangelands.gov](http://www.forestsandrangelands.gov)
- NYS DEC Forest Ranger Division Annual Report for 2012; <http://www.dec.ny.gov/regulations/2371.html>



## Section 4: MITIGATION STRATEGY

### 2014 SHMP Update

- The goals and objectives were revised to more closely align the mitigation strategy to mitigation activities, and reflect lessons learned from three major disasters since 2011. The goals and objectives were also assessed to correlate with 56 Local Hazard Mitigation Plans (LHMPs) to ensure consistency with the State Hazard Mitigation Plan (SHMP).
- The projects from the 2011 SHMP were reviewed and updates provided, where available. Seventy three projects were removed from the activities list, as they were identified during the 2014 evaluation as: **(1)** ongoing program functions or capabilities; **(2)** completed projects; or **(3)** no longer needed/viable.
- 98 new activities were identified by participating agencies in the 2014 SHMP update process and have been added, to the 15 activities retained from 2011, for a total of 112 actions and activities.
- Two new lists were added to represent **(1)** implemented and/or completed projects, and **(2)** activities in development. (Appendix A)
- Additional information related to state and local mitigation capabilities was combined with information from the 2011 SHMP **Sections 4.2** and **4.3**.
- The list of funding sources in the 2011 SHMP was researched, expanded, and updated in **Section 4.5**.

### "Roadmap" Activity<sup>1</sup>

In addition to the long-term and ongoing multi-hazard and hazard-specific strategies identified in this section, DHSES will continue to develop this section in key areas identified and agreed upon by the State and described in **Table 4.4g** over the life cycle of the plan.

***Requirement §201.4(c)(3):** To be effective the plan **must** include a Mitigation Strategy that provides the State's blueprint for reducing the losses identified in the risk assessment.*

***Requirement §201.4(c)(3)(i):** [T]he State mitigation strategy **shall** include a description of State goals to guide the selection of activities to mitigate and reduce potential losses.*

***Requirement §201.4(d):** Plan **must** be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities.*

<sup>1</sup> Roadmap Activities are action items to be developed further during the life-cycle of the plan, through the monitoring, evaluation and update process. The comprehensive list of action items can be found in **Sections 2** and **4**.



**Requirement §201.4(c)(3)(ii):** *The State mitigation strategy shall include a discussion of the State’s pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including: an evaluation of State laws, regulations, policies, and programs related to hazard mitigation as well as to development in hazard-prone areas and a discussion of State funding capabilities for hazard mitigation projects.*

**Requirement §201.4(c)(3)(ii):** *The State mitigation strategy shall include a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.*

**Requirement §201.4(c)(3)(iii):** *State plans shall include an identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy. This section should be linked to local plans, where specific local actions and projects are identified.*

**Requirement §201.4(c)(3)(iv):** *The State mitigation strategy shall include an identification of current and potential sources of Federal, State, local or private funding to implement mitigation activities.*

This section provides the mitigation strategy for New York State, beginning with a discussion of the vision and how it will be achieved through goals and objectives. Mitigation actions and activities that support the goals and objectives are described, analyzed, and prioritized, and a list of potential funding sources is provided. In addition, this section discusses the current mitigation capabilities of state and local agencies and organizations, demonstrating an ongoing history of mitigation in New York State.

- 4.1 Hazard Mitigation Goals
  - 4.1.1 Revision Process for 2014 Goals
  - 4.1.2 Goals and Objectives
- 4.2 State Capability Assessment
- 4.3 Local Capability Assessment
- 4.4 Mitigation Actions and Activities
- 4.5 Funding Sources

Operationally, **mitigation** is defined as “any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects. This definition distinguishes actions that have a long-term impact from those that are more closely associated with immediate preparedness, response, and recovery activities. Maintenance operations are also distinguished from mitigation because they maintain structures without an increase in the level of protection.”<sup>2</sup>

<sup>2</sup> Multi-Hazard Mitigation Planning Guidance Under the Disaster Mitigation Act of 2000, FEMA, January 2008 (Revised).



The goals presented in this plan are framed around five broad mitigation categories, which also serve as the foundation for defining the objectives and mitigation actions and activities:

- **Prevention:** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.
- **Property Protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard, or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
- **Public Education and Awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

These definitions provide the framework for the State's mitigation strategy.

## Vision Statement

**The first Vision Statement developed for the State's Hazard Mitigation program was created during a planning summit held in 1995:**

*"A society whose daily activities reflect a commitment shared by government, business, and the public to reduce or eliminate impacts from natural and technological disasters."*



**The 2002 SHMP updated the State's Hazard Mitigation Vision Statement to read:**

*"To create communities whose daily activities reflect a comprehensive commitment by government, business, non-profit organizations, and the public to eliminate or reduce risks and adverse impacts from natural, technological, and human-caused hazards."*

The 2002 SHMP Vision Statement, which was carried through to the 2008 SHMP, was both more inclusive in scope and focused on integration of mitigation into all levels of New York communities. It also expanded the all-hazards emphasis with the inclusion of technical and human-caused hazards.

**During the 2011 SHMP update, Planning Committee members reviewed the Vision Statement and concurred that it should be revised to reflect a more proactive leadership and support role on the part of New York State and its relationship to local governments and institutions.**

*"To demonstrate by example how hazard mitigation benefits the citizens of the State of New York and their communities by eliminating or reducing risks and adverse impacts from hazards, and to encourage and actively support the hazard mitigation activities of local governments, businesses, institutions and non-profit organizations."*

During the 2014 SHMP update process, the SHMP Team, through discussion of the history of the Vision Statement, determined that the Vision Statement again needed revision to reflect the major impacts from multiple hazard events between 2011 and 2014. **The resulting modification of the vision statement, goals, objectives, and activities was based on numerous factors that have occurred since 2011 and as part of the 2014 SHMP update process, including:**

- Reassessment of hazard vulnerabilities and losses based on updated data, reports, and information
- Significant impacts from Hurricanes Irene and Sandy, Tropical Storm Lee, and repetitive flood events
- Availability of federal post-disaster funding resulting from the multiple disasters that increased mitigation opportunities
- Redefining mitigation actions to focus on mitigation activities related to prevention, property protection, public education and awareness, natural resource protection, and structural projects.
- Refocusing on natural hazards that have impacted, or have the potential to impact, New York State. Information about human-caused, technological, or biological hazards can be found in Volume 2 of the Comprehensive Emergency Management Plan (CEMP)



**In addition, the Vision Statement was influenced by multiple reports, studies, and plans that have been implemented since 2011, such as:**

- New York State 2100 Commission – tasked with finding ways to improve the resilience and strength of the State’s infrastructure in the face of natural disasters and other emergencies.
- New York Rising Community Reconstruction Program – established to facilitate community redevelopment planning and the resilience of communities, and provide additional rebuilding and revitalization assistance to communities severely damaged by Hurricanes Sandy and Irene and Tropical Storm Lee.

The following Vision Statement was developed for the 2014 SHMP, as a reflection on the priorities and programs discussed above:

### **2014 Hazard Mitigation Vision Statement**

*New York State will continually aim to reduce deaths, injuries, and economic losses stemming from natural hazards, and to lead by example in fostering community resilience and protecting the environment in the face of future natural events to improve the lives of the people of the State.*

## **4.1 Hazard Mitigation Goals**

With a successful hazard mitigation program, New York State can meet many of the serious and pervasive disaster-related challenges facing state and local governments, residents, businesses, and the environment. After an analysis of the hazards that impact the state, goals were created to guide the State and its communities in the development and selection of appropriate mitigation activities. Pursuing these goals will allow the State to achieve the ideal described in the State’s Hazard Mitigation Vision Statement.

### **4.1.1 Revision Process for 2014 Goals and Objectives**

The 2011 SHMP goals and objectives were developed through analysis of the hazards that impact the state to guide the State and its agencies in the development and selection of appropriate mitigation activities. The thirteen (13) 2011 goals were defined within four categories: end users, services, administration, and legislation.

The SHMP Team utilized the same approach in assessing the 2011 goals for the 2014 plan update. Taking into consideration the catastrophic events that have occurred within the previous three years, it was determined that the 2014 goals should be redefined to align with the new direction of the State’s mitigation efforts and priorities. The redefined goals also further supported the planning hierarchy established by linking measurable and achievable activities to the guiding principles of the overarching strategy. After review of



the 2011 goals, the SHMP Team determined that the goals should be revised to align with the five mitigation categories described earlier in this section.

The resulting assessment of the 2011 goals of the New York State Hazard Mitigation Program is described in **Table 4.1a**.

**Table 4.1a: Explanation of Revision and Resolution of 2011 Goals**

	2011 Goals		2014 Revision/Resolution
<b>End User</b>	<b>Goal 1:</b>	Promote hazard mitigation awareness and education throughout the State.	Revised as Goal 3
<b>(Services)</b>	<b>Goal 1:</b>	Build a State and Local hazard mitigation infrastructure within the State and promote mitigation as the most effective means to reduce future disaster losses.	Revised – concept integrated into Goal 1
<b>(Services)</b>	<b>Goal 2:</b>	Implement, maintain, and update a comprehensive State Multi-Hazard Mitigation Plan.	Removed – development and maintenance of State Hazard Mitigation Plan (SHMP) is required under 44 CFR 201.4
<b>(Services)</b>	<b>Goal 3:</b>	Reduce risk to lives and property from frequent natural, technological and human caused disasters. Set priority on hazards that are repetitive and pose severe risk to life and property.	Revised – concept integrated into Goals 2 and 5 (repetitive flood loss)
<b>(Services)</b>	<b>Goal 4:</b>	Promote the implementation of flood mitigation plans and projects in flood-prone areas of the State, in accordance with the Flood Mitigation Assistance (FMA), Repetitive Flood Claims (RFC) and Severe Repetitive Loss (SRL) Programs.	Revised – concept integrated into Goal 2 (repetitive flood loss)
<b>(Services)</b>	<b>Goal 5:</b>	Encourage the development and implementation of long-term, cost-effective and environmentally-sound mitigation projects at the Local level.	Revised – concept integrated into Goal 1
<b>(Services)</b>	<b>Goal 6:</b>	Promote Hazard-Resistant Construction, especially in residential buildings throughout the State.	Revised – concept integrate into Goal 5
<b>(Services)</b>	<b>Goal 7:</b>	Ensure hurricane safety for the people and infrastructure of vulnerable areas of New York State (NYS).	Removed – concept integrated into Goals 2 and 5
<b>(Services)</b>	<b>Goal 8:</b>	Ensure earthquake safety for the people, property, and infrastructure of New York State.	Removed – concept integrated into Goals 2 and 5
<b>(Services)</b>	<b>Goal 9:</b>	Reduce the risks of wildfire and utility failure resulting from damaged trees.	Removed – concept integrated into Goals 2 and 5
<b>(Services)</b>	<b>Goal 10:</b>	Reduce the length of utility “downtimes.”	Removed – concept integrated into Goal 5
<b>(Administration)</b>	<b>Goal 1:</b>	Ensure adequate administrative support to enable SOEM - [DHSES] hazard mitigation staff to meet their goals and objectives in a professional and efficient manner.	Removed – ongoing programmatic function that supports the SHMP
<b>(Legislation)</b>	<b>Goal 1:</b>	Track, and/or recommend, Federal, State and Local legislation related to hazard mitigation.	Revised – concept integrated into Goal 1



The New York State 2100 Commission, created in the immediate aftermath of Hurricane Sandy, was tasked with finding ways to improve the resilience and strength of the State's infrastructure in the face of natural disasters and other emergencies. **The Commission's report framed the State's recovery process, identifying and recommending nine crosscutting major actions to address multiple vulnerabilities and priorities in the State of New York:**

- a. Protect, Upgrade, and Strengthen Existing Systems
- b. Rebuild Smarter: Ensure Replacement with Better Options and Alternatives
- c. Create Shared Equipment and Resource Reserves
- d. Encourage the Use of Green and Natural Infrastructure
- e. Promote Integrated Planning and Develop Criteria for Integrated Decision-making for Capital Investments
- f. Enhance Institutional Coordination
- g. Improve Data, Mapping, Visualization, and Communication Systems
- h. Create New Incentive Programs to Encourage Resilient Behaviors and Reduce Vulnerabilities
- i. Expand Education, Job Training, and Workforce Development Opportunities

In addition to this renewed focus on strengthening resiliency to disasters, within the past two years the State has also implemented more buyout projects than ever before to eliminate repetitive loss and severe repetitive loss properties from future flood events.

Collectively, these actions represent the foundation for the sort of broad-based changes that are essential to building the long-term resiliency of the State and its citizens. **This focus on reducing vulnerability and promoting resiliency as an approach to mitigation led to the determination by the SHMP Team that the five primary themes described previously in this plan embodied the 2014 State mitigation goals:**

- Prevention
- Property Protection
- Public Education and Awareness
- Natural Resource Protection
- Structural Projects

#### 4.1.2 Goals and Objectives

Utilizing the themes described above, goal statements were developed, and objectives were then defined and used as the tool to identify activities that support the overall strategy.

**Goal 1: Promote a comprehensive state hazard mitigation policy framework for effective mitigation programs that includes coordination between federal, state, and local organizations for planning and programs.**



**Objective 1.1:** Promote integrated land use planning to encourage resilient and sustainable efforts throughout statewide programs that address zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.

**Objective 1.2:** Continue to participate in state and local programs and efforts that focus on practices that support or enhance resiliency.

**Objective 1.3:** Improve hazard data through studies, research, and mapping to enhance information related to the impacts of hazards and related risks, vulnerability, and losses.

**Goal 2: Protect property including public, historic, private structures, and critical facilities and infrastructure.**

**Objective 2.1:** Encourage homeowners, renters, and businesses to insure property for all hazards, including flood coverage under the National Flood Insurance Program (NFIP).

**Objective 2.2:** Identify mitigation opportunities to protect, upgrade and strengthen existing structures from all-hazards through acquisition, elevation, relocation, and retrofit.

**Objective 2.3:** Encourage resilient and sustainable structures to reduce vulnerabilities, encouraging the use of green and natural infrastructure.

**Objective 2.4:** Promote the continued use of natural systems and features, open space preservation, and land use development planning with local jurisdictions.

**Objective 2.5:** Acquire, retrofit, or relocate repetitive loss properties from flood-prone areas in the state.

**Goal 3: Increase awareness and promote relationships with stakeholders, citizens, elected officials, and property owners to develop opportunities for mitigation of natural hazards.**

**Objective 3.1:** Offer trainings about hazard awareness, mitigation planning and grants, and how to incorporate mitigation into ongoing program functions.

**Objective 3.2:** Reduce the impact of hazards on vulnerable populations through education and awareness programs.

**Objective 3.3:** Improve systems that provide warning, awareness, and emergency communication.



**Objective 3.4:** Conduct education and awareness programs for flood mitigation planning and funding assistance.

**Goal 4:** **Encourage the development and implementation of long-term, cost-effective, and resilient mitigation projects to preserve or restore the functions of natural systems.**

**Objective 4.1:** Encourage the use of green and natural infrastructure.

**Objective 4.2:** Provide technical assistance to communities and stakeholders in the application and implementation of mitigation projects that preserve or restore natural systems.

**Objective 4.3:** Maintain and encourage ongoing relationships between state agencies and partners to play an active and vital role in preservation and restoration of vulnerable natural systems.

**Goal 5:** **Build stronger by promoting mitigation actions that emphasize sustainable construction and design measures to reduce or eliminate the impacts of natural hazards.**

**Objective 5.1:** Encourage building and rebuilding practices that address resiliency through higher standards and sustainable design to resist impacts of natural hazards.

**Objective 5.2:** Enhance coordination with state and local agencies that promote resiliency and sustainability.

**Objective 5.3:** Identify sustainable flood and erosion control projects and activities that demonstrate resiliency practices.

**Objective 5.4:** Provide assistance in the implementation of flood mitigation plans and projects in flood-prone areas, in accordance with federal and state regulatory, funding, and technical assistance programs.

Pursuing these goals and objectives will allow the State to achieve the ideal described in the State's Hazard Mitigation Vision Statement.



## 4.2 State Capability Assessment

*Requirement §201.4(c)(3)(ii): The State mitigation strategy **shall** include a discussion of the State's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including: an evaluation of State laws, regulations, policies, and programs related to hazard mitigation as well as to development in hazard-prone areas and a discussion of State funding capabilities for hazard mitigation projects.*

New York State has a broad capacity to manage mitigation options and capabilities in both the pre- and post-disaster phases of any incident. State agencies and organizations manage, coordinate, and develop various policies, programs, initiatives and projects that support mitigation.

The preferred methodology for implementing mitigation is to initiate actions before a disaster impacts New York, and this pre-disaster approach is the cornerstone of the State's mitigation strategy, planning, and project activities. As stated in **Section 1**, the New York State (NYS) Consolidated Laws, Executive Law, Article 2-B establishes the framework for the State's management of all disaster-related activities, empowering the Disaster Preparedness Commission (DPC) with the authority to act on behalf of the State in pre- and post-disaster matters including, but not limited to, planning activities. However, it should be emphasized that the concept of Local Home Rule determines and sets limits on the authorities any State agency may have within the boundaries of a local jurisdiction.

In addition to applicable laws and regulations referenced in **Section 1**, state agencies give special consideration to the outcomes of disaster prevention and mitigation activities, which may be included in or result from any and all actions of the agency. Attention to disaster prevention and mitigation activities is a highly desirable goal for all State agencies, which should include such considerations in their actions whenever they are feasible and compatible with program purposes and goals. Actions that would potentially have a negative impact on the prevention or mitigation of disasters should be avoided or modified to preclude a negative impact. Agency actions may be conducted by direction of law, rule, or agency discretion; as part of agency budgets; or as normal functions of the individual agency's programs or projects. Agencies are committed to lessening the impacts from disasters in the state through the activities identified and described in this section.

Additions to agency activity listings occur as the relationship of various State programs to disaster prevention/mitigation is fully realized, as programs develop, and, especially, as programs are added or amended as the result of increased State interest in comprehensive emergency management and mitigation as a life-saving and cost-saving philosophy.



## Program and Development Trends in Response to Hurricane Irene, Tropical Storm Lee and Hurricane Sandy

Since FEMA's approval of the 2011 SHMP, and as a result of the disasters that New York State endured in 2011 and 2012, the State's focus for redevelopment and future development has demonstrated the shift through ongoing programs and new initiatives that have set a precedence of resiliency in the recovery phase.

Recovery programs initiated by the State in response to the multiple major disasters have focused on mitigation through the theme of "resiliency." New York State agencies and authorities, including but not limited to the Department of State (DOS), Department of Environmental Conservation (DEC), Department of Health (DOH), Department of Transportation (DOT), DHSES, New York State Energy Research and Development Authority (NYSERDA), and the New York State Canal Corporation collaborate through formal and informal processes to achieve recovery and mitigation goals and activities for the State as well as local communities. This is accomplished through numerous initiatives and programs such as FEMA's Public Assistance Program, coastal management, building codes, and flood control that present opportunities to rebuild to higher levels of protection from natural hazards.

Programs and initiatives identified throughout the 2014 SHMP planning process that support a renewed focus on mitigation and resiliency for the State's future include efforts such as the following:

### *New York State 2100 Commission<sup>3</sup>*

The Commission reviewed the vulnerabilities faced by the State's infrastructure systems and developed specific recommendations that can be implemented to increase New York's resilience in five main areas: transportation, energy, land use, insurance, and infrastructure finance. These recommendations are intended to:

- Identify immediate actions that should be taken to mitigate or strengthen existing infrastructure systems – some of which suffered damage in the recent storms – to improve normal functioning and to withstand extreme weather more effectively in the future.
- Identify infrastructure projects that would, if realized over a longer term, help to bring not only greater climate resilience but also other significant economic and quality of life benefits to New York State's communities.
- Assess long-term options for the use of "hard" barriers and natural systems to protect coastal communities.
- Create opportunities to integrate resilience planning, protection, and development approaches into New York's economic development decisions and strategies.

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<sup>3</sup> In 2012 Governor Cuomo formed the NYS 2100 Commission that is tasked with identifying ways to improve the resilience and strength of the state's infrastructure in the face of natural disasters and other emergencies.



- Shape reforms in the areas of investment, insurance, and risk management related to natural disasters and other emergencies.

### *Coastal Management*

According to *Article 34, Environmental Conservation Law, Coastal Erosion Hazard Areas 6 NYCRR Part 505, Coastal Erosion Management Regulations*, specific activities related to development in a coastal area require a permit to minimize damage to property, natural protective features, and other natural resources; prevent the exacerbation of erosion hazards; and protect human life.

### *Water Resource Law*

In 2011, Governor Cuomo signed legislation to further protect New York's waters by requiring a DEC permit for water withdrawal systems having the capacity to withdraw 100,000 gallons per day or more of surface water or groundwater. This law requires statewide registration of existing agricultural withdrawals that are greater than 100,000 gallons per day (30-day average) and major basin water diversions of greater than 1,000,000 gallons per day. The law became effective on April 1, 2013.

### *Silver Jackets Program*

The Silver Jackets Program is a federally-led interagency team that continuously works together to reduce flood risk at the state level. The goal of the program is to reduce flood risk, provide agencies with a better understanding of and ability to leverage each other's programs, develop collaboration between various agencies, better coordinate programs, and produce cohesive solutions, as well as to be a multi-agency technical resource for state and local agencies, and provide a venue for establishing relationships to facilitate and integrate solutions post-disaster.

### *New York Rising*

This program is the Governor's initiative to address economic development, education, public health, public safety, infrastructure, resiliency, and housing. As a result of responding to multiple crises, the program was developed to focus on strengthening systems through protecting and hardening infrastructure. The initiative addresses critical systems and assistance to property owners and critical infrastructure through programs that cover issues such as resiliency of healthcare facilities; home buyout programs; strengthening coastal protection; protecting transportation systems against future storms; hardening fuel delivery systems; hardening utilities; strengthening wastewater systems; and protecting vulnerable populations.



*New York State Resiliency Institute for Storms & Emergencies (NY RISE)*

The New York State Resiliency Institute for Storms & Emergencies (NY RISE) is an “applied think tank” led by New York University and Stony Brook University. NY RISE serves as a hub of research and education on emergency preparedness, as well as a clearinghouse of information regarding extreme weather and natural disasters. The Resiliency Institute serves as a statewide anchor for policymakers and emergency responders, providing comprehensive analysis to inform critical decisions before, during, and after extreme weather events.

*New York Works Statewide Capital Plan*

The New York Works Task Force created a 10-year plan for the State’s capital spending. The plan presents a flexible tool for the Governor and the Legislature to make forward-looking decisions for the economic future of New York State. As an enterprise, New York State holds a strong competitive position in the global economy, and is dependent on its population, environment, and businesses to sustain this position. The Works plan was built on a seven-step approach that encompasses areas of State capabilities in mitigation planning and resilient construction, by conducting a statewide infrastructure assessment and identifying projects with the goal of ensuring that future State spending will “reduce the total cost of ownership over the life of the asset, produce positive spillover benefits, improve environmental and financial sustainability, and maximize return on investments.”

*State inter-agency adaptation working group (ad hoc)*

This working group began in 2007 as a group of five agencies designated and tasked by the State Legislature as the Sea Level Rise Task Force with the purpose of identifying and “assessing the anticipated impacts of sea level rise, as well as providing recommendations related to actions the State may take to protect areas at risk of damage, adaptive measures and regulatory and/or statutory changes.” The process was facilitated by DEC with the participation of the Department of State’s Division of Coastal Resources, DHSES, NYSERDA, DOH, DOT, and others. The group’s report was submitted to the Legislature on December 31, 2010; however, in the process of accomplishing its assigned task, the group recognized the value of continuing to meet to routinely exchange information related to common issues and to coordinate projects with a multi-agency focus. Attendance has steadily increased since its inception to as many as 12 agencies in regular attendance. Although the impetus for meeting was for the discussion of issues related to the State’s adaptation to climate change concerns, resulting discussion has extended beyond climate change and into areas of sustainability, resiliency, and all-hazard mitigation.



*Mighty Waters Working Group*

Other statewide initiatives such as the multi-agency Mighty Waters Working Group created in June 2012 by the NYS Department of Environmental Conservation and NYS Department of State (DOS) bring together stakeholders ranging from businesses and economic development councils, local governments, academic institutions, federal agencies, civic leaders and non-governmental organizations to focus on efforts to improve environmental sustainability and flood hazard risk reduction. The working group also helps position the region to receive and strategically deploy federal resources that may become available.

**Pre-Disaster Capabilities**

New York State's capabilities related to mitigation extend into the following categories:

*Compliance/Enforcement Programs*

Regulations and enforcement programs can assist in preventing or mitigating hazards that threaten the health and safety of the public, property, and the environment. Numerous State agencies manage regulatory programs such as building and fire codes; construction and maintenance of infrastructure (bridges, roads, and dams); regulation of development in hazard-prone areas (floodplain management); and other types of functions. State regulatory oversight and enforcement is a key element in preventing and mitigating disasters.

*Education/Public Awareness*

State agencies provide information related to hazards, threats, risks, and vulnerabilities to the public, which allows them to take appropriate and timely actions to reduce the effects of disasters. Examples include the use of warning systems, web pages, Facebook, Twitter, and YouTube to provide awareness and emergency information. Lessons learned from previous disasters and incidents have shown that a well-informed public plays a significant role in the development and implementation of disaster prevention/mitigation goals and activities. Ongoing awareness programs and activities can result in private individuals, organizations, agencies, and others taking actions that reduce their impact from disasters.

*Zoning/Land Use Programs*

Based on historical records of previous disasters in New York State, it is apparent that hazard impacts often occur repetitively in the same locations. Therefore, appropriate land use management is a means to avoiding or reducing the impacts of disasters. Because New York is a home rule state and the regulation of land development has been delegated to local governments, the SHMP and other mitigation efforts encourage and guide rather than require municipalities to use appropriate land use regulatory authority to support mitigation efforts.



### ***Monitor Potential Disasters***

State agencies have the responsibility to monitor potential disaster conditions, to identify specific sites, and to anticipate situations that could develop into a disaster. A reporting and warning system, utilizing field staff, relays the information through State agency liaisons to DHSES, which then notifies the chair of the DPC. In times of increased threat, this reporting/warning system is expanded in order to provide the DPC with the best available information. Systems for monitoring potential disasters can also provide significant data and information related to changing levels of risk and vulnerability for specific hazards. An example of this is a long-term water level monitoring station in a river estuary that looks at water levels and tide stages and tracks long-term sea level rise in order to define changes over time.

### ***Plans/Planning***

The planning process and the dissemination and implementation of plans allow all stakeholders to participate in consensus-building processes based upon a shared level of knowledge and understanding, thus increasing the potential for success. In addition to State agencies preparing plans for response and mitigation covering their own activities, their plans can support and encourage the development of local plans.

### ***Prevention/Mitigation Projects***

State agency programs and projects may be implemented at the State level or serve to influence local government activities. In addition, State agency programs and projects can also have a direct impact on local mitigation programs and projects by providing funding, technical assistance, or other types of support. Mitigation projects fall within the following five categories: prevention; property protection; public education and awareness; natural resource protection and structural projects. An example of a structural project is construction of a flood control system to protect critical infrastructure.

### ***Technical Assistance***

Many state agencies have specialized capabilities (e.g., engineering, scientific), which can be utilized for guidance and support to communities faced with disasters. Due to the cost of these services and capabilities, local governments may not be able to acquire them without assistance, which the State may be able to provide to help prevent/mitigate the impact of disasters.



### *Training*

Disaster plans require trained personnel to implement associated activities and tasks. In relation to mitigation, State agencies can provide training for emergency workers, public officials, employees, and local jurisdictions specific to measures, techniques, and activities that reduce or eliminate loss from hazards.

### *Risk/Vulnerability Assessment*

The 2014 SHMP update describes enhanced hazard management capabilities that were not in place in 2011. The State now funds multi-jurisdictional planning grants only on the county level. This focus has allowed the DHSES Mitigation Section to develop a systematic approach to local plan review that allows for more statewide continuity with mitigation planning. In addition, the recent emphasis on mitigation planning as a result of multiple storms has empowered jurisdictions in the State with the knowledge and ability to take actions to avoid or reduce the impact of hazards in their community. Given the upsurge of plans and projects in recent years, it is apparent that a significant enhancement in NYS has been the focus on pre-disaster mitigation activities as a means of reducing future losses.

Another development in the hazard management capabilities of NYS has been the development and implementation of NY Alert, a system with the capability to inform or forewarn citizens of a pending event, whether in small localized areas or statewide. The capabilities of this system are profound in terms of the potential to save lives and protect property. This system is described further in the Mitigation Actions and Activities list contained in **Section 4.4**.

A State program capability that has been significantly enhanced since the 2011 plan is in the area of the repetitive loss and severe repetitive loss programs. Although these programs have recently been combined under the Flood Insurance Reform Act of 2012 (Biggert Waters), a robust property buyout program has developed over the past few years as a result of the State's focus on this as a priority initiative, and the availability of increased post-disaster mitigation funding to support it. This program will continue to be a priority for the State and as such will enable many more jurisdictions and citizens to initiate actions to mitigate against the risk of flood damage.

Data and information related to past disasters, including impacts to people, property, environment, and the economy, help stakeholders to evaluate and anticipate vulnerabilities and the potential frequency of future events. Some state agencies have a formalized program of reporting information relating to specific types of disasters. This information is gathered during the mitigation planning cycle and is used to determine or reassess the threat or likelihood of impacts from future disasters, especially in relation to estimating the potential losses.

An evaluation of the State's capabilities in a pre-disaster operational phase reveals that the responsibility of pre-disaster actions rests with DHSES and the DPC agencies. Through a coordinated level of preparedness, the DPC assures that resources and manpower are



available to assist jurisdictions and/or State facilities that may experience impacts from a disaster. Each agency is required to have in place a Continuity of Operations Plan (COOP) for each facility to assure that essential services and functions can continue if conditions restrict full operation of the agency's functions. Several levels of contingency plans are in place for State agencies, and each agency is required to designate a manager to maintain the necessary planning and exercises to ensure that essential functions of the agency and facility can continue.

In order to determine potential losses from natural hazards, DHSES conducts damage loss estimation for NYS government critical facilities by coordinating with State agencies post-disaster to collect and analyze the scope of impact and estimated dollar value of damages. Data collected by this means can be integrated with the New York State Office of General Services (OGS) fixed asset database, and serves as a basis for development of cost-effective activities. Information related to impacts and damages from the recent storms was gathered from State agencies during the 2014 SHMP update.

In addition, the State addresses and explores loss reduction options for identified repetitive loss properties by assisting communities to identify repetitive loss locations and support the search for potential funding to mitigate future losses. DHSES continues to promote hardening of existing and future critical facilities in local communities and to educate local planning staff through the "comprehensive" (master plan) technical assistance program of the DOS.

State capabilities may be diminished if a local jurisdiction is unable or hesitant to fully engage in pre-disaster planning activities. In this situation, State agencies may not be able to go beyond programmatic limitations to engage the jurisdiction in efforts that have mutual benefits; however, efforts in mitigation education conducted across the State have had a positive impact on the number of jurisdictions that participate in pre-disaster mitigation opportunities.

At the time the 2011 SHMP update was prepared, it was noted that the State had been challenged in carrying out pre-disaster mitigation efforts to enhance the goals and objectives presented in this section of the SHMP due to a shortage in staff and related resources. Recognizing this, the State has taken steps since 2011 to secure an acceptable level of staffing that is expected to be sustained throughout the life cycle of the 2014 SHMP update.

### ***Post-Disaster Capabilities***

Similar to FEMA's Emergency Support Function (ESF) #14 - Long-Term Community Recovery, New York State's Article 2-B provides a considerable and flexible framework for the activities of State agencies during and after a disaster. Specifically, Article 2-B of the New York State Executive Law, §28-a, *Post disaster recovery planning*, defines the requirements for the development and implementation of local recovery and redevelopment plans whenever a State disaster emergency has been declared. Per the statute:



*“A local recovery and redevelopment plan shall include, but need not be limited to: plans for replacement, reconstruction, removal or relocation of damaged or destroyed facilities; proposed new or amended regulations such as zoning, subdivision, building, or sanitary ordinances and codes; and plans for economic recovery and community development. Such plans shall take into account and to the extent practicable incorporate relevant existing plans and policies, and such plans shall take into account the need to minimize the potential impact of any future disasters on the community.”*

The section further defines requirements for public input to the recovery plan via public hearings, the submittal of the plan to the State DPC, the ability of the DPC to assist the municipality in preparing its recovery plan, and the provisions for adoption and revision of the recovery plan, as necessary.

In addition, the full resources of the State are brought to bear in the State Emergency Operations Center (SEOC), where all DPC agencies, FEMA, the American Red Cross, and Salvation Army, and other entities are on call to assist with the more immediate needs of local jurisdictions that do not have the resources to respond to the impacts and consequences of the hazard.

The resources of the DHSES Recovery Section are essential components of the post-disaster activities required to mitigate any further impact of a hazard. The Recovery Section works closely with the Mitigation Section to ensure that all appropriate measures are followed in order to assist in the restoration of jurisdictions to their pre-disaster condition. However, there are opportunities post-disaster when additional work can be initiated to increase a project’s resiliency to hazards, as long as the benefit-cost ratios justify the project, so that reconstruction projects can exceed pre-disaster conditions, increasing resilience against future events.

The Mitigation Section has developed a comprehensive set of policies and procedures that enable an efficient process from application through project completion for jurisdictions undertaking mitigation projects. The vast majority of funding flows from FEMA to the State, which is obligated to ensure that the funds are appropriately used and accounted for in the funding process. Several levels of accountability have been instituted in order to guarantee that this obligation is met.

The 2014 SHMP includes several on-going hazard management capabilities that were not documented in the 2011 or 2008 plans. The Mitigation Section continues to work with FEMA to promote the development of all-hazard mitigation plans, which will enable jurisdictions in the State to take actions to avoid or reduce the impact of hazards. The upsurge of plans and projects that the Mitigation Section now receives is a positive indicator in the development of a progressive attitude that demonstrates the intent to integrate mitigation in local emergency management programs. For example, as of the



2011 SHMP, between 100 and 120 Letters of Intent (LOIs) had been received for the previous grant cycle announcement, compared to the most recent grant cycle in August 2013 when more than 2,000 LOIs were received, totaling requests for more than \$11 billion dollars.

The Governor continuously supports local planning in communities that have been significantly impacted by disasters. In April 2013, Governor Cuomo announced the Community Reconstruction Zones program, now called Community Reconstruction Program (CRP), funded by State and federal government initiatives. The CRP is a community-driven approach to empowering local initiatives, officials, and residents affected by Hurricane Sandy, Hurricane Irene, or Tropical Storm Lee to develop comprehensive local rebuilding and recovery plans. Many CRP communities will be eligible for grants ranging from \$3 million to \$25 million, if approved. An example of communities that have accepted this challenge for support for local planning initiatives is Prattsville (Greene County). Volunteers with the Town of Prattsville have secured \$2.3 million in grant funding to reestablish homeowners, reopen businesses, and foster economic growth. (Additional information for Prattsville may be found online at [www.prattsville.org](http://www.prattsville.org).) With over a 102 CRP communities statewide, what started as a response-and-recovery effort following Sandy, Irene and Lee has become a standard procedure for identifying pre-disaster capabilities.

**Table 4.2b** provides a summary of additional State capabilities that are implemented through various programs and initiatives, some of which may be time-limited programs and others ongoing programmatic functions. In addition, these programs may provide opportunities to develop and implement separate mitigation activities that support the program or initiative. Programs noted with a 2011 identifier were included as activities in the 2011 SHMP, but are more appropriately included on this list because they describe a program or initiative that has become an on-going programmatic function. In some cases, projects, such as NY Alert are also included on the Mitigation Actions and Activities list because there are opportunities for mitigation projects that support program capabilities.

Although the State's mitigation capabilities have demonstrated improvement over the past few planning cycles, the overwhelming numbers of major disasters that have occurred in the past few years have caused some impact to mitigation capabilities. Conversely, the repetitive disasters have resulted in an increase in post-disaster mitigation opportunities and funding. This relationship is discussed further in **Section 5.1.4**.



**Table 4.2b: State Capabilities Programs and Initiatives**

<b>Name</b>	<b>Description</b>	<b>Agency</b>	<b>Category</b>	<b>Identifier</b>
<b>Statewide Mitigation Collaboration (2011-MH 1)</b>	Multi-level mitigation coordination and training; mitigation education to property owners, builders, and environmental groups	All State Agencies, Local/Regional Planning Agencies, Local Emergency Management, and Elected Leadership	Plans/Planning	2011-MH1
<b>Mitigation and Hazard Awareness Public Education Program</b>	Awareness initiative and information to the public and partner agencies via print media, website, information dissemination, schools, and curriculum development	DHSES & Appropriate State and Local Agencies, including Education Department, American Red Cross	Education/Public Awareness	2011-MH5,6 & 7
<b>Mitigation Planning and Project Resources to Local Government</b>	Technical assistance and training for mitigation including grant application and administration, plan development, and project identification.	DHSES, County Mitigation Coordinators	Plans/Planning	2011-MH10
<b>NOAA Weather Radio (NWR) Alert Receivers</b>	Promotes awareness and use of NOAA Weather Alert receivers and warning program to all citizens, government agencies, and emergency managers.	NWS, DHSES, All State Agencies	Education/Public Awareness	2011-MH12



Name	Description	Agency	Category	Identifier
<p><b>NY Alert System</b>  <i>(This capability is also included as a mitigation action in this section to support public education and warning activities)</i></p>	<p>Encourage utilization of NY-Alert statewide: NY-Alert currently has 6.3 million subscribers. Of these, 2.79 million subscribers can receive reverse 911 notifications because their counties have incorporated their 911 databases into the NY-Alert system. Since NY-Alert’s inception, reverse 911 notifications have been activated approximately 10,000 times for weather-related events, as well as one potential dam breach. Approximately 95% of NYAlert’s notices are prompted by natural events.</p> <ul style="list-style-type: none"> <li>• During the 15-day window combining the State’s response to Irene and Lee, NYAlert issued 72,000 faxes, 2.1 million phone calls, 25 million text messages, and 135 million e-mail warnings.</li> <li>• This occurred in 68 discrete activations initiated by local government EMS agencies, 45 of which were direct life safety alerts (reverse 911) either warning residents to evacuate or dispatching help for water or air rescues. These were updated 700 times during the course of these events (e.g., to add information on evacuation routes or shelter locations). At one time there were 45 simultaneous activations in Broome, Orange, and Rockland counties.</li> </ul>	<p>DHSES (Lead), All State and Local Agencies</p>	<p>Education/Public Awareness</p>	<p>2011-MH-13</p>
<p><b>Emergency Alert System (EAS) Radio and TV Broadcast</b></p>	<p>Public warning supported by initiative to provide a direct link from DHSES to all NYS Broadcasters</p>	<p>DHSES</p>	<p>Education/Public Awareness</p>	<p>2011-MH14</p>
<p><b>Building Codes</b></p>	<p>Promotes building techniques to resist natural hazards. Programs about construction methods to reduce the risk of natural hazard damage such as wind, flood, and seismic. Promoted via distribution/availability of "Protecting Home and Family Project" or other information brochures at conferences, training, and state &amp; local agency web pages.</p>	<p>Lead: DOS ; Support: DHSES, DEC, FEMA</p>	<p>Education/Public Awareness</p>	<p>2011-MH20</p>



Name	Description	Agency	Category	Identifier
<b>Local Waterfront Revitalization Program (LWRP): Promote land-use practices that reduce risk from natural hazards</b>	Develop a natural hazard database system to assist state and local officials with risk assessment, mitigation, and other planning initiatives. Heighten awareness of natural hazard exposure by developing a comprehensive database. DOS requires that all LWRPs include a section for inventory, assessment, and planning to manage coastal areas. Technical assistance provided to local governments concerning proposed storm damage reduction projects. Local ordinances addressing coastal hazard risks are a routine requirement of LWRP communities. Enhanced State freeboard provision under New York State Codes, Rules and Regulations, Part 502, Floodplain Management are incorporated into agreements with the Division for funding from Environmental Protection Grants.	DOS, DEC	Compliance/ Enforcement Programs & Education/Public Awareness	2011-MH22, 29
<b>Coastal Erosion Hazard Areas (CEHA)</b>	Program to increase participation level of communities that incorporate hazard mitigation into local development ordinances. Promote through educational and awareness media the loss reduction benefits including hazard mitigation activity in local development regulations. The Division of Coastal Resources provides guidance and technical assistance to municipalities considering adoption of local laws implementing Coastal Erosion Hazard Areas Act.	DEC	Compliance/ Enforcement Programs & Education/Public Awareness	2011-MH23
<b>Disaster Preparedness Commission (DPC)</b>	NYS Disaster Preparedness Commission (DPC) guides and advances statewide hazard mitigation initiatives. The DPC is the Governor's policy oversight group for the State's emergency management program. Encourages state agencies to incorporate mitigation activities in day-to-day operations.	All State Agencies designated as DPC member agencies	Program Management and Evaluation	2011.MH-25



Name	Description	Agency	Category	Identifier
<b>New York State Building Code</b>	Enhanced State freeboard provision under New York State Codes, Rules and Regulations, Part 502, Floodplain Management. For example, when an existing structure is elevated, the Building Code requires Based Flood Elevation (BFE) plus two feet.	Educational Services Unit of the Division of Code Enforcement	Compliance/ Enforcement Programs	2011-MH30
<b>Code Enforcement Disaster Assistance Response (CEDAR) Program</b>	Ongoing program implemented by DOS to provide 6-hour CEDAR course for code officials	DOS, DEC	Compliance/ Enforcement Programs, Training	2011-MH31
<b>NYS Highway Infrastructure</b>	DOT routinely incorporates hazard mitigation activities, such as seismic design regulations for bridges into its engineering and operations management activities	DOT, NYSTA, NYS Bridge Authority, MTA	Compliance/ Enforcement Programs	2011-MH36
<b>NYS Bridge Flood Watch Program</b>	Ensures operability of State highway infrastructure by monitoring pre-identified scour-susceptible bridges when NWS issues a flood warning	DOT, NYSTA	Monitor Potential Disasters	2011-F1
<b>Floodplain Management and Mitigation Program Administration</b>	Implementation of floodplain mitigation planning and projects for feasibility and cost effectiveness, including coordination with local jurisdictions to develop and implement comprehensive mitigation programs. Program is ongoing since 2008, with more than 1,232 buyouts since 2006.	DEC, NFIP Participating Communities	Prevention/ Mitigation Projects	2011-F2,4
<b>Forest Fire Safety Awareness and Public Education Program</b>	Ongoing program that addresses wildfire prevention and risks associated with wildfires. Public Service Announcements, "Smokey the Bear," "FIREWISE," Wildfire Survival Program, pamphlets, and information dissemination.	DEC	Education/Public Awareness	2011-WF1
<b>Coastal Zone Management</b>	Implementation of CEHA, Coastal Management, and LWRP programs to preserve natural protective features and protect property from flood and erosion hazards.	DEC, DOS	Compliance/ Enforcement Programs	2011-F3



Name	Description	Agency	Category	Identifier
<b>Dam Safety Program</b>	Administration of Dam Safety Program: safety inspection of dams; technical review of inserted dam construction or modification; monitoring of remedial work for compliance with dam safety criteria; and emergency preparedness	DEC	Compliance/ Enforcement Programs	2011-F6
<b>National Flood Insurance Program (NFIP) and Community Rating System (CRS)</b>	Participation in the NFIP program including the Community Rating System and insuring structures located in floodplains and flood-prone areas. Continue promoting NFIP to increase number of NFIP insured structures in the floodplain to protect property owners from financial losses. Encourage communities to participate in voluntary CRS program to reduce property owners flood insurance premiums.	DEC, DHSES, DOS	Prevention/ Mitigation Projects	2011-F5
<b>NFIP Repetitive Loss / Severe Repetitive Loss Program</b>	Promote education and awareness of the public and local officials related to loss reduction for repetitive flood claims under the NFIP. Encourage outreach and education for property owners about mitigation options and funding potential.	FEMA, DEC, DHSES, DOS	Education/Public Awareness, Prevention/ Mitigation Projects	2011-F15
<b>FEMA Flood Mapping / Risk Mapping</b>	Ongoing flood map modernization program including the “state mapping advisory committee” to assist in recommendations on priorities, reviewing map product utility and improvements, and identifying cooperating agencies (e.g., USACE, NRCS, etc.). Ensures mapping is updated periodically to provide the best available technology and maximize usefulness in identifying high-hazard areas and vulnerable populations and properties. Map modernization was completed in four counties between 2011 and 2014.	DEC, DHSES, FEMA	Plans/Planning, Technical Assistance, Risk/Vulnerability Assessment	2011-F17
<b>Stream Maintenance Program</b>	State agencies provide technical assistance and training programs for local governments, increasing visibility and accessibility, and promoting the benefits of the stream maintenance program	DEC, USACE, DOS, SWCD, DHSES	Technical Assistance, Training	2011-F7



Name	Description	Agency	Category	Identifier
<b>DOT "Snow School"</b>	Ongoing program to train DOT employees, local municipalities, and contractors in policies and procedures related to the removal of snow and ice on the state's highways.	DOT	Training	2011-WS4
<b>Seismic Design Specifications for New Bridges</b>	New bridges designed with minimal average return of 1000 years to seismic design specifications. Designs compensate for foundation soils and structure support due to seismic vibrations. Bridge rehabilitation projects also include seismic evaluation of existing structures and undertaking of corrective actions.	DOT	Compliance/ Enforcement Program	2011-E2
<b>Storm water Management Program</b>	Ongoing program to enhance promotion and awareness of storm water management regulations, including improving availability of model storm water regulations, training of code enforcement officials, awareness of planning/zoning, and integration into comprehensive land use planning training by DOS.	DEC, DOS	Compliance/ Enforcement Program, Technical Assistance	2011-F9



### 4.3 Local Capability Assessment

**Requirement §201.4(c)(3)(ii):** *The State mitigation strategy shall include a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.*

The DHSES Mitigation Section has been actively working with local governments in the development of LHMPs and guiding them toward identifying measures effective for mitigation purposes. Because New York State is a home rule state, the primary impetus for mitigation activities must come from the local level.

The increasing number of LHMPs approved since 2011 demonstrates that local governments acknowledge the benefits of developing and adopting LHMPs. Through a variety of outreach methods, DHSES has been actively encouraging local governments to incorporate mitigation considerations into their daily activities. Since the 2011 SHMP, the Mitigation Section has worked with FEMA Region II in the development of *Hazard Mitigation Planning Standards*, discussed in **Section 5**, and included in **Appendix 5** that serves as a valuable resource for local hazard mitigation planners. The 2011 SHMP discussed budget constraints at all levels of government, which slowed local mitigation planning efforts, with some communities expressing frustration with their inability to devote staff to developing plans. There has been a significant turn-around in this occurrence since the 2011 SHMP. Following Hurricane Irene and Tropical Storm Lee, 18 planning grants were awarded totaling more than \$9 million dollars.

Likewise, the 2011 SHMP discussed an ongoing effort for appropriate hazard mitigation planning standards and a more refined, strategy-focused process with FEMA and the National Emergency Management Association (NEMA) in 2010-2011; and New York is one of four states tapped to participate on the project team. Due to the number and severity of the declared disasters since the 2011 SHMP, the DHSES Mitigation Section has not yet been able to participate in these efforts, though it intends to do so in the future.

Support and coordination with FEMA in relation to mitigation policies, planning, and funding has increased since 2011, and through continuing FEMA programs remains high. **New York State has received seven Presidential disaster declarations since 2011, making more than \$890.8 million available in Hazard Mitigation Grant Program (HMGP) planning and project grants:**

- FEMA-1957-DR-NY – Severe Winter Storm and Snowstorms (Declared February 18, 2011) - \$7,050,735 (6 month)
- FEMA-1993-DR-NY – Severe Storms, Flooding, Tornadoes, and Straight-line Winds (Declared June 10, 2011) \$5,264,029 (6 month)
- FEMA-4020-DR-NY – Hurricane Irene (Declared August 31, 2011) \$89,157,146 (12 month)



- FEMA-4031-DR-NY – Remnants of Tropical Storm Lee (Declared September 13, 2011) \$39,347,912 (12 month)
- FEMA-4085-DR-NY – Hurricane Sandy (Declared October 30, 2012) \$750,000,000
- FEMA-4111-DR-NY – Severe Winter Storms (Declared April 23, 2013) funding amount not yet available
- FEMA-4129-DR-NY – Severe Storms and Flooding (Declared July 12, 2013) funding not yet available

New York State jurisdictions have also taken full advantage of all of FEMA's Hazard Mitigation Assistance (HMA) grant programs since 2011. In addition to the HMGP, these include the Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA) programs. **DHSES's requested totals for planning and project grants are primarily in the PDM program, as noted below:**

- 2011 – \$422,358.75 (actual funding approved)
- 2012 – \$970,810.00 (actual funding approved)
- 2013 – In process

With the hiring of additional staff, and with substantial assistance from FEMA, the DHSES Mitigation Section has already demonstrated a more active role that it intends to continue in future years in working with local governments in the development of LHMPs and providing guidance in identifying effective mitigation measures.

By working with local jurisdictions throughout the planning process, the Mitigation Section has encouraged local governments to review policies currently in place to determine their effectiveness for hazard mitigation. The concepts, goals and actions developed in LHMPs can and should be integrated and merged with existing planning and regulatory mechanisms, and have been assimilated into the 2014 SHMP goals for a comprehensive statewide approach to achieving goals, as identified in **Section 5.2.2, Table 5f**. The DHSES Mitigation Section actively encourages the use of building codes, zoning ordinances, land use plans (current and potential future land use), revitalization plans, economic development plans, subdivision regulations, and capital improvement plans to promote the consideration of mitigation priorities at all stages of the local planning process. The DHSES Mitigation staff provides technical assistance for incorporating these and other planning priorities. The effectiveness of each of these planning tools, including the adoption of a hazard mitigation plan, is determined by each jurisdiction's resolve to support and enforce the specific terms of related plans or codes. Communities where growth and development are increasing must take particular care in all decisions that might authorize development in hazard-prone districts, areas that rely on open space, or environmentally-sensitive lands.

While improvement has been noted in terms of the local capability to prevent or reduce the impacts of hazards, much progress is still possible regarding the full integration and merging of mitigation goals and objectives into county and municipal planning and code enforcement regulations, policies, and procedures. **Table 4.3c** provides examples of mitigation planning tools that can assist local government planners.



**Table 4.3c: Mitigation Implementation Tools for Local Governments**

<b>Policy</b>	<b>Description</b>	<b>Applicability</b>	<b>Effectiveness</b>
<b>Building Codes</b>	The State has adopted the IBC building code and local governments adopt and enforce this code.	The adoption and enforcement of building codes relates the design and construction of structures to standards established for withstanding a variety of forces.	All structures built after 2002 must comply with the IBC code, which includes special provisions for building in the floodplain, including NYS higher freeboard standards, of 2 feet above base flood elevation.
<b>Zoning</b>	Laws and ordinances regulate development by dividing the community into zones and by setting development criteria for each zone. Zoning decisions are delegated to local governments in New York State.	Zoning can keep inappropriate development out of hazard-prone areas and can designate certain areas for such things as conservation, public use, or agriculture.	Communities in NYS can designate areas in their community as “open space,” thereby reducing the effect of flooding on the community.
<b>Land Use Planning</b>	Comprehensive land use planning provides a mechanism to prevent development in hazardous areas and allow development in a manner that minimizes damage from hazards.	Local governments can use land use planning to identify those areas subject to damage from hazards and work to keep inappropriate development out of these areas. Land use planning can also be used for a more regional approach when local governments work together.	Communities can incorporate a mitigation review into the land use planning process, thereby potentially minimizing development in identified hazard areas.
<b>Subdivision Regulations</b>	Sets construction and location standards for subdivision layout and infrastructure.	Contains standards for such things as storm water management, erosion control, and subdivision size.	Urban flooding is often a result of building residential or commercial developments without consideration for storm water drainage issues. These regulations have the potential to reduce the impact of urban flooding on a community.



Policy	Description	Applicability	Effectiveness
<p><b>Capital Improvements Planning</b></p>	<p>Identifies where major public expenditures will be made over the next five to ten years.</p>	<p>Capital Improvement Plans can secure hazard-prone areas for low-risk uses; identify roads or utilities that need strengthening, replacement, or realignment; and can prescribe standards for the design and construction of new facilities.</p>	<p>May reduce the amount of public dollars spent on construction in hazard-prone areas.</p>



As part of LHMP development, local communities identify programs and policies within their communities that contribute to mitigation activities. Additionally, local communities identify methods to incorporate the LHMP into routine activities, thereby ensuring the LHMP remains viable, and goals and objectives are achieved.

The Mitigation Section offers a variety of training courses to assist local officials in expanding their capabilities by facilitating learning and enhancing disaster preparedness. The DHSES Training Section offers courses developed by FEMA's Emergency Management Institute (EMI), as well as those created by the Mitigation Section and DPC agency partners in response to the specific needs identified by emergency management professionals in New York State. The Planning, Recovery, and Mitigation Sections all augment the Training Section's efforts by providing training opportunities for local officials endeavoring to expand their knowledge of mitigation and planning.

Due to New York State's large size; the great number of municipalities contained within it; and its diverse physical, demographic, political, and socio-economic characteristics, it is challenging to develop a list of prioritized projects that are applicable to the entire State. Moreover, and consistent with the State's home-rule philosophy, the responsibility to implement appropriate mitigation measures generally rests with the local jurisdiction where the action is needed. However, the State has developed a recommended list of project types and non-structural mitigation measures based upon the hazards to which it is vulnerable. In that sense, this section of the SHMP serves as a valuable tool for local governments and state agencies considering alternative mitigation measures to reduce or eliminate specific risks to infrastructure and facilities.

Jurisdictions across the state are encouraged to look closely at the relatively low-cost actions that can be implemented to initiate a sound mitigation program in a relatively short time period. The recommended project types, sorted by hazards with the highest potential for impacting the state are included in **Table 4.3d**. For example, zoning regulations, land use policies, and public awareness campaigns can all be initiated through the existing resources of most jurisdictions. While the following list can be used by local jurisdictions to develop strategies to address specific hazards that impact their area, it is not intended to be all-inclusive.



**Table 4.3d: Recommended Project Types by Natural Hazards**

Hazard	Project Type
Hurricane / Tropical Storm/Coastal Storm	<ul style="list-style-type: none"> <li>• Public Awareness</li> <li>• Tree Pruning</li> <li>• Strengthen/Improve/Enforce Building Codes in Hazard Areas</li> <li>• Wind Resistant Design and Construction</li> <li>• Structural Retrofit</li> <li>• Evacuation Plan</li> </ul>
Climate Change	<ul style="list-style-type: none"> <li>• Public Awareness</li> <li>• Strengthen/Improve/Enforce Building Codes in Hazard Areas</li> <li>• Elevation</li> <li>• Acquisition</li> <li>• Protective Measures for Critical Facilities</li> <li>• Reduce Public Infrastructure within High-Hazard Areas</li> <li>• Identify Locations of Vulnerable Populations</li> </ul>
Flooding / Dam Failure	<ul style="list-style-type: none"> <li>• Public Awareness</li> <li>• Planning and Zoning</li> <li>• Acquisition</li> <li>• Relocation</li> <li>• Protective Measures for Critical Facilities</li> <li>• Storm water Management</li> <li>• Elevation</li> <li>• Wet/Dry Flood Proofing</li> <li>• Reduce Public Infrastructure within High-Hazard Areas</li> <li>• Transfer Development Rights</li> <li>• Property Swap Program</li> </ul>
High Winds/Tornadoes	<ul style="list-style-type: none"> <li>• Public Awareness</li> <li>• Tree Pruning</li> <li>• Strengthen/Improve/Enforce Building Codes in Hazard Areas</li> <li>• Wind Resistant Design and Construction</li> <li>• Structural Retrofit</li> <li>• Safe Room Construction</li> </ul>
Earthquake	<ul style="list-style-type: none"> <li>• Public Awareness</li> <li>• Planning and Zoning</li> <li>• Strengthen/Upgrade/Enforce Building Codes</li> <li>• Retrofit/Upgrade Critical Facilities</li> <li>• Seismic Retrofit</li> </ul>
Coastal Erosion	<ul style="list-style-type: none"> <li>• Public Awareness</li> <li>• Elevation</li> <li>• Protective Measures for Critical Facilities</li> <li>• Reduce Public Infrastructure within CEHA's</li> <li>• Acquisition of Structures (Demolish &amp; Convert to Open</li> </ul>



Hazard	Project Type
	Space) <ul style="list-style-type: none"> <li>• Relocation of Structures</li> <li>• Bank / Dune Stabilization</li> <li>• Natural Protection Features</li> </ul>
Extreme Heat/Cold	<ul style="list-style-type: none"> <li>• Public Awareness</li> <li>• Identify Location of Vulnerable Populations</li> <li>• Establish Heating/Cooling Centers</li> <li>• Issue Advisories and Warnings</li> </ul>
Drought	<ul style="list-style-type: none"> <li>• Public Awareness</li> <li>• Drought Preparedness/Planning</li> <li>• Drought Resistant Vegetation</li> <li>• Increase Water Conservation Standards</li> <li>• Retrofit/Upgrade Irrigation System</li> </ul>
Winter Storm/Ice Storm	<ul style="list-style-type: none"> <li>• Public Awareness</li> <li>• Hazard Resistant Construction</li> <li>• Tree Pruning</li> <li>• Strengthen/Improve/Enforce Building Codes in Hazard Areas</li> <li>• Retrofit Critical Structures</li> <li>• Redundant Utilities/Communications</li> </ul>
Wildfire	<ul style="list-style-type: none"> <li>• Public Awareness</li> <li>• Planning &amp; Zoning (i.e., urban-wildland interface set-back ordinances)</li> <li>• Open Space Preservation (especially along the urban-wildland interface)</li> <li>• Instituting periodic, proactive tree trimming and brush cutting programs to protect public infrastructure investments</li> </ul>
Landslide / Land Subsidence	<ul style="list-style-type: none"> <li>• Public Awareness</li> <li>• Planning and Zoning</li> <li>• Open Space Preservation</li> <li>• Acquisition of Structures (Demolish &amp; Convert to Open Space)</li> <li>• Relocation of Structures</li> <li>• Bank Stabilization</li> </ul>
Hail Storm	<ul style="list-style-type: none"> <li>• Building Codes</li> <li>• Public Awareness</li> <li>• Weather warning system improvements and modernization</li> </ul>



## 4.4: Mitigation Actions and Activities

*Requirement §201.4(c)(3)(iii): State plans shall include an identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy. This section should be linked to local plans, where specific local actions and projects are identified.*

Due to New York State's large size; the great number of local municipalities contained within it; and their diverse physical, demographic, political, and socio-economic characteristics, it is challenging to develop a list of prioritized projects that encompass the entire State. Many mitigation projects across the state are initiated and implemented at the local level, and because New York State is "home rule," the State government cannot enforce the actions local governments take or do not take in relation to mitigation actions and activities. Therefore, this section focuses on those activities for which the State has the authority to undertake and implement.

### 4.4.1 Identifying Mitigation Actions and Activities

The 2014 SHMP identifies mitigation measures that can be implemented at the state government level. **Section 3.0** of this plan describes the methodology used to identify the hazards that present the highest level of risk and potential losses to New York State. The outcome of the comprehensive profiling, assessment and ranking of fifteen hazards resulted in the determination that the following six hazards are considered to be of the **highest** risk to the state and will be addressed through appropriate mitigation actions and activities:<sup>4</sup>

1. Hurricane
2. Climate Change
3. Flood
4. High Winds
5. Earthquake
6. Coastal Erosion

Severe winter weather, extreme temperatures, and drought - ranked as low hazards based on their overall impacts - occur with some frequency, but primarily require preparedness and response actions at the local jurisdictional level to address their impacts. For this reason, mitigation measures were not developed to address these hazards in the 2014 SHMP. Two additional hazards, wildfire and landslides, do present mitigation opportunities and activities, such as the national "FIREWISE" program, and the Department

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<sup>4</sup> Although these hazards are ranked as high for the purpose of identifying cost-effective, technically feasible and environmentally sound mitigation activities at the state level, additional hazards may also present significant risks within local jurisdictions and should be fully assessed at the local level for vulnerabilities and potential losses.



of Transportation's road construction standards, that are currently being carried out through various State agency initiatives. For this reason, activities that support wildfire and landslide mitigation are included in **Table 4.4e**. Other hazards that were ranked as low based on frequency, probability, and/or magnitude are not addressed by mitigation actions or activities in the 2014 SHMP, but will be reevaluated for the next plan update.

The 2014 SHMP includes a full hazard profile and risk assessment for **climate change** for the first time. Significant information is provided in **Section 3.4** regarding characteristics, locations and potential impacts from climate change. Climate change includes multiple individual hazards, and while it is not required to be addressed by federal mitigation planning criteria, it has been an issue of high concern in New York State and numerous institutions are addressing adaptation measures to climate change. Analysis of the conditions brought on by climate change can provide a better understanding of how risk and vulnerability of population, property, environment, and the economy may be affected in the future. In addition, changing climatic conditions may exacerbate the impacts of other identified hazards that already affect New York State. Although increased certainty about climate change and its links to human-caused activities has emerged since the 2011 plan, the focus of this plan is the mitigation of affects caused by natural hazards.

With this understanding of climate change, and its inclusion in the 2014 SHMP as a high hazard, mitigating activities have been identified and included in this plan. In addition, activities identified and directly associated with other hazards such as flooding and coastal erosion, may also indirectly address the secondary hazards that result from climate change.

Mitigation Actions and Activities presented in this section were developed through a collaborative process with the SHMP Team, which included New York State agencies and organizations. The original list of strategic activities was an outcome of the collaborative effort from the 2002 NYS Mitigation Planning Summit and subsequent plan update cycles where the framework, guidelines, and criteria were discussed, established, and revised to ensure that appropriate mitigation measures were developed following the requirements as stated in the federal regulation. For the 2014 SHMP update, actions and activities were discussed at all meetings with stakeholders to ensure that information gathered for the plan was accurate and up-to-date. Mitigation activities cited in the 2011 SHMP were extensively reviewed, and in some cases it was deemed appropriate to combine activities with similar objectives or outcomes.

#### 4.4.2 Evaluation of Mitigation Actions and Activities

In general, the SHMP Team recognized that despite the short timeframe for the 2014 SHMP update, the multiple major disasters in the previous three years had elevated mitigation to a higher level of importance in a number of state and local agencies and organizations. For this reason, it was important to capture as much information on 2011 projects as possible, as well as any new activities that had been developed as a result of the recent disaster experiences.



For the 2014 SHMP update, stakeholder agencies first had the opportunity to review the mitigation activities table from the 2011 plan and provide input. A submittal form (See **Appendix 4, Attachment A.**) was developed and disseminated to the mitigation stakeholder group to collect specific information related to activities that should be included in the updated plan. Input received from the agencies was used to update the current status of the 2011 activities, which were then reviewed with the SHMP Team. It was determined that some revisions were required for the 2014 update in order to narrow the focus of activities to address achievable and measurable results. In addition, a tracking matrix was initiated in the 2014 update to document progress in achieving goals and reducing losses. During the 2014 plan update meetings, stakeholder participants were prompted to share information related to changes in policies, programs, initiatives, and projects, including ongoing functions that support mitigation. Activities that had become institutionalized processes or programs within specific agencies since 2011 were removed from the activities list and documented in the new “State Capabilities” table (**Table 4b**) to demonstrate achievement in integrating specific initiatives into ongoing programmatic functions. Activities that were identified as completed or implemented since the 2011 plan were placed in a new “Mitigation Progress” table developed to document overall progress. This methodology also supports the State’s philosophy of institutionalizing hazard mitigation in current policies and programs to ensure that mitigation planning is a long-term process with a collaborative effort to support integration and implementation of mitigation into day-to-day operations of the State and local governments.

An additional table was created during the 2014 update process for the purpose of capturing activities and projects in development, with the intent of reviewing these as potential activities during each annual plan review and monitoring cycle. All activities included in this list should have the potential to be technically feasible, cost effective and environmental sound, but are not yet fully developed to be able to make this determination at the time of submission. (See “Activities in Development” table in **Appendix 4, Attachment B.**)

Evaluation of mitigation actions and activities occurs at two levels – first, when potential activities are submitted for consideration and inclusion in the mitigation plan; and, second, during the annual monitoring and evaluation process for the plan. This process, described below, was redefined and followed for the 2014 SHMP update.

When potential activities are first submitted to the DHSES Mitigation Section, the staff determines that all information necessary for evaluation and ranking has been included, and that the activity meets the definition of a mitigation activity based on the five categories for potential projects (prevention, property protection, public awareness, education, natural resources protection or structural project), which also align with the State’s mitigation goals. (The format used for project submission is provided in **Appendix 4, Attachment A.**) The process to evaluate activities during the life cycle of the plan is described in **Section 6 – Plan Maintenance.**



### 4.4.3 Prioritization of Mitigation Actions and Activities

The prioritization or “ranking” of the proposed actions and activities provides a guide for choosing funding projects; however, each activity has its own merit. After the action is submitted and staff determines that there is sufficient information, the project is evaluated using a modified ranking system modeled on the “STAPLEE” criteria. This acronym represents the set of evaluation criteria: S-social, T-technical, A-administrative, P-political, L-legal, E-economic, and E-environmental. Although STAPLEE is a generally accepted evaluation process that provides a systematic approach to identifying and prioritizing opportunities associated with a particular alternative, the SHMP Team modified the STAPLEE criteria to ensure that it aligned with the State’s mitigation strategy and priorities, and emphasized activities that were cost-effective, environmentally sound, and technically feasible.

**Table 4.4e** explains the criteria and instructions for the State’s Mitigation Actions and Activities Ranking System:

NYS HAZARD MITIGATION PLAN		
ACTIONS AND ACTIVITES RANKING SYSTEM INSTRUCTIONS		
<b>Probability of Acceptance by Population</b>	4	Likely to be endorsed by the entire population
	3	Of benefit only to those directly affected and would not adversely affect others
	2	Would be somewhat controversial with special interest groups or a small percentage of the population
	1	Would be strongly opposed by special interest groups or a significant percentage of the population
	0	Would be strongly opposed by nearly all of the population
<b>Funding Availability</b>	4	Little to no direct expenses
	3	Can be funded by operating budget
	2	Grant funding identified
	1	Grant funding needed
	0	Potential funding source unknown
<b>Probability of Matching Funds</b>	4	Funding match is available / or funding match not required
	-	N/A
	2	Partial Funding match available
	-	N/A



<b>NYS HAZARD MITIGATION PLAN</b>		
<b>ACTIONS AND ACTIVITES RANKING SYSTEM INSTRUCTIONS</b>		
	0	No funding match available/ or funding match unknown
	4	Likely to meet Benefit Cost Review
	-	N/A
<b>Benefit Cost Review</b>	2	Benefit Cost Review not required
	-	N/A
	0	Benefit Cost Review unknown
	4	Environmentally sound and relatively easy to implement
	3	Environmentally acceptable and not anticipated to be difficult to implement
<b>Environmental Benefit</b>	2	Environmental concerns and somewhat difficult to implement because of complex requirements
	1	Difficult to implement because of significantly complex requirements and environmental permitting
	0	Very difficult to implement due to extremely complex requirements and environmental permitting problems
	4	Proven to be technically feasible
	-	N/A
<b>Technical Feasibility</b>	2	Expected to be technically feasible
	-	N/A
	0	Technical feasibility unknown or additional information needed
	4	1 year
	3	2 years
<b>Timeframe of Implementation</b>	2	3 years
	1	4 years
	0	More than 4 years
Minimum = 0	Ranking Level:	<b>Low: 0-10; Medium: 11-21; High: 22-32</b>
Maximum = 32		



Each activity submitted for 2014, and 2011 activities retained on the 2014 list, were evaluated using this ranking system. **Appendix 5, Attachment C** is a table of the raw scores for all activities ranked in the 2014 update. The summary score for each activity was then included on the Mitigation Actions and Activities Table (**Table 4f**). The methodology used to rank mitigation activities as projects that are submitted for funding allows for targeting of specific priorities when funding becomes available.

In addition to the ranking system score, the following additional information was included in the activities matrix to provide a comprehensive representation of each activity:

Year/Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
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### Definitions:

- **Year/Activity Number** – identifies the year the activity was submitted/added to the list.
- **Hazard** – identifies the natural hazard the activity addresses.
- **Title** – identifies the type of activity.
- **Description of Activity** – prompts consideration for evaluation, technical feasibility, cost-benefit, and environmental value. Descriptions should include the name of the program and/or activity; expected results, including reduction of potential impact from the natural hazard; detail on the specific activity/phases or elements; and implementation strategy or how the activity will be implemented to meet the desired outcome. For example, if the proposed activity is to “increase awareness,” the implementation strategy might be the use of web sites or web training, or increased collaboration among stakeholders by way of scheduled meetings and conferences.
- **Agency** – list the agency or agencies that would likely be involved in implementing the proposed activity, or would be responsible for implementation. Agencies might include federal, state and/or local agencies and organizations.
- **Estimated Cost** – prompts consideration of cost-effectiveness. Estimate the actual cost of or budget for the activity. If the actual cost cannot be determined, but it is determined that it would be marginal or significant compared with the overall agency program/activity cost, identify accordingly.



- **Funding Source** – identify all potential funding sources that support the agency programs or funding sources for the activity itself, including operating budgets, and capital improvement plans, and potential (or awarded) grants.
- **Timeframe** – identify the timeframe within which the activity will be implemented. For example, **short-term** (< 2 years) if the activity can reasonably be expected to be implemented within the next 2 years; **long-term** (> 2 years) if the activity is more complex, requires significant time, widespread support, and/or resources in order for implementation to occur; or **ongoing** if it is a current and ongoing program that incorporates periodic activities. For example, NY Alert is an ongoing warning program that requires periodic public awareness and education efforts to maintain its effectiveness in reducing impacts to the population.
- **Priority Ranking** – (**high**= 22-32 points; **medium**= 11-21 points; or **low**= 0-10 points) prompts consideration for prioritization by ranking based on the ranking system criteria described in **Table 4e**, above. The ranking score may be determined by the agency submitting the activity, by DHSES Mitigation Section staff, or by the SHMP Team during annual monitoring and review of activities.
- **Mitigation Goal** – prompts consideration of how goals (and objectives) are supported by mitigation activities. Each activity should be linked to one or more goals.
- **Current Status (by year)** – For the purpose of the plan update, this column is used to evaluate the progress made during the past planning cycle. In evaluating each item, the SHMP Team will survey all agencies to gain feedback on progress made on each specific activity. While some of the responses obtained from the agencies may be more detailed, the information will be edited to provide a concise summary of the progress. Terminology used to describe progress is: **Good**, which indicates significant progress has been made and it is anticipated that this activity will be ongoing or completed within the next planning cycle, thus requiring consistent effort and monitoring; **Fair**, which indicates moderate progress has been made, but it is clear that additional effort is needed; **Limited**, which indicates areas where there has been limited or no progress on the specific activity. All newly-submitted activities will be noted as **New**.

**Table 4.4f** presents the 2014 Mitigation Actions and Activities as a compilation of activities that were maintained from the 2011 plan, as well as those submitted as new activities for the 2014 update. Fifteen activities were carried over from the 2011 SHMP, and 98 new activities were added, for a total of 112 actions and activities.



Table 4.4f: 2014 Mitigation Actions and Activities

CLIMATE CHANGE MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-001	Climate Change	Building Capacity in Hudson River Communities to Create Climate- Adapted Hazard Mitigation Plans	Provide training and technical assistance to Hudson River Estuary communities and hazard mitigation consultants to update or enhance current FEMA-approved hazard mitigation plans to include climate adaptation and green infrastructure in risk assessment and mitigation strategies.	DEC	\$40,000	FMA, HMA, Staff Time	S	M	4		New project
2014-002	Climate Change	Conduct a Climate Vulnerability and Economic Assessment for At- Risk Transportation Infrastructure in the Lake Champlain Basin	Prioritize road-stream crossings (culverts) and road segments that are most vulnerable to climate change impacts, and have significant safety and ecological roles; develop engineering-based design adaptation options; incorporate the benefits and costs of adaptation options. The study is also supporting the development of the USGS StreamStats tool for NYS, which will be expanded to allow projecting trends.	DOT		FHWA	L	M	4 5		New project
2014-003	Climate Change	Conduct a risk study of the extreme weather and climate change as it relates to capital programs.	NYS is a pilot state for the transportation asset management plan (NYSDOT TAMP) and risk management process under MAP-21. The plan to be developed in the next 6 months will consider extreme weather and climate	DOT		HMGP, PDM	S	M	1		New project



CLIMATE CHANGE MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
			change as a component of environmental risk. The risk management register will address trade-off analyses of risk versus impact and the next capital program update instructions are expected to reflect the results of this broader risk analysis.								
2014-004	Climate Change	Conduct a study based off of the Cornell study on intense precipitation models to determine future stream and culvert flows for new projects	Continue to look at changes in design for bridges, culverts, etc.; need to help engineers determine future stream flows to design culverts, bridges. This study will be completed at the regional level on a scale of (50 miles by 50 miles). Design standards need to accommodate flow at the end of their design life, not just the beginning.	DOT		NYSERDA funding	S	M	1 5		New project



COASTAL EROSION MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-005	Coastal Erosion	East River State Park – Shoreline Stabilization	This park is located on a former industrial site on the East River in Williamsburg, Brooklyn. The park’s shoreline is experiencing ongoing erosion. This project will stabilize the shoreline through a variety of storm resilient techniques, creating an engineered “soft” shoreline so that the public can continue to safely enjoy the waterfront.	OPRHP	\$585,000	CDBG	S	M	4 5		New project
2014-006	Coastal Erosion	Great South Bay Pool & Bath House Demolition	State Parks closed the park’s swimming pool in 2011, due to its deteriorating condition and its location, immediately adjacent to the Great South Bay where it is prone to flooding and damage during coastal storms (over the years, protective dunes and beach have eroded away). This project would demolish the closed pool and bathhouse, and replace it with new recreational facilities that are designed to be resilient to future coastal storms.	OPRHP	\$6,000,000	CDBG	S	M	2		New project



COASTAL EROSION MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-007	Coastal Erosion	Jones Beach State Park - Dune Creation Project	While most of Jones Beach State Park is buffered from coastal storms by natural dunes, there are no coastal dunes in front of the park's most developed section which includes the West Bathhouse, Central Mall, Boardwalk, and the East Bathhouse. These areas experienced significant damage during Hurricane Sandy. This project will construct a protective dune system as a natural protection measure for park facilities.	OPRHP	\$40,000,000	CDBG	S	H	4 5		New project
2014-008	Coastal Erosion	Multiple State Park Project	State Parks need to repair several bridges and large culverts on Tiroati Brook Road, Seven Lakes Drive, and Lake Welch Drive that are in poor condition and subject to undermining and other failures during large rainfall events. These structures are on roads that provide critical access routes to park facilities, as well as for the public traveling through the park. Failure of one or more structures would have significant impacts on Harriman's children's group camps and the surrounding communities.	OPRHP	\$1,500,000	CDBG	S	M	4 5		New project



COASTAL EROSION MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-009	Coastal Erosion	Orient Beach State Park – Shoreline Protection	The majority of Orient Beach State Park – Shoreline Protection the park’s entrance road has already been stabilized with a rock revetment. Approximately 1,700 linear feet of the access road still requires protection. The roadway and utility lines running along the road have experienced significant damage during a number of coastal storms, including Sandy.	OPRHP	\$3,000,000	CDBG	S	H	4 5		New project
2014-010	Coastal Erosion	Robert Moses State Park - Beach Nourishment & Dune Construction	Robert Moses State Park has suffered significant erosion from coastal storms over the past decade. Hurricane Sandy caused significant damage to the park, eroding large amounts of beachfront and dunes, collapsing a portion of the park’s traffic circle, and heavily damaging the Field 5 boardwalk and bathhouse. State Parks has completed a \$10 million “Phase 1” nourishment project to restore part of the eroded beachfront. However, the park’s roadways, buildings, and infrastructure remain highly vulnerable to future storms. A “Phase 2” beach nourishment and dune construction project is urgently needed to protect the park from future storms.	OPRHP	\$40,000,000	CDBG	S	H	4 5		New project
2014-011	Coastal Erosion	Roberto Clemente Park- Bulkhead replacement	Roberto Clemente is a 25-acre waterfront park with 3,700 linear feet of waterfront along the Harlem River in the Bronx.	OPRHP	\$35,000,000	CDBG	S	M	4 5		New project



COASTAL EROSION MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
			The park, along with a very large adjacent housing complex, is protected from the Harlem River by a 2,100 linear foot steel sheet pile bulkhead that is in poor condition due to severe corrosion of the unprotected steel and loss of fill under the esplanade due to Super storm Sandy. During Sandy the park was three feet under water. This project will replace the failing bulkhead with a new, storm resilient bulkhead. The project will include creation of a 9,000 square foot tidal pool that will serve as green shoreline infrastructure and will facilitate habitat along the Harlem River. The project will also reconstruct the aging shoreline esplanade running along the top of the bulkhead, utilizing a variety of storm resiliency and storm water capture measures.								
2014-012	Coastal Erosion	Stabilize Natural Shoreline North of The Bulkhead, at Roberto Clemente Park (Ref Baird 11)	Funding is needed to stabilize 1,600 feet of stone and natural shoreline located directly north of the bulkhead at Roberto Clemente Park, to protect park facilities including baseball fields and recreational fields. This project will provide for a resilient shoreline and park facilities, including a tidal wetlands restoration project.	OPRHP	\$7,000,000	CDBG	S	M	4 5		New project
2014-013	Coastal Erosion	Bayswater Park Project	Bayswater is located on an historic estate on Jamaica Bay.	OPRHP	\$2,200,000	CDBG	S	M	4 5		New project



COASTAL EROSION MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
			The park has lost most of its structured bulkhead over the years yielding a succession to salt marsh grasses. This project will enhance establishment of a natural, storm resilient shoreline through creation of tidal wetlands, dunes, and native plantings.								
2014-014	Coastal Erosion  Flood  Hurricane	Soil Stabilization Demonstration Projects to Reduce Erosion Risks to Railroad Structures and Infrastructure	Working in partnership with Metro- North to assess erosion of railroad tracks along the Hudson River Estuary, and protect using methods which follow the best management practices of the Hudson River Sustainable Shorelines project in order to reduce the erosion risk to railroad infrastructure. Solutions would include using a combination of native vegetation and rip-rap or other bank toe protection.	DEC		HMA & Staff Time	L	H	4 5		New project



COASTAL EROSION MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-015	Coastal Erosion  Flood  Hurricane	Soil Stabilization Demonstration Projects to Reduce Erosion Risks to Structures and Infrastructure	Plan and implement erosion control demonstration projects along the Hudson River Estuary to reduce risk to structures and/or infrastructure from flooding, storm surge, wind, waves, and ice using technical approaches derived from the Hudson River Sustainable Shorelines Project. Projects would include installing geotextiles and vegetative buffer strips, preserving mature vegetation, decreasing slope angles, adding wave breaks, and stabilizing with rip rap and other means of slope anchoring. These projects would be identified in partnership with local communities and agencies.	DEC	\$3,000,000	HMA & Staff Time	L	H	4 5		New project



EARTHQUAKE MITIGATION ACTION AND ACTIVITIES MATRIX											
Year	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014/ 016	Earthquake	Bridge and Tunnel Restoration	Identify and incorporate seismic requirements in bridge and tunnel restoration projects.	MTA			L	L	2 5		New project
2011/ 017	Earthquake	Seismic Study & Retrofit	NYS Bridge Authority has conducted seismic retrofit studies to its bridges. In January of 2004, seismic rehabilitation work was completed on the Kingston-Rhinecliff Bridge. Bridge rehabilitation projects also include seismic evaluation of existing structures and corrective actions commenced. The remaining bridges will be retrofitted based on studies and funding available.	NYS Bridge Authority			L	M	2 5		New project
2011/-018	Earthquake	Post-Seismic Inspection	Develop post seismic inspection guidelines for transportation infrastructure to better mitigate damages and loss during high magnitude earthquakes within NYS	DOT			S	M	1 2		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-019	Flood	Assessing Flooding Risks and Mitigation Options from a Watershed Perspective	This project would study key rivers and streams from a watershed perspective, and determine 1. Flooding risks and 2. Potential mitigation options. This assessment will go beyond municipal boundaries to examine entire watershed(s). The study would use watershed delineation, GIS mapping data, and hydraulic modeling to determine what mitigation methods would be most appropriate for local implementation and what would be most effective at reducing flooding impacts.	DEC			S	M	1 4		New project
2014-020	Flood	Amsterdam Flood Control Project	Amsterdam Flood Control Project repair damage to right bank flood wall on South Chuctanumda Creek, repair washed out riprap (500 feet), replace missing sections of bank in separate locations on the South Chuctanmunda, repair bank erosion along the Mohawk river floodwall.	DEC			S	M	5		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-021	Flood	Binghamton Flood Control Project	Binghamton Flood Control Project. Repair of severe shoaling in the Pine Creek at several locations, bank erosion along Pierce Creek at several locations, significant scour along foundation of floodwall at Park Creek, large amount of sediment in Park Creek pressure conduit, overtopping at several locations including at tie in to high ground.	DEC			S	M	5		New project
2014-022	Flood	Binghamton South Flood Control Project	Binghamton South Flood Control Project. Binghamton South Severe shoaling in Pierce Creek; bank erosion along Pierce Creek; Scour along foundation of flood wall along Conklin Ave; Significant scouring and void along flood wall Park Creek; Large amount of sediment in Park Creek pressure conduit; Overtopping at several locations including at the tie in to high ground. Northeast Binghamton: Voids adjacent to floodwall, joint leakage between wall sections upstream of RxR bridge, brick pavers broken along the wall where lamp post are present, piping from building draining at landside of base of wall; Large voids and course at base of flood walls; Erosion along wing wall and levee just upstream of the Court Street closure; Erosion along levee toed and Chamberlain Creek left bank; Chamberlin Creek culvert	DEC			S	M	5		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
			significantly jammed with debris, sloughing riverside slope.								
2014-023	Flood	Green Infrastructure to Reduce Localized Flooding	Green infrastructure practices can reduce storm water runoff through infiltration. By strategically implementing appropriate green infrastructure practices, especially as retrofits, localized flooding problems can be reduced. Implementation can be site-specific or within a particular sub watershed to improve storm water management during storms. While many potential sites have already been identified, a component of this project could be a plan to identify the most strategic locations to specifically reduce flooding problems.	DEC			S	M	4 5		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2011-024	Flood	Identify and Evaluate Loss Reduction Options for Repetitive Loss Properties	Address and explore loss reduction options for defined repetitive loss properties. Assist communities to identify repetitive loss locations and support search for potential funding to mitigate future loss.	DEC		Operating budget for daily support State/Federal mitigation programs and HMA	L	H	1 2 5	On-going program efforts with continued progress.	During the 2013 Unified HMA process the state only supported the acquisition of SRL properties. A special emphasis was placed on Benefit Cost Analysis for each property.
2014-025	Flood	Northeast Binghamton Flood Control Project	Northeast Binghamton severe shoaling in Pierce Creek; bank erosion along Pierce Creek; Scour along foundation of flood wall along Conklin Ave.; Significant scouring and void along flood wall Park Creek; large amount of sediment in Park Creek pressure conduit; Overtopping at several location including at the tie in to high ground.	DEC			S	M	5		New project
2014-026	Flood	Northeast Binghamton Floodwall Project	Northeast Binghamton: Voids adjacent to floodwall; joint leakage between wall sections upstream of RxR bridge; brick pavers broken along the wall where lamp post are present; piping from building draining at land side of base of wall; Large voids and course at base of flood walls; erosion along wing wall and levee just upstream of the Court Street closure; erosion along levee toed and Chamberlin Creek left bank; Chamberlin Creek culvert significantly jammed with debris; sloughing riverside slope.	DEC	\$420,000		S	M	5		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-027	Flood	Real-Time Gages for Early Detection of Flooding Risk	While the USGS stream gage system provides invaluable information, there are many additional rivers and streams that are not currently being monitored. These streams may respond to precipitation differently, and at different times, based on their individual watersheds. Precipitation may also be quite localized, which could increase flooding risk for a particular location. This project would strategically install rain gages to capture information on precipitation duration/intensity and stream gages to capture information on height or discharge and provide an early warning for flooding risk. This network would supplement the existing USGS system for more localized data.	DEC			S	M	1 3		New project
2014-028	Flood	Targeted Dam Removal Hudson Estuary Watershed	Dam infrastructure is aging, while precipitation is predicted to become more intense. These two factors increase the future risk of catastrophic, and unplanned, dam failures. Dams can also create upstream flooding around the impoundment. A regional program that identifies the highest risk dams to downstream flooding as well as those contributing to upstream flooding, will be identified, and dam removal will be pursued	DEC			L	M	4 5		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
			with willing dam owners to permanently eliminate dam related flood risks.								
2014-029	Flood	Adjust Insurance Rates	Coordinate with State Floodplain Managers to work with FEMA to adjust insurance rates for those homes who elevate utilities above BFE.	DEC			L	L	1 2		New project
2014-030	Flood	Elevate Utilities Above BFE	Approximate 80% of housing was built pre-FIRM. These structures have basements that are vulnerable to flooding. Most utilities are located in the basement. This action will provide grant funds to homeowners to elevate the utilities above BFE.	DEC			L	L	2		New project
2014-031	Flood	Continue and Enhance Promoting the NFIP Community Rating System (CRS)	Continue and enhance promoting the NFIP Community Rating System (CRS). Improve awareness by ensuring comprehensive integration into State agency technical assistance & training program curriculum for local governments and increasing visibility and accessibility of data via the NYS (DHSES/DEC/DOS) web site. For instance; DOS technical planning assistance for LWRP and Comprehensive planning.	DEC		Operating budget Federal Grants	S	H	1 2		New project
2014-032	Flood	Shandaken flood control project	Repair to the armored bank at the Shandaken flood control project not covered under PL-84-99. Shoal and tree debris removal is required.	DEC	\$80,000		S	M	4 5		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-033	Flood	Hudson River National Estuarine Research Reserve Project	This area of the park, located directly on the Hudson River, includes the Hudson River National Estuarine Research Reserve environmental center and offices, a public marina, parking area, roadway, restrooms, and a picnic area. This project will implement a number of storm-proofing and resiliency measures to make the area less vulnerable to flooding and damage during storm surges on the Hudson.	OPRHP	\$4,000,000	CDBG	S	H	5		New project
2014-034	Flood	Lake Kanawauke and Lake Sebago Project	The stream corridor that connects Lake Kanawauke and Lake Sebago was heavily damaged by flooding during Tropical Storm Irene. The stream passes through several culverts and pipes that do not have sufficient capacity for major flood events. This project will remedy the capacity problems and restore the stream to natural conditions, removing a potential impoundment hazard that is vulnerable to failure and poses a significant additional risk to the Lake Sebago dam and downstream communities.	OPRHP	\$2,000,000	CDBG	S	H	4 5		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-035	Flood	Dinsmore Golf Course Flood Project	Mills-Norrie is adjacent to the hamlet of Staatsburg in Dutchess County. Staatsburg has experienced severe flooding during various storm events in recent years. The Dinsmore Golf Course, located with the State Park, presents an opportunity to attenuate some of the flooding issues that have caused property damage to numerous homes and businesses in low-lying areas. This project will construct storm water capture features, permeable surfaces, and management practices in the golf course to reduce downstream storm water volumes and reduce flood impacts in the nearby community.	OPRHP	\$6,000,000	CDBG	L	M	4 5		New project
2014-036	Flood	Hither Hills Campground	The 168-site Hither Hills campground is extremely popular, with virtually 100% occupancy during the summer season. During coastal storm and heavy rain events, sections of the campground routinely flood damaging park facilities. A project to raise the elevation of portions of the campground and improve drainage structures is needed to alleviate this problem.	OPRHP	\$2,000,000	CDBG	L	M	4 5		New project
2014-037	Flood	Rebuild Beach Bathhouse at Orient Beach	The existing swimming beach bathhouse at Orient Beach is considerably lower than the base flood elevation, consequently; the building routinely floods during coastal storms. This	OPRHP	\$3,000,000	CDBG	L	M	2 5		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
			project will construct a new bathhouse at a higher elevation, and will incorporate flood resiliency features into the facility.								
2014-038	Flood	Mills-Norrie State Park - Norrie Point Improvements	The Hudson River National Estuarine Research Reserve environmental center and offices are located on the Hudson River. The center provides a marina, parking area, roadway, restrooms, and a picnic area to the general public. This project will implement a number of storm-proofing and resiliency measures to make the area less vulnerable to flooding and damage during storm surges on the Hudson.	OPRHP	\$4,000,000	CDBG	L	M	5		New project
2014-039	Flood	Harriman State Park Dam Code Upgrades	There are several dams in Harriman State park that are rated as High Hazard - funding would be used to upgrade dams to meet current dam safety codes	OPRHP	\$50,000,000	CDBG	S	M	4 5		New project
2014-040	Flood	Flood Studies for Non Tunnel Facilities	Determine vulnerabilities and conceptual designs for mitigation work at non-tunnel facilities.	MTA			S	M	1 5		New project
2014-041	Flood	Conduct scour studies on critical bridges	Conduct scour studies on critical bridges to determine prioritization of the most critical bridges for repairs to be scheduled.	DOT		HMGP	S	M	1 2		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-042	Flood	Continue to execute the Governor's Executive Order for DOT to assist local governments	Continue to replace culverts, conduct stream work and retaining walls to mitigate future problems, improving infrastructure, culverts, roads, repairing washouts and increasing culvert size.	DOT			L	M	5		New project
2014-043	Flood	Critical infrastructure Assessments of Hurricane Sandy and 2011 extreme weather events	FHWA Participating pilot: "New York - New Jersey - Connecticut Transportation Vulnerability Assessment and Adaptation Analysis". NYSDOT is partnering with the North Jersey Transportation Planning Authority (NJTPA), New York Metropolitan Transportation Council (NYMTC), South Western Regional Planning Agency (SWRPA), and the Greater Bridgeport Regional Council (GBRC), New Jersey and Connecticut DOT's to assess the effects of Hurricane Sandy and 2011 extreme weather events to analyze adaptation strategies for critical infrastructure. A final report will highlight the Region's most vulnerable transportation assets and analyze the adaptation measures available. Pilot Partnership with NYSDOT is partnering with the North Jersey Transportation Planning Authority (NJTPA), New York Metropolitan Transportation Council (NYMTC), South Western Regional Planning Agency (SWRPA), and the Greater	DOT, NYMTC, MTA	\$675,000 plus staff time	FHWA	L	M	1 2		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
			Bridgeport Regional Council (GBRC), New Jersey and Connecticut DOT's.								
2014-044	Flood	Design new bridges to accommodate a 50-year flood	Design new bridges to accommodate a 50-year flood. Stream channels are lined with heavy stone to mitigate against bank erosion. At stream crossings, newly designed bridges are founded on sound rock to prevent scour on bridge substructure elements.	DOT		Operating Budget	L	M	2 5		New project
2014-045	Flood	Flooding Vulnerability Assessment	Complete a statewide risk assessment for flooding based on experienced and projected (future) flooding; create a GIS inventory of flooding vulnerabilities to serve as a screening layer for decision makers. Hazards considered will include inland riverine flooding due to more intense precipitation as well as sea level rise and storm surge along coastlines.	DOT		Operating Budget	S	M	1		New project
2014-046	Flood	Orient Beach State Park - Maintenance Area	During major storms the parks maintenance area is susceptible to flooding, which has caused equipment damage. This project will reconstruct the facility to make it less vulnerable to coastal flooding.	OPRHP	\$750,000	CDBG	S	M	2		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-047	Flood / Hurricane	Governor Island Ventilation Seawall Project	Raise the seawall around the artificial ventilation building on Governor's Island.	MTA			L	M	5		New project
2014-048	Flood / Hurricane	Harden all MTA B&T Facilities	Perform work to harden those areas that are required to maintain B&T operations and relocate electronic systems to less vulnerable locations.	MTA			L	M	2		New project
2014-049	Flood/ Climate Change	Conduct research on rainfall extremes across New York State for use in making policy decisions	NYSDOT is participating in NYSERDA research projects with Cornell University's Department of Earth and Atmospheric Sciences will be completed by end 2015. This project will model projected rainfall extremes for future time periods across New York State, to allow policy makers to make decisions based on the most up-to-date science.	DOT		HMGP, PDM	S	M	1		New project
2014-050	Flood (Dam)	Back up Control Generators	Permanent backup generators have been installed at the eight movable dams in Montgomery and Schenectady counties in order to operate the water control structures during power outages. If funding from outside sources were to become available, permanent generators would be installed at additional locations and would provide considerable flood mitigation.	Canal Corp.	<b>\$500,000 (Total)</b>		S	H	2		New project
2014-051	Flood (Dam)	Back up Control Generators	Backup Control Generator Location: Lock C-1 Waterford	Canal Corp.	\$50,000	HMGP	S	H	2		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-052	Flood (Dam)	Back up Control Generators	Backup Control Generator Location: Court Street Dam Rochester	Canal Corp.	\$50,000	HMGP	S	H	2		New project
2014-053	Flood (Dam)	Back up Control Generators	Backup Control Generator Location: Delta Reservoir Rome	Canal Corp.	\$50,000	HMGP	S	H	2		New project
2014-054	Flood (Dam)	Back up Control Generators	Backup Control Generator Location: Lock C-12 Whitehall	Canal Corp.	\$50,000	HMGP	S	H	2		New project
2014-055	Flood (Dam)	Back up Control Generators	Backup Control Generator Location: Lock C/S-1 Cayuga	Canal Corp.	\$50,000	HMGP	S	H	2		New project
2014-056	Flood (Dam)	Back up Control Generators	Backup Control Generator Location: Lock E-18 Jacksonburg	Canal Corp.	\$50,000	HMGP	S	H	2		New project
2014-057	Flood (Dam)	Back up Control Generators	Backup Control Generator Location: Lock E-23 Brewerton	Canal Corp.	\$50,000	HMGP	S	H	2		New project
2014-058	Flood (Dam)	Back up Control Generators	Backup Control Generator Location: Lock E-24 Baldwinsville	Canal Corp.	\$50,000	HMGP	S	H	2		New project
2014-059	Flood (Dam)	Back up Control Generators	Backup Control Generator Location: Lock E-26 Clyde	Canal Corp.	\$50,000	HMGP	S	H	2		New project
2014-060	Flood (Dam)	Back up Control Generators	Backup Control Generator Location: Lock E-27 Lyons	Canal Corp.	\$50,000	HMGP	S	H	2		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-061	Flood	Implementation of watershed-based Flood Warning Systems for Champlain, Erie, Oswego, Cayuga/Seneca Canals	Implementation of watershed-based Flood Warning Systems for the Upper Hudson River Basin (Champlain Canal), Mohawk River Basin (Erie Canal) and Oswego River Basin (Erie, Oswego, and Cayuga/Seneca Canals) would lower the risk to flood prone communities and the associated financial losses by enabling the State, emergency managers and the public to view and understand the areal extent of forecasted flood conditions. Additionally, the ability of communities to appropriately prepare and protect lives, private property, public infrastructure and critical facilities can result in as much as a 30% reduction in damages by providing accurate forecasted flood conditions in advance of severe events and on a real-time basis. The funding would be used as a direct grant for system design, gage installation and operation, model development, and creation and operation of the Flood Warning Systems. An operating funding component for this project would be needed throughout the life of the project.	Canal Corp.	\$8,517,500		S	H	3		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-062	Flood	Modify and removal of water control structures	Modify the water control structures to remove the hydraulic obstructions associated with the lower gates and uprights to remove the ability of debris to accumulate at these locations	Canal Corp.	\$30,637,965	PAHMP-4031, Thruway General Reserve	S	H	4		New project
2014-063	Flood	Water Control Gate Automation	Water Control Gate Automation - The automation of water control gates is being piloted at the NYS Canal Corporation's Utica Taintor Gate Dam to minimize flood damage through the elimination of delays in manual operation. This project is currently under construction with an expected completion in mid-2016. If funding from outside sources were to become available, water control gate automation at other locations would provide considerable flood mitigation. Proposed locations and estimated costs are as follows, funding for these locations will allow the expansion of automated control gates.	Canal Corp.			S	H	2		New project
2014-064	Flood		Water Control Gate Automation Location: Court Street Dam Rochester	Canal Corp.	\$3,500,000	HMGP	S	H	2		New project
2014-065	Flood		Water Control Gate Automation Location: Delta Reservoir	Canal Corp.	\$1,000,000	HMGP	S	H	2		New project
2014-066	Flood		Water Control Gate Automation Location: Lock C-1 Waterford	Canal Corp.	\$1,800,000	HMGP	S	H	2		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-067	Flood		Water Control Gate Automation Location: Lock C-12 Whitehall	Canal Corp.	\$1,000,000	HMGP	S	H	2		New project
2014-068	Flood		Water Control Gate Automation Location: Lock C/S-1 Cayuga	Canal Corp.	\$1,800,000	HMGP	S	H	2		New project
2014-069	Flood		Water Control Gate Automation Location: Lock E-18 Jacksonburg	Canal Corp.	\$1,100,000	HMGP	S	H	2		New project
2014-070	Flood		Water Control Gate Automation Location: Lock E-23 Brewerton	Canal Corp.	\$2,400,000	HMGP	S	H	2		New project
2014-071	Flood		Water Control Gate Automation Location: Lock E-24 Baldwinsville	Canal Corp.	\$1,000,000	HMGP	S	H	2		New project
2014-072	Flood		Water Control Gate Automation Location: Lock E-26 Clyde	Canal Corp.	\$1,000,000	HMGP	S	H	2		New project
2014-073	Flood		Water Control Gate Automation Location: Lock E-27 Lyons	Canal Corp.	\$1,300,000	HMGP	S	H	2		New project
2014-074	Flood	Main Mill Dam (Imperial)	Lower spillway to safely pass design storm. Impoundment sediment removal will be required.	DEC	\$4,500,000	NYWI	S	H	4 5		New project
2014-075	Flood	Papish Pond Dam	Reconstruction of outlet structure to improve flow capacity.	DEC	\$550,000	NYWI	S	H	4 5		New project
2014-076	Flood	Marcell Roth Dam	Reconstruction of outlet structure to improve flow capacity, and the addition of embankment to improve stability.	DEC	\$500,000	NYWI	S	H	4 5		New project



FLOOD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-077	Flood	Hatchery Dam (Oneida)	Replacement of spillway structure to correct flow deficiencies.	DEC	\$800,000	NYWI	S	M	4 5		New project
2014-078	Flood	Avon Marsh Dam	Reconstruction of outlet structure to improve flow capacity and addition of embankment to improve stability.	DEC	\$500,000	NYWI	S	M	4 5		New project
2014-079	Flood	Johnson City Flood Control Project	Survey, vegetation removal, concrete repairs, shoal removals, closure repairs, drainage improvements, pipe repairs, levee improvement, flap gate replacement.	DEC	\$783,600	NYWI	S	M	4 5		New project
2014-080	Flood	Lilse Flood Control Project	Survey, inspect conduit, closure improvements, rodent control & damage repair, vegetation removal.	DEC	\$206,400	NYWI	S	M	4 5		New project
2014-081	Flood	Port Dickinson Flood Control Project	Upgrade pump station, inspect & repair conduits, rodent control & damage repair.	DEC	\$346,400	NYWI	S	M	4 5		New project
2014-082	Flood	Twin Orchards Flood Control Project	Survey, rodent control & damage repair, rip rap, vegetation removal, drainage improvements and inspect conduits.	DEC	\$148,300	NYWI	S	M	4 5		New project
2014-083	Flood	Corning & Painted Post	Concrete repairs, rodent control & damage repair, inspect conduits, survey, vegetation removal, levee repairs, and pump station improvements.	DEC	\$1,339,788	NYWI	S	M	4 5		New project



HIGH WINDS MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-084	High Winds / Hurricane	Infrastructure Reinforcement	Study, design, and construct bridge features that mitigate against the effects of severe windstorm events.	MTA			L	L	2 5		New project



LANDSLIDE MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-085	Landslide	Continue assessments to identify vulnerable slopes statewide.	Continue identifying and creating a master document of vulnerable slopes state wide using input from regions within the state as a resource to aid in the creation of a master list to monitor for changes in risk. Geotech engineers will create a GIS mapping system with layers.	DOT			L	M	1		New project
2014-086	Landslide	Continue FHWA pilot plan on Assets /Risk Assessment of the asset management plan to meet federal legislation.	NYS is a pilot state program for Asset/Risk Assessment. NYS has engaged a consultant to work on risk assessment, risk registry, as part of the plan which is scheduled to be in place by May 2014. (The plan is currently in the process of being written. This plan will meet the federal legislation requirement.	DOT		FHWA	S	H	1		New project
2011-087	Landslide	Landslide Hazard Data & Susceptibility Mapping	Continue and enhance efforts to promote awareness of landslide hazard via improved and more accessible mapping. Increase scale of landslide hazard mapping to 1:24,000 or higher via latest digital topography. Create and gather GIS layers of several instability factors such as Soil Type, Slope, Hydrology, Road Network and Drainage	DHSES, USGS, NYSDOT, NYSGS and all county EM, CSICC		HMGP	S	H	1 3	Limited progress. Budget constraints precluded hiring expert to validate certain data that would have allowed us to expand the 2008 Schenectady Co. pilot to a State wide program.	The first phase of the 2008 Schenectady Co. pilot has been completed. An application has been submitted to the Hazard Mitigation Grant Program to expand the study statewide. The application is for the second phase of the project, which will be to further the study in Essex County.



LANDSLIDE MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
			Network. The identified Sources are Natural Resources Conservation Services' Soil Survey, the State Digital Elevation Model, etc. Establish a working relationship with critical agencies and develop a Memorandum of Understanding between NYSDOT, NYSGS and USGS to collect subsurface data, samples and exchange the analytical data in order to better develop data sets relating to the landslide hazard.								
2011-088	Landslide	Slope Stability	Continue to undertake slope stabilization and landslide projects to fix loss of ground and prevent future movements which could undermine or bury highway infrastructure. DOT also stabilizes rock slopes to mitigate against the effects of rock slope failures and rockfalls on motorists.	NYSDOT			S	M	2.5	Ongoing program with continued progress.	Update pending



MULTI-HAZARD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-089	Multi-hazard/ Hurricane	Juvenile Justice Center Generators	OCFS is looking to replace a total of 23 generators in the following Juvenile Justice Centers, and training facilities. Backup power generators are essential for the continued operation and care of youth in custody. The following is the breakdown by facility, number of generators and county. Below find the breakdown by facility, number of generators, and county: Highland Residential Center (RC) (13) Ulster County, Taberg RC for Girls (2) Oneida County, Finger Lakes RC (1) Tompkins County, Red Hook RC(1) Columbia County, Sgt Henry Johnson (1) Delaware County, Allen (1) Delaware County, Brookwood SC (1) Columbia County, Brentwood RC (1) Nassau County, Parker Training Academy (2) Columbia County.	OCFS	\$1,500,000		S	M	2		New project
2014-090	Multi-hazard/ Hurricane	Switch gear upgrades at the East Campus, serving the hospital	Grant was requested to provide improved electrical service to the hospital by upgrading existing switch gear.	SUNY		HMGP	S	H	2		New project
2014-091	Multi-hazard/ Hurricane	Back up electrical power system at Westbury	Request for Hazard Mitigation Grant for electrical power system back up.	SUNY		HMGP	S	H	2		New project



MULTI-HAZARD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2014-092	Multi-hazard/ Hurricane	Backup generator at HAB center	Grant was requested to provide for generator in the main administrative building (HAB Center) to provide for better continuity of operations during power outage conditions.	SUNY		HMGP	S	H	2		New project
2014-093	Multi-hazard/ Hurricane	Backup generator at Elting Gym	Provide emergency generator set with some additional wiring to Elting Gym, a designated emergency shelter building, under agreement with the American Red Cross.	SUNY		HMGP	S	H	2		New project
2014-094	Multi-hazard/ Hurricane	Backup Power for 16,000 Gallon Fuel Storage Pumps and Infrastructure	Grant was requested to provide emergency power to the pumps and other infrastructure for the 16,000 gallon fuel supply. During Sandy the campus was unable to access its reserves.	SUNY		HMGP	S	H	2		New project
2014-095	Multi-hazard/ Hurricane	Emergency Generator at Empire Commons	Provide emergency generator to power Empire Commons, a residential community. Such capability would permit for longer shelter in place.	SUNY		HMGP	S	H	2		New project
2014-096	Multi-hazard/ Hurricane	Emergency Generator at Memorial Hall	Provide emergency generator to power Memorial Hall. This space may be designated to shelter campus and/or community populations during an emergency.	SUNY		HMGP	S	H	2		New project
2014-097	Multi-hazard/ Hurricane	Emergency Generator at the College Center	Provide emergency generator to power the Campus Center. This space may be designated to	SUNY		HMGP	S	H	2		New project



MULTI-HAZARD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
			shelter campus and/or community populations during an emergency.								
2014-098	Multi-hazard/ Hurricane	Emergency Generator at the Field House	Provide emergency generator to power the Field House. This space may be designated to shelter campus and/or community populations during an emergency.	SUNY		HMGP	S	H	2		New project
2014-099	Multi-hazard/ Hurricane	Stand-by Generator Installations	OPWDD community residences are designed to meet the needs of vulnerable individuals by providing the critical infrastructure tailored for the population residing in the residence. OPWDD is currently installing stand-by electrical generators in community residences, to provide continuity of operations during power outages caused by local outages and /or severe weather events.	OPWDD 1, 2, 3, 4 & 6	\$3,267,500	Operational budgets	S	H	2 3		New project
2014-100	Multi-hazard/ Flood/ Hurricane	Elevate sewage lift station controls	During previous rain events associated with severe weather patterns, the sewage lift station flooded causing extensive damage to the electrical components associated with the lift station. Major disruption of services occurs in meeting the needs of the developmentally disabled staff through displacement of service staff and the closing of buildings that these services are provided in.	OPWDD, State Operations Region 2: Newark Campus	\$33,000	Operational budgets	S	H	2		New project



**MULTI-HAZARD MITIGATION ACTION AND ACTIVITIES MATRIX**

Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
			The failure of the lift station results in backed up sewage within buildings creating an unsanitary condition. Additionally, structure damage can result from these backups. By elevating the controls for pumps and other equipment above the predicted water levels resulting from flood events, the disruptions become minimized.								
2014-101	Multi-hazard	Continue GIS tracking system of assets	Continue GIS tracking system database that includes all local bridges, state assets, culverts, bridges with spans over 20" and large culverts that span 5" to 20".	DOT			S	M	1		New project
2014-102	Multi-Hazard	Road Map activities	Implement the SHMP Road Map activities outlined in Section 4, Table 4.	DHSES		HMGP	S	H	1		New project
2011-103	Multi-hazard	Enhance GIS database through increased collaboration	Increase collaboration among local-State technical resources such as GIS, databases, partner with universities and industries to share technical resources and data (GIS layers), and develop GIS resources to support local government mitigation planning efforts.	DHSES, State Agencies			S	M	1	The state continues to make progress with collaboration efforts. Partnering with the NYS GIS Clearing House has significantly expanded so all NYS agencies, various NGO's and many municipalities across the State to share and access GIS data. Efforts to extend and improve on satellite imagery and	Update pending



MULTI-HAZARD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
										LiDAR data continues. New products on sea level rise/flood inundation have been developed by NY NGO's and are being used. However extreme budgetary constraints have and will continue to limit our ability to fully meet needs.	
2011-104	Multi-hazard	Comprehensive Public Education Hazard Awareness Program	<p>Part 1. Continue the Hazard Awareness Program - Maintain NYS citizens and public officials' awareness of natural hazards via the program network capabilities including NYS web site and links, circulating print media, and public service news release.</p> <p>Part 2. Public Education Hazard Awareness Program Enhance the Hazard Awareness Program - Assess program to ensure comprehensive format and collaborate with State agencies to improve information dissemination, i.e. County links to the State Web site and other appropriate outlets.</p> <p>Part 3. General Hazard Awareness Continue and advance hazard awareness initiatives, consider accomplishing initiatives via</p>	DHSES, OTDA, & appropriate State and Local agencies including DOS, DEC, FEMA, Education Department, American Red Cross and NWS			0	H	3	<p>1. The state has made continued progress; and will make every effort further improvement, within the current budgetary constraint.</p> <p>2. Good Progress has been made within the state and local emergency management system. DOS disseminates information pertaining to hazard management and watershed planning on its website. The Division of Coastal Resources recently completed material on watershed planning to be used in public outreach.</p> <p>3. School health curriculum programs</p>	Update pending



MULTI-HAZARD MITIGATION ACTION AND ACTIVITIES MATRIX											
Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
			Schools and Curriculum Development.							continue to stress the importance of personal preparedness. OTDA maintains an intranet site for use by its employees & local district offices that provides Disaster Information.	
2011-105	Multi-hazard	Natural Hazard Analysis data and mapping	Enhance existing statewide hazard analysis data and mapping and continue to improve efforts to make data accessible. Continue use of GIS mapping technology to develop and improve hazard mapping and vulnerability assessments. For instance, consider exploring use of real property data and overlay with landslide hazard characteristics (topo and soils) data to identify vulnerable structures and to assist with hazard mitigation requirements, such as vulnerability assessment and loss estimation. Utilize DHSES web site for web based downloadable hazard information. Encourage NYS Agency contribution to and promote community use of NYS GIS Clearinghouse.	DHSES, Geological Services, DEC, OGS			S	M	1	Continued progress. DHSES will continue to make efforts to develop additional GIS hazard mapping products and make those available thru the NYS GIS Clearinghouse.	Update pending



**MULTI-HAZARD MITIGATION ACTION AND ACTIVITIES MATRIX**

Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
2011-106	Multi-hazard/ Hurricane	Public and Local Officials Education – Mitigation through Hazard Resistant Construction	Enhance efforts to educate NYS citizens and local officials regarding hazard resistant construction methods.	DHSES, DOS, DEC Local Mitigation Planners			O	M	1 3	Limited progress to date has been made on this item. Further action is needed to improve on activity.	Update pending
2011-107	Multi-hazard	Damage loss estimation for NYS government critical facilities	Analyze individual NY State critical facilities to determine potential loss from natural hazards. Conduct detailed loss assessment using NYS OGS fixed asset database, NYS Cyber Security Critical Infrastructure Coordination database and available hazard maps including Q3 and similar maps. Gathering state facility data such as building attributes, positional accuracy, and natural hazard loss estimation will continue through agency partnerships and collaboration in order to support more accurate vulnerability analysis and loss estimation.	DHSES, OGS, All State Agencies		NY State Operating Budget-Federal Grant funds	S	H	1	Efforts to create better data sets are ongoing. Progress has been delayed due to the lack of some information, such as, first floor elevation and latitude/longitude for spacial accuracy.	The first phase of a comprehensive statewide facility inventory project will be implemented Fall 2013, which will develop the methodology to identify risk to state facilities based on hazard vulnerability. The expected completion of Phase one is 2014.
2011-108	Multi-hazard	Promote hardening of NYS Government and State critical facilities to increase resistance to natural hazards	Protect critical government facilities– prioritize structural and non-structural retrofits based on hazard vulnerability analysis.	OGS, DHSES All State Agencies		State operating budget & Federal Mitigation Funds	L	H	2	Continued progress has been made. Facility managers will continue to mitigate for the effects of natural hazards.	The first phase of a comprehensive statewide facility inventory project will be implemented Fall 2013, which will develop the methodology to identify risk to state facilities based on hazard vulnerability. The expected completion of Phase one is 2014. This activity is an expected outcome of the previous activity.
2011-109	Multi-	NY Alert	Encourage utilization of NY-	DHSES			O	H	3	Effort is ongoing.	Encourage State agencies, county and



**MULTI-HAZARD MITIGATION ACTION AND ACTIVITIES MATRIX**

Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
	hazard		Alert statewide: NY-Alert currently has 6.3 million subscribers. Of these, 2.79 million subscribers can receive reverse 911 notifications because their counties have incorporated their 911 databases into the NY-Alert system.								local governments, emergency service agencies and institutions of higher learning to participate in the public warning system. Continue public education and awareness efforts.
2011-110	Multi-hazard/ Coastal Erosion/ Hurricane /Climate Change	Acquisition of Land	Continue to purchase land & explore enhancement options that may prevent development encroachment into hazardous areas. Identifying alternate funding sources for land acquisition resulting in open space or some sort of development prevention in a hazard area is a fundamental form of hazard mitigation.	NYS Parks, NYSDEC (Coastal Erosion) DHSES		Environmen tal Protection Fund & federal grant funding	S	H	2	NYS Parks, DEC, & DHSES continue to pursue properties as well as funding for acquisitions to reduce the vulnerability of structures in hazard prone areas as well as the preservation and addition of open-space in NYS.	Update pending
2011-111	Multi-hazard/ Flood/ Hurricane/ Climate Change	Repetitive Loss Properties -	Identify & Mitigate Severe Repetitive Loss (SRL) and Repetitive Loss Properties. Continue and enhance the comprehensive loss reduction efforts to target repetitive loss properties for mitigation including acquisition and appropriate retrofit of structures.	FEMA, DHSES, DEC		FEMA: HMGP, FMA, and PDM CDBG	S	H	2 3 5	On-going program efforts with continued progress Project funding sources, such as Severe Repetitive Loss Program (SRL) and Repetitive Flood Claims Program (RFC).	Funding allocated through the Community Development Block Grant (CDBG) program.  By the terms of Federal law, activities using NYS CDBG-DR funding may be funded in the following counties: Albany, Bronx, Broome, Chemung, Clinton, Columbia, Delaware, Dutchess, Essex, Fulton, Greene, Herkimer, Kings, Montgomery, Nassau, New York, Oneida, Orange, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk,



**MULTI-HAZARD MITIGATION ACTION AND ACTIVITIES MATRIX**

Year/ Activity Number	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Ranking	Mitigation Goal	2011 Status	2014 Status
											Sullivan, Tioga, Ulster, Warren, Washington, and Westchester.
2011-112	Multi-hazard	Bridge Safety Assurance	DOT is developing a program to assess a bridge's relative vulnerability to the different modes of failure (scour, overloads, steel detail deficiencies, collision, concrete detail deficiencies & earthquakes).	DOT		Operating Budget	0	H	1 2		Update pending



MITIGATION ACTION AND ACTIVITIES MATRIX											
Year	Hazard	Title	Description of Activity	Agency	Est. Cost (General dollar amount)	Funding Source	Timeframe	Priority Rating	Mitigation Goal	2011 Status	2014 Status
2011-114	Wildfire	Forest Fire Safety Awareness and Public Education	Continue Public education and public awareness as key areas in a wildfire prevention program. Programs such as Firewise Communities encourage local solutions for safety by involving homeowners in taking individual responsibility for mitigating their homes from the risk of wildfire. Increase the use of Public Service Announcements, offering a Wildfire Survival Program and developing a pamphlet on the use and benefit of such programs.	DEC	\$10,000	OFSA	0	H	3		NYS receives \$24,000 in grant funding through an annual grant, which has recently turned into a 6-year grant cycle.



In the process of reviewing mitigation actions and activities for the 2014 SHMP update, the SHMP Team reviewed and determined the current status for four “short-term initiatives” that were noted in the 2011 plan. Although competing priorities between 2011 and 2014 limited the State’s ability to report on each of the initiatives within the timeframes noted below, good progress has been made on three of the four topics, with some progress made on the fourth.

- 1. Review the Plan’s Flood Risk Assessment components to:** a) consider reorganizing information to facilitate its use in local plans and explain how to use the Plan’s resources in developing local plans; b) explain how to determine the availability of DFIRM maps, how to access and use them, and what to do if they are not available for a jurisdiction; and c) discuss FEMA’s new Risk MAP (Risk Mapping, Assessment and Planning) Program and its objectives as they evolve and are developed, and provide web links to the most current Risk MAP information on FEMA’s web site (estimated 4-6 months).

*2014 Status: Good progress has been made. The 2014 SHMP Flood Hazard section has been reorganized to include significant local plan information related to flood; data update on the availability of DFIRM maps; and Risk MAP status of the State’s partnership to conduct updates for map flooding. Risk MAP has progressed in phases and will continue into the next plan cycle.*

- 2. Create a section to guide local plan writers by providing:** a) clear descriptions of mitigation measures (as opposed to response measures) and provide sample action plans; b) a primer describing the steps in creating a mitigation plan, their sequence and timeframes, and the tools and skill sets needed to accomplish each task; and c) sample risk assessment information organized by hazard and explaining how to use the Plan’s data to determine a jurisdiction’s own vulnerability (estimated 4-6 months).

*2014 Status: Limited progress has been made. The DHSES Mitigation Section has had to reprioritize limited staff for local plan reviews and post-disaster mitigation actions between 2011 and 2014. SHMP Team suggests carrying the initiative forward into the next planning cycle.*

- 3. Reorganize the Plan’s vulnerability materials to:** a) provide guidance and clarity to local plan writers; b) consistent with security protocols, provide a general discussion of the types, numbers, and locations of State critical facilities to better inventory to State’s assets and assist State and local Continuity of Operations (COOP)-Continuity of Government (COG) efforts (estimated 5-7 months).

*2014 Status: Good progress has been made. a) The Hazard Identification Risk Assessment (HIRA) Sections of the 2014 SHMP have been restructured to strictly follow the 44 CFR 201.4. Individual hazard sections follow the same formats; making it easier to locate characteristics, vulnerabilities and loss information. b) A Statewide Fixed*



*Assets Inventory Project was initiated in September 2013, with a pilot phase scheduled for completion in mid-2014. It is anticipated that this will be a multi-year project.*

4. **Clarify updated material in the Plan by developing a consistent approach at the start of each section:** an example would be to list: a) what the section covers and hopes to accomplish; b) what significant changes are incorporated (or not); c) “local plan writers should pay particular attention to....” (5-7 months)

**2014 Status:** Initiative parts a) and b) have been accomplished by revision of the 2014 SHMP. Part c) can be integrated into initiative #2, above, and this initiative can be removed.

### On-Going “Roadmap Activities”

During the 2014 SHMP update process, additional planning activities were identified for further development during the life cycle of the 2014 plan. These activities will be considered as the State’s “Road Map” to continue enhancing the mitigation plan and program. The Roadmap table is included in this plan as **Appendix 6**.

#### **4.4.4 Progress on Mitigation Actions and Activities**

For the first time, a “Mitigation Progress” table has been included in the 2014 SHMP to provide a comprehensive report on the State’s progress in achieving mitigation goals through implementing activities. This list will be maintained during the monitoring, evaluation and update process described in **Section 6 – Plan Maintenance**, with the goal of providing detailed information in future updates related to activities that have presented the greatest opportunity to reduce the vulnerabilities from specific hazards, and quantifying losses avoided.



**Table 4.4g: Progress on Mitigation Actions and Activities**

Year Added	Proj. No.	Project Title	Project Descriptions	Agency	Hazard Mitigated	Total Project Cost	Funding Source	Losses Avoided (dollars, benefits)	Progress/ Status
N/A	N/A	Event Specific Mitigation	Electrical and mechanical equipment for lock and dam structures has been relocated to higher elevations to avoid repetitive flood damage due to water inundation. Lockhouses, which are re-constructed in flood prone areas, are now placed on piles to avoid scour damage and foundation failure. Dam spillways are constructed to meet or exceed current design standards to reduce future flood damage.	NYS Canal Corp	Flood	Cost Unknown	Funding Source Unknown	TBD	Completed project
2014	N/A	New York State Wildfire Management Plan	Comprehensive plan to mitigate wildfires across the state - outlines plans for training, firefighting, fuel management and prevention education.	DEC	Wildfire	Cost Unknown	Operating Budget	TBD	Completed project



Year Added	Proj. No.	Project Title	Project Descriptions	Agency	Hazard Mitigated	Total Project Cost	Funding Source	Losses Avoided (dollars, benefits)	Progress/ Status
2011	LS6	Establish a working relationship with critical agencies	Develop a Memorandum of Understanding between NYS DOT, NYSGS and USGS to collect subsurface data, samples and exchange the analytical data in order to better develop data sets relating to the landslide hazard.	NYS DOT, NYSGS, USGS	Landslide	N/A	Operating Budget	TBD	Component of Landslide project
2012	N/A	LIDAR	The collection of high resolution elevation data (LIDAR) in 2012 through the NOAA Coastal Services Center. The collection covers the entire tidally-influenced shoreline of NYS from the federal dam at Troy to Long Island (excluding New York City). This data is being used in order to identify areas at greatest risk of coastal flooding, areas of potential tidal wetland mitigation, and to remap state-regulated Coastal Erosion Hazard Areas.	DEC	Coastal Erosion, Climate Change	Cost Unknown	Hudson River Estuary Program	TBD	Completed project
2014	N/A	Sustainable Shoreline Project	Development of guidance for communities on the tradeoffs among management options for controlling shoreline erosion, including relative costs, impacts on habitat functions, and resilience to storms and sea level rise. The project included a series of green shoreline demonstration projects including the design of two ecologically-enhanced (or "green") shoreline treatments to control erosion on shorelines in Cold Springs and Nyack.	DEC	Coastal Erosion	N/A	Hudson River Estuary Program	TBD	Funded



Year Added	Proj. No.	Project Title	Project Descriptions	Agency	Hazard Mitigated	Total Project Cost	Funding Source	Losses Avoided (dollars, benefits)	Progress/ Status
2014	N/A	Assessing Flood Risk in the Mohawk and Hudson River Basin	Research at the State University of New York (SUNY) School of Environmental Science and Forestry to characterize causes of flooding in the Mohawk and Hudson River valleys, including high precipitation, ice dams, and storm surge, and evaluate the relative contribution of upland watershed flow and storm surge to water levels on the main channel of the Hudson River. This will create a statistical framework for assessments of how future flood risk may change.	DEC	Hurricane, Coastal Erosion	Cost Unknown	Hudson River Estuary Program	TBD	Funded – Completion date TBD
2014	N/A	Kingston Waterfront Task Force	Scenic Hudson, the Hudson River National Estuarine Research Reserve, NYS Department of State and the Consensus Building Institute have been working with the Hudson River Estuary Program to design a waterfront flooding task force process for the City of Kingston, NY. The process allows Hudson River waterfront communities to select sea level rise and storm scenarios, undertake a simplified local flood vulnerability assessment, complete a site specific cost-benefit analysis for adaptation strategies to protect their waterfronts, and develop a roadmap for locals. DEC contracting with Catalysis Adaptation Partners (CAP) to use their Coastal Adaptation to Sea level rise Tool (COAST) to undertake the program's cost benefit analysis. The final report is complete and a public meeting is scheduled for fall 2013.	DEC	Climate Change, Flood, Coastal Erosion	Cost Unknown	Hudson River Estuary Program	TBD	Funded



Year Added	Proj. No.	Project Title	Project Descriptions	Agency	Hazard Mitigated	Total Project Cost	Funding Source	Losses Avoided (dollars, benefits)	Progress/ Status
2014	N/A	Habitat Corridor Mapping in the Hudson Valley	Cornell University is working with the Estuary Program to develop a landscape-scale habitat connectivity map based on changes in species distribution caused by climate change. This will help to prioritize land conservation for north-south corridors to allow wildlife migration as the climate changes (plants, animals, and ecosystems).	DEC	Climate Change	Cost Unknown	Hudson River Estuary Program	TBD	Funded
2014	N/A	Long-term Water Level Monitoring Station in the Hudson Estuary	The Hudson River National Estuarine Research Reserve is leading an effort to install a long term water level monitoring station in the Hudson Estuary near Kingston, in partnership with NOAA. This station will help resolve water levels and tide stages for the estuary and track long-term sea level rise.	DEC	Climate Change, Coastal Erosion	Cost Unknown	Hudson River Estuary Program	TBD	Funded
2014	N/A	SLAMM Modeling in the Hudson Estuary	Cornell University and Scenic Hudson are using the SLAMM (Sea Level Rise Affecting Marshes Model) to model potential marsh migration in the Hudson Estuary to develop shoreline conservation priorities and assess the need for barrier removal to facilitate the landward migration of tidal wetlands as sea level rises. Loss of tidal wetlands can impact water quality especially in drought or heat extremes.	DEC	Climate Change, Coastal Erosion	Cost Unknown	Hudson River Estuary Program	TBD	Funded



Year Added	Proj. No.	Project Title	Project Descriptions	Agency	Hazard Mitigated	Total Project Cost	Funding Source	Losses Avoided (dollars, benefits)	Progress / Status
2014	N/A	Hudson Estuary Watershed Resiliency Project	The Estuary Program is funding Cornell Cooperative Extension staff in Columbia, Dutchess, Greene, Orange and Putnam counties to conduct outreach to municipal and landowner audiences in target watersheds on flood resiliency. This effort will address the need for communities to enhance their understanding of stream dynamics, floodplain function and watershed planning to enhance their vulnerability to floods. The project will also evaluate the capacity of communities to respond to floods in a manner that ensures the long-term viability of stream systems and reduces future flooding impacts.	DEC	Flood, Coastal Erosion	Cost Unknown	Hudson River Estuary Program	TBD	Funded
2014	N/A	Climate Smart Communities Certification Program	The Hudson River Estuary Program is funding Vanesse Hagen and Brustlin (VHB) to develop a certification program for the NYS Climate Smart Communities Program. The work is being piloted in four communities in 2013. The program track active Climate Smart Communities and recognize the most active communities. The project will design a roadmap for community climate action.	DEC	Climate Change, Coastal Erosion	Cost Unknown	Hudson River Estuary Program	TBD	Funded
2014	N/A	Oakwood Beach, Staten Island (PL 84-99)	Repair levee and replace damaged electrical equipment	DEC	Hurricane, Coastal Erosion	\$200,000	Federal	TBD	Funded, in progress
2014	N/A	Coney Island Public Beach (PL 84-99)	Repair and re-nourish beach to original design profile	DEC	Hurricane, Coastal Erosion	\$28,000,000	Federal	TBD	Funded, in progress
2014	N/A	Rockaway Public Beach (PL 84-99)	Repair and re-nourish beach to original design profile	DEC	Hurricane, Coastal Erosion	\$84,000,000	Federal	TBD	Funded, in progress



Year Added	Proj. No.	Project Title	Project Descriptions	Agency	Hazard Mitigated	Total Project Cost	Funding Source	Losses Avoided (dollars, benefits)	Progress / Status
2014	N/A	Fire Island Inlet, Gilgo Beach (PL 84-99)	Repair and re-nourish Gilgo Beach back to pre-storm profile	DEC	Hurricane, Coastal Erosion	\$21,046,640	Federal	TBD	Funded, in progress
2014	N/A	Tobay Beach, Town of Oyster Bay	Re-nourish beach area to support new dunes and pavement	DEC	Hurricane, Coastal Erosion	\$2,355,250	NY Works	TBD	Funded, in progress
2014	N/A	Overlook Beach, Town of Babylon	Repair beach; linked to USACE Gilgo Project (PL 84-99)	DEC	Hurricane, Coastal Erosion	\$424,000	NY Works	TBD	Funded, in progress
2014	N/A	Westhampton Interim Project (PL 84-99)	Repair and re-nourish beach to original design profile	DEC	Hurricane, Coastal Erosion	\$34,000,000	Federal	TBD	Funded, in progress
2014	N/A	West of Shinnecock (PL 84-99)	Repair and re-nourish beach to original design profile	DEC	Hurricane, Coastal Erosion	\$10,000,000	Federal	TBD	Funded, in progress
2014	N/A	Coney Island / Sea Gate	Stabilize beach through re-nourishment and building T-groins	DEC	Hurricane, Coastal Erosion	\$30,000,000	Federal	TBD	Funded, in progress
2014	N/A	Rockaway Storm Damage Reduction Project	Study being completed analyzing three alternatives to increase beach stability, relocate boardwalk, and increase resiliency	DEC	Hurricane, Coastal Erosion	\$1,500,000	Federal	TBD	Funded, in progress
2014	N/A	Long Beach Island Storm Damage Reduction Project	Complete study of beach and dune erosion; construct beach and dune system	DEC	Hurricane, Coastal Erosion	\$1,000,000	Federal	TBD	Funded, in progress
2014	N/A	Fire Island to Montauk Point (FIMP)	Beach and dune re-nourishment, breach closure planning, elevation of homes on mainland Long Island, elevation of utilities and roads	DEC	Hurricane, Coastal Erosion	\$700,000,000	Federal	TBD	Funded, in progress
2014	N/A	Fire Island Stabilization Project- part of FIMP	Rebuilding dunes to 15' and beach re-nourishment; may involve property acquisition to allow new alignment	DEC	Hurricane, Coastal Erosion	Cost Unknown	Federal	TBD	Funded, in progress
2014	N/A	Montauk Point Lighthouse Storm Damage Reduction Project	Stabilize rock revetments and slopes supporting Montauk Lighthouse	DEC	Hurricane, Coastal Erosion	\$500,000	Federal	TBD	Funded, in progress
2014	N/A	South Shore Staten Island	USACE to complete feasibility study to provide protection for structures using beaches, dunes, interior drainage areas, seawalls, and revetments	DEC	Hurricane, Coastal Erosion	\$1,500,000	Federal	TBD	Funded, in progress



Year Added	Proj. No.	Project Title	Project Descriptions	Agency	Hazard Mitigated	Total Project Cost	Funding Source	Losses Avoided (dollars, benefits)	Progress/ Status
2014	N/A	Oakwood Beach Natural Infrastructure Feasibility Study	Mini-feasibility study to see if wetlands can be added to USACE project for South Shore of Staten Island Feasibility Study	DEC	Hurricane, Coastal Erosion	\$469,520	NY Works	TBD	Funded, in progress
2014	N/A	Village of Asharoken Storm Damage Reduction Project	Complete feasibility study and conduct design and construct measures, including renourishment, to protect road connecting Eaton's Neck to mainland Long Island	DEC	Hurricane, Coastal Erosion	\$1,500,000	Federal	TBD	Funded, in progress
2014	N/A	Village of Bayville Storm Damage Reduction Project	Feasibility study to determine measures needed to protect Village from flooding	DEC	Hurricane, Coastal Erosion	\$2,000,000	Federal	TBD	Funded, in progress
2014	N/A	Hashamomuck Cove Storm Damage Reduction Project	Feasibility study to determine method to protect County Route 48	DEC	Hurricane, Coastal Erosion	\$2,600,000	Federal	TBD	Funded, in progress
2014	N/A	Lake Montauk Harbor Storm Damage Reduction and Navigation Project	Feasibility study to re-nourish beach, build a groin, and expand navigational channel to provide heightened protection to properties	DEC	Hurricane, Coastal Erosion	\$1,000,000	Federal	TBD	Funded, in progress
2014	N/A	Robert Moses Beach Phase II	Dredge approximately 1,200,000 CY of sand; requires impact analysis	DEC	Hurricane, Coastal Erosion	\$40,000,000	Federal	TBD	Funded, in progress



## 4.5 Mitigation Funding Source

New York State acknowledges the importance of not only recognizing the mitigation actions and activities that will achieve its mitigation goals and objectives, but also providing sources for funding the implementation of these activities. **Table 4.5h** provides a list of programs, descriptions, and links for local, regional, and state planners who are seeking funding sources. **Table 4.5h** indicates whether the available funding is for projects involving Regulatory, Technical, or Financial aspects of hazard mitigation.

These sources include not only programs actively providing funding for current mitigation projects (as indicated in **bold font** in **Table 4.5h**), but also those that may be of interest to local planners as potential funding sources. Several current funding sources and the respective lead agencies noted in **Table 4.5h** appear throughout this plan as integral to the successful coordination and achievement of several projects involving multiple stakeholders at the local, state, and federal levels, as well as the private sector. These funding sources include the United State Army Corps of Engineers (USACE), which is actively funding multiple hazard mitigation projects related to coastal erosion in the areas impacted by Hurricane Sandy, and the New York State Energy Research and Development Authority (NYSERDA), which has funded several collaborative studies in the area of the impacts of climate change as a result of the ongoing coordination efforts of the statewide interagency adaptation working group.

Changes of note since the 2011 Plan include the passing of the Biggert Waters Flood Insurance Reform Act of 2012 (BW-12), which made modifications to the National Flood Insurance Program (NFIP). According to FEMA's web site, the legislation "will require the NFIP to raise rates to reflect true flood risk, make the program more financially stable, and change how Flood Insurance Rate Map (FIRM) updates impact policyholders." Regarding funding sources, the legislation eliminated the Severe Repetitive Loss (SRL) and Repetitive Flood Claims (RFC) programs, rolling these into the Hazard Mitigation Assistance (HMA) grant programs. For additional information regarding these changes, local planners are encouraged to refer to FEMA's Unified Hazard Mitigation Assistance Guidance available on the FEMA web site<sup>5</sup>.

Additionally, the impact of repeat severe disasters since the 2011 Plan – including Hurricane Irene, Tropical Storm Lee, and Hurricane Sandy – has made available significant post-disaster funding for hazard mitigation and focused the entire state on the concepts of mitigation and resiliency, which are strongly championed by the Governor's office. Mitigation is a top priority statewide, which has energized interagency collaboration on projects and led to the reprioritization of state funds to strengthen infrastructure and support buyout programs for repetitive loss properties. The state has worked diligently with local governments and homeowners to identify and address roadblocks to buyout program success, including making additional funds available to eliminate homeowner cost shares and providing funding to help local governments identify and pre-designate

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<sup>5</sup> FEMA's Unified Hazard Mitigation Assistance Guidance - <http://www.fema.gov/media-library/assets/documents/33634?id=7851>



appropriate relocation development sites in order to alleviate concerns that buyout programs might erode tax bases and reduce voting populations.

Statewide initiatives such as New York Rising, New York Works, and the New York State Resiliency Institute for Storms & Emergencies (NY RISE) focus top academic leaders, policy makers, emergency experts, planners, government leaders, and first responders from throughout the state and across the nation on developing strategies and priorities for strengthening local communities and statewide capabilities and resiliency to better withstand future disaster events. As part of these initiatives, the State has implemented creative use of available funding sources, including Community Development Block Grant (CDBG) Disaster Recovery funds appropriated under Public Law 113-2, to support critical infrastructure mitigation projects in the most impacted communities from Hurricane Sandy, Hurricane Irene, and Tropical Storm Lee.

While this section and **Table 4.5h** focus on funding sources, it is important to note that many of the agencies listed as funding sources and as partners in this plan (please see **Section 2** for a detailed list of State partners and participants) are also invaluable sources of regulatory and technical information, assistance, and support. For example, county soil and water conservation districts ([www.nys-soilandwater.org](http://www.nys-soilandwater.org)) provide technical assistance and tools, including GIS watershed maps; the Delaware and Susquehanna River Basin Commissions are federal-interstate commissions created to manage water resources, including flood mitigation projects, and are excellent resources for technical information and assistance; higher education partners have coordinated, funded, and performed numerous research projects in areas such as climate change, adding important data to the statewide and national discussions on these topics; and numerous institutes across New York State offer a variety of technical information, resources, and assistance (e.g., Urban Land Institute guidance on long-term rebuilding to promote resilience and adaptability to sea-level rise; environmental research and information available through the Cary Institute of Ecosystem Studies; and the newly launched New York State Resiliency Institute for Storms & Emergencies). Regional planning councils ([www.cdrpc.org/nysarc.html](http://www.cdrpc.org/nysarc.html)) are another important source of technical assistance, including support for plan writing.

Local planners should note that each resource listed in **Table 4.5h** will have its own eligibility requirements and project criteria, all of which should be researched, understood, and taken into consideration when seeking funding. Certain funding sources specifically require approved hazard mitigation plans as a prerequisite for eligibility. These funding sources include all of FEMA's Hazard Mitigation Assistance (HMA) programs, which comprise the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA) grant programs.

The following is not intended to be a comprehensive list, but rather a starting point for additional research specific to the mitigation projects being undertaken. To assist local planners in this process, clearinghouse web sites have been included at each level (federal, state, and private) to provide a starting point for researching current, specifically applicable funding opportunities. It should be noted that many programs have both federal



and state components, and that many federally funded programs are administered by State agencies and thus may have a State point of contact.

**Table 4.5h: Mitigation Funding Sources**

Federal						
Program	Description	Lead Agency	Link	Regulatory	Technical	Financial
Federal Grant and Assistance Programs for Governments	Catalog of federal disaster assistance and hazard-related grants and assistance	FEMA	<a href="http://www.fema.gov/tribal/grants-and-assistance-programs-governments">http://www.fema.gov/tribal/grants-and-assistance-programs-governments</a>		X	X
Grants.gov	Searchable catalog of federal grant opportunities	U.S. Department of Health and Human Services	<a href="http://www.grants.gov/web/grants/home.html">http://www.grants.gov/web/grants/home.html</a>	X	X	X
National Earthquake Hazards Reduction Program	Program research to advance understanding earthquakes occurrence and impact	National Institute of Science and Technology	<a href="http://www.nehrp.gov/index.htm">http://www.nehrp.gov/index.htm</a>		X	
Decision, Risk, and Management Science Program	Scientific research directed at increasing the understanding and effectiveness of decision making by individuals, groups, organizations, and society	National Science Foundation (NSF)	<a href="http://www.nsf.gov/funding/pgm_summ.jsp?ims_id=5423">http://www.nsf.gov/funding/pgm_summ.jsp?ims_id=5423</a>		X	
Societal Dimensions of Engineering, Science, and Technology Program	Proposals benefiting the study of interactions of engineering, science, technology, and society	NSF	<a href="http://www.nsf.gov/funding/pgm_summ.jsp?ims_id=5323&amp;org=SES">http://www.nsf.gov/funding/pgm_summ.jsp?ims_id=5323&amp;org=SES</a>		X	
Aquatic Ecosystem Restoration	Direct support for carrying out aquatic ecosystem restoration projects that will improve the quality of the environment	Environmental Protection Agency (EPA)	<a href="http://www.epa.gov">http://www.epa.gov</a>			



Federal						
Program	Description	Lead Agency	Link	Regulatory	Technical	Financial
Beneficial Uses of Dredged Materials	Direct assistance for projects that protect, restore, and create aquatic and ecological habitats, including connection with dredging an authorized Federal wetlands, in navigation project	EPA	<a href="http://water.epa.gov/type/oceb/oceandumping/dredgedmaterial/beneficial_use.cfm">http://water.epa.gov/type/oceb/oceandumping/dredgedmaterial/beneficial_use.cfm</a>			
Clean Water Act Section 319 Grants	Grants to States to implement non-point source programs, including support for non- structural watershed resource restoration activities	EPA	<a href="http://water.epa.gov/pollwaste/nps/funding.cfm">http://water.epa.gov/pollwaste/nps/funding.cfm</a>	X	X	X
Water Grants	A variety of grants related to water and wastewater infrastructure projects, including a catalog of federal funding for watershed protection projects	EPA	<a href="http://water.epa.gov/grants_funding">http://water.epa.gov/grants_funding</a>	X	X	X
Urban Waters Small Grants Program	Protect and restore urban waters by improving water quality through activities that also support community revitalization and other local priorities	EPA	<a href="http://www2.epa.gov/urbanwaters">http://www2.epa.gov/urbanwaters</a>		X	
Coastal Zone Management Program	Grants for planning and implementation of nonstructural coastal flood and hurricane hazard mitigation projects and coastal wetlands	National Oceanic and Atmospheric Administration (NOAA)	<a href="http://coastalmanagement.noaa.gov/programs/czm.html">http://coastalmanagement.noaa.gov/programs/czm.html</a>	X	X	X
<b>Community Development Block Grant (CDBG)</b>	Grants to states and local governments to develop viable communities (e.g., housing, suitable living environment, expanded economic opportunities) and recover from Presidentially declared disasters; principally for low- and moderate-income areas	US Department of Housing and Urban Development (HUD)	<a href="http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs">http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs</a>	X	X	X



Federal						
Program	Description	Lead Agency	Link	Regulatory	Technical	Financial
Disaster Housing Program	Emergency assistance for housing, including minor repair of home to establish livable conditions, mortgage and rental assistance	HUD	<a href="http://www.hud.gov/news/dhap.cfm">http://www.hud.gov/news/dhap.cfm</a>			X
HOME Investment Partnerships Program	Grants to local and state government and consortia for permanent and transitional housing, (including financial support for property acquisition and rehabilitation for low-income persons)	HUD	<a href="http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/affordablehousing/programs/home">http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/affordablehousing/programs/home</a>			X
HUD Disaster Recovery Assistance	Grants to fund gaps in available recovery assistance after disasters (including mitigation)	HUD	<a href="http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/dri">http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/dri</a>			X
Section 108 Loan Guarantee	Enables states and local governments participating in the Community Development Block Grant (CDBG) program to obtain federally guaranteed loans for disaster-distressed areas	HUD	<a href="http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/108">http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/108</a>			X
National Flood Insurance Program	Formula grants to States to assist FEMA communities to comply with NFIP floodplain management requirements (Community Assistance Program)	FEMA	<a href="http://www.fema.gov/national-flood-insurance-program">http://www.fema.gov/national-flood-insurance-program</a>	X		
National Dam Safety Program	Technical assistance, training, and grants to help improve State dam safety programs	FEMA	<a href="http://www.fema.gov/about-national-dam-safety-program">http://www.fema.gov/about-national-dam-safety-program</a>	X	X	
Hazard Mitigation Assistance (HMA)	Grants to provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages – includes FMA, HMGP, PDM (below)	FEMA	<a href="http://www.fema.gov/hazard-mitigation-assistance">http://www.fema.gov/hazard-mitigation-assistance</a>		X	X



Federal						
Program	Description	Lead Agency	Link	Regulatory	Technical	Financial
<b>Flood Mitigation Assistance (FMA) Program</b>	Grants to States and communities for pre-disaster mitigation planning and projects to help reduce or eliminate the long-term risk of flood damage to structures insurable under the National Flood Insurance Program	FEMA	<a href="http://www.fema.gov/flood-mitigation-assistance-program">http://www.fema.gov/flood-mitigation-assistance-program</a>		X	X
<b>Hazard Mitigation Grant Program (HMGP)</b>	Grants to States and communities for planning and projects providing long-term hazard mitigation measures following a major disaster declaration	FEMA	<a href="http://www.fema.gov/hazard-mitigation-grant-program">http://www.fema.gov/hazard-mitigation-grant-program</a>		X	X
<b>Pre-Disaster Mitigation (PDM) Competitive Grant Program</b>	Grants to States and communities for planning and projects that provide long-term hazard pre-disaster mitigation measures	FEMA	<a href="http://www.fema.gov/pre-disaster-mitigation-grant-program">http://www.fema.gov/pre-disaster-mitigation-grant-program</a>		X	X
<b>Public Assistance: Hazard Mitigation Funding Under Section 406</b>	Hazard mitigation discretionary funding available under Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act following a Presidentially declared disaster	FEMA	<a href="http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit/hazard-mitigation-funding-under-section-406-0">http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit/hazard-mitigation-funding-under-section-406-0</a>			X
<b>Partners for Fish and Wildlife</b>	Financial and technical assistance to private landowners interested in pursuing restoration projects affecting wetlands and riparian habitats	US Fish and Wildlife Service	<a href="http://www.fws.gov/partners">http://www.fws.gov/partners</a>		X	X
National Trust Preservation Funds (NTPF)	Funding awarded to nonprofit organizations and public agencies for planning and education projects	National Trust for Historic Preservation	<a href="http://www.preservationnation.org">http://www.preservationnation.org</a>		X	



Federal						
Program	Description	Lead Agency	Link	Regulatory	Technical	Financial
Historic Preservation Financial Assistance – General	Federal financial assistance specifically for historic preservation	Advisory Council on Historic Preservation	<a href="http://www.achp.gov/funding-general.html">http://www.achp.gov/funding-general.html</a>		X	X
<b>FHWA Emergency Relief Program</b>	Fund for the repair or reconstruction of Federal-aid highways that have suffered serious damage as a result of (1) natural disasters or (2) catastrophic failures from an external cause	U.S. Department of Transportation (DOT)	<a href="http://www.fhwa.dot.gov/programadmin/erelief.cfm">http://www.fhwa.dot.gov/programadmin/erelief.cfm</a>			X
Transportation Investment Generating Economic Recovery (TIGER)	Investing in critical road, rail, transit and port projects across the nation	DOT	<a href="http://www.dot.gov/tiger">http://www.dot.gov/tiger</a>		X	X
<b>American Recovery and Reinvestment Act of 2009</b>	Invest in transportation, environmental protection, and other infrastructure that will provide longer term economic benefits	DOT	<a href="http://www.dot.gov">http://www.dot.gov</a>		X	X
National Institute of Food and Agriculture's Disaster Resilience for Rural Communities Grant Program	Advance basic research in engineering and in the social, behavioral, and economic sciences to enhance disaster resilience in rural communities	United States Department of Agriculture (USDA)	<a href="http://www.usda.gov/wps/portal/usda/usdahome">http://www.usda.gov/wps/portal/usda/usdahome</a>		X	
Emergency Loan Program	USDA's Farm Service Agency (FSA) provides emergency loans to help producers recover from production and physical losses due to drought, flooding, other natural disasters or quarantine	USDA	<a href="http://www.usda.gov/wps/portal/usda/usdahome">http://www.usda.gov/wps/portal/usda/usdahome</a>			X



Federal						
Program	Description	Lead Agency	Link	Regulatory	Technical	Financial
<b>Emergency Watershed Protection (EWP) program</b>	Provide assistance to relieve imminent hazards to life and property caused by floods, fires, drought, windstorms, and other natural occurrences	Natural Resources Conservation Service (NRCS)	<a href="http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/ewp/">http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/ewp/</a>		X	X
Financial Assistance	Financial assistance to help plan and implement conservation practices that address natural resource concerns or opportunities to help save energy, improve soil, water, plant, air, animal and related resources on agricultural lands and non-industrial private forest land	NRCS	<a href="http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial">http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial</a>		X	X
Homeland Security Grant Program (HSGP)	Prevent, protect against, mitigate, respond to, and recover from acts of terrorism and other threats.	Department of Homeland Security (DHS)	<a href="http://www.dhs.gov/news/2013/08/23/dhs-announces-grant-allocation-fiscal-year-fy-2013-preparedness-grants">http://www.dhs.gov/news/2013/08/23/dhs-announces-grant-allocation-fiscal-year-fy-2013-preparedness-grants</a>		X	X
Urban Areas Security Initiative (UASI)	Enhance regional preparedness and capabilities in 25 high-threat, high-density areas	DHS	<a href="http://www.dhs.gov">http://www.dhs.gov</a>		X	X
Operation Stonegarden (OPSG)	Enhance cooperation and coordination among local, tribal, territorial, state, and Federal law enforcement agencies to jointly enhance security along the United States land and water borders	DHS	<a href="http://www.dhs.gov">http://www.dhs.gov</a>		X	X
Emergency Management Performance Grants (EMPG) Program	Assist local, tribal, territorial, and state governments in enhancing and sustaining all-hazards emergency management capabilities	DHS	<a href="http://www.dhs.gov">http://www.dhs.gov</a> - OR - <a href="http://www.fema.gov/fy-2013-emergency-management-performance-grants-empg-program-0">http://www.fema.gov/fy-2013-emergency-management-performance-grants-empg-program-0</a>		X	X



Federal						
Program	Description	Lead Agency	Link	Regulatory	Technical	Financial
FY 2012 Disaster Relief Opportunity	Help communities and regions devise and implement long-term economic redevelopment strategies through a variety of construction and non-construction projects	Economic Development Administration (EDA)	<a href="http://www.eda.gov/disasterrecovery.htm">http://www.eda.gov/disasterrecovery.htm</a>		X	X
Solicitation of Project Proposals for Innovative Safety, Resiliency, and All-Hazards Emergency Response and Recovery Research Demonstrations	Research, Development, Demonstration, and Deployment Program funds for innovative safety, resiliency, and all-hazards emergency response and recovery research demonstration projects of national significance.	Federal Transit Administration (FTA)	<a href="http://www.fta.dot.gov/grants/13077_15698.html">http://www.fta.dot.gov/grants/13077_15698.html</a>		X	X
Land & Water Conservation Fund	Matching grants to states and local governments for the acquisition and development of public outdoor recreation areas and facilities (as well as funding for shared federal land acquisition and conservation strategies)	National Park Services	<a href="http://www.nps.gov/lwcf/">http://www.nps.gov/lwcf/</a>		X	X
Missions & Appropriations	Budget and funding to support missions including research, feasibility studies, construction, and disaster relief (e.g., Disaster Relief Appropriations Act of 2013)	U.S. Army Corps of Engineers (USACE)	<a href="http://www.usace.army.mil">http://www.usace.army.mil</a> <b>Buffalo District:</b> <a href="http://www.lrb.usace.army.mil">http://www.lrb.usace.army.mil</a> <b>New York District:</b> <a href="http://www.nan.usace.army.mil">http://www.nan.usace.army.mil</a>	X	X	X



Federal						
Program	Description	Lead Agency	Link	Regulatory	Technical	Financial
State Water Resources Research Institute Program	National competitive grants to support research on the topic of improving and enhancing the nation's water supply, including evaluation of innovative approaches to water treatment, infrastructure design, retrofitting, maintenance, management, and replacement; evaluation of the dynamics of extreme hydrological events and associated costs; development of methods for better estimation of the physical and economic supply of water	U.S. Geological Survey (USGS)	<a href="http://www.usgs.gov">http://www.usgs.gov</a>		X	
Sea Grant	National competitive funding opportunities in the areas of research and development, education, extension and outreach to respond to high priority issues and opportunities (e.g., climate, aquaculture)	National Oceanic and Atmospheric Administration (NOAA)	<a href="http://seagrant.noaa.gov">http://seagrant.noaa.gov</a>		X	X
State						
New York State Grant Opportunities	Centralized listing of funding programs & grant opportunities	New York State	<a href="http://www.nysegov.com/citGuide.cfm?superCat=102&amp;cat=410&amp;content=main">http://www.nysegov.com/citGuide.cfm?superCat=102&amp;cat=410&amp;content=main</a>	X	X	X
DHSES Grant Programs	Centralized listing of various Homeland Security grants	New York State Department of Homeland Security & Emergency Services (DHSES)	<a href="http://www.dhses.ny.gov/grants">http://www.dhses.ny.gov/grants</a>		X	X



State						
Program	Description	Lead Agency	Link	Regulatory	Technical	Financial
Grant & Bid Opportunities	Grant, bid, and funding opportunities including local waterfront revitalization and watershed protection	NYS Department of State (NYSDOS)	<a href="http://www.dos.ny.gov/funding">http://www.dos.ny.gov/funding</a>		X	X
Local Government Records Management Improvement Fund (LGRMIF) Disaster Recovery Grants	Grants for disaster recovery projects related to damage caused by a sudden, unexpected event involving fire, water, man-made or natural phenomena where a timely response is necessary to prevent the irretrievable loss of vital or archival records, or to ensure reasonable, timely access to vital records	New York State Archives / New York State Education Department	<a href="http://www.archives.ny.gov/a/grants/grants_lgrmif.shtml">http://www.archives.ny.gov/a/grants/grants_lgrmif.shtml</a>		X	X
The New York State Emergency Services Revolving Loan	Repair of firefighting apparatus, ambulances, or rescue vehicles; Renovation, rehabilitation, or repair of facilities that house firefighting equipment, ambulances, rescue vehicles, and related equipment	New York State Division of Homeland Security and Emergency Services (DHSES)	<a href="http://www.dhSES.ny.gov/ofpc/services/loan/">http://www.dhSES.ny.gov/ofpc/services/loan/</a>			X
<b>NY Rising Community Reconstruction Program</b>	Provide additional rebuilding and revitalization assistance to communities severely damaged by Hurricanes Sandy and Irene and Tropical Storm Lee	New York State Housing Trust Fund Corporation (HTFC)	<a href="http://stormrecovery.ny.gov/community-reconstruction-program">http://stormrecovery.ny.gov/community-reconstruction-program</a>			X



State						
Program	Description	Lead Agency	Link	Regulatory	Technical	Financial
Environmental Protection Fund (EPF)	Matching grants for the acquisition, planning, development, and improvement of parks, historic properties	New York State Parks, Recreation & Historic Preservation (NYSOPRHP)	<a href="http://www.nysparks.com/grants">http://www.nysparks.com/grants</a>			X
Recreational Trails (RTP) Program	Matching grants for the acquisition, development, rehabilitation and maintenance of trails and trail-related projects	NYSOPRHP	<a href="http://www.nysparks.com/grants">http://www.nysparks.com/grants</a>			X



State						
Program	Description	Lead Agency	Link	Regulatory	Technical	Financial
New York State Disaster Homeownership Repair and Rebuilding Fund	Providing new funding for qualified homeowners whose property was damaged or destroyed by Hurricane Sandy	New York State	<a href="http://scoem.suffolkcountyny.gov/OEM/DisasterHomeownershipRepairandRebuildingFund.aspx#.UnPOUvkqjbk">http://scoem.suffolkcountyny.gov/OEM/DisasterHomeownershipRepairandRebuildingFund.aspx#.UnPOUvkqjbk</a>			X
<b>Energy-Related Funding Opportunities</b>	Funding available to private or institutional entities submitting project plans to address NYSERDA's broad energy and environmental challenges	New York State Research & Development Authority (NYSERDA)	<a href="http://www.nyserda.ny.gov/Funding-Opportunities.aspx">http://www.nyserda.ny.gov/Funding-Opportunities.aspx</a>		X	X
Environmental Protection & Improvement Grants	Competitive grants for environmental protection and improvement; available for municipalities, community organizations, not-for-profit organizations and others	New York State Department of Environmental Conservation	<a href="http://www.dec.ny.gov/pubs/grants.html">http://www.dec.ny.gov/pubs/grants.html</a>		X	X



Non-Profit Organizations – NGO's						
Program	Description	Lead Agency	Link	Regulatory	Technical	Financial
Foundation Center	Online tool to assist in finding funders, help with proposal writing, and information on private philanthropy in the United States	Foundation Center	<a href="http://foundationcenter.org">http://foundationcenter.org</a>		X	X
Western New York Grantmakers Association	Partnership with local libraries to provide grantseeking resource for nonprofits and consultants, updated weekly with interactive maps and charts showing foundations' giving priorities	Western New York Grantmakers Association	<a href="http://www.wnygrantmakers.org">http://www.wnygrantmakers.org</a>		X	X
American Red Cross	Shelter, food, support, supplies, and direct assistance to populations impacted by disaster	American Red Cross	<a href="http://www.redcross.org">http://www.redcross.org</a>		X	X
Rockefeller Foundation	Grants to support initiatives that meet their goals of revaluing ecosystems, advancing health, securing livelihoods, and transforming cities (includes resiliency)	Rockefeller Foundation	<a href="http://www.rockefellerfoundation.org/grants">http://www.rockefellerfoundation.org/grants</a>		X	X
Philanthropy New York	Association of NY/NJ grant makers; main area of interest for grant seekers is their list of funders accepting the Association's common application	Philanthropy New York	<a href="http://www.philanthropynewyork.org/s_nyrag/doc.asp?CID=5494&amp;DID=14857">http://www.philanthropynewyork.org/s_nyrag/doc.asp?CID=5494&amp;DID=14857</a>			X
The Nature Conservancy	Conservation organization partnering with communities, business, government, and other non-profits to protect ecologically important lands and waters for nature and people	The Nature Conservancy	<a href="http://www.nature.org">http://www.nature.org</a>		X	X



Non-Profit Organizations – NGO's						
Program	Description	Lead Agency	Link	Regulatory	Technical	Financial
The Trust for Public Land	Assistance to state and local governments including land conservation transactions, conservation finance, park design & development	The Trust for Public Land	<a href="http://www.tpl.org/services/conservation-finance">http://www.tpl.org/services/conservation-finance</a>		X	X
New York Land Protection Program & Conservation Finance Program	Direct acquisition and conservation easements; grants and short-term, low-cost bridge loans for land transactions in selected landscapes in the eastern United States	Open Space Institute	<a href="http://www.osiny.org/site/PageServer?pagename=Program_CFP">http://www.osiny.org/site/PageServer?pagename=Program_CFP</a>		X	X
Public Health Programs	Provides funding, expertise, information, leadership and/or connections to specific groups of people for projects addressing priority public health challenges	CDC Foundation	<a href="http://www.cdcfoundation.org">http://www.cdcfoundation.org</a>		X	X
The Breezy Point Disaster Relief Fund	To aid Breezy Point community members in the greatest financial need in the wake of Hurricane Sandy	The Breezy Point Disaster Relief Fund, Inc.	<a href="http://breezypointdisasterrelief.org">http://breezypointdisasterrelief.org</a>			X



## Section 5: COORDINATION OF LOCAL MITIGATION PLANNING

### 2014 SHMP Update

- Meets Requirements §201.4(c)(4)(i), §201.4(c)(4)(ii), §201.4(c)(4)(iii), and §201.4(d)
- Updated review process for Local Hazard Mitigation Plans (LHMPs)
- Integrated goals and hazard rankings from LHMPs
- Updated current process and criteria for potential funding
- Integrated planning and non-planning grant prioritization process

### "Roadmap" Activity<sup>1</sup>

In addition to the long-term and ongoing multi-hazard and hazard-specific strategies identified in **Section 4**, DHSES will continue to develop this section in key areas, such as integration of vulnerability and loss data from hazard mitigation plans, over the life cycle of the plan.

**Requirement §201. (c)(4)(i):** *The section on the Coordination of Local Mitigation Planning **must** include a description of the State process to support, through funding and technical assistance, the development of local mitigation plans.*

**Requirement §201. (c)(4)(ii):** *The section on the Coordination of Local Mitigation Planning **must** include a description of the State process and timeframe by which the local plans will be reviewed, coordinated, and linked to the State Mitigation Plan.*

**Requirement §201. (c)(4)(iii):** *The section on the Coordination of Local Mitigation Planning **must** include] criteria for prioritizing communities and local jurisdictions that would receive planning and project grants under available funding programs, which **should** include consideration for communities with the highest risks, repetitive loss properties, and most intense development pressures. Further, that for non-planning grants, a principal criterion for prioritizing grants **shall** be the extent to which benefits are maximized according to a cost benefit review of proposed projects and their associated costs.*

**Requirements §201.4(d):** *Plan **must** be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and change in priorities.*

<sup>1</sup> Roadmap Activities are action items to be developed further during the life-cycle of the plan, through the monitoring, evaluation and update process. The comprehensive list of action items can be found in **Sections 2 and 4**.



**This section focuses on the State's participation in and support of local mitigation planning. The following topics are addressed in the sub-sections:**

- 5.1 Local Funding and Technical Assistance
- 5.2 Local Plan Integration
- 5.3 Prioritizing Local Assistance

## 5.1 Local Funding and Technical Assistance

***Requirement §201.4(c)(4)(i):** The section on the Coordination of Local Mitigation Planning **must** include a description of the State process to support, through funding and technical assistance, the development of local mitigation plans.*

With the enactment of the Disaster Mitigation Act (DMA) of 2000, all jurisdictions must have a hazard mitigation plan approved by FEMA to receive funding from the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance (FMA) program. It is the role of the State to provide funding and technical assistance to local governments for plan development and enhancement, and to ultimately support progress in mitigation by implementation of local initiatives through funding assistance.

### 5.1.1 Background

Starting in 1997, following the passage of the National Flood Insurance Reform Act of 1994 which mandated the preparation of floodplain management plans as a pre-requisite for project implementations funds, the New York State Division of Homeland Security and Emergency Services (DHSES) Mitigation Section has facilitated and supported planning at the local level. At that time, local community mitigation plans were largely unavailable and local hazard and risk information was not consistently maintained. Since that time, local planning and data management has improved significantly, and the process has evolved into a more formal and intentional effort to focus assistance to local governments in the form of funding and technical assistance for planning as well as projects and activities. Previous updates of the SHMP have documented the continual enhancement of this process.

Local plan development has evolved especially during the past two update cycles to focus on multi-jurisdictional plans at the county level. The *New York State Hazard Mitigation Planning Standards* (October 2012) (**Appendix 5, Attachment A**) were developed to provide guidance for the local planning process and plan content. **This process will continue and become even more fully integrated during the next SHMP plan update cycle. Guidance provided by the Planning Standards ensures that counties will continue to:**

- Meet the requirements of DMA 2000 for local hazard mitigation plans



- Include the unincorporated and incorporated parts of the county, regardless of population
- Specifically address natural hazards and mitigation strategies and initiatives for each jurisdiction
- Develop data, risk assessments, and mitigation strategies that are consistent enough to facilitate not only local analysis and action, but also regional and state-wide analysis and collaborations

### 5.1.2 Process to Support Local Plan Development

The DHSES Mitigation Section provides support for local plan development on an on-going basis during day-to-day operations, during county LHMP update cycles and in the aftermath of disasters.

Depending on the issue in question, the Mitigation Section may respond immediately or, if research is required, provide a response as quickly as possible. **Questions fielded from local jurisdictions as part of day-to-day operations typically consist of the following topics:**

- Hazard Mitigation Plan development and funding
- Planning process and mitigation strategy
- Project development and/or implementation
- Plan monitoring and evaluation
- Potential funding sources
- Grant applications and funding cycles
- DMA 2000 and 44 CFR 201.4

During a local jurisdiction's plan update cycle, technical assistance requests are addressed as they are received, unless there is a time-critical element related to the deadline for FEMA approval or a grant funding period. Technical assistance may be ongoing throughout a local jurisdiction's plan update cycle.

During and immediately after disasters, the Mitigation Section staff monitors hazard conditions that have impacted or may potentially impact current or planned actions and activities. In addition, the Public Assistance (PA) process allows the Mitigation Section to provide input to state and local project development that may create opportunities for mitigation through Section 406 funding. Following each disaster, the Mitigation Section manages the HMGP, as well as other federal mitigation grant programs that provide funding for plan development and projects.

Assistance is provided by phone, email and face-to-face interactions.



### 5.1.3 Funding Support for Local Plan Development

LHMPs are an integral part of the strategy for the reduction of risk in New York State. Recognizing their value, funding is available to assist jurisdictions in new and updated LHMP development.

Many jurisdictions require some form of funding assistance to develop and update their LHMPs (FEMA requires that local plans be updated every five years, but plans may be updated more frequently if needed—e.g., after a major disaster). The availability of post-disaster mitigation funds in New York as a result of numerous recent disaster declarations has provided further incentive to local jurisdictions to develop and update their mitigation plans.

The primary source of mitigation funding for local plan development is through FEMA's Hazard Mitigation Assistance (HMA) grant programs, which provides funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. The FEMA-administered HMA includes the specific grant programs described in **Table 5.1a**.

**Table 5.1a: FEMA Unified Hazard Mitigation Assistance (HMA) Program**

<b>Hazard Mitigation Grant Program (HMGP)</b>
<p><b>Purpose:</b> To significantly reduce or permanently eliminate future risk to lives and property from natural hazards. HMGP funds mitigation planning, as well as projects consistent with priorities identified in State, Tribal, or local hazard mitigation plans.</p> <p><b>Available:</b> Post-disaster - tied to disaster and emergency declarations under the HMA</p>
<b>Pre-Disaster Mitigation (PDM)</b>
<p><b>Purpose:</b> To provide funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event, to reduce immediate overall risks to the population and structures, and long-term reliance on funding from disaster declarations.</p> <p><b>Available:</b> Annually</p>
<b>Flood Mitigation Assistance (FMA)</b>
<p><b>Purpose:</b> To reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program (NFIP).</p> <p><b>Available:</b> Annually</p>

In addition to FEMA HMA grants, plan development funding is available through a State legislative pre-disaster mitigation (L-PDM) grant. The Mitigation Section provides information to local governments related to this source of funding when it becomes available.



The process for providing funding support for hazard mitigation planning begins with FEMA notification to the NYSDHSES Mitigation Section that funding is available to support hazard mitigation planning grants. The State Hazard Mitigation Office, with input from Mitigation Section staff, makes a determination whether funding is adequate to provide to all counties with scheduled plan expiration within the grant period. Fortunately, in the past New York State has had adequate funding to support all counties that commit to the planning requirements described in the Planning Standards. In the case that funding is insufficient to provide assistance to all counties in a funding cycle, the Mitigation Section has developed general criteria that can guide prioritization of planning grants (see **Section 5.3.1**).

Once the funding amount is confirmed and notification of awards is made to the county emergency management offices, requirements of the Planning Standards are defined in contractual obligations.

During the grant contract period, Mitigation Staff coordinates on a regular basis with local sub-grantee jurisdictions. Coordination during the grant period involves quarterly reports and staff availability for monthly outreach through telephone calls and meetings. Six months prior to the end of the grant period (for planning grants), a draft of the plan is submitted to the DHSES Mitigation Section. Extensions may be granted for special considerations, but are determined on a case-by-case basis. Under the “extraordinary circumstances” provision, the State may request an extension from FEMA if a county has received project grant funding and doesn’t have a current FEMA-approved plan in place. In that situation, the county then has 12 months from the expiration date of the project grant to complete their LHMP and have it approved by FEMA.

#### 5.1.4 Funding Assistance for Local Mitigation Plan Development

**Table 5.1b** defines the nineteen (19) county multi-jurisdictional plans funded by FEMA between 2011 and 2014 (all funded August 27, 2012). Funding was provided primarily through the HMGP and PDM funding programs. Additional jurisdictions received funding assistance through the L-PDM.

**Table 5.1b: Multi-Jurisdictional Planning Grant Applications Approved by FEMA**

Applicant	4020 Planning Application #	Population	Total Cost	75% Federal Share	Local Share
Chautauqua County	013-001	161,199	\$ 58,250	\$ 43,688	\$ 14,563
Clinton County	019-001	82,128	\$ 40,000	\$ 30,000	\$ 10,000
Columbia County	021-002	63,096	\$ 79,990	\$ 59,993	\$ 19,998



Applicant	4020 Planning Application #	Population	Total Cost	75% Federal Share	Local Share
Dutchess County	027-001	297,488	\$ 300,000	\$ 225,000	\$ 75,000
Franklin County	033-001	51,599	\$ 40,000	\$ 30,000	\$ 10,000
Livingston County	051-001	64,328	\$ 77,880	\$ 58,410	\$ 19,470
Madison County	053-001	72,500	\$ 43,400	\$ 32,550	\$ 10,850
Montgomery County	057-005	50,219	\$ 62,500	\$ 46,875	\$ 15,625
Nassau County	059-019	1,339,532	\$ 300,000	\$ 225,000	\$ 75,000
New York City (including Bronx, Kings, New York, Queens, & Richmond Counties)	061-023	8,000,000	\$ 1,000,000	\$ 750,000	\$ 250,000
Oneida County	065-001	230,000	\$ 100,000	\$ 75,000	\$ 25,000
Town/Village of Warwick (Orange County)	071-020	32,065	\$ 110,000	\$ 82,500	\$ 27,500
Putnam County	079-002	104,741	\$ 206,250	\$ 154,688	\$ 51,563
Schenectady County	093-004	154,727	\$ 64,800	\$ 48,600	\$ 16,200
Schuyler County	097-001	18,343	\$ 50,000	\$ 37,500	\$ 12,500
Suffolk County	103-001	1,493,350	\$ 533,000	\$ 399,750	\$ 133,250
Ulster County	111-007	182,493	\$ 200,000	\$ 150,000	\$ 50,000
Westchester County	119-007	949,113	\$ 240,000	\$ 180,000	\$ 60,000
Wyoming County	121-001	43,000	\$ 39,500	\$ 29,625	\$ 9,875
<b>TOTALS</b>		<b>13,389,921</b>	<b>\$ 3,545,570</b>	<b>\$ 2,659,178</b>	<b>\$ 886,393</b>

### 5.1.5 Process for Technical Assistance Support for Local Plan Development

Although funding assistance provides a strong impetus for local mitigation planning efforts, technical assistance from the DHSES Mitigation Section ensures that local plans meet FEMA requirements and support the state's overall mitigation strategy.



Between 2011 and 2014, New York State was impacted by multiple major disasters that reprioritized limited staffing in the Mitigation Section. Although technical assistance was continuously provided during this period, staff resources for local plan review were limited. Despite the impact to Mitigation Section resources, technical assistance has been ongoing through trainings, web-based resources and one-on-one phone and email support. Day-to-day technical assistance support for local plan development is available to all counties. During the LHMP planning update and review cycles, guidance is provided to assist in planning efforts. Additionally, the Mitigation Section promotes FEMA's free online mitigation training courses through the FEMA website, as part of the Independent Study Program (ISP).

The DHSES Mitigation Section provides technical assistance for hazard mitigation planning to any community that requests it. Technical assistance may take the form of guidance documents, regional workshops, one-on-one meetings with the community, or telephone conversations. Mitigation Staff also review and critique draft mitigation plans to ensure they meet the federal requirements prior to submitting the plans to FEMA for review and approval.

In addition, many state agencies and organizations (including colleges and universities) have specialized capabilities (e.g., engineering, scientific) that can provide guidance, technical assistance, and support to communities when faced with disasters, or during the mitigation planning process. These types of services and resources might be cost prohibitive for local jurisdictions to maintain, but state agencies' technical assistance to communities can enhance risk and vulnerability assessments, and help to identify cost-effective and technically feasible mitigation actions.

During the maintenance process for local plan coordination, the DHSES Mitigation Section provides local communities with mitigation planning tools, and guidance. In addition, the Mitigation Section may provide materials by request on a limited basis such as hazard maps, and data including landslide susceptibility, wind zone maps, historical information including disaster declarations, and NFIP report statistics describing both the number of policies and claims. The Mitigation Section has also initiated a process to provide print maps and downloadable PDF and Geographic Information System (GIS) files, hazard maps and data, and a number of planning tools and guidance resources via the DHSES Mitigation web page. During the update process, State mitigation staff also review and critique drafts of local mitigation plans to ensure that they meet the federal mitigation planning requirements prior to submitting the plans to FEMA for review and approval.

The DHSES Planning Section provides support for the use of the state's hazard analysis software (HAZNY) which has become a tool for local communities preparing DMA 2000 LHMPs. During the 2014 SHMP update process, HAZNY was used in a modified format as the State's hazard ranking tool. This process used the general HAZNY criteria in a manner consistent with the local hazard ranking method, but added a mitigation potential weighting factor to determine the final hazard score. (See **Section 3.2.1** for a description of the "HAZNY-Mitigation" ranking process methodology used for the 2014 SHMP.)



## 5.2 Local Plan Integration

**Requirement §201. (c)(4)(ii):** *The section on the Coordination of Local Mitigation Planning **must** include a description of the State process and timeframe by which the local plans will be reviewed, coordinated, and linked to the State Mitigation Plan.*

The local plan review and integration process provides the opportunity for the DHSES Mitigation Section to assess progress in local mitigation planning and projects, as well as trends in development and changes in priorities.

Since 2011, funding and technical assistance support provided by the DHSES Mitigation Section contributed to the successful approval of numerous multi-jurisdictional LHMPs. Of the 62 counties in New York State, 28 currently (as of October 30, 2013) have FEMA-approved LHMPs, and seven (7) have been funded and submitted drafts for review. Also, one (1) county has been funded and submitted a pre-draft; 19 have been funded with no draft yet submitted; one (1) county has a plan approved for county government only. Two (2) county plans need revision and three (3) have expired. During the 2014 SHMP update process, 56 county plans were available for review. **Table 5.2c** provides the current status of all county plans and how to access them.

**Table 5.2c: Local Hazard Mitigation Plan Approval Status (2011-2014)**

County	Status	Plan Date	Access (Web, Electronic, Hard Copy, or Not Available)
Albany	Approved	2010	E
Allegany	Approved	2011	W
Bronx*	Funded, No Draft Submitted	2009	W
Broome	Approved	2013	W
Cattaraugus	Funded, Draft Submitted	2013	W
Cayuga	Funded, Draft Submitted	2013	W
Chautauqua	Funded, No Draft Submitted	(New)	W
Chemung	Approved	2012	W
Chenango	Expired	2008	W
Clinton	Funded, Draft Submitted	2013	W
Columbia	Funded, Draft Submitted	2008	W
Cortland	Approved	2011	N/A
Delaware	Approved	2013	W
Dutchess	Funded, No Draft	2011	W (hazards only)
Erie	Funded, Draft Submitted	2005	W
Essex	Approved	2011	W
Franklin	Funded, Pre-Draft Submitted	2013	E
Fulton	Approved	2011	W
Genesee	Approved	2011	W



County	Status	Plan Date	Access (Web, Electronic, Hard Copy, or Not Available)
Greene	Approved	2011	E
Hamilton	Needs Revisions	n/a	N/A
Herkimer	Needs Revisions	n/a	N/A
Jefferson	Approved	2011	W
Kings*	Funded, No Draft Submitted	2009	W
Lewis	Approved	2011	W
Livingston	Funded, No Draft Submitted	2008	N/A
Madison	Funded, No Draft Submitted	2008	W
Monroe County	Approved	2011	W
Montgomery	Approved	2009	W
Nassau	Funded, No Draft Submitted	2007	E
New York*	Funded, No Draft Submitted	2009	W
Niagara	Approved	2009	W
Oneida	Funded, No Draft Submitted	2007	W
Onondaga	Approved	2012	W
Ontario	Approved	2010	E
Orange	Approved (for govt. only)	2011	W
Orleans	Expired	2008	W
Oswego	Approved	2013	W
Otsego	Approved, Pending Adoption	2013	W
Putnam	Funded, No Draft Submitted	New	N/A
Queens*	Funded, No Draft Submitted	2009	W
Rensselaer	Approved	2012	W
Richmond*	Funded, No Draft Submitted	2009	W
Rockland	Approved	2011	W
Saratoga	Approved	2011	W
Schenectady	Funded, No Draft Submitted	2008	W
Schoharie	Approved	2013	W
Schuyler	Funded, No Draft Submitted	2008	W
Seneca	Expired	2008	E
St. Lawrence	Funded, No Draft Submitted	New	N/A
Steuben	Approved	2010	W
Suffolk	Funded, No Draft Submitted	2008	W
Sullivan	Approved	2013	W
Tioga	Approved	2013	W
Tompkins	Funded, Draft Submitted	2013	W
Ulster	Funded, No Draft Submitted	2011	W
Warren	Approved	2011	W
Washington	Approved	2010	H/C
Wayne	Funded, No Draft Submitted	2007	W
Westchester	Funded, No Draft Submitted	2005	E, H/C
Wyoming	Funded, Draft Submitted	2008	W
Yates	Approved	2011	W

Source: FEMA and DHSES; \*New York City Plan



The State Mitigation Section is responsible for the initial review and coordination of all local mitigation plans within New York State. To ensure consistency in the review process, Mitigation staff use FEMA's Local Mitigation Plan Review Guide (October 1, 2011) and the Local Mitigation Plan Review Tool as review criteria. This guide provides the framework for coordination between the State and FEMA, and describes the process for plan submittals, reviews and revisions.

Prior to 2011, DHSES resources were sufficient to support continuity in review of local mitigation plans. Between 2011 and 2012, repetitive disasters and staffing changes led to challenges in performing local plan reviews. For these reasons, FEMA provided temporary assistance during this period. Since 2013, DHSES Mitigation Section resources have been sufficient to once again assume full responsibility for this function and it is anticipated that this capability can be sustained throughout the implementation period of the 2014 SHMP.

As of October 2012, counties are required to utilize the *New York State Hazard Mitigation Planning Standards (Appendix 5, Attachment A)* for the LHMP planning process, if receiving a state-administered grant to prepare a plan. These standards were developed in close coordination with FEMA Region II hazard mitigation staff. **The state's goal is to make local plans more useful and consistent and to tie them to other non-mitigation planning and activities in disaster management, such as through the following planning recommendations:**

- Communities that convene to prepare a county-wide plan must review flood maps; the state's Planning Standards encourage them to develop or upgrade evacuation routes at the same time.
- The Planning Standards encourage tracking damages at critical facilities in floodplains to document repetitive damage, in order to mitigate at every opportunity, and take full advantage of funding opportunities to mitigate vulnerable facilities through FEMA mitigation funding as well as other potential federal, state and local funding sources.
- Communities are encouraged to prioritize opportunities to mitigate repetitive flood loss properties.
- Communities are encouraged to identify suitable locations to install temporary post-disaster housing and/or relocate flood-damaged homes, keeping people in their communities and near their friends, schools, and places of worship both short-term and long-term.

As of October 30, 2013, 38 of the 62 counties in New York State have FEMA-approved hazard mitigation plans, have submitted drafts, or have plans pending approval or adoption. The other 24 counties were in various stages of plan updates. DHSES works with all counties to provide assistance as well as funding, when available, to counties that are updating plans or do not have a plan in place. In addition, while some counties choose to update their plans without funding assistance, DHSES continues to help in identifying potential funding sources for plan development for counties requiring assistance.



### 5.2.1 Process and Timeframe to Review Local Plans

The DHSES Mitigation Section has a state review process and timeframe in place for local mitigation plans. The state reviews each of the county plans for applicability to the federal requirements prior to FEMA's formal review. The process and timeframe employed by the state for review is described in **Table 5.2d**.

**Table 5.2d: DHSES Local Plan Review Process and Timeframe**

<b>Step 1:</b>	The initial draft of the county plan is sent to DHSES for review which takes place within a timeframe that is dependent upon current disaster status, Mitigation Section staff availability, and the number of plans pending review. If required, revisions are sent back to the county for correction. If no revisions are required, the draft is submitted to FEMA for review and approval.
<b>Step 2:</b>	The county sends the revised draft to DHSES within the agreed-upon timeframe. If all revisions are corrected, DHSES submits the plan to FEMA for review and approval.
<b>Step 3:</b>	DHSES reviews the revisions. If additional revisions are required, the draft is sent back to the county. If all revisions are addressed, DHSES submits the plan to FEMA for review and approval.
<b>Step 4:</b>	FEMA completes its review within 45 days and forward their comments to DHSES. DHSES reviews FEMA's comments and promptly forwards DHSES and FEMA review comments to the county.
<b>Step 5:</b>	The county addresses any FEMA comments. The county submits the corrected final draft to DHSES.
<b>Step 6:</b>	DHSES checks the corrected final draft and forwards it to FEMA for review of corrections.
<b>Step 7:</b>	FEMA completes its second review within 45 days and if all comments were satisfactorily addressed in the corrected final draft of the plan, a letter stating that the plan is adoptable is mailed to DHSES and DHSES notifies the county. In cases where comments have not been addressed satisfactorily, the county again addresses the comments and repeats the process, thereby delaying the timeframe for approval and adoption.
<b>Step 8:</b>	The plan is then formally adopted by all participating jurisdictions within the county within a reasonable period that allows for local review, public participation, legal notices, public hearings, and governing body adoptions. The local adoption process should be completed within a 30- to 60-day timeframe.
<b>Step 9:</b>	The plan is officially approved. The timeframe from the county's submission of the initial draft plan to adoption of the final approved plan can take up to six (6) months to complete.



**Submittal of local plans to FEMA should include the following:**

1. Transmittal letter or email from the State Hazard Mitigation Officer, Governor's Authorized Representative, or other delegated State officer.
2. Local Mitigation Plan document to be reviewed.
3. *Plan Review Tool* completed by the State.
4. If the plan is already adopted by one or more of the participating local jurisdictions, copies of any adopting resolution(s) or letter(s) must be included.

Throughout the development, review and update process, DHSES serves as a liaison between FEMA and the local jurisdictions.

**5.2.2 Process and Timeframe to Coordinate and Link Local and State Plans**

This section provides a description of the State's process and timeframe for coordinating and linking local plans to the state plan. In order to meet the local plan integration requirement, the risk assessment and mitigation strategies of local plans are reviewed to ensure consistency with the state plan.

**The review of local plans focuses on consistency with three main areas:**

1. Federal requirements for Local Hazard Mitigation Planning
2. New York State's hazards and risks
3. New York State's mitigation strategy, goals, and actions

The purpose of this review is to cross-check the state hazard data with that of the local risk assessments. Further, the review ensures that the State's mitigation strategy is reflective of the local mitigation strategies. DHSES also utilizes this opportunity to identify areas where local plans may be improved during the local plan updates.

The State's methodology for local plan review has evolved over the past several mitigation plan updates. In 2005, fewer local plans had been developed, approved and adopted, so the time required to review and integrate local plan data in the SHMP was minimal. The methodology described in the 2011 plan was built on the increasing demand for on-going plan review, funding, technical assistance and monitoring with local jurisdictions. The process at that time was scheduled to commence two years into the SHMP planning cycle, at which time information in the FEMA-approved local plans was to be reviewed and, as deemed appropriate, and incorporated into the appropriate sections of the SHMP (i.e. hazard profiles, jurisdictions most vulnerable, etc.), in an effort to continually improve the accuracy of the SHMP. Information from the local plans was to be compared at that time to the risk areas defined in the SHMP for each hazard, and the SHMP would be adjusted as needed.

Because staff resources since the adoption of the 2011 have had to be redirected to focus on disaster recovery priorities resulting from multiple major disasters, the intended timing



for initiating the local plan integration in the SHMP update was delayed and did not occur until the 2014 update planning process.

A similar methodology was followed for the 2014 SHMP update; however, due to the time-constrained plan update cycle, review of local plans did not begin until three months prior to expiration of the 2011 plan.

The process used for the 2014 update began with identification of all current FEMA-approved county plans and how to access these, such as whether via the web, electronic copy and/or hard copy. Although most LHMPs are available online (and the 2012 NYS *Hazard Mitigation Planning Standards* now require that counties post plans on their websites once approved) some plans remain available only in hard copy at the DHSES Mitigation Section. During the planning process, 56 of 62 county plans were accessed and reviewed. **Table 5.2c** describes the status of county mitigation plans (as of October 30, 2013.)

### **Hazard Identification and Profiles**

The second step to coordinate and link the 56 reviewed county plans to the SHMP was to develop a hazards matrix, based on the 15 hazards identified by the SHMP (see Section 3.0.) Each county plan was reviewed and all identified and ranked hazards were included in the matrix. Next, using the hazards matrix, a separate hazard table was developed for each hazard indicating the top five counties (or less, if fewer incidents had occurred) by previous occurrences and losses. During this step, all counties ranking that hazard as high or moderately high were also noted in the matrix.

DHSES reviewed the hazards identified in both the state and local plans to ensure that there was consistency between the documents. In the 2014 SHMP, DHSES refined its list of hazards to reflect those hazards commonly found in local plans and those hazards which affect the state (Section 3.0). For example, hazards that have no potential to impact the state, such as volcanoes, were removed from the hazard identification list. This hazard list was also used to review local plans for the 2014 update. The natural hazards addressed in this plan are described in **Section 3**.



Table 5.2e: Local Natural Hazards Ranking Matrix (\*RA= Risk Assessment)

County	Flooding	RA Flooding Ranking	Hurricane	RA Hurricane Ranking	High Wind	RA High Wind Ranking	Severe Winter Storm	RA Severe Winter Storm Ranking	Hailstorm	RA Hailstorm Ranking
ALBANY	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE HIGH	YES	MODERATE HIGH	NO	
ALLEGANY										
- Northern Region	YES	MODERATE HIGH	NO		YES	MODERATE HIGH	YES	MODERATE HIGH	NO	
- Western Region	YES	HIGH	NO		YES	MODERATE HIGH	YES	MODERATE HIGH	NO	
- Southern Region	YES	HIGH	NO		YES	MODERATE HIGH	YES	MODERATE HIGH	NO	
- Eastern Region	YES	HIGH	NO		YES	MODERATE HIGH	YES	MODERATE HIGH	NO	
BRONX	YES		YES		YES		YES		NO	
BROOME	YES	HIGH	YES	MODERATE	YES	MODERATE	YES	HIGH	YES	MODERATE
CATTARAUGUS	YES	MODERATE HIGH	NO		YES	MODERATE LOW	YES	MODERATE HIGH	NO	
CAYUGA	YES	HIGH	YES	MODERATE	YES	MODERATE	YES	HIGH	YES	MODERATE
CHAUTAUQUA	YES	HIGH	NO		YES	MODERATE HIGH	YES	MODERATE HIGH	NO	
CHEMUNG	YES		YES		YES		YES		NO	
CHENANGO	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE HIGH	YES	MODERATE LOW	NO	
CLINTON	YES		YES		YES		YES		NO	
COLUMBIA	YES	MODERATE LOW	NO		YES	MODERATE LOW	YES	MODERATE LOW	NO	
CORTLAND										
DELAWARE	YES	HIGH	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE HIGH	NO	
DUTCHESS	YES		YES		YES		YES		NO	
ERIE	YES	MODERATE LOW	NO		YES	MODERATE LOW	YES	MODERATE LOW	NO	
ESSEX	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE HIGH	NO	
FRANKLIN	YES	HIGH	YES		YES		YES	HIGH	YES	
FULTON	YES	MODERATE	YES	HIGH	YES	HIGH	YES	HIGH	YES	HIGH
GENESSE	YES	MODERATE HIGH	NO		YES	MODERATE LOW	YES	MODERATE LOW	NO	
GREENE	YES	HIGH	NO		NO		YES	HIGH	NO	
HAMILTON										
HERKIMER										
JEFFERSON	YES	MODERATE HIGH	NO		YES		YES	MODERATE HIGH	NO	
KINGS	YES		YES		YES		YES		NO	
LEWIS	YES	MODERATE HIGH	YES	MODERATE LOW	YES		YES	MODERATE HIGH	NO	
LIVINGSTON										
MADISON	YES	MODERATE LOW	YES	LOW	YES	MODERATE LOW	YES	MODERATE HIGH	NO	
MONROE	YES	HIGH	NO		YES	MODERATE LOW	YES	MODERATE HIGH	NO	
MONTGOMERY	YES	HIGH	YES	HIGH	YES	HIGH	YES	HIGH	YES	HIGH
NASSAU	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE LOW	YES	
NEW YORK	YES		YES		YES		YES		NO	
NIAGARA	YES	MODERATE	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	HIGH	YES	
ONEIDA	YES		YES		YES		YES		NO	
ONODAGA	YES	MODERATE HIGH	YES	LOW	YES	MODERATE	YES	MODERATE HIGH	NO	
ONTARIO	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE HIGH	YES	MODERATE HIGH	NO	
ORANGE	YES	HIGH	YES	MODERATE LOW	YES	MODERATE HIGH	YES	MODERATE LOW	NO	
ORLEANS	YES	LOW	YES	MODERATE HIGH	YES	MODERATE LOW	YES	HIGH	NO	
OSWEGO	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE HIGH
OTSEGO	YES	HIGH	NO		YES	HIGH	YES	MODERATE HIGH	NO	
PUTMAN										
QUEENS	YES		YES		YES		YES		NO	
RENSSELAER	YES	HIGH	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE HIGH	NO	
RICHMOND	YES		YES		YES		YES		NO	
ROCKLAND	YES		YES		YES		YES		NO	
SARATOGA	YES	HIGH	YES	HIGH	YES	HIGH	YES	HIGH	YES	HIGH
SCHENECTADY	YES	MODERATE LOW	NO		YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE HIGH
SCHOHARIE	YES	MODERATE HIGH	YES	MODERATE HIGH	NO	MODERATE LOW	YES	MODERATE LOW	NO	
SCHUYLER	YES	HIGH	YES	MODERATE LOW	YES	MODERATE HIGH	YES	MODERATE LOW	YES	HIGH
SENECA	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE HIGH	NO	
ST. LAWRENCE										
STEUBEN	YES		NO		YES		YES		YES	
SUFFOLK	YES	MODERATE	YES	HIGH	YES	HIGH	YES	HIGH	YES	HIGH
SULLIVAN	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE HIGH
TIOGA	YES	HIGH	YES	MODERATE	YES	MODERATE	YES	HIGH	YES	MODERATE
TOMPKINS	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW	NO	
ULSTER	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE HIGH	NO	
WARREN	YES	MODERATE HIGH	YES		NO		YES	MODERATE HIGH	NO	
WASHINGTON	YES		NO		YES		YES		NO	
WAYNE	YES	MODERATE HIGH	NO		YES	MODERATE LOW	YES	MODERATE HIGH	NO	
WESTCHESTER	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE LOW	YES	
WYOMING	YES	MODERATE HIGH	NO		YES	MODERATE LOW	YES	MODERATE HIGH	NO	
YATES	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW	NO	



County	Wildfire	RA Wildfire Ranking	Drought	RA Drought Ranking	Extreme Temperatures	RA Extreme Temp Ranking	Earthquakes	RA Earthquake Ranking	Landslide	RA Landslide Ranking
ALBANY	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE HIGH
ALLEGANY										
- Northern Region	YES	MODERATE LOW	NO		NO		NO		NO	
- Western Region	YES	MODERATE HIGH	NO		NO		YES	MODERATE HIGH	YES	MODERATE HIGH
- Southern Region	NO		NO		NO		NO		NO	
- Eastern Region	NO		NO		NO		NO		YES	MODERATE HIGH
BRONX	NO		YES		YES		YES		NO	
BROOME	NO		YES	MODERATE	YES	LOW	YES	MODERATE	NO	
CATTARAUGUS	YES	MODERATE LOW	YES	MODERATE LOW	NO		YES	MODERATE LOW	YES	LOW
CAYUGA	NO		NO		NO		NO		NO	
CHAUTAQUA	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE HIGH	YES	LOW	YES	LOW
CHEMUNG	YES		NO		NO		YES		NO	
CHENANGO	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW	NO		NO	
CLINTON	NO		NO		YES		YES		NO	
COLUMBIA	YES	LOW	YES	LOW	NO		YES	MODERATE LOW	YES	LOW
CORTLAND										
DELAWARE	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE HIGH	YES	LOW	NO	
DUTCHESS	YES		YES		YES		YES		NO	
ERIE	YES	MODERATE LOW	YES	LOW	YES	MODERATE LOW	YES	MODERATE LOW	NO	
ESSEX	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE HIGH
FRANKLIN	YES	MODERATE	YES	MODERATE	YES		YES		YES	
FULTON	NO		NO		NO		YES	LOW	NO	
GENESSE	NO		YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW	NO	
GREENE	NO		NO		NO		YES	LOW	NO	
HAMILTON										
HERKIMER										
JEFFERSON	YES		YES	MODERATE LOW	YES		YES	MODERATE LOW	YES	
KINGS	NO		YES		YES		YES		NO	
LEWIS	YES	MODERATE HIGH	YES	LOW	YES		YES		YES	
LIVINGSTON										
MADISON	YES	LOW	YES	MODERATE LOW	YES	MODERATE LOW	YES	LOW	NO	
MONROE	NO		YES	MODERATE LOW	YES	MODERATE LOW	YES	LOW	YES	MODERATE LOW
MONTGOMERY	YES	MODERATE	YES	LOW	NO		NO		NO	
NASSAU	YES	LOW	YES	MODERATE LOW	YES	MODERATE LOW	NO		NO	
NEW YORK	NO		YES		YES		YES		NO	
NIAGARA	NO		YES	MODERATE LOW	NO		YES	MODERATE HIGH	YES	LOW
ONEIDA	YES		YES		YES		YES		YES	
ONODAGA	NO	LOW	YES	LOW	YES	LOW	YES	LOW	YES	LOW
ONTARIO	YES	MODERATE LOW	YES	MODERATE LOW	NO		YES	MODERATE LOW	NO	
ORANGE	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW	YES	
ORLEANS	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE LOW
OSWEGO	YES	LOW	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE HIGH	YES	MODERATE LOW
OTSEGO	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE LOW	YES	LOW	YES	MODERATE LOW
PUTMAN										
QUEENS	NO		YES		YES		YES		NO	
RENSSELAER	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE HIGH
RICHMOND	NO		YES		YES		YES		NO	
ROCKLAND	YES	MODERATE	YES		YES		YES		YES	
SARATOGA	NO		NO		NO		YES	LOW	YES	MODERATE
SCHENECTADY	NO		NO		NO		YES	LOW	YES	MODERATE LOW
SCHOHARIE	YES	LOW	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW
SCHUYLER	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW
SENECA	YES	LOW	YES	LOW	YES	LOW	YES	LOW	NO	
ST. LAWRENCE										
STELBEN	YES		YES		YES		YES		YES	
SUFFOLK	YES	LOW	YES	LOW	NO		YES	LOW	NO	
SULLIVAN	YES		YES		NO		YES		YES	
TIOGA	NO		YES	LOW	NO		YES	LOW	NO	
TOMPKINS	NO		YES	MODERATE LOW	YES	MODERATE LOW	YES	MODERATE LOW	YES	LOW
ULSTER	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE
WARREN	YES	MODERATE HIGH	YES		YES		YES		YES	
WASHINGTON	NO		YES		NO		YES		YES	
WAYNE	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE LOW	YES	LOW	YES	LOW
WESTCHESTER	YES	MODERATE HIGH	YES	MODERATE LOW	YES	MODERATE HIGH	YES	MODERATE HIGH	YES	MODERATE LOW
WYOMING	YES	MODERATE HIGH	YES	MODERATE LOW	YES	LOW	YES	MODERATE LOW	YES	LOW
YATES	YES	MODERATE LOW	YES	LOW	YES	MODERATE LOW	YES	LOW	YES	MODERATE LOW



County	Land Subsidence and Expansive Soils	RA Land Subsidence and Expansive Soils Ranking	Coastal Erosion	RA Coastal Erosion Ranking	Avalanche	RA Avalanche Ranking	Tsunami	RA Tsunami Ranking
ALBANY	NO		NO		NO		NO	
ALLEGANY								
- Northern Region	NO		NO		NO		NO	
- Western Region	NO		NO		NO		NO	
- Southern Region	NO		NO		NO		NO	
- Eastern Region	NO		NO		NO		NO	
BRONX	NO		YES		NO		NO	
BROOME	NO		NO		NO		NO	
CATTARAUGUS	YES	LOW	NO		NO		NO	
CAYUGA	NO		NO		NO		NO	
CHAUTAUQUA	NO		NO		NO		NO	
CHEMUNG	YES		NO		NO		NO	
CHENANGO	NO		NO		NO		NO	
CLINTON	YES		NO		NO		NO	
COLUMBIA	NO		NO		NO		NO	
CORTLAND								
DELAWARE	NO		NO		NO		NO	
DUTCHESS	NO		NO		NO		NO	
ERIE	NO		NO		NO		YES	MODERATE LOW
ESSEX	NO		NO		YES	MODERATE LOW	NO	
FRANKLIN	YES		YES		NO		NO	
FULTON	NO		NO		NO		NO	
GENESSE	NO		NO		NO		NO	
GREENE	YES	MODERATE	NO		NO		NO	
HAMILTON								
HERKIMER								
JEFFERSON	NO		YES		NO		NO	
KINGS	NO		YES		NO		NO	
LEWIS	NO		NO		NO		NO	
LIVINGSTON								
MADISON	NO		NO		NO		NO	
MONROE	NO		NO		NO		NO	
MONTGOMERY	NO		NO		NO		NO	
NASSAU	NO		YES	MODERATE HIGH	NO		YES	
NEW YORK	NO		YES		NO		NO	
NIAGARA	NO		YES		NO		NO	
ONEIDA	NO		NO		NO		NO	
ONODAGA	YES	LOW	NO		NO		NO	
ONTARIO	NO		NO		NO		NO	
ORANGE	NO		NO		NO		NO	
ORLEANS	NO		NO		NO		NO	
OSWEGO	NO		NO		NO		NO	
OTSEGO	NO		NO		NO		NO	
PUTNAM								
QUEENS	NO		YES		NO		NO	
RENSSELAER	NO		NO		NO		NO	
RICHMOND	NO		YES		NO		NO	
ROCKLAND	NO		NO		NO		YES	LOW
SARATOGA	NO		NO		NO		NO	
SCHENECTADY	NO		NO		NO		NO	
SCHOHARIE	NO		NO		NO		NO	
SCHUYLER	NO		NO		NO		NO	
SENECA	NO		NO		NO		NO	
ST. LAWERENCE								
STEUBEN	NO		NO		NO		NO	
SUFFOLK	NO		YES	MODERATE	NO		NO	
SULLIVAN	NO		NO		NO		NO	
TIOGA	NO		NO		NO		NO	
TOMPKINS	NO		NO		NO		NO	
ULSTER	NO		NO		NO		NO	
WARREN	YES		YES		YES		YES	
WASHINGTON	YES		NO		NO		NO	
WAYNE	NO		NO		NO		NO	
WESTCHESTER	NO		NO		NO		NO	
WYOMING	NO		NO		NO		NO	
YATES	NO		NO		YES	LOW	YES	LOW



## Potential Loss Estimates

Following development of the individual hazard matrices, LHMPs were researched for risk, vulnerability and losses. The review conducted for the 2014 update indicated that the local plan developers used a wide range of methodologies to determine these potential loss estimates, including historical data, Geographical Information Systems (GIS), Hazus and others. This information was incorporated throughout the appropriate hazard sections in **Section 3** of the SHMP. In addition, where notable data, tables, and/or maps were identified in county plans to illustrate and quantify vulnerability or losses, that information was integrated into the appropriate SHMP hazard sections to link local risk assessments to the SHMP risk assessment. This information also serves as examples of tools and methodologies that may assist in local plan development.

## Mitigation Goals and Actions

The final step of the local plan review involved identifying consistency of LHMP goals (and supporting objectives) with those in the SHMP. Each of the local plans was reviewed to determine if the actions in the local plan met the goals as defined in the SHMP; and conversely, to determine if the SHMP goals were reflective of local goals, objectives and actions. The SHMP hazard mitigation goals are:

**Goal 1: Promote a comprehensive state hazard mitigation policy framework for effective mitigation programs that includes coordination between federal, state, and local organizations for planning and programs.**

**Objective 1.1:** Promote integrated land use planning to encourage resilient and sustainable efforts throughout statewide programs that addresses zoning, building codes, capital improvement programs, open space preservation and storm water management regulations.

**Objective 1.2:** Continue to participate in state and local programs and efforts that focus on practices that support or enhance resiliency.

**Objective 1.3:** Improve hazard data through studies, research, and mapping to enhance information related to the impacts of hazards and related risks, vulnerability, and losses.

**Goal 2: Protect property including public, historic, and private structures, and critical facilities and infrastructure.**

**Objective 2.1:** Encourage homeowners, renters, and businesses to insure property for all hazards, including flood coverage under the National Flood Insurance Program (NFIP).



**Objective 2.2:** Identify mitigation opportunities to protect, upgrade and strengthen existing structures through acquisition, elevation, relocation and retrofit.

**Objective 2.3:** Encourage resilient and sustainable structures to reduce vulnerabilities, encouraging the use of green and natural infrastructure.

**Objective 2.4:** Promote the continued use of natural systems and features, open space preservation, and land use development planning with local jurisdictions.

**Objective 2.5:** Acquire, retrofit, or relocate repetitive loss properties from flood-prone areas in the state.

**Goal 3:** **Increase awareness and promote relationships with stakeholders, citizens, elected officials and property owners to develop opportunities for mitigation of natural hazards.**

**Objective 3.1:** Offer trainings about hazard awareness, mitigation planning and grants, and how to incorporate mitigation into ongoing program functions.

**Objective 3.2:** Reduce the impact of hazards on vulnerable populations through education and awareness programs.

**Objective 3.3:** Improve systems that provide warning, awareness, and emergency communication.

**Objective 3.4:** Conduct education and awareness programs for flood mitigation planning and funding assistance.

**Goal 4:** **Encourage the development and implementation of long-term, cost-effective, and resilient mitigation projects to preserve or restore the functions of natural systems.**

**Objective 4.1:** Encourage the use of green and natural infrastructure.

**Objective 4.2:** Provide financial assistance to communities and stakeholders in the application and implementation of mitigation grants.

**Objective 4.3:** Maintain and encourage ongoing relationships with state agencies and partners to play an active and vital role in preservation and restoration of vulnerable natural systems.



**Goal 5: Build stronger by promoting mitigation actions that emphasize sustainable construction and design measures to reduce or eliminate the impacts of natural hazards.**

**Objective 5.1:** Encourage building and rebuilding practices that address resiliency through higher standards and sustainable design to resist impacts of natural hazards

**Objective 5.2:** Enhance coordination with state and local agencies that promote resiliency and sustainability.

**Objective 5.3:** Identify sustainable flood and erosion control projects and activities that demonstrate resiliency practices.

**Objective 5.4:** Provide assistance in the implementation of flood mitigation plans and projects in flood-prone areas, in accordance with federal and state regulatory, funding, and technical assistance programs.

**Table 5.2f** summarizes the results of this review, indicating the alignment between local and the State mitigation goals.



Table 5.2f: Review and Comparison, State and Local Goals

County	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5
Albany		✓		✓	
Allegany	✓	✓	✓	✓	
Bronx	✓	✓	✓	✓	✓
Broome		✓	✓	✓	
Cattaraugus		✓	✓	✓	
Cayuga		✓	✓	✓	
Chautauqua		✓			✓
Chemung		✓	✓	✓	
Chenango		✓	✓	✓	
Clinton		✓	✓		
Columbia	✓	✓	✓		
Cortland*					
Delaware		✓	✓		
Dutchess**					
Erie		✓	✓		
Essex				✓	
Franklin		✓	✓	✓	✓
Fulton		✓	✓	✓	
Genesee			✓	✓	
Greene		✓	✓	✓	
Hamilton*					
Herkimer*					
Jefferson		✓		✓	✓
Kings	✓	✓	✓	✓	✓
Lewis		✓		✓	✓
Livingston*		✓		✓	
Madison		✓	✓	✓	✓
Monroe		✓			
Montgomery	✓	✓	✓		
Nassau		✓	✓	✓	✓
New York	✓	✓	✓	✓	✓
Niagara		✓		✓	
Oneida		✓	✓		✓
Onondaga	✓	✓	✓	✓	✓
Ontario		✓	✓	✓	
Orange			✓	✓	✓
Orleans		✓	✓	✓	✓
Oswego			✓	✓	
Otsego		✓	✓	✓	
Putnam*					



County	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5
Queens	✓	✓	✓	✓	✓
Rensselaer		✓		✓	✓
Richmond	✓	✓	✓	✓	✓
Rockland		✓		✓	✓
Saratoga		✓	✓	✓	
Schenectady		✓	✓		
Schoharie	✓	✓	✓		
Schuyler			✓	✓	✓
Seneca		✓	✓		
St. Lawrence*					
Steuben		✓	✓	✓	✓
Suffolk		✓	✓	✓	
Sullivan		✓	✓	✓	
Tioga	✓	✓	✓	✓	
Tompkins		✓	✓	✓	
Ulster		✓	✓	✓	✓
Warren		✓	✓		
Washington		✓	✓	✓	
Wayne		✓	✓	✓	✓
Westchester		✓	✓	✓	✓
Wyoming		✓	✓	✓	✓
Yates		✓	✓	✓	

\*Hazard Mitigation Plans in development

\*\*County Hazard Mitigation Plan goals were unavailable for review

This review demonstrates that local mitigation goals, objectives and actions are consistent with the SHMP goals; and conversely that the SHMP hazard mitigation goals are reflective of the local goals, objectives and actions.

### Future Local Plan Review and Incorporation

The review and incorporation of local plan information has confirmed that this plan is reflective of local hazards, risks, loss estimates, and goals. However, these elements evolve over time, given that the Disaster Mitigation Act of 2000 and the Interim Final Rule (IFR) require local plans to be updated every five years. As a result, future state plan updates, which will be performed on a three-year cycle, will continue to incorporate the latest information regarding local risk assessment and mitigation strategy. It is anticipated that the multi-step monitoring, evaluation and update process described in full in **Section 6** will be implemented by the DHSES Mitigation Section in subsequent updates of this plan. The LHMP integration component of the multi-year update process is described in **Table 5.2g** below.



Table 5.2g: LHMP Integration Process and Timeline

Timeline	Integration Process
<p style="text-align: center;"><b>May</b> <i>(First year following SHMP approval)</i></p>	<p>DHSES Mitigation Section will conduct an internal review of the local mitigation planning process to:</p> <ul style="list-style-type: none"> <li>• Identify the number of plans approved since January 2014</li> </ul> <p>Identify any disaster events that may have impacted local risks, mitigation goals, and/or activities</p>
<p style="text-align: center;"><b>May</b> <i>(Second year following SHMP approval)</i></p>	<p>DHSES Mitigation Section will review:</p> <ul style="list-style-type: none"> <li>• Hazard rankings and previous occurrences in the LHMPs, to coordinate with the 2014 SHMP hazard rankings</li> </ul> <p>Goals identified in LHMPs, to ensure that they align with the state goals</p>
<p style="text-align: center;"><b>January – August</b> <i>(Third year following SHMP approval)</i></p>	<p>DHSES Mitigation Section will review and integrate in the 2017 SHMP:</p> <ul style="list-style-type: none"> <li>• Significant changes in LHMP risk assessments noted during plan review</li> <li>• Significant changes in LHMP goals, especially those that do not fall into one of the identified 2014 SHMP goals</li> </ul> <p>Implemented LHMP mitigation goals and activities, and assessment of progress in achieving goals</p>

To ensure ongoing availability of all LHMPs, and to facilitate future integration of local plans into SHMP updates, the Mitigation Section has adopted the following methods:

- The ***Hazard Mitigation Planning Standards (2012)*** require that all local jurisdictions submit electronic versions of their updated plans to the State Hazard Mitigation Officer (SHMO)
- SHMO will maintain an electronic copy by CD or electronic file; and/or maintain a physical copy.



### 5.3 Prioritizing Local Assistance

***Requirement §201.4(c)(4)(iii):** The section on the Coordination of Local Mitigation Planning **must** include criteria for prioritizing communities and local jurisdictions that would receive planning and project grants under available funding programs, which should include consideration for communities with the highest risks, repetitive loss properties, and most intense development pressures. Further, that for non-planning grants, a principal criterion for prioritizing grants shall be the extent to which benefits are maximized according to a cost benefit review of proposed projects and their associated costs.*

***Requirement §201.4(d):** Plan **must** be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities.*

**This sub-section discusses the four criteria described above which requires special emphasis placed on:**

- Communities with the highest risks
- Repetitive loss properties
- Intense development pressures
- Benefits maximized according to a cost benefit review

The 2011 SHMP identified the development of the mitigation planning and project applications for communities interested in obtaining planning and non-planning (project) grants. **The plan included a sample HMGP application and described the following process for receiving planning and project grant applications:**

- Mitigation Staff receive and review applications
- Mitigation Staff prioritize applications based on the criteria developed for that specific grant cycle, as identified by priorities and objectives in the HMGP application (see **Appendix 5, Attachment B: Sample Letter of Intent for HMGP funding**).

The Mitigation Section continues to enhance the mitigation project application process identified in the 2011 SHMP for communities interested in obtaining planning and non-planning (project) grants. For the 2014 SHMP update, it is acknowledged that the process to develop planning and project applications could be defined in more detail. This has not occurred to date due to the State's preference to remain flexible in response to specific disaster impacts and resulting immediate priorities. As outlined in **Section 5.3.1**, New York State does maintain a more general set of criteria that can be applied to funding cycles with highly competitive applications that exceed the amount of funding to assist in identifying projects that are technically feasible, cost effective and address the highest risks.



New York State depends upon two phases for ranking and prioritization of mitigation-related activities and projects. In the first phase, actions and activities submitted for inclusion on the SHMP activities list go through a multi-step ranking process for the purpose of maintaining a comprehensive list of mitigation activities in approximate order of importance. These activities are assessed against the best available information at the time they are submitted to the activities list. While there is general consideration of cost-benefit at this time, the ranking is conducted only for the purpose of placing the activities on the list in order of priority aligned with the goals and hazards the activities address.

The second phase for prioritization takes place when applications for funding for planning or project grants are submitted to the State, and is primarily associated with FEMA mitigation funding. This process requires formal notification of the availability of funding to prospective applicants, description of the prioritization criteria and process, and completion of an application. A Benefit Cost Analysis (BCA) is conducted during the application and evaluation process to ensure that the project is cost-effective and eligible for funding.

Various resources are available to assist in the mitigation prioritization process, including FEMA's How-to-Guide #5 (386-5): Using Benefit Cost Review in Mitigation Planning. This guide provides methods and examples for reviewing benefits and costs, prioritizing actions, and documenting that the process meets cost-benefit requirements.

**The primary steps of the State's Hazard Mitigation Grant Program grant funding process are described below:**

- 1. Notice of Funding Availability:** The funding process begins with notification from FEMA to DHSES following a federally-declared disaster of funding availability for planning and project grants, based on requirements and timeframes of the individual funding programs. Information, including funding priorities, eligibility, and a brief description of the prioritization and funding methodology, are then developed and disseminated to prospective applicants, electronically or by mail. In addition, supplemental criteria specific to the disaster may be provided to assist in prioritization and identification of projects.

Announcements about funding availability are then disseminated to prospective grant applicants. Criteria for prioritization must be publicly announced at the time of the notification of funding availability, and provided to the Attorney General and Comptroller as a requirement of the official notification.

(Unified Hazard Mitigation Assistance (HMA): FEMA notifies all states and territories of the program's annual funding cycle, traditionally in June.)



**Notifications of funding availability described above are made electronically through the following lists and websites:**

- DHSES Regional Offices
  - County Emergency Managers - All New York State
  - County Hazard Mitigation Coordinators
  - County Planners
  - State Agency Liaisons
  - Metropolitan Planning Offices
  - County Soil and Water Conservation Districts
  - Regional Planning Agencies
  - <http://www.dhSES.ny.gov/oem/mitigation/>
  - <http://www.nysandyhelp.ny.gov/content/hazard-mitigation-grant-program-hmGP-0> (specific to Hurricane Sandy mitigation)
2. **Canvass for Applications:** DHSES disseminates program information and solicits Letters of Intent (LOIs) from eligible applicants. (A Sample LOI is included as **Appendix 5, Attachment D.**) LOIs submitted by eligible applicant and describing eligible program activities continue to the application development phase. Those that do not, are notified with the reason (ineligible applicant, ineligible activity, or both) and, where possible, given recommendations to address eligibility issues and make the proposal competitive in future grant rounds.

(Unified HMA: The process is identical.)

Letters of Intent (LOIs), or other indications of interest for other funding sources, are submitted by prospective sub-grantees for federal programs.

3. **Application Development:** Applicants continue to work closely with DHSES and FEMA staff to flesh out the project and address program, environmental, and cost-effectiveness requirements. Information is gathered by correspondence and e-mails, and in phone calls, meetings and site visits. Not all eligible applicants with eligible projects conclude the process: some do not continue due to staffing, timing or funding (sponsor match) issues; occasionally a project initially deemed eligible is found to be ineligible as more information is gathered (one example is a road project that may be eligible for Federal Highway Administration (FHWA) funding); and some applicants do not meet the requirement of a FEMA-approved mitigation plan in effect at the time of application submission (Unified HMA) or award (HMGP).



**In general, the following information is provided during the application process for planning and non-planning grants, and addresses special considerations required by the State:**

- a. Community's exposure and vulnerability to hazards, emphasizing those with increased risks
- b. GIS analysis of project locations and risk exposure
- c. Number or claims history of repetitive loss properties (NFIP)
- d. Community's disaster loss history by disaster type, with repetitive loss properties identified, as appropriate
- e. Status of an All-Hazard Local Mitigation plan
- f. Indications of intense development pressure
- g. Community-initiated, or -completed, mitigation measures/projects relative to the identified hazards, with or without FEMA and State assistance
- h. Opportunity for, and current experience with, private sector interest and involvement in hazard risk reduction activities for the community
- i. A description of how long-term mitigation planning is supported by local elected officials, including the commitment to programmatic, policy and legislative remedies in addition to fiscal and other local government resources
  - a. Benefits maximized according to the Benefit Cost Analysis, including the benefits resulting from the mitigation action versus the cost of that action.
  - b. (Unified HMA: The interaction among applicant, State and FEMA is similar, but application materials must be submitted online using FEMA's eGrants system.)

Upon receipt of grant applications, Mitigation staff reviews each application and reviews it for completeness, based on the criteria described in **Section 5.3.1**, and hazard- or disaster-specific priorities developed for the specific grant application period. In addition, a special emphasis is placed on the Benefit Cost Analysis and Benefit Cost Ratio in consideration of funding for projects.

4. **Project Ranking:** If the requests for funding exceed the available monies, a Project Review Board (PRB) is convened to rank all eligible projects based on the State priorities. (If all eligible planning and project activities can be funded, there is no need for a PRB.)

**In general, project grants are awarded based on the information provided for, but not limited to, the following:**

- Criteria developed during each grant application period which takes into consideration current priorities and the benefit-cost of the proposed project. When the funds requested for eligible projects exceed the available project funding in a given grant cycle, the Mitigation Section uses an independent Project Review Board (PRB) made up of representatives from the Disaster



Preparedness Commission (DPC) agencies and local jurisdictions. The role of the PRB is to assist in determining which projects should be recommended for funding, based on the prioritization criteria described in **Section 5.3.1** and the BCA and environmental reviews.

- BCAs and preliminary environmental reviews are conducted by the Mitigation Section before applications for projects are sent to the PRB. The Mitigation Section utilizes the most recent FEMA standards for BCAs by incorporating any and all mitigation policy updates. Mitigation Policy FP-108-024-01, released June 2013, has been included in **Appendix 5** as the current standard for BCA.

(Unified HMA: no ranking is currently necessary as multiple applications can be submitted under the various Unified HMA programs.)

5. **Submission to FEMA:** Projects are submitted to FEMA along with any outstanding required information (e.g., the Form 424 Request for Federal Assistance, Administrative Plan, Budget Forms and Assurances).

(Unified HMA: submission is made online using FEMA's eGrants system.)

6. **Administrative:** Notices of FEMA award or denial are transmitted to the applicants. Contracts are executed with applicants with awarded planning and project grants and kick-off meetings are held to ensure that applicants are aware of program requirements and deadlines.

(Unified HMA: the process is similar, with notifications made on FEMA's eGrants system.)

7. **Monitoring:** DHSES contacts each applicant once a month to discuss project status, upcoming benchmarks and deadlines, and any needed assistance. Applicants must also submit quarterly status reports for active grants; DHSES sends out e-mail reminders and contacts applicants who do not provide required documentation. Coordination occurs with FEMA and DHSES fiscal staff (e.g., extension request, scope changes) as necessary.

(Unified HMA: the process is identical.)

8. **Closeout:** Applicants complete all required paperwork and document their expenses. DHSES does not process final payments until the completed work has been inspected by Albany or Regional staff.

As an additional step, final payments for all acquisition projects are held until the applicant provides a notarized property deed containing the protective covenants required by FEMA. It should be noted that acquisition parcels must be managed in accordance with open space requirements in perpetuity and require the applicant to



submit reports to DHSES and FEMA every three years to document conformance with those standards and the provisions of the grant.

(Unified HMA: the process is identical.)

### 5.3.1 Criteria for Prioritizing Planning Grants

**The Robert T. Stafford Act, as amended by Public Law 106390, October 30, 2000, Section 203 Pre-disaster Hazard Mitigation Sub-Section (d) State Recommendations –(C) Criteria, references use of criteria established in sub-section (g) in determining awards for assistance (Allocation of Funds). In summary, criteria include:**

- Extent and nature of hazards to be mitigated
- Degree of commitment
- Contribution to mitigation goal/priorities of State and similarly, consistent with own plan
- Consistent with other assistance provided by this Act
- Extent of eligible activities to produce meaningful/definable outcomes are clearly defined
- Maximize net benefits to society
- Extent of assistance funds activity in small impoverished communities
- Other such criteria the President establishes

Between 2011 and 2014, all applications for LHMP planning grants were awarded. During the 2011-2012 time period, 34 (23 in 2012 and 11 in 2013) planning grants for county LHMPs were awarded. Due to the State's ability to fund all planning applications in the past, a prioritization process has not yet been needed for plan development funding applications.

For the 2014 update, however, general criteria were developed to guide prioritization of future planning and project grants. **Should the applications for planning or project grants exceed available funding, the DHSES Mitigation Section will utilize a PRB (as described above) to prioritize grant applications based on the following ranking criteria:**

1. Meets the criteria for the applicable grant program (HMGP, PDM, FMA, etc.)
2. Plan expiration date
3. Number of federal disaster declarations (past 25 years)
4. Susceptibility of the community to natural hazards
5. Participation in the National Flood Insurance Program, and number or claims history of repetitive loss properties
6. Past mitigation funding, and record of successful grant performance
7. Jurisdiction is small, fiscally-constrained, or experiencing special development pressures



8. Current priorities as determined by the disaster and resulting conditions or issues

**Appendix 5, Attachment C** describes the planning activity application and evaluation process and ranking system for planning and non-planning grants. **Appendix 5, Attachment D** provides FEMA Mitigation Policy 108-024-01, June 2013.

### 5.3.2 Criteria for Prioritizing Non-Planning Grants

Applicants must demonstrate that their risk is sufficient to merit grant funds, particularly when compared to the project cost, but there is often considerable uncertainty in risk determinations. For this and other reasons, the State places a special emphasis on the BCA, while considering a variety of factors in addition to cost and level of risk in determining its priorities for mitigation grants. A BCA must be performed by the DHSES Mitigation Section for non-planning grants to determine eligibility for funding.

FEMA provides a BCA “toolkit” to assist state and local planners, which standardizes the evaluation of cost effectiveness and quantifies the financial and social benefits of a proposed mitigation activity. Typical mitigation project benefits are derived from avoided damage to structures and contents, avoided deaths and injuries and avoidance of other quantifiable losses that a mitigation project can significantly reduce or eliminate. Acquisition-related mitigation projects have proven to be the most effective example of hazard mitigation. For all mitigation projects, those applications that receive less than a 1.0 ratio of benefit to cost are ineligible for federal HMA funding.

The Mitigation Section utilizes a combination of resources for BCAs to assist State and Local applicants in the mitigation actions and activities prioritization process.

New York State’s mitigation non-planning grant prioritization criteria is consistent with the law in that the methodology and ranking criteria aligns with that described in the Stafford Act. In addition to the standard prioritization criteria described in **Section 5.3.1** for planning grants, special disaster-specific conditions and/or priorities may be added to the criteria for project applications.

To ensure that all participants have realistic expectations, when interested applicants for non-planning grants are notified of the estimated pool of money and estimated maximums, the specific funding priorities are described in the notification of funding availability.

Eligible activities that may be funded through the HMA programs are described in **Table 5.3h**.



Table 5.3h: Eligible Mitigation Activities, by HMA Program

Eligible Activities	HMGP	PDM	FMA
<b>1. Mitigation Projects</b>	√	√	√
Property Acquisition and Structure Demolition	√	√	√
Property Acquisition and Structure Relocation	√	√	√
Structure Elevation	√	√	√
Mitigation Reconstruction			√
Dry Floodproofing of Historic Residential Structures	√	√	√
Dry Floodproofing of Non-residential Structures	√	√	√
Minor Localized Flood Reduction Projects	√	√	√
Structural Retrofitting of Existing Buildings	√	√	
Non-structural Retrofitting of Existing Buildings and Facilities	√	√	√
Safe Room Construction	√	√	
Wind Retrofit for One- and Two-Family Residences	√	√	
Infrastructure Retrofit	√	√	√
Soil Stabilization	√	√	√
Wildfire Mitigation	√	√	
Post-Disaster Code Enforcement	√		
Generators	√	√	
5 Percent Initiative Projects	√		
Advance Assistance	√		
<b>2. Hazard Mitigation Planning</b>	√	√	√
<b>3. Management Costs</b>	√	√	√

For HMA grants, the Mitigation Section uses FEMA's six-month lock-in from the declaration date to establish an available funding pool. This is the minimum HMGP funding the State can expect to receive; final amounts are fixed at the twelve-month lock-in and FEMA regulations mandate that the six-month estimate can increase but never decrease. Allotted funds are divided by five, or multiples of five, to achieve a per-project maximum not to exceed \$1 million. The top-ranking project (based on the prioritization process established for that specific HMGP cycle) in each of DHSES's five regions is selected and other projects on the list move up. The remaining projects are then selected based solely on ranking, until all available funds are awarded. HMGP planning grants are administered similarly, ensuring that at least one planning grant and one project grant will be funded in each of the five regions.

There are special considerations for grant funds and the extension of deadlines; hazard mitigation projects fall under these special considerations. Funds for permanent work projects must be completed within 18 months of the declaration date; however, New York State has the authority to extend the deadline up to 30 months after the declaration date. Only permanent work is eligible for hazard mitigation.



A new online application process was initiated in October 2013 to submit and review Hurricane Sandy HMGP project applications.

### Section 406 Mitigation during Disasters

The Mitigation Section actively supports Section 406 mitigation activities associated with Public Assistance projects that are undertaken during recovery efforts. Funds for these projects occur following Presidential disaster declarations and emergency declarations. Mitigation staff maintains a presence in the Joint Field Office and in the field as needed, participates in applicant briefings and outreach efforts, reviews project worksheets, and conducts BCA when requested, as well as assisting FEMA in developing disaster-specific mitigation strategies. The Mitigation Section utilizes an information flyer to inform state and federal PA staff about the BCA for project grants, consistent with FEMA's effort to unify HMGP (Section 404) and recovery (Section 406) mitigation actions.

The State has the option of providing a portion of the 25% non-federal share under the PA program, and occasionally funds the acquisition of properties (see example at - [www.nysdhcr.gov/Programs/FloodRemediation/](http://www.nysdhcr.gov/Programs/FloodRemediation/), Greater Catskill Flood Remediation Program). The State provides no match under HMGP or the Unified HMA grant programs.

#### Section 406 Mitigation Funds - Public Assistance (PA) Program

**Purpose:** Available to government-owned or operated facilities and infrastructure damaged in a Presidentially declared disaster. Section 406 provides discretionary authority to fund mitigation measures in conjunction with the repairs due to disaster damage. These opportunities usually present themselves during the repair efforts. The mitigation measures must be related to eligible disaster-related damages and must directly reduce the potential of future, similar disaster damages to the eligible facility. Normally, this work is performed on the parts of the facility that were actually damaged by the disaster. In some instances, an eligible mitigation measure may not be an integral part of the damaged facility. FEMA will consider these exceptions on a case-by-case basis. For measures that exceed the above costs, the grantee or sub-grantee must demonstrate through an acceptable benefit/cost analysis methodology to validate that the measure is cost effective.



## Section 6: PLAN MAINTENANCE PROCESS

### 2014 SHMP Update

All sections of the 2011 State Hazard Mitigation Plan (SHMP) were reviewed for this update.

- Meets Requirements §201.4(c)(5)(i), §201.4(c)(5)(ii) and §201.4(c)(5)(iii)
- Redefined timeline and criteria to monitor, evaluate, and update
- Expanded criteria to be used in the update process and outlined timeframe

### "Roadmap" Activity<sup>1</sup>

In addition to the long-term and ongoing multi-hazard and hazard-specific strategies identified in **Section 4**, DHSES will continue to develop this section in key areas, such as review and integration of risk assessments and development trends from local mitigation plan in the SHMP, over the life cycle of the plan.

*Requirement §201.4(c)(5)(i): The Standard State Plan Maintenance Process **must** include an established method and schedule for monitoring, evaluating, and updating the plan.*

*Requirement §201.4(c)(5)(ii): The Standard State Plan Maintenance Process **must** include a system for monitoring implementation of mitigation measures and project closeouts.*

*Requirement §201.4(c)(5)(iii): The Standard State Plan Maintenance Process **must** include a system for reviewing progress on achieving goals as well as activities and projects in the Mitigation Strategy.*

**This section focuses on two aspects of the State's involvement in the plan maintenance process:**

- 6.1 Monitoring, Evaluating, and Updating the Plan
- 6.2 Monitoring Progress of Mitigation Activities

Specific additions to this section for the 2014 update include a description of the challenges experienced in implementing the monitoring, evaluation, and updating process that was defined in the 2011 plan, and how this process will be modified in the next update cycle to correct shortcomings. Also included in this section is a description of state agency responsibilities and staffing duties as they relate to the plan maintenance process, including monitoring progress of mitigation activities, and how this process has changed since the last SHMP update.

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<sup>1</sup> Roadmap Activities are action items to be developed further during the life-cycle of the plan, through the monitoring, evaluation and update process. The comprehensive list of action items can be found in **Sections 2 and 4**.



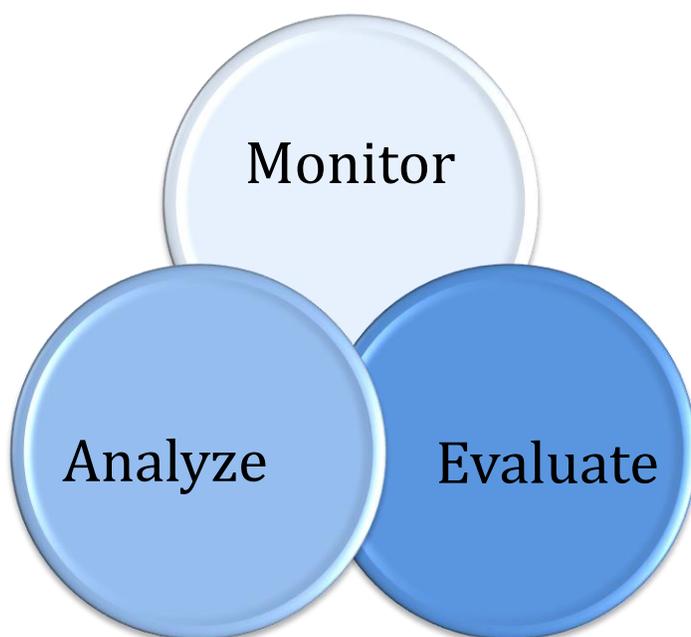
## 6.1 Monitoring, Evaluating, and Updating the Plan

**Requirement §201.4(c)(5)(i):** *The Standard State Plan Maintenance Process **must** include an established method and schedule for monitoring, evaluating, and updating the plan.*

Hazard mitigation planning is a continuous process that documents the State's progress in reducing and eliminating vulnerabilities and losses as a result of natural hazards. Policies and procedures described in this plan reflect the current emergency management and hazard mitigation perspective at both the state and national levels. Changes in hazard mitigation programs and/or priorities, including changes in legislation and available funding, may require changes to this plan. A major disaster could also prompt review and modifications to this plan.

**Figure 6.1a** illustrates the dynamic interrelationship between monitoring, evaluating and analyzing in the plan update cycle. Results of the annual status updates of activities, projects, goals, objectives, and hazard events will be analyzed throughout the lifecycle of the plan to assist in revising and improving the plan in the next update.

**Figure 6.1a: Mitigation Plan Maintenance and Update Cycle**



### 6.1.1 Method and Schedule for Monitoring the Plan

Processes first identified in the State's 2005 SHMP were modified in the 2008 plan to address deficiencies in monitoring and accountability. In addition, **changes were made to the 2008 plan maintenance procedures which focused on several essential elements:**

- A system to ensure an efficient and active SHMP monitoring, evaluation, and update process
- Administrative commitment and systems which support appropriate goals and activities
- Renewed stakeholder commitment at the agency and departmental levels
- Clearly defined responsibilities of key positions
- Procedures and reports to ensure plan maintenance and monitoring of mitigation measures and projects across the state
- Creation of a calendar of events to guide the New York State Division of Homeland Security and Emergency Services (DHSES), the Disaster Preparedness Commission (DPC), and key stakeholders in monitoring and maintaining the plan. It was planned that the SHMP would be a standing annual agenda item for the DPC and would appear on the agenda of the DHSES senior staff meeting at least semi-annually.

**In the 2011 SHMP, the procedure was further amended to provide for the following actions:**

- DPC agencies would be contacted and asked for input at each of the monitoring/evaluation benchmarks
- Public stakeholder comments would be solicited via an online survey
- The SHMP update would be discussed at various DHSES Senior Staff meetings, although not on a regular basis as originally envisioned.

DHSES Mitigation staff acknowledges that there have been challenges to maintaining the monitoring, evaluation, and update schedule envisioned in the 2011 plan. First, the plan was not a standing item on the DPC's agenda between 2011 and 2014, primarily because there were no substantive changes that required review and re-approval. Also, while agency liaisons were contacted on a regular basis as noted, the loss or turnover of staff resulting from layoffs and retirement made it difficult to maintain continuity and momentum. In addition, three major disasters between 2011 and 2012 required Mitigation staff to focus on post-disaster mitigation programs and projects. While efforts in response to the disasters supported and implemented the State's mitigation strategy and goals, these priorities overshadowed the plan monitoring, evaluation, and update schedule.

As a result of these limitations, the State made the determination to focus efforts during the 2014 planning cycle on rebuilding the engagement of State agencies in the planning process and in active identification, implementation, and monitoring of mitigation actions



and activities. In addition, **several opportunities to improve the outcome for monitoring and evaluation were identified during the 2014 SHMP update process:**

- Enhance communication and collaboration with state and non-state agencies related to mitigation planning activities;
- Integrate the tracking of mitigation activities with existing programs, plans, processes, timelines, and reports
- Continue to underscore the value of mitigation to protect the State's investment in communities and infrastructure in the face of impacts from multiple disasters and diminishing tax revenues

Monitoring and evaluation of hazard risks, goals, objectives, and activities identified in the SHMP will occur, at a minimum, annually and/or following any major disaster with directed outreach to State agencies to request information and updates on revised strategies and activities, particularly if new hazard information or updated profiles are warranted based on events in the past reporting cycle.

During the monitoring, evaluation and update process, DHSES, as the lead mitigation planning agency, will attempt to identify implementation challenges (technical, political, legal, and financial) as they appear and, as appropriate, to develop recommendations and strategies to overcome them. The following sub-sections describe the method and schedule for monitoring, evaluating, and updating the plan, including processes for monitoring and the criteria used to evaluate effectiveness. In addition, responsibilities for monitoring and evaluation are described.

### **Method and Schedule for Monitoring the 2014 Plan**

The method and schedule for monitoring the plan that was identified in the 2011 SHMP was disrupted by the timing of Hurricane Irene and Tropical Storm Lee in 2011 and Hurricane Sandy on October 29, 2012, requiring a significant shift in staff focus that limited the annual monitoring and evaluation process during that period, as well as the beginning of the 2014 plan update cycle. The new process defined in the 2014 update, which is a streamlined method with clear objectives and criteria, will facilitate the next three-year SHMP update process by consolidating outcomes of the monitoring and evaluation process into the update cycle. In addition to ensuring that there is a continuous process to maintain the plan, this method makes effective use of available resources including DHSES Mitigation staff and contractors. It is anticipated that the implementation of regularly scheduled monitoring activities will improve efficiency and accountability in the update process.

In order to establish a more clearly defined system of plan maintenance that will continue in future planning cycles, a calendar of events, responsible parties, and three-year timelines are defined in **Tables 6.1a, 6.1b, 6.1c, and 6.1d**, in the following sections.



### 6.1.2 Responsibility for Monitoring and Evaluation

While key agencies and stakeholders across New York State remain keenly interested in the outcomes of the SHMP, the lead responsibility for plan maintenance continues to rest with the State Hazard Mitigation Officer (SHMO), who oversees all mitigation planning and project activities within DHSES. **Specific duties related to the process may be delegated to DHSES Mitigation staff or other entities such as a contractor or consultant, as described:**

- Facilitating the review process to ensure progress in accomplishing the overall mitigation strategy described in the plan
- Coordinating stakeholder participation, as envisioned and specified in the plan
- Implementing monitoring, evaluation, and update activities that have been scheduled according to the timelines established in the plan.
- Updating data in a timely fashion, and documenting progress in meeting mitigation goals and objectives described in the plan
- Documenting outcomes of the plan maintenance process and progress achieved in the completion of mitigation activities

NYSDHSES, in collaboration with key State agencies, will implement the process to monitor and maintain the SHMP in a manner designed to increase accountability, facilitate regular review and revisions, and ensure that the plan remains an active and useful tool in the State's mitigation efforts. Additionally, DHSES will continue to enhance the relationships developed with other agencies and organizations during this and future plan development, evaluation, and update activities.

### 6.1.3 Monitoring

**Table 6a** provides the overall timeframes for specific monitoring activities to take place in order to assure that the plan is consistent with ongoing mitigation needs and efforts. The purpose of monitoring is to gain a periodic snapshot of the status of mitigation activities and projects being implemented by various agencies and organizations. This information, in turn, is used during the evaluation process to gauge the State's progress in achieving mitigation goals and objectives.

The steps for monitoring the status of actions and activities are described in **Table 6a** and include coordination with stakeholder agencies to gather information updates on current activities and projects, and solicit information on new projects as well as those activities that are in development. Information collected during the monitoring phase will be used to adjust elements of the plan, as needed, and incorporated into the evaluation phase in preparation for updating the plan.



**Table 6.1a: Monitoring Process- Annually and/ or Following Major Disaster**

<b>Step 1: SHMO – Initiate Monitoring Process</b>
<ul style="list-style-type: none"> <li>• Identify/designate lead individual, agency, or entity to facilitate annual review               <ul style="list-style-type: none"> <li>○ Are there additional organizations that need to be represented or contacted?</li> <li>○ Disseminate report form for mitigation activity updates to representatives of agencies with activities included in current actions and activities list</li> <li>○ Disseminate request form for proposed mitigation activities to representatives of agencies with potential mitigation actions and activities.</li> </ul> </li> </ul>
<b>Step 2: Facilitator and SHMP Team – Collect and Assess Status of Activities and Projects</b>
<ul style="list-style-type: none"> <li>• Assess progress in current activities and projects, including implemented and funded projects, and any new opportunities for mitigation actions               <ul style="list-style-type: none"> <li>○ Are there different or additional resources now available?</li> <li>○ Are mitigation activities being implemented and monitored?</li> <li>○ Have new mitigation activities been identified?</li> <li>○ Have any mitigation activities/projects been completed?</li> </ul> </li> </ul>
<b>Step 3: Facilitator and SHMP Team – Assess New Opportunities for Mitigation</b>
<ul style="list-style-type: none"> <li>• Has a major disaster occurred that presents opportunities for mitigation?</li> <li>• Is there a new initiative, agency priority, or information that is not represented in the current activities?</li> </ul>
<b>Step 4: Facilitator and SHMP Team – Update Integration of Local Hazard Mitigation Plans (LHMPs)</b>
<ul style="list-style-type: none"> <li>• Conduct a review and benchmark of LHMPs as new plans are submitted and approved and update SHMP annually to incorporate information from local plans.</li> </ul>
<b>Step 5: Facilitator and SHMP Team – Prepare and Disseminate Status Report to All Stakeholders, including DPC</b>
<ul style="list-style-type: none"> <li>• Status of current activities and implemented projects</li> <li>• Proposed activities</li> <li>• Potential funding sources</li> <li>• New opportunities for mitigation (Activities in Development, etc.)</li> </ul>

### 6.1.4 Evaluation

The SHMO will coordinate with the Mitigation staff to conduct two evaluations that will be incorporated to serve as the foundation of the update cycle. These will occur annually in May of the first and second years after adoption. **Table 6b** describes the process for annual monitoring of the plan.



**Table 6.1b: Evaluation Process – Annually and/or Following a Major Disaster**

<b>Action</b>	<b>Responsible Party</b>	<b>Tasks</b>	<b>Deliverable/Outcome</b>
<b>Initiate Annual Review</b>	SHMO	Identify/ designate lead individual, agency, or entity to facilitate annual review	Work plan, schedule, and assigned resources to implement plan review process
<b>Invite Key Agencies</b>	DHSES Mitigation Section (or other designated entity)	Invite key agency representatives, including DPC, new agencies and staff, to participate in the plan monitoring and evaluation process	List of invited existing and new agencies and other key planning partners; invitation to participate
<b>Review Policies and Regulations</b>	DHSES Mitigation Section (or other designated entity)	Research new or updated laws, policies, regulations, initiatives, and studies that contribute to the hazard risk assessment or identified mitigation activities	Status report: Existing and new policies, regulations, initiatives and/or studies
<b>Review Programs</b>	DHSES Mitigation Section (or other designated entity)	Assess changes in state agencies and/or their procedures, new grant programs, or new areas of focus	Status report: Existing and new agencies, organizations, procedures, grant programs and/or new areas of focus
<b>Hazards</b>	DHSES Mitigation Section (or other designated entity)	Research new or updated data and information that contributes to the risk assessments, loss estimates, or vulnerabilities in State assets	Status report: Recent disasters, hazard impacts and losses, lessons learned, status of State facilities and infrastructure; update SHMP annually to reflect new risk assessment and capability data gathered from review of LHMPs.
<b>Activities</b>	DHSES Mitigation Section (or other designated entity)	Assess progress in previously implemented actions that reduce vulnerability and losses, and any new opportunities for mitigation actions	Status report: Completed projects, pending projects, implementation status of activities and projects
<b>Outcomes</b>	DHSES Mitigation Section (or other designated entity)	Maintain and complete documentation of the SHMP plan review process and prepare summary report	Summary report: Mitigation Strategy - Annual Update (incorporating results of annual monitoring and evaluation)



**Table 6.1c** provides guidance on the topics and scope of information that will be gathered during the first annual evaluation.

**Table 6.1c: Evaluation Guidance- First Annual Evaluation (June 2014)**

<b>Planning Process</b>
<ul style="list-style-type: none"> <li>• What are lessons learned from the 2014 SHMP update process?</li> <li>• Have there been changes in staff, agency partners, or planning team members that warrant inviting new members?</li> <li>• Are there organizations that need to be represented or contacted?</li> <li>• Conduct an annual review and benchmark of LHMPs using the May 31 FEMA Local Plan Status report.</li> </ul>
<b>Hazards and Risk Assessment</b>
<ul style="list-style-type: none"> <li>• Are there changes in hazard vulnerabilities and/or losses?</li> <li>• Are there new studies and initiatives which affect or update the risk assessment?</li> <li>• Are there changes in development trends related to specific hazards?</li> <li>• Have new local plans been researched as they are submitted and reviewed to capture local information related to capabilities, vulnerabilities, estimated potential losses, and changes/trends in development</li> </ul>
<b>Goals and Objectives</b>
<ul style="list-style-type: none"> <li>• Do the goals still align with State priorities and hazard risks?</li> <li>• Are the goals still considered attainable?</li> <li>• Is there a new initiative, agency priority, or information that is not represented in the goals and objectives?</li> </ul>
<b>Mitigation Activities</b>
<ul style="list-style-type: none"> <li>• Are there different or additional resources now available?</li> <li>• Are mitigation activities being implemented and monitored?</li> <li>• Have new mitigation activities been identified?</li> <li>• Have any mitigation activities been completed?</li> </ul>



**Table 6.1d** provides guidance on the topics and scope of information that will be gathered during the second annual evaluation.

**Table 6.1d: Evaluation Guidance – Second Annual Evaluation (June 2015)**

<b>Planning Process</b>
<ul style="list-style-type: none"> <li>• Have there been changes in staff, agency partners, or planning team members that warrant inviting new members?</li> <li>• Are there organizations that need to be represented or contacted?</li> <li>• Conduct an annual review and benchmark of LHMPs using the May 31 FEMA Local Plan Status report and changes in development trends</li> </ul>
<b>Risk Assessment</b>
<ul style="list-style-type: none"> <li>• What are the changes in hazard vulnerabilities and/or losses?</li> <li>• What are the changes in the risk threshold for each hazard?</li> <li>• Are there new studies and initiatives that affect or update the risk assessment?</li> <li>• Are the hazard rankings and predicted occurrences in the LHMPs consistent with the 2014 SHMP hazard rankings?</li> <li>• Have new local plans been researched as they are submitted and reviewed to capture local information related to capabilities, vulnerabilities, estimated potential losses, and changes/trends in development?</li> <li>• In the last two years, has there been a hazard event that was a greater severity than identified in the risk assessment?</li> <li>• What are areas of concern to be monitored for the upcoming year leading to the update?</li> </ul>
<b>Goals and Objectives</b>
<ul style="list-style-type: none"> <li>• Do the goals and objectives still align with State priorities, and are they considered attainable?</li> <li>• Do the goals identified in LHMPs align with the State goals?</li> <li>• Is there a new initiative, agency priority, or information that is not represented in the goals?</li> <li>• Which goals and/or objectives have been either partially or completely met through the mitigation activities?</li> <li>• Has a goal and/or objective been partially or completely met through other programs throughout New York State agencies?</li> </ul>
<b>Mitigation Action and Activities</b>
<ul style="list-style-type: none"> <li>• Are there different or additional resources now available?</li> <li>• Are mitigation activities being implemented and monitored?</li> <li>• Is progress in reducing the risk of priority hazards being tracked and documented through implemented mitigation activities or projects?</li> <li>• Have there been new activities identified?</li> <li>• Have any mitigation activities or projects been completed?</li> <li>• Are there changes in state agencies or their procedures that would affect activities?</li> <li>• Have there been any changes in the management or monitoring of mitigation activities?</li> </ul>



Information obtained during the evaluation process will be compiled into a report or other format such as a presentation and disseminated to the DPC and other mitigation partner agencies and organizations. In addition, the status of current activities listed in the plan and/or new activities gathered during the monitoring process will be documented on the Mitigation Activities spreadsheet. Information provided during the monitoring and evaluation process related to potential developing activities will be added to the “Activities in Development” spreadsheet.

### 6.1.5 Updating the SHMP

The continuous monitoring and evaluation steps taken to maintain the plan will be integrated with plan update activities throughout the planning cycle. **Table 6.1e** describes the full scope of the update cycle, including integration of results of the monitoring and evaluation phases, as well as activities that will be initiated at the beginning of the 3<sup>rd</sup> year following adoption of the plan to ensure completion of the update prior to the next scheduled expiration of the plan [January 2017]. The Mitigation Section, or other entity as designated by the SHMO, will conduct all update activities with participation of mitigation partner agencies and organizations. (Agencies and organizations that participated in the 2014 update process are described in **Section 2**.)

**Table 6.1e: Plan Update Schedule and Process**

Schedule	Process
<b>Monitoring and Evaluation Activities</b> – <i>Ongoing throughout the three-year planning cycle</i>	<ul style="list-style-type: none"> <li>Monitoring and evaluation results, meeting documentation, and other pertinent documents will be collected throughout the three year life cycle of the plan and used in the next SHMP update</li> <li>Multiple meetings with federal and state agencies, interested parties, and the SHMP Team will be conducted</li> <li>Activities, meetings, and interactions will be tracked and documented throughout the planning cycle</li> <li>An annual review and benchmark of LHMPs, to include FEMA-approval status, hazard events and ranking, goals and objectives, and activities, will be conducted using the May 31 FEMA Local Plan Status report</li> </ul>
<b>Update Risk Assessment</b> – <i>January – May (conducted in third year of planning cycle)</i>	<ul style="list-style-type: none"> <li>SHMO and SHMP Team lead will identify key partners to contribute to the updated risk assessment</li> <li>Monitoring and evaluation results will be incorporated</li> <li>Changes since the previous plan approval will be identified</li> <li>Each hazard will be assessed and updated to include new data since the date of plan approval and project information for the next planning cycle</li> <li>New hazard occurrences and potential changes in low-ranked hazards will be identified and assessed</li> <li>Any significant changes in LHMP risk assessments will be noted during plan review and integrated into the updated SHMP</li> </ul>
<b>Review and</b>	<ul style="list-style-type: none"> <li>SHMO will coordinate with key partners to assess the status of current</li> </ul>



Schedule	Process
<b>Update Goals and Objectives –</b> <i>May – August</i> <i>(conducted in third year of planning cycle)</i>	SHMP goals and objectives for potential revision <ul style="list-style-type: none"> <li>• Any significant changes in LHMP goals, especially those that are not consistent with the current plan goals, will be assessed and incorporated as appropriate in the updated SHMP</li> <li>• Monitoring and evaluation results will be utilized to modify the goals and objectives and describe achievements</li> </ul>
<b>Review and Update Mitigation Actions and Activities –</b> <i>May – August</i> <i>(conducted in third year of planning cycle)</i>	<ul style="list-style-type: none"> <li>• SHMO will coordinate with the responsible agencies identified in the current plan actions and activities to obtain an update</li> <li>• Monitoring and evaluation results will be utilized to assess the effectiveness of actions and activities in meeting the goals and reducing risks</li> <li>• Assess state and local mitigation activities implemented since the plan was approved and how they have contributed to the achievement of goals</li> <li>• Management and maintenance data from the implemented activities will be used to describe actions and activities in the previous three years</li> </ul>
<b>Compile and Review</b> <i>August – October</i> <i>(conducted in third year of planning cycle)</i>	<ul style="list-style-type: none"> <li>• SHMP Team will compile the data and develop the updated SHMP</li> <li>• Draft will be made available for partner review</li> <li>• All comments and suggestions will be incorporated and the final draft completed</li> </ul>
<i>October</i> <i>(third year of planning cycle)</i>	<ul style="list-style-type: none"> <li>• FEMA review of draft SHMP update</li> </ul>
<b>Adopted</b> <i>(third year of planning cycle)</i>	<ul style="list-style-type: none"> <li>• Updated SHMP will be adopted prior to January 1 (2014 plan expires in January 2017)</li> </ul>

During the life cycle of the current plan, any necessary adjustments to the responsibilities, schedule, or activities related to monitoring, evaluating, and updating the SHMP will be documented as they occur in order to ensure that the next plan revision adequately captures the root cause of any changes that should be addressed in the next update.



## 6.2 Monitoring Progress of Mitigation Activities

**Requirement §201.4(c)(5)(ii):** *The Standard State Plan Maintenance Process **must** include a system for monitoring implementation of mitigation measures and project closeouts.*

**Requirement §201.4(c)(5)(iii):** *[The Standard State Plan Maintenance Process **must** include a] system for reviewing progress on achieving goals as well as activities and projects in the Mitigation Strategy.*

### 6.2.1 Monitoring Implementation of Mitigation Measures and Project Closeouts – Federal Funding

The DHSES Mitigation Section ensures that all Hazard Mitigation Assistance (HMA) grants are implemented in accordance with current FEMA guidance: *Hazard Mitigation Assistance Unified Guidance: Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and Flood Mitigation Assistance Program (FMA) [including repetitive loss and severe repetitive loss]*. The State has established a monitoring system for tracking the implementation and closeout of FEMA-funded mitigation actions **(1)** through the quarterly reports submitted by subgrantees and **(2)** by contacting the subgrantees monthly to discuss project status, upcoming benchmarks and deadlines, and to determine if the project is on track or if assistance is needed. In addition, the DHSES Mitigation Section maintains a spreadsheet that documents the progress of projects.

This procedure has demonstrated success by the decrease in the number of extensions and project delays since January 2010. The project closeout phase is monitored by Mitigation staff and completed by ensuring that all subgrantee paperwork, including documentation of all expenses, has been received and DHSES staff has inspected the project prior to final payment. As an additional step, final payments for all flood acquisition projects are held until the applicant provides a notarized property deed containing the protective covenants required by FEMA. It should be noted that flood acquisition parcels must be managed in accordance with open space requirements in perpetuity and related projects require the applicant to submit reports to the Mitigation Section and FEMA every three years to document conformance with those standards and the provisions of the grant. For the complete implementation process from grant availability to closeout, see **Appendix 5**.

Due to the success of the processes implemented since 2011, no modifications to the FEMA grant project management procedures are necessary for the 2014 SHMP to track the initiation, status, or completion of federally-funded mitigation projects.



## 6.2.2 Monitoring Implementation of Mitigation Activities and Project – All Activities and Projects

The damage wrought by Hurricane Irene, Tropical Storm Lee, and Hurricane Sandy created many opportunities for State agencies to enhance already-established relationships and create new ones. The State has taken several steps since the 2011 Mitigation Plan to foster cross-agency cooperation and encourage and support comprehensive mitigation planning and activities, including:

Two ad hoc groups keep agencies involved in mitigation and/or critical facilities in constant contact and collaboration:

- Silver Jackets agencies (Army Corps, NOAA, USGS and FEMA, and the NYS Canal Corporation, Transportation, Environmental Conservation, Homeland Security and State (Coastal) Departments continues to provide technical and financial assistance to flooded communities across the State, with special emphasis placed on flood mapping, NFIP and mitigation programs in communities and regions where there was no Federal declaration or assistance.
- Adaptation Working Group, consisting of agencies whose programs interface with climate change, continues to meet to reinforce each other's programs.
  - Recent examples:
    - On July 17, 2013 Governor Cuomo established the Mohawk Valley and 2013 Upstate Flood Recovery Program to respond to upstate flooding for which a Presidential declaration was denied and placed various agency representatives in the field with counties and communities to speed recovery;
    - With input from DHSES and DEC, the Dept. of State (Coastal) developed criteria with which communities can gauge their risk from flooding and storm surge;
    - DEC is working with NYSERDA and DHSES to give Climate Smart communities points for activities like developing evacuation routes or updating hazard mitigation plans that can be used when ranking NYSERDA and DHSES grants. This collaboration increases the incentives for communities to do the right thing as points captured for good mitigation or resiliency actions can offer benefits across multiple State programs.
    - DHSES (mitigation grants), DEC (NFIP) and Dept. of State (State Building Code) met with a community to explain the interrelationship between the State Code and local floodplain regulations to ensure continued compliance and eligibility for HMGP grants. This multi-agency approach was considered a success by all and serves as a model for other targeted outreach and assistance.
- DHSES instituted new policies to save lives and money. The office:



- Will not participate in projects that elevate homes in riverine floodways (acquisition still remains a fundable option);
  - Will fund only county-wide hazard mitigation plans, which produce much better actions and strategies and make best use of scarce planning funds.
- After Irene and Lee, DHSES supported mitigation planning and efforts to acquire or elevate properties within the 100-year floodplain, sending grants to FEMA requesting nearly:
    - \$2.7 million for 19 multi-jurisdictional plans protecting nearly 13.4 million New Yorkers;
    - \$158 million to acquire or elevate 1232 homes in the floodplain.

After Superstorm Sandy, DHSDES invested in the “MB3” Emergency Management Grants management system: <https://recovery.dhSES.ny.gov/index.cfm>. Recovery.DHSES.NY.gov will track and cross-reference Public Assistance (PA) and Hazard Mitigation (HM) applicants and their projects, allowing DHSES to perform better analysis of projects based on type, location and applicant, and will enhance opportunities to maximize mitigation by dovetailing Section 404 and Section 406 activities

Mitigation activities identified in the 2014 SHMP will be monitored for goal achievement and documentation of progress. As described previously in this section, mitigation activities will be reviewed each year through the monitoring and evaluation processes. Information related to the current status; funding source(s), if applicable; and outcome (value of losses mitigated, objectives achieved, etc.) for activities in the current plan will be collected annually from agency sponsors and documented on the “Mitigation Activities” or “Projects in Development” spreadsheets. In addition, other activities or projects that have been implemented and completed independently by other state entities will also be captured through the monitoring process and documented on the “Mitigation Progress” spreadsheet. Annual maintenance of the status of activities and projects will facilitate the update process.

### 6.2.3 Achieving Goals

Goals will be reviewed for progress during the monitoring, evaluation, and update process as detailed in **Tables 6.1a, b, c, and d. Section 4, Table 4.4g** validates that the State, through its agencies and organizations, is achieving progress in meeting its identified goals and objectives by completing mitigation activities that reduce vulnerabilities and prevent or eliminate future losses. In addition, integration of LHMP goals with the SHMP throughout the life cycle of the plan demonstrates the State’s comprehensive approach to mitigation through coordination at the local, county, state, and federal levels.



## Section 7: SEVERE REPETITIVE LOSS STRATEGY

### 2014 SHMP Update

- Reviewed all sections of the 2011 State Hazard Mitigation Plan (SHMP)
- Restructured information from the 2011 SHMP as a stand-alone section for the 2014 update to be consistent with 44 CFR 201.4
- Updated Goals that support the selection of mitigation activities for Repetitive Loss and Severe Repetitive Loss Properties
- Data tables and figures related to Repetitive Loss and Severe Repetitive Loss in the 2011 SHMP were updated and moved to this section.

***Requirement §201.4(c)(3)(v):** A state may request the reduced cost share authorized under §79.4(c)(2) of this chapter for the Flood Mitigation Assistance (FMA) and Severe Repetitive Loss (SRL) program, if it has an approved State Mitigation Plan...that also identifies specific actions the State has taken to reduce the number of repetitive loss properties (which **must** include severe repetitive loss properties), and specifies how the State intends to reduce the number of such repetitive loss properties. In addition, the State **must** describe the strategy the State has developed to ensure that local jurisdictions with severe repetitive loss properties take actions to reduce the number of these properties, including the development of local mitigation plans.*

### 7.1 Repetitive Loss Mitigation Strategy

New York State has prioritized the elimination of repetitive flood loss properties for a number of years. From the period of 2004 through 2007, fifty-nine (59) federally-funded hazard mitigation projects were completed in over 20 counties within New York State. These projects were varied in number and type, with acquisitions being the most funded project type.

The 2008 New York State Hazard Mitigation Plan (SHMP) described the Repetitive Flood Claims (RFC) grant program which was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, and amended the National Flood Insurance Act of 1968. The RFC provided funding to reduce or eliminate the long-term risk of flood damage to structures insured under the National Flood Insurance Program (NFIP) that had one or more claims for flood damages. RFC funding was used by the State between 2008 and 2011 for property acquisition projects to address flood losses.

Since the 2011 SHMP plan was adopted, the Biggert-Waters Flood Insurance Reform Act of 2012 eliminated the RFC program, and integrated three grant programs, including the



Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) Program and Flood Mitigation Assistance (FMA) Program under the Unified Hazard Mitigation Assistance (HMA) Program. Final guidance for the HMA (July 2013) describes the current requirements, eligibility, and application procedures for the HMA program.

To be eligible for an increased Federal cost share, a FEMA-approved State (Standard or Enhanced) Mitigation Plan that addresses repetitive loss repetitive loss (RL) properties must be in effect at the time of the grant award and the property that is being submitted for consideration must be a RL property. Guidance on addressing RL properties is provided in the *Unified Hazard Mitigation Assistance Planning Guidance* and in 44 CFR Section 201.4(c) (3) (v). The Repetitive Loss Strategy identifies the specific actions the State has taken to reduce the number of repetitive loss properties, which must include severe repetitive loss (SRL) properties, and specify how the State intends to reduce the number of such repetitive loss properties. In addition, the hazard mitigation plan must describe the State's strategy to ensure that local jurisdictions with severe repetitive loss properties take actions to reduce the number of these properties, including the development of local mitigation plans.

Property acquisitions are an effective mitigation measure to address repetitive flood claims, because they are a permanent form of mitigation. FEMA funds are available to states to purchase property in flood-prone areas and dedicate that property as green space not available for development. This type of project allows New York State and local jurisdictions to remove people and property from floodplains, and reducing future costs associated with a community's disaster response, recovery, and repair.

## 7.2 State Repetitive Loss Properties' Mitigation Goals

New York State's five mitigation goals are identified in **Section 4.1** of the 2014 Plan. After receiving millions of dollars in damage from Tropical Storm Lee, and Hurricanes Irene and Sandy, the State identified the need to revise the 2011 vision statement and goals for the 2014 Plan Update. The revised goals address prevention, property protection, public education and awareness, natural resource protection, and structural projects while focusing on reducing vulnerability and promoting resiliency. **Goals 2, 3, and 5** directly support the State's repetitive loss mitigation activities and strategies.

**Goal 2: Protect property including public, historic, private structures, and critical facilities and infrastructure.**

**Objective 2.1:** Encourage homeowners, renters, and businesses to insure property for all hazards, including flood coverage under the National Flood Insurance Program (NFIP).

**Objective 2.2:** Identify mitigation opportunities to protect, upgrade and strengthen existing structures through acquisition, elevation, relocation and retrofit.



**Objective 2.5:** Acquire, retrofit, or relocate repetitive loss properties from flood-prone areas in the state.

**Goal 3:** Increase awareness and promote relationships with stakeholders, citizens, elected officials and property owners to develop opportunities for mitigation of natural hazards.

**Objective 3.4:** Conduct education and awareness programs for flood mitigation planning and funding assistance.

**Goal 5:** Build stronger by promoting mitigation actions that emphasize sustainable construction and design measures to reduce or eliminate the impacts of natural hazards.

**Objective 5.4:** Provide assistance in the implementation of flood mitigation plans and projects in flood-prone areas, in accordance with federal and state regulatory, funding, and technical assistance programs.

### 7.3 State and Local Policies, Programs, and Capabilities Related to Repetitive Loss Properties

In order to reduce cost to New York State, local jurisdictions and communities, the State offers to buy properties located in areas where repetitive flood loss occurs. Although the State has experienced limited resources such as funding and staffing in the past, it has been able to significantly expand its acquisition projects in recent years, primarily due to post disaster funding becoming available. The State also encourages and provides technical assistance to local jurisdictions to apply for HMA grants to mitigate RL properties in their communities.

New York State Department of Environmental Conservation (DEC) administers the National Flood Insurance Program, including repetitive loss and severe repetitive loss, training, and technical assistance. The following process is used to identify properties for acquisitions. The State Floodplain Coordinator and DEC have direct access to RL properties and the SRL properties by address in the Federal Bureau Net database. Spreadsheets are then created and used by the Mitigation Section to track mitigated and non-mitigated properties in each community. A representative from the Mitigation Section sends the list of RL and SRL properties with a privacy act disclaimer to the county and/or local jurisdiction planner. The local planner verifies the Bureau Net spreadsheets provided by the State and compares it to local data for accuracy.

Notice of Funding Availability letters are sent to the local counties and/or jurisdictions after a Presidential Disaster Declaration (PDD) to notify the Emergency Manager of available HMGP post-disaster funding opportunities. When applicable, this letter may also alert local governments to the locations of RL and severe repetitive loss (SRL) properties



within their communities. Local jurisdictions are required to have a current FEMA-approved local hazard mitigation plan in order to be eligible to receive any HMA funding.

After New York State coastal and inland communities were devastated by Hurricane Irene, Tropical Storm Lee and Hurricane Sandy in 2011 and 2012, the New York State Department of Homeland Security and Emergency Services (DHSES) Mitigation Section began further discussion with FEMA in reference to new mitigation projects, as well as updating the SHMP, which is adopted by the Disaster Preparedness Commission (DPC) on a three-year cycle. The State coordinated with FEMA Region II to implement a mitigation strategy focusing on acquisitions of both substantially-damaged and non-substantially damaged properties and elevations of floodplain properties while continuing to fund current mitigation planning efforts necessary under FEMA's HMGP, PDM, and FMA Programs.

From August 2012 to March 2013 the State submitted 103 project applications to FEMA for Unified HMA assistance for community buyout and structural elevation projects. If all projects are implemented the State will have mitigated approximately 1,198 RL and/or SRL properties. **Table 7a** summarizes the total cost to fund those project and planning grants submitted to FEMA, and the federal and state shares from the following Presidential Declared Disasters: DR-1957 (Severe Winter Storm and Snowstorm), DR-1993 (Severe Storms, Flooding, Tornadoes, and Straight-line Winds), DR-4020 (Hurricane Irene), and DR-4031 (Remnants of Tropical Storm Lee).

On August 29, 2013, the State announced 2013 Unified HMA funding opportunities for HMGP projects for qualified local and state government agencies and authorities. Only SRL communities designated by FEMA were eligible to apply; additionally funding required that mitigation activities be directed to SRL properties within those communities with current NFIP policies. To date, 84 applications have been sent to FEMA for statewide acquisition or elevation projects to mitigate 1,232 properties. Estimated total cost is \$210 million, the federal share is \$157 million, and \$53 million is the State's share. Data for the above findings is in **Table 7.3a**.



**Table 7.3a: NYS Summary of Grant Applications Submitted to FEMA for Potential Unified Hazard Mitigation Assistance (HMA) Funding, August 2012 to March 2013**

Disaster Number/ Grant Type	Project/Plan Type	Total Projects	# of Properties	Total Cost	75% Federal Share	25% State Share
1957, 1993, 4020, 4031 Projects	Substantially Damage Buyouts	55	1,061	\$187,424,142	\$140,562,106	\$46,856,035
1957, 1993, 4020, 4031 Projects	Non-Substantially Damage Buyouts	12	44	\$6,665,097	\$4,998,822	\$1,666,574
1957, 1993, 4020, 4031 Projects	Structural Elevations	17	93	\$16,070,609	\$12,052,957	\$4,017,652
4020 Planning	Multi-Jurisdictional	19	13,389,921	\$3,545,570	\$2,659,178	\$886,393

Source: DHSES, as of October 2013

During the SHMP update cycle, local hazard mitigation plans are reviewed to ensure that repetitive loss and several repetitive loss properties receive the level of consideration required by the number of repetitive flood claims and losses. In addition, the Mitigation Section provides on-going technical assistance to local jurisdictions for development of mitigation plans, goals, objectives, actions and projects related to repetitive and severe repetitive loss.

Flooding is the most common and most expensive natural disaster in the country. New York State's Department of Homeland Security and Emergency Services (DHSES), and Department of Environmental Conservation (DEC) work diligently in collaborating efforts to inform and provide technical assistance to local jurisdictions and communities about FMA Programs and mitigation strategies.

The State Floodplain Coordinator and staff travel throughout the state to share with local communities the recent changes to the NFIP, such as the Biggert- Waters Flood Insurance Reform Act of 2012 (BW-12), as well as introducing the benefits of participating in the Community Rating System (CRS).

Prior to BW-12, owners of certain older properties in high-risk areas were charged premiums that did not reflect full flood risk. Only the properties that were built before the community adopted its first Flood Insurance Rate Map (FIRM) were eligible for certain subsidies. These properties are referred to as "pre-FIRM". In 2012 Congress passed reform legislation creating the removal of certain subsidies provided to some policyholders



and for rates to more accurately reflect flood risk.<sup>1</sup> It is important more than ever for property owners to have access to flood insurance, as flood exposure continues to increase.

The CRS program awards local municipalities with discounts to their constituents' flood insurance premiums for being proactive with flood and stream management and mitigation projects in their communities. A video of the NYS Floodplain Coordinator speaking to residents in Dutchess County at the Hudson Estuary Watershed Resiliency Project first series of seminars related to the topics of flooding and stream management can be viewed at <http://vimeo.com/70812908>.

In addition to community outreach, the State's Hazard Mitigation Planning Standards (October 2012) describes requirements that local governments must follow in developing its Local Hazard Mitigation Plan (LHMP). These standards put high emphasis on flood mitigation through adherence to applicable local flood plain laws and NYS Building Codes. For example, when an existing structure is elevated, the Building Code requires Base Flood Elevation (BFE) plus two feet, referred to as "ABFE" or Above Base Flood Elevation.

#### 7.4 Repetitive Loss Properties Addressed in the 2014 Risk Assessment

New York State, in coordination with its local jurisdictions, elevates structures and acquires properties to reduce loss of life and property by lessening the impacts of flood hazards in areas where RL and SRL properties are located. NYS has an ongoing partnership with its local jurisdictions through the LHMP planning process to identify and develop strategies to mitigate properties in these areas. Between August 2012 and March 2013, 84 townships, villages, and cities in 16 counties submitted applications to the State to receive Unified Hazard Mitigation Assistance (HMA) to elevate structures or acquire properties located in SRL areas.

In 2006 severe storms and flooding occurred in Broome, Cortland, Fulton, Greene, Hamilton, Madison, Oneida, Rensselaer, Schenectady, Schoharie, Tioga, Tompkins, and Westchester Counties, causing more than \$246 million in damages. This event was declared a Presidential Disaster (DR-1650) and NYS received \$19.5 million in HMA funding to buy out 220 RL properties in the above counties.

As described in **Section 3.9.2**, the NYS Mitigation Team reviewed FEMA-approved LHMP's and identified the following 34 counties that ranked flood as a "high" or "moderately high" hazard:

**"High" Flood Hazard** – Allegany, Broome, Cayuga, Chautauqua, Delaware, Franklin, Greene, Monroe, Montgomery, Orange, Ostego, Rensselaer, Saratoga, Schuyler and Tioga Counties.

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<sup>1</sup> FEMA, *Biggert-Waters Flood Insurance Reform Act of 2012*



**“Moderately High” Flood Hazard** – Albany, Cattaraugus, Chenango, Essex, Genesee, Jefferson, Lewis, Nassau, Onondaga, Ontario, Schoharie, Seneca, Sullivan, Ulster, Warren, Wayne, Westchester, Wyoming, and Yates Counties.

**Figures 7a, 7b and 7c** illustrate the statewide impacts for flooding for three recent PDD storm events:

- **DR 1993** – Severe Storms, Public Assistance , as of June 29, 2011
- **DR 4020** – Hurricane Irene, Public Assistance as of July 25, 2013
- **DR 4031** – Remnants of Tropical Storm Lee, Public Assistance as of July 25, 2013



Figure 7.4a represents counties receiving public assistance after Severe Storms, Flooding, Tornadoes, and Straight-line Winds (DR-1993) as of June 29, 2011.

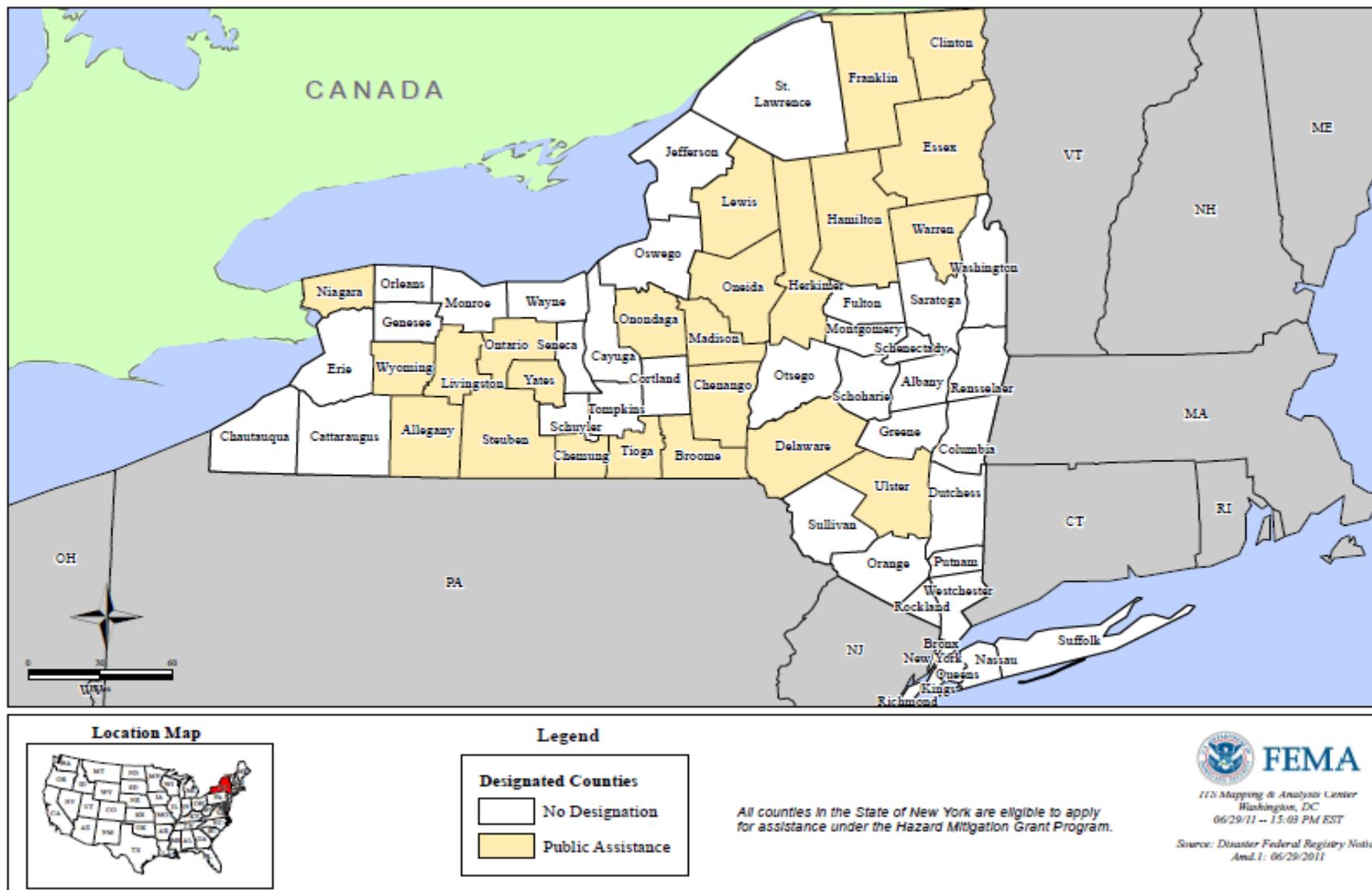


Figure 7.4b represents NYS counties receiving public assistance and/or individual assistance after Hurricane Irene (DR-4020) as of July 25, 2013.

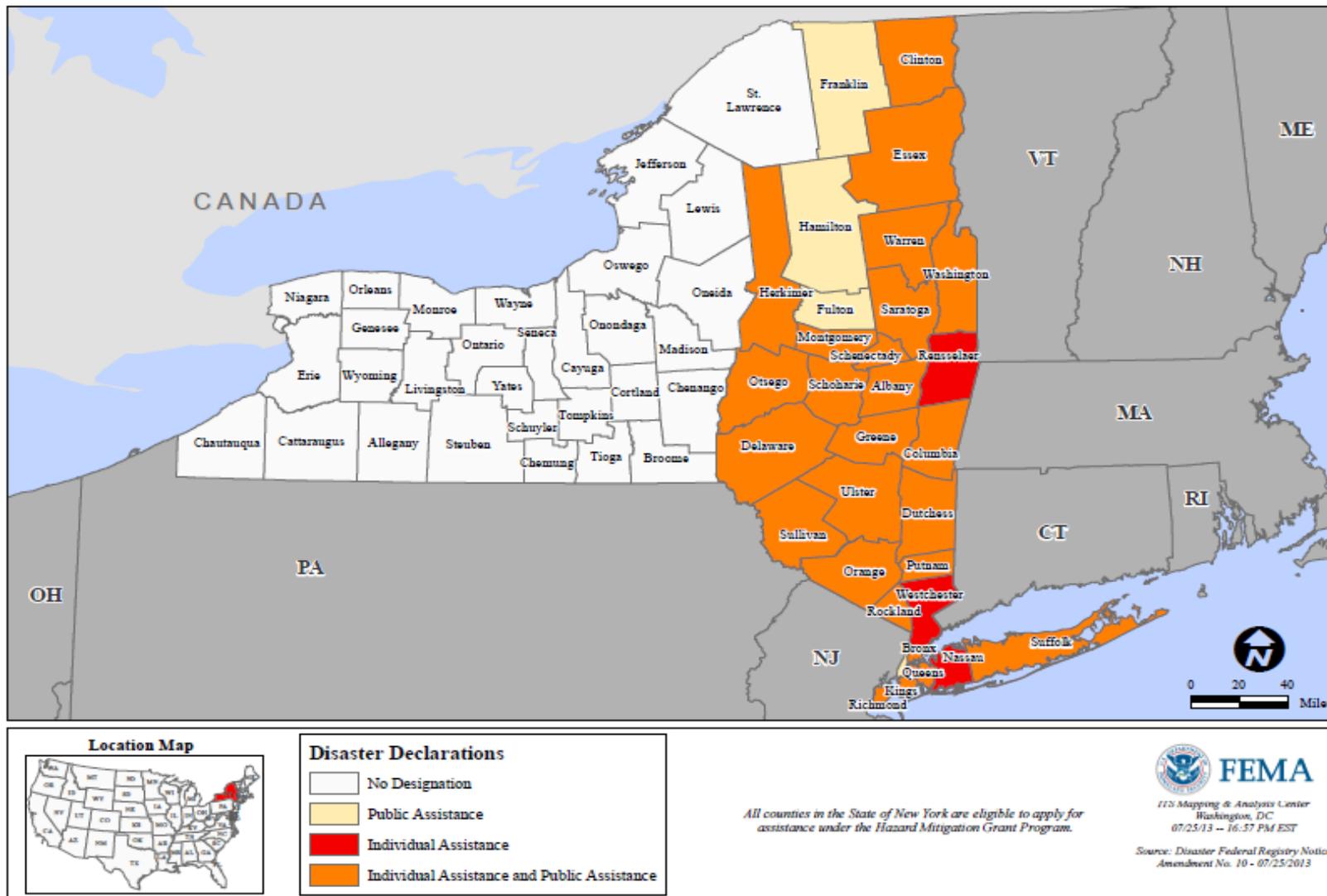
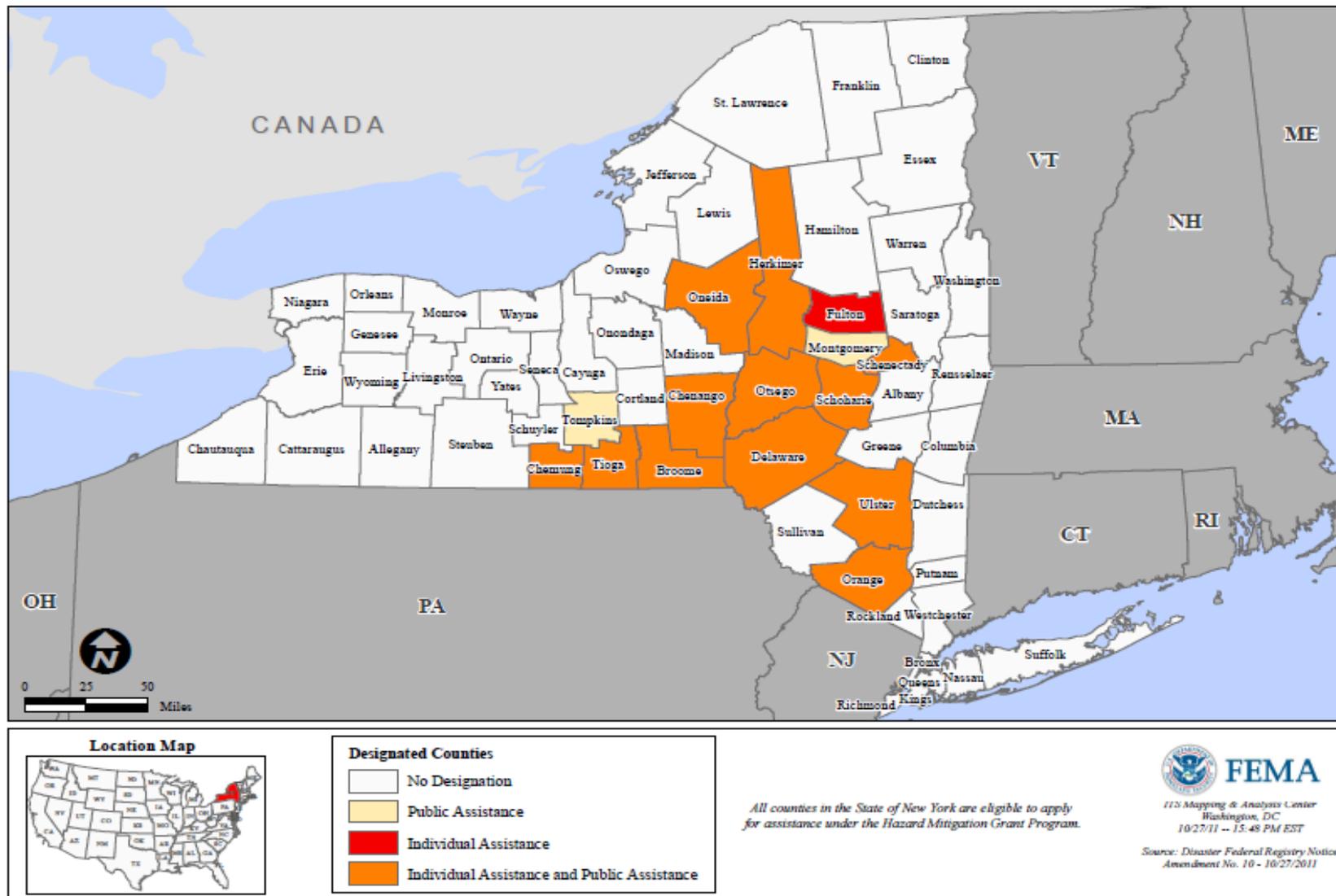


Figure 7.4c represents NYS counties receiving public assistance and/or individual assistance after Remnants of Tropical Storm Lee (DR-4031) October 27, 2011.



The State is progressively working with local jurisdictions to reduce deaths, injuries, and economic losses stemming from natural hazards. Of the 34 counties that ranked flood as “high” or “moderately high”, 67 communities in 12 of the counties applied for funding to buyout properties or elevate structures. **Table 7b** shows communities that applied for HMA funding for DR-1957, DR-1993, DR-4020, and DR-4031. *(Please note: New York State is participating in repetitive loss/severe repetitive loss mitigation activities with local jurisdictions through various post-disaster programs/projects such as: New York Rising and Hurricane Sandy Rebuilding Task Force.)*

Also, **Section 3.9.2** references **Tables 3.9f, 3.9g, and 3.9h** which represent National Flood Insurance Program CRS, RL, and SRL data provided by FEMA as of July 2013.

### 7.5 Repetitive Loss Properties Addressed in 2014 Mitigation Activities

Because of the significant disaster events involving flooding in the past three years, the State has stepped up its prioritization of repetitive loss and severe repetitive loss to address through mitigation activities and projects.

The process for identifying, evaluating and prioritizing cost-effective, environmentally sound and technically feasible mitigation activities is described in full in **Section 4**.



The following projects are included in the 2014 Mitigation Actions and Activities Table and described in more detail in **Section 4**.

**Table 7.5b: 2014 Flood Mitigation Actions and Activities**

Activity Number	Project Title	Description	Linking Goal(s)
2014-024	Identify and Evaluate Loss Reduction Options for Repetitive Loss Properties	Explore loss reduction options for defined repetitive loss properties. Assist communities to identify repetitive loss locations and support search for potential funding to mitigate future losses.	1, 2, 5
2014-031	Continue and Enhance Promotion of National Flood Insurance Program (NFIP and Community Rating System)	Improve awareness by ensuring comprehensive integration into State agency technical assistance and training program curriculum for local governments, and increasing visibility and accessibility of data via the agency web site. Example: DOS technical planning assistance for Local Waterfront Redevelopment Program Communities' comprehensive planning	1,2
2011-110	Repetitive Loss Properties	Identify and mitigate severe repetitive loss and repetitive loss properties. Continue and enhance the comprehensive loss reduction efforts to target repetitive loss	2, 3, 5

Source: NYSOEM



**Section 5.3** of the 2014 SHMP describes the prioritization criteria for flood mitigation project funding, which includes special considerations for:

- Community's disaster loss history by disaster type, with repetitive loss properties identified, as appropriate
- Participation in the National Flood Insurance Program, and number or claims history of repetitive loss properties
- Cost-benefits of the project

This criterion provides the opportunity for jurisdictions with high numbers of repetitive loss properties to be competitive for available funding. Any proposed project must meet benefit-cost analysis requirements to be eligible for funding. This ensures that a project is also technically feasible and environmentally sound.

## 7.6 Implemented Mitigation Actions for Repetitive Loss Properties

From August 2012 to February 2013, NYS reviewed 84 project applications submitted by local jurisdictions in Albany, Broome, Chenango, Clinton, Delaware, Essex, Greene, Montgomery, Nassau, Orange, Rockland, Schoharie, Suffolk, Tioga, Ulster, and Westchester Counties to FEMA to mitigate RL and SRL properties.

Once completed, these projects will elevate structures above the ABFE or buyout properties located in hazard prone area. **Properties located in communities impacted by one or more of the Presidential Declared Disasters listed below were eligible to apply for funding:**

- Severe Winter Storm and Snowstorms (DR-1957)
- Severe Storms, Flooding, Tornadoes, and Straight-line Winds (DR- 1993)
- Hurricane Irene (DR-4020)
- Remnants of Tropical Storm Lee (DR-4031)

**Table 7.6c** provides a detailed report of the 1,232 projects approved between 2012 and 2013 for implementation. The total cost of these projects is \$210,159,848.



Table 7.6c: Mitigation Grant Applications Approved by FEMA for Acquisition or Elevation Projects (2012-2013)

County	Applicant	DR # 1957/1993/ 4020/4031 Project Application #	# of Properties	Project Type	Total Cost	75% Federal Share	Local Share	Date Submitted to FEMA
Albany	Town of Berne	001-009	1	Substantially Damaged Buyout	\$ 203,000	\$ 152,250	\$ 50,750	3/12/2013
Broome	Town of Union	007-037	5	Substantially Damaged Buyout	\$ 846,700	\$ 635,025	\$ 211,675	2/28/2013
Broome	City of Binghamton	007-020B	10	Not Substantially Damaged Buyout	\$ 1,371,818	\$ 1,028,864	\$ 342,955	1/29/2013
Broome	City of Binghamton	007-020	12	Substantially Damaged Buyout	\$ 1,581,780	\$ 1,186,335	\$ 395,445	8/27/2012
Broome	Town of Conklin	007-019	60	Substantially Damaged Buyout	\$ 5,483,664	\$ 4,112,748	\$ 1,370,916	8/27/2012
Broome	Town of Kirkwood	007-005	4	Substantially Damaged Buyout	\$ 503,320	\$ 377,490	\$ 125,830	8/27/2012
Broome	Town of Union	007-011/012	176	Substantially Damaged Buyout	\$ 17,441,261	\$ 13,080,946	\$ 4,360,315	8/27/2012
Broome	Town of Vestal	007-027	61	Substantially Damaged Buyout	\$ 7,661,391	\$ 5,746,043	\$ 1,915,348	8/27/2012
Broome	Town of Vestal	007-033	3	Substantially Damaged Buyout	\$ 413,350	\$ 310,013	\$ 103,338	3/12/2013
Broome	Village of Endicott	007-017/018	2	Substantially Damaged Buyout	\$ 221,951	\$ 166,463	\$ 55,488	8/27/2012
Broome	Village of Johnson City	007-029	9	Substantially Damaged Buyout	\$ 1,026,490	\$ 769,868	\$ 256,623	8/27/2012
Broome	City of Binghamton	007-021	3	Structural Elevation	\$ 539,535	\$ 404,651	\$ 134,884	2/7/2013
Broome	Town of Vestal	007-013	1	Structural Elevation	\$ 158,832	\$ 119,124	\$ 39,708	2/7/2013
Chenango	Town of Afton	017-034	1	Substantially Damaged Buyout	\$ 61,834	\$ 46,376	\$ 15,459	9/17/2012
Chenango	Village of Afton	017-004	1	Substantially Damaged Buyout	\$ 90,500	\$ 67,875	\$ 22,625	8/27/2012



County	Applicant	DR # 1957/1993/ 4020/4031 Project Application #	# of Properties	Project Type	Total Cost	75% Federal Share	Local Share	Date Submitted to FEMA
Chenango	Village of Afton	017-005	1	Substantially Damaged Buyout	\$ 157,500	\$ 118,125	\$ 39,375	3/12/2013
Clinton	Clinton County	019-002B	1	Not Substantially Damaged Buyout	\$ 109,900	\$ 82,425	\$ 27,475	1/29/2013
Clinton	Clinton County Legislative Office	019-002	1	Substantially Damaged Buyout	\$ 195,950	\$ 146,963	\$ 48,988	8/27/2012
Delaware	Delaware County	025-010	34	Structural Elevation	\$ 2,931,355	\$ 2,198,516	\$ 732,839	3/12/2013
Delaware	Delaware County	025-062-2	7	Substantially Damaged Buyout	\$ 2,165,390	\$ 1,624,043	\$ 541,348	3/12/2013
Delaware	Delaware County	025-063B	2	Not Substantially Damaged Buyout	\$ 271,099	\$ 203,324	\$ 67,775	1/29/2013
Delaware	Delaware County	025-062/076	46	Substantially Damaged Buyout	\$ 7,008,105	\$ 5,256,079	\$ 1,752,026	10/23/2012
Essex	Essex County	031-001-2	6	Substantially Damaged Buyout	\$ 678,875	\$ 509,156	\$ 169,719	3/12/2013
Essex	Essex County	031-001B	10	Not Substantially Damaged Buyout	\$ 1,170,245	\$ 877,684	\$ 292,561	1/29/2013
Essex	Essex County	031-001	26	Substantially Damaged Buyout	\$ 3,530,631	\$ 2,647,974	\$ 882,658	9/17/2012
Greene	Greene County (Town of Lexington)	039-040B	2	Not Substantially Damaged Buyout	\$ 343,300	\$ 257,475	\$ 85,825	3/12/2013
Greene	Village of Greene	017-006	14	Structural Elevation	\$ 2,168,023	\$ 1,626,017	\$ 542,006	3/12/2013
Greene	Greene County (Town of Catskill)	039-041	1	Substantially Damaged Buyout	\$ 123,150	\$ 92,363	\$ 30,788	2/28/2013
Greene	Greene County (Town of Lexington)	039-043	1	Substantially Damaged Buyout	\$ 213,750	\$ 160,313	\$ 53,438	2/28/2013
Greene	Greene County (Town of Hunter)	039-027	3	Substantially Damaged Buyout	\$ 553,620	\$ 415,215	\$ 138,405	9/17/2012
Greene	Greene County (Town of Jewett)	039-029	2	Substantially Damaged Buyout	\$ 697,500	\$ 523,125	\$ 174,375	9/17/2012



County	Applicant	DR # 1957/1993/ 4020/4031 Project Application #	# of Properties	Project Type	Total Cost	75% Federal Share	Local Share	Date Submitted to FEMA
Greene	Greene County (Town of Cairo)	039-024	1	Substantially Damaged Buyout	\$ 171,450	\$ 128,588	\$ 42,863	9/17/2012
Greene	Greene County (Town of Catskill)	039-031	8	Substantially Damaged Buyout	\$ 1,356,210	\$ 1,017,158	\$ 339,053	9/17/2012
Greene	Greene County (Town of Durham)	039-030	1	Substantially Damaged Buyout	\$ 228,450	\$ 171,338	\$ 57,113	9/17/2012
Greene	Greene County (Town of Lexington)	039-028	2	Substantially Damaged Buyout	\$ 328,200	\$ 246,150	\$ 82,050	9/17/2012
Greene	Greene County (Town of Windham)	039-026	3	Substantially Damaged Buyout	\$ 363,450	\$ 272,588	\$ 90,863	9/17/2012
Greene	Greene County (Town of Ashland)	039-025	1	Substantially Damaged Buyout	\$ 148,750	\$ 111,563	\$ 37,188	9/17/2012
Greene	Greene County (Town of Prattsville)	039-023	8	Substantially Damaged Buyout	\$ 1,848,400	\$ 1,386,300	\$ 462,100	9/17/2012
Greene	Ulster County	111-006	33	Substantially Damaged Buyout	\$ 5,947,154	\$ 4,460,366	\$ 1,486,789	9/17/2012
Montgomery	Town of Florida	057-004B	3	Not Substantially Damaged Buyout	\$ 620,590	\$ 465,443	\$ 155,148	3/12/2013
Montgomery	Town of Charleston	057-006	3	Substantially Damaged Buyout	\$ 359,000	\$ 269,250	\$ 89,750	3/12/2013
Montgomery	Town of Florida	057-008	1	Substantially Damaged Buyout	\$ 214,885	\$ 161,164	\$ 53,721	3/12/2013
Montgomery	Village of Fonda	057-007	1	Structural Elevation	\$ 60,000	\$ 45,000	\$ 15,000	2/7/2013
Multiple Counties	NYS HCR	999-001	400	Substantially Damaged Buyout	\$ 100,880,000	\$ 75,660,000	\$ 25,220,000	3/13/2013
Nassau	Town of Oyster Bay	059-005	6	Structural Elevation	\$ 1,023,680	\$ 767,760	\$ 255,920	2/28/2013
Orange	Village of Washingtonville	071-017	18	Substantially Damaged Buyout	\$ 4,590,303	\$ 3,442,727	\$ 1,147,576	8/27/2012



County	Applicant	DR # 1957/1993/ 4020/4031 Project Application #	# of Properties	Project Type	Total Cost	75% Federal Share	Local Share	Date Submitted to FEMA
Orange	Town of New Windsor	071-015B	1	Not Substantially Damaged Buyout	\$ 342,800	\$ 257,100	\$ 85,700	1/29/2013
Orange	Town of Deerpark	071-014	1	Structural Elevation	\$ 130,000	\$ 97,500	\$ 32,500	2/28/2013
Rockland	Village of Montebello	087-015	2	Substantially Damaged Buyout	\$ 816,000	\$ 612,000	\$ 204,000	8/27/2012
Rockland	Village of Suffern	087-019	4	Substantially Damaged Buyout	\$ 1,446,000	\$ 1,084,500	\$ 361,500	8/27/2012
Schoharie	Town of Gilboa	095-010B	1	Not Substantially Damaged Buyout	\$ 68,482	\$ 51,362	\$ 17,121	3/12/2013
Schoharie	Town of Blenheim	095-011	4	Substantially Damaged Buyout	\$ 474,249	\$ 355,687	\$ 118,562	10/23/2012
Schoharie	Town of Blenheim	095-014	3	Substantially Damaged Buyout	\$ 240,510	\$ 180,383	\$ 60,128	3/12/2013
Schoharie	Town of Broome	095-005	2	Substantially Damaged Buyout	\$ 210,490	\$ 157,868	\$ 52,623	9/17/2012
Schoharie	Town of Esperance	095-009	8	Substantially Damaged Buyout	\$ 909,640	\$ 682,230	\$ 227,410	10/23/2012
Schoharie	Town of Fulton	095-003	5	Substantially Damaged Buyout	\$ 753,651	\$ 565,238	\$ 188,413	10/23/2012
Schoharie	Town of Gilboa	095-010	3	Substantially Damaged Buyout	\$ 398,780	\$ 299,085	\$ 99,695	10/23/2012
Schoharie	Town of Middleburgh	095-007	7	Substantially Damaged Buyout	\$ 1,807,895	\$ 1,355,921	\$ 451,974	10/23/2012
Schoharie	Town of Schoharie	095-008	3	Substantially Damaged Buyout	\$ 341,550	\$ 256,163	\$ 85,388	10/23/2012
Schoharie	Village of Middleburg	095-017	2	Substantially Damaged Buyout	\$ 351,504	\$ 263,628	\$ 87,876	3/12/2013
Schoharie	Village of Middleburgh	095-004	6	Substantially Damaged Buyout	\$ 772,039	\$ 579,029	\$ 193,010	10/23/2012



County	Applicant	DR # 1957/1993/ 4020/4031 Project Application #	# of Properties	Project Type	Total Cost	75% Federal Share	Local Share	Date Submitted to FEMA
Schoharie	Village of Schoharie	095-006	6	Substantially Damaged Buyout	\$ 855,741	\$ 641,806	\$ 213,935	10/23/2012
Schoharie	Village of Schoharie	095-016	1	Substantially Damaged Buyout	\$ 147,630	\$ 110,723	\$ 36,908	3/12/2013
Suffolk	Suffolk County	103-002B	1	Not Substantially Damaged Buyout	\$ 1,086,300	\$ 814,725	\$ 271,575	3/12/2013
Suffolk	Town of Babylon	103-028	11	Structural Elevation	\$ 1,521,940	\$ 1,141,455	\$ 380,485	3/12/2013
Suffolk	Village of Lindenhurst	103-018	1	Structural Elevation	\$ 123,000	\$ 92,250	\$ 30,750	3/12/2013
Suffolk	Village of Lindenhurst	103-025	1	Structural Elevation	\$ 125,000	\$ 93,750	\$ 31,250	3/12/2013
Suffolk	Town of Islip	103-007	2	Structural Elevation	\$ 277,500	\$ 208,125	\$ 69,375	2/28/2013
Suffolk	Village of Babylon	103-012	3	Structural Elevation	\$ 597,028	\$ 447,771	\$ 149,257	2/7/2013
Suffolk	Village of Lindenhurst	103-015	1	Structural Elevation	\$ 120,500	\$ 90,375	\$ 30,125	2/7/2013
Tioga	Town of Barton	107-094B	7	Not Substantially Damaged Buyout	\$ 452,270	\$ 339,203	\$ 113,068	2/7/2013
Tioga	Village of Owego	107-105B	2	Not Substantially Damaged Buyout	\$ 216,881	\$ 162,661	\$ 54,220	3/12/2013
Tioga	Town of Owego	107-044	6	Structural Elevation	\$ 849,817	\$ 637,363	\$ 212,454	3/12/2013
Tioga	Village of Owego	107-012	29	Structural Elevation	\$ 3,587,538	\$ 2,690,653	\$ 896,884	2/28/2013
Tioga	Village of Owego	107-104	11	Structural Elevation	\$ 1,352,878	\$ 1,014,659	\$ 338,219	3/12/2013
Tioga	Town of Barton	107-094	19	Substantially Damaged Buyout	\$ 993,590	\$ 745,193	\$ 248,398	8/27/2012
Tioga	Town of Nichols	107-058	8	Substantially Damaged Buyout	\$ 1,073,269	\$ 804,951	\$ 268,317	11/29/2012
Tioga	Town of Owego	107-059	36	Substantially Damaged Buyout	\$ 4,735,851	\$ 3,551,888	\$ 1,183,963	8/27/2012
Tioga	Town of Tioga	107-057	15	Substantially Damaged Buyout	\$ 1,533,373	\$ 1,150,030	\$ 383,343	11/29/2012
Tioga	Village of Owego	107-095	9	Substantially Damaged Buyout	\$ 712,464	\$ 534,348	\$ 178,116	8/27/2012



County	Applicant	DR # 1957/1993/ 4020/4031 Project Application #	# of Properties	Project Type	Total Cost	75% Federal Share	Local Share	Date Submitted to FEMA
<b>Tioga</b>	Village of Owego	107-105	9	Substantially Damaged Buyout	\$ 905,431	\$ 679,073	\$ 226,358	3/12/2013
<b>Ulster</b>	Ulster County	111-006B	4	Not Substantially Damaged Buyout	\$ 611,412	\$ 458,559	\$ 152,853	1/29/2013
<b>Westchester</b>	Village of Mamaroneck	119-012	2	Structural Elevation	\$ 503,983	\$ 377,987	\$ 125,996	3/12/2013
<b>Westchester</b>	Town of Greenburgh	119-017	1	Substantially Damaged Buyout	\$ 648,520	\$ 486,390	\$ 162,130	8/27/2012
<b>Total</b>			<b>1232</b>		<b>\$ 210,159,848</b>	<b>\$ 157,619,886</b>	<b>\$ 52,539,961</b>	



## 7.7 Current and Potential Sources of Federal, State, Local or Private Funding to Implement Repetitive Loss Mitigation Activities

The primary source of mitigation funding for flood mitigation projects, including repetitive loss and severe repetitive loss is through FEMA's Unified Hazard Mitigation Assistance (HMA) grant programs, which provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. The FEMA-administered HMA includes the specific grant programs described in **Table 7.7d**.

**Table 7.7d: FEMA Unified Hazard Mitigation Assistance (HMA) Program**

<b>Hazard Mitigation Grant Program (HMGP)</b>
<p><b>Purpose:</b> To significantly reduce or permanently eliminate future risk to lives and property from natural hazards. HMGP funds mitigation planning, as well as projects consistent with priorities identified in State, Tribal, or local hazard mitigation plans.</p> <p><b>Available:</b> Post-disaster - tied to disaster and emergency declarations under the HMA</p>
<b>Pre-Disaster Mitigation (PDM)</b>
<p><b>Purpose:</b> To provide funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event, to reduce immediate overall risks to the population and structures, and long-term reliance on funding from disaster declarations.</p> <p><b>Available:</b> Annually</p>
<b>Flood Mitigation Assistance (FMA)</b>
<p><b>Purpose:</b> To reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program (NFIP).</p> <p><b>Available:</b> Annually</p>



**Table 7.7e** describes which flood mitigation activities are eligible under the HMA program.

**Table 7.7e: Eligible Flood Mitigation Activities, by HMA Program**

Eligible Activities	HMGP	PDM	FMA
<b>1. Mitigation Projects</b>	√	√	√
Property Acquisition and Structure Demolition	√	√	√
Property Acquisition and Structure Relocation	√	√	√
Structure Elevation	√	√	√
Mitigation Reconstruction			√
Dry Floodproofing of Historic Residential Structures	√	√	√
Dry Floodproofing of Non-residential Structures	√	√	√
Minor Localized Flood Reduction Projects			
5 Percent Initiative Projects			
Advance Assistance			
<b>2. Hazard Mitigation Planning</b>			
<b>3. Management Cost</b>			

In addition to federal mitigation funding, other funding sources such as Community Development Block Grants (CDBG) may support repetitive loss projects. The *State of New York Action Plan for Community Block Development Grant Disaster Recovery*<sup>2</sup> provides information on multiple programs targeted to homeowners for buyout programs, such as:

- **Recreate NY Smart Home Resilience**
  - Available to owners of one- and two-unit homes located outside of New York City whether owner occupied or income generating, including: Condominiums, Co-Ops and Garden Apartments. New York City will administer its own CDBG-DR programs directly.
  - Property is located within a 100-year floodplain and damaged, or property was substantially damaged (i.e., lost more than 50% of pre-storm FMV), and still needs additional rehabilitation.
  - Will cover costs to mitigate future damage.
  - Assistance shall be for unmet rehabilitation or repair and mitigation needs after accounting for all Federal, State, local and/or private sources of disaster-related assistance, including, but not limited to, homeowners and/or flood insurance proceeds.
  - Assistance for repair and mitigation funding will be capped at the lesser of a specified dollar amount to be determined by New York State, or the unmet repair, rehabilitation and mitigation need as described above. To direct sufficient levels of assistance to those most in need, especially low- to moderate-income and minority households, a higher overall dollar cap

<sup>2</sup> New York State Homes and Community Renewal Office of Community Renewal, April, 2013



amount may be applied to those households of low or moderate- income, where the need is justified.

- All reconstruction or mitigation of substantially damaged buildings must meet Green Building Standards.
- Rehabilitation of non-substantially damaged buildings must follow guidelines in the HUD Green Building Retrofit Checklist.
- Household income will be required for reporting purposes even for those households assisted under the National Objective of urgent need.
- Households earning less than 80% of the area median income will be prioritized in the order of processing applications for assistance.

See **Section 4** for the full list of funding sources.

Current flood mitigation projects in the state are being funded through HMGP, FMA and CDBG.



# APPENDIX 1

## *Introduction*

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**NYS Disaster Preparedness Commission 2012 Annual Report.....pg. 2-113**



**A.1a: NYS Disaster Preparedness Commission (DPC) 2012 Annual Report**

**New York State  
Disaster Preparedness Commission**

**2012 Annual Report**

Prepared by the  
NYS Division of Homeland Security & Emergency Services  
Office of Emergency Management

March 31, 2013

Andrew M. Cuomo  
Governor

Jerome M. Hauer  
Chairman



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## INTRODUCTION

The New York State Disaster Preparedness Commission (DPC) is comprised of the commissioners, directors or chairpersons of 32 State agencies and one volunteer organization - the American Red Cross. The responsibilities of the DPC include: the preparation of State disaster plans; the direction of State disaster operations and coordinating those with local government operations; and the coordination of federal, State and private recovery efforts. New York State Executive Law, Article 2-B, Section 21 enacted in 1978, shifted emphasis from Civil Defense to all-hazards preparedness activities and missions; created the Disaster Preparedness Commission; and assigned responsibility for off-site radiological emergency preparedness for commercial nuclear power plants.

The DPC Member Agencies are comprised of:

Department of Agriculture and Markets	Military and Naval Affairs
American Red Cross	Office of Children and Family Services
Division of Criminal Justice	Office of Counter Terrorism
Department of Corrections and Community Supervision	Office of Cyber Security
Department of Financial Services	Office of Emergency Management
Education Department	Office of Interoperability and Emergency Communications
Empire State Development Corporation	Office of Parks, Recreation and Historic Preservation
Energy Research and Development Agency	Office of People with Developmental Disabilities
Department of Environmental Conservation	Office of Information Technology Services
Office of Fire Prevention and Control	Office of Victim Services
Office of General Services	Port Authority of NY and NJ
Department of Health	Public Service Commission
Division of Housing and Community Renewal	Department of State
Department of Labor	Division of State Police
Office of Mental Health	Office of Temporary and Disability Assistance
Metropolitan Transportation Authority	Thruway Authority
	Department of Transportation



## OVERVIEW

Ordinarily, the time covered in this annual report would be noteworthy for several incidents, including brush fires in April that occurred in 16 counties and New York City, affecting over 1,100 acres in four municipalities in Suffolk County and approximately 330 acres in the Hammock State park in Rockland County; or the line of severe thunderstorms in late July that caused power outages for over 100,000 New Yorkers and spawned a tornado in Chemung County, resulting in severe damage in downtown Elmira; or the industrial fire in the Town of Ghent in Columbia County, involving potentially hazardous materials and necessitating the ordered evacuation of residents living within a one-mile radius of the fire (as well as residents in neighboring Berkshire County, Massachusetts living within fifteen miles of the fire who were recommended to "shelter-in-place" due to the track of the plume from the fire).

But all of these events were eclipsed by the most catastrophic storm in our State's history: Superstorm Sandy. The storm caused once-in-a-generation flooding and catastrophic power outages, bringing down power lines, uprooting trees, and forcing the evacuation of close to half a million people in New York City and Long Island from their homes and businesses. With the impact of Hurricane Irene and Tropical Storm Lee still being felt throughout the State, Superstorm Sandy tore into the State with an unprecedented level of ferocity and fury. As discussed later in this report, the level of damage caused by Sandy was of a level never before experienced in New York State and the impact will be felt for years to come.



Moving forward, with the added experience gleaned from all of these incidents – whether natural disasters or manmade incidents – including the recent Winter Storm Nemo (though it technically falls outside the timeline of this report) the State, under the leadership of Governor Andrew M. Cuomo, will continue to enhance and refine its disaster response capabilities.

It also remains a core component of the Disaster Preparedness Commission's (DPC) mission to leverage its resources and expertise to help improve local disaster response capabilities. Over the past year, the DPC and its constituent agencies continued to provide extensive assistance to local authorities in their efforts to improve local disaster preparedness, which is outlined in the Planning section of this Annual Report.



As noted above, recent events have confirmed the State's vital role in improving local disaster preparedness. Major storms Hurricane Irene, Tropical Storm Lee, and Superstorm Sandy swept through the State, quickly overwhelming – in some cases, crippling – the capacity of local governments to effectively respond to the catastrophic damage caused by these storms. Moreover, there is a significant likelihood that future storms will only increase in frequency and severity. Accordingly, the DPC recommends that the State continue to actively assist localities enhance their ability to respond to disasters and examine ways to improve and expand such assistance. The DPC also recommends that the State continue to develop its own disaster response plans to prepare for instances where the State is required to assume direction of local disaster operations because an affected locality is itself unable to manage those operations.



To that end, the DPC will soon provide more detailed recommendations to Governor Cuomo on how to best enhance the planning/preparation for State-local cooperation in the face of impending natural disasters (or unanticipated man-made disasters), and for the coordination and implementation of a State-led response when local municipalities cannot manage the impact and consequences of such events.



## HIGHLIGHTS OF ACTIVITIES

### April 2012 Fire Incidents – Eastern New York State

In the spring of 2012, abnormally dry conditions over the previous winter and spring produced minor to moderate drought conditions across a large portion of New York State. In early April, low relative humidity and strong winds contributed to multiple fire incidents across parts of eastern and southern New York State.



The largest fire occurred in Suffolk County across 1,124 acres in four municipalities (Ridge, Wading River, Manorville and Brookhaven). Residences in those areas were evacuated, some of which were sheltered by the American Red Cross, and several local firefighters were treated for injuries sustained battling this blaze. In Rockland County, approximately 350 acres in the Harriman State Park were affected by wildfire. In Sullivan County, a structure fire at the Grandview

Palace condominium spawned multiple brush fires that caused the evacuation of approximately 100 residents.

On April 9, in response to the fires in Long Island, the State Emergency Operations Center (State EOC) in Albany was activated with the following agencies: Office of Emergency Management (NYSOEM), Department of Environment Conservation (NYSDEC), Office of Fire Prevention and Control (OFPC), NYS Department of Health (NYSDOH), Division of Homeland Security and Emergency Services (DHSES), Division of Military and Naval Affairs (DMNA), Office of Parks, Recreation and Historical Preservation (OPRHP), NYS Division of State Police (NYSP), Department of Transportation (NYSDOT), and the American Red Cross (ARC).

On April 10, Governor Andrew M. Cuomo declared a State of Emergency for Suffolk County to allow New York State to coordinate and respond with local governments to fight the wildfires.

In Long Island, more than 245 personnel assisted in the emergency response effort, and an additional 150 firefighters from 27 local volunteer fire departments participated in firefighting efforts. NYSP field staff, DEC Forest Rangers, OFPC Fire Protection Specialists, and NYSDOEM staff were deployed to assist local governments in Suffolk County. In addition, NYS Office of Interoperable and Emergency Communications (OIEC) deployed a Strategic Technology Reserve (STR) communications vehicle to assist with communications issues. Aerial assets deployed included a New York State Police helicopter that conducted more than 20 water dropping operations, and a National Guard helicopter that conducted aerial surveys to determine fire perimeter and fire spread projections. State and local law enforcement, including K-9 teams, monitored potential arson activity.



In Rockland County, in response to the fire at the Harriman State Park, staff from NYSOEM, OFPC, NYSDAC, OPRHP and ARC, as well as AmeriCorp and The Nature Conservancy (TNC) teams, provided support to the Incident Command Post at the Anthony Wayne Recreation Area. OIEC provided an STR communications vehicle and ARC provided food for firefighters and command post personnel.

On April 14, NYSOEM, OFPC and ARC provided support to Sullivan County in response to the fire at the Grandview Palace condominium that spawned multiple brush fires and destroyed several nearby buildings. Fire districts from Sullivan, Ulster and Orange counties responded to the incident, and approximately 60 displaced residents sheltered at the Sullivan County Community College were assisted by ARC and the Sullivan County Office for Family Assistance.

From April 9-21, various other fires (brush, structural, etc.) were reported across eastern New York State, including Albany, Clinton, Delaware, Dutchess, Oneida, Orange, Otsego, Rensselaer, Richmond, Saratoga, Schenectady, Sullivan and Ulster counties, and New York City.

#### June 2012 Wallenda Tightrope Walk – Niagara Falls, Erie County

In anticipation of public interest generated by the Wallenda tightrope performance at Niagara Falls on June 13, 2012, DHSES and NYSOEM were tasked with planning and managing public safety during the performance. More than 30 federal, state, local and international partners participated in event planning, which was conducted over several months before the performance date.



Days before the performance, an emergency operations center was established at the Niagara Falls Conference Center, as well as a command post near the site. Public safety during the performance was managed by approximately 30 agencies, including a Unified Command staff consisting of NYSOEM, NYSP, and State Parks Police. The Unified Command staff was also responsible for pre-staged assets that would be deployed if a separate incident were to occur during the Wallenda performance. In addition, Office of Interoperable and Emergency Communications staff was deployed to assist with communication issues.

There were no major issues reported before, during or after the Wallenda performance.



#### July 2012 Severe Storms / Elmira Tornado

On July 26, a line of severe thunderstorms caused power outages for almost 100,000 New Yorkers, damage to homes, apartments, businesses, public and private property, and damaged and downed thousands of trees.

In anticipation of the approaching storm, the State EOC in Albany was activated with the following State agencies: NYSP, NYSDEC, NYSDOH, NYSDOT, OFPC, OPRHP, Office of Mental Health (OMH), Office for People With Developmental Disabilities (OPWDD), Public Service Commission (PSC), and ARC.



As a precaution, OPRHP evacuated tent campers at ten (10) campgrounds in the expected path of severe weather – campers were offered a full refund and were informed that they could return to the campgrounds after the storm, if conditions warranted. In addition, NYSDEC advised all campers in the Catskills and Southern Adirondacks of the impending weather and strongly encouraged tent campers to seek shelter.

Governor Andrew M. Cuomo declared a State of Emergency for Chemung County in response to widespread damage caused by a line of severe thunderstorms that produced winds in excess of 60 miles per hour and hail over one inch in diameter. There was a confirmed tornado touchdown in Elmira that damaged several structures, caused multiple structural fires, and downed numerous trees and power lines. The National Weather Service (NWS) and NYSOEM Region IV staff reported severe damage to the downtown area of Elmira, including partial building collapses, numerous structure fires, and trees and wires down in the Town of Vestal and the City of Binghamton. The City of Elmira also declared a State of Emergency to respond to the extensive damage, and ARC opened a shelter for 100 persons in the City of Elmira.

In Onondaga County, a 9-1-1 center tower was struck by lightning, which effected the relocation of Onondaga County to its alternate site in downtown Syracuse. As a result of the lightning strike, the county was able to use only one of the three channels used to dispatch police agencies throughout the county.

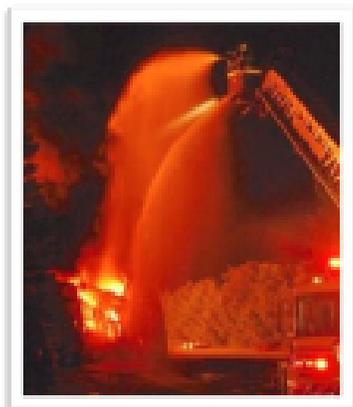
On July 28, news media reported that 16 houses were declared uninhabitable in the aftermath of the tornado. One death was also reported by news media: a 61-year-old man was reportedly struck by collapsing scaffolding outside a church in Brooklyn during the storms.

#### August 2012 Structure Fire – Town of Ghent, Columbia County

On August 1, a fire involving potentially hazardous materials broke out at a facility owned and operated by TCI Incorporated in the Town of Ghent. The fire involved several different types of materials stored in the facility, including sodium, diesel fuel, propane and fuel oil.



At the direction of Governor Andrew M. Cuomo, State personnel were instructed to assist in the emergency response effort, including NYSOEM, NYSDEC, OFPC, OPRHP, NYSP, DMNA, and NYSDOT.



In response to the incident, the Town of Ghent declared a State of Emergency. The Columbia County Sheriff's Department and NYSP conducted evacuations of approximately 40 residences within a one-mile radius of the incident. ARC established a shelter at the Chatham Fire Station for displaced residences.

Due to the eastward track of the plume from the fire in Ghent, located ten miles from the Massachusetts border, the Massachusetts Emergency Management Agency recommended that residents within 15 miles of the fire shelter-in-place, especially communities in the Southern Berkshire County east and south of Alford and Great Barrington. The shelter-in-place recommended was defined as a precautionary action until the exact impact of the chemicals that might be contained in the plume was determined by health officials. The Commonwealth dispatched personnel from the Department of Environmental

Protection, Department of Public Health, Department of Fire Services and National Guard to determine the impacts of the plume to Massachusetts residents.

In addition, the Federal Aviation Administration (FAA) in Boston, MA approved a "no-fly zone" within a five-mile radius of the incident for a 24-hour period.

The investigation into the cause of the TCI fire by OFPC spanned from August 2 through September 29. The length of the investigation was due to the extensive fire damage and building collapse, along with the possibility of chemical contamination of the building, equipment contained within the building, and the overall property site. The fire origin-and-cause investigation was performed in unison with State public safety and environmental agencies in coordination with a licensed environmental contractor. Dozens of interviews were conducted, extensive photographic documentation was compiled, and physical evidence was examined. OFPC investigators were able to eliminate numerous accidental and natural fire causes, with the exception of a possible chemical reaction – spontaneous heating of materials. Based on the investigation and review of all hypotheses examined, OFPC classified the TCI fire as accidental.

In regards to potential public health risks as a result of the fire, according to a NYSDEC report (updated September 20, 2012: <http://www.dec.ny.gov/chemical/84125.html>), "Multiple series of tests associated with the TCI fire ... performed since August 2 ... show there is no threat to public health in the surrounding area ... All of the data indicates there is little evidence for people's potential exposure to PCBs, dioxins, or furans in the surrounding area from this fire."



#### August 2012 – Maccabi Games, Rockland County

The JCC Maccabi Games are an Olympic-style sporting competition held each summer in North America. It is the largest organized sports program for Jewish teenagers in the world. This year's Games were held in Rockland County August 11-17 and nearly 1,500 people were in daily attendance.

Through its five offices, DHSES provided a wide range of support for the Maccabi Games, including: pre-event planning; operational support; coordination of fire services; fire code inspections; radio communications; and staff serving as a multi-agency intelligence center partner, and providing a cache of VHF radios programmed on the Sheriff's department frequency.

Specifically, in the months ahead of the Games, DHSES Office of Emergency Management (OEM) and Office of Counter Terrorism (OCT) executives met frequently with the Rockland County Sheriff's office and event coordinators on matters of event planning, security, threat intelligence and response.

OCT communicated with New York State Intelligence Center, FBI New York Office and fusion centers in other Maccabi host states to share any pre-event intelligence. DHSES Office of Fire Prevention and Control (OFPC) participated in the pre-event planning and coordination with county fire service, code officials, and Rockland Community College personnel. During the event, staff from OCT, OIEC, OEM and OFPC were in attendance, providing fire code inspections, County EOC coverage, and staffing the DHSES Command One vehicle. For the first time ever, Command One served as a mobile intelligence center utilized by OCT and law enforcement agencies to monitor any incoming threats.

DHSES staff was commended by Rockland County officials for the outstanding efforts in support of the Games.



## October 2012 Superstorm Sandy

### Overview

Superstorm Sandy was one of the most devastating storms ever to impact the State of New York. On October 28 and 29, New York State was battered with torrential rain, storm surges and powerful winds, the effects of which lasted in some places for more than 24 hours. The storm caused once-in-a-generation flooding and catastrophic power outages, bringing down power lines, uprooting trees, and forcing the evacuation of more than 400,000 people in New York City and Long Island from their homes and businesses.

After the storm passed, 60 deaths were attributed to Sandy, up to ten inches of rain were received in southern and eastern parts of the State, and more than 2.1 million customers lost electrical service. Several thousand individuals and families sought food, water and warmth in more than 106 shelters across the affected areas.

Two days before the storm struck, Governor Andrew M. Cuomo ordered NYSDEM to prepare for Sandy's arrival, including the pre-deployment of assets in preparation for the response to the impact of the storm. On Friday, October 26, the State EOC in Albany was activated to coordinate State response activities. State agencies, county and city government agencies, NWS, and the Federal Emergency Management Agency (FEMA) participated in numerous conference calls to discuss the potential tracks of the storm and to coordinate storm planning efforts such as operations support and field staff deployments.



Also on Friday, October 26, Governor Cuomo declared a State Disaster Emergency in preparation for the potential impact of Superstorm Sandy. The emergency declaration was enacted to activate State resources to assist local governments more effectively and quickly, to allow the State to activate the national Emergency Management Assistance Compact (EMAC) to bring in resources from out of the State, and to access key federal resources early in anticipation of the emergency.

### Federal Disaster Declaration

On Tuesday, October 30, President Obama granted Governor Cuomo's request for a federal disaster declaration for seven counties: Bronx, Kings, Nassau, New York, Richmond, Queens and Suffolk. The federal emergency declaration was enacted to enable the federal government to provide assistance and resources to New York State and local governments to support activities related to evacuation, sheltering, and other protective measures, including debris removal, logistics management and electric power generation.



In the following months, FEMA approved additional counties to receive federal disaster assistance based on damage assessments. As of February 2013, there were a total of 14 counties included in the federal disaster declaration for Sandy: Bronx, Kings, Nassau, New York, Orange, Putnam, Richmond, Rockland, Queens, Suffolk, Sullivan, Ulster and Westchester counties (Individual Assistance and Public Assistance), and Greene County (Individual Assistance only).

#### General Storm Statistics

- 60 fatalities
- More than two (2) million customers without power
- More than 300,000 housing units destroyed or damaged
- More than 400,000 residents evacuated from New York City and Long Island
- 36 facilities evacuated in New York City, and Nassau, Westchester and Suffolk counties
- 6,001 patients evacuated from New York City healthcare facilities
- 3.6 million cubic yards of debris removed; 17 bridges and three tunnels closed; 161 road segments impacted



#### Response Statistics

- 212,282 personnel from 23 State agencies during peak deployment, including:
  - Five (5) Swiftwater Rescue Teams
  - 36 Fire Protection Specialists
  - 1,614 NYS Troopers
  - 3,095 DMVA personnel
- National Guard deployed 800 personnel from 10 states
- EMAC – 22 states sent 1,127 personnel
- 1,061 volunteers from 29 states assisted in response and recovery
- ARC established 147 shelters that served approximately 29,364 people

#### Disaster Assistance Statistics

- 270,832 individuals registered for federal Individual Assistance
- Individual Assistance: \$939.7 million
- Public Assistance: \$806 million
- Sheltering and Temporary Essential Power (STEP) program: 12,578 repairs to 12,951 eligible properties in NYC and Long Island
- Small Business Administration (SBA): 20,398 loan applications approved for \$1.333 billion
- National Flood Insurance Program (NFIP): 36,676 estimated claims with approximately \$3.179 billion paid



**Expanded Regions: Focused Support to Local Partners**

During this reporting period, NYSOEM subdivided its five existing regions and doubled the number of personnel assigned to these regions, allowing for more personalized coverage at the local level. The ten Regional Directors, supported by Regional Coordinators, will help foster collaborative relationships among State agencies servicing a given region, as well as with a smaller number of counties and localities within the regions.

The new construct is further enhanced by coordinating efforts among DHSES employees across its merged agencies, as well as sister State agencies within the regions such as NYS, DMNA, NYSDOT, NYSEEC, NYSDOH, and other appropriate members of the DPC.

Within the construct comes the opportunity to co-locate workspace among agencies such as NYSOEM and OFPC to provide better communications, planning and response capabilities within DHSES family agencies.

Filling existing vacancies created by the region expansion are a priority to meet the anticipated level of support with the geographic locations that make up the regions across the State. This allows cross coverage and depth "on the bench" for multiple or prolonged responses, as well as the ability to provide additional personnel in areas particularly hard-hit such as downstate region during Superstorm Sandy and Winter Storm Nemo.



### PROGRAM STATUS

The NYS Office of Emergency Management (NYSOEM), as the operational arm of the DPC, provides the State's emergency management programs. The programs include all aspects of the phases of emergency management (preparedness, response and recovery). It is important to note the various efforts that are on-going to continue the development of State and local disaster plans, on-going recovery and mitigation efforts and more 'routine' operational response efforts.

Outlined below are several key NYSOEM program areas, their on-going efforts summarized and a few key metrics provided.

#### Grant Administration

The following table illustrates federal and State share of funding for recent federally-declared disasters under the Public Assistance program:

Public Assistance Disaster	Incident Period	FEMA #	Federal Share	State Share
Severe Storms and Flooding	May 13–June 17, 2004	DR-1534	\$42,290.98	\$8,955.75
Severe Storms and Flooding	April 2–4, 2005	DR-1589	\$95,709.31	\$15,737.30
Severe Storms and Flooding	June 26–July 10, 2006	DR-1650	\$18,852,912.23	\$1,120,052.62
Severe Storms and Flooding	November 16–17, 2006	DR-1670	\$372,608.81	\$119,079.21
Severe Storms and Inland and Coastal Flooding	April 14–18, 2007	DR-1692	\$2,958,793.39	\$142,523.05
Severe Winter Storm	December 11–31, 2008	EM-3299	\$58.00	\$0.68
Severe Winter Storm	December 11–31, 2008	DR-1827	\$21,827.74	\$3,637.98
Severe Storms and Flooding	August 8–10, 2009	DR-1857	\$4,071,436.57	\$428,985.68
Severe Storms and Flooding associated with Tropical Depression Ida and Nor'easter	November 12–14, 2009	DR-1869	\$28,747.88	\$0.00
Severe Storms and Flooding	March 13–31, 2010	DR-1899	\$365,471.49	\$42,353.52
Severe Storms, Tornadoes and Straight-line Winds	September 16, 2010	DR-1943	\$712,929.67	\$84,480.29
Severe Winter Storm and Snowstorm	December 26–27, 2010	DR-1957	\$5,313,102.68	\$885,517.11
Severe Storms, Flooding, Tornadoes and Straight-line Winds	April 26–May 8, 2011	DR-1993	\$2,424,359.95	\$390,599.18
Hurricane Irene	Aug. 25–Sept. 5, 2011	EM-3328	\$1,312,446.00	\$98,457.55
Hurricane Irene	Aug. 26–Sept. 5, 2011	DR-4000	\$202,529,595.19	\$43,638,858.92
Remnant of Tropical Storm Lee	September 7–11, 2011	DR-4031	\$31,187,410.59	\$8,342,347.67
Superstorm Sandy	Oct. 27–Nov. 8, 2012	DR-4085	\$331,652,093.28	\$0.00
		TOTAL	\$599,741,791.74	\$58,319,595.45



## Operations

### NYS Emergency Operations Center Activations

In times of emergency or disaster, the New York State Emergency Operations Center (State EOC), located in Albany, is activated to support local government by coordinating the response of State agencies. Since January 2012, the State EOC was activated 13 times in support of the following events:

Date	Incident Name
January 11, 2012	Contaminated Items
February 11, 2012	SUNY Canton Fire
February 29, 2012	Snow Storm
April 9-14, 2012	High Risk Wild Fires
April 16-19, 2012	Brush and Wild Fires
May 29, 2012	Severe Weather
June 13, 2012	Wellheads Event
July 26, 2012	Severe Weather
September 8, 2012	Severe Weather
October 26, 2012 - present	Superstorm Sandy/Nor'easter
December 26-27, 2012	Winter Storm
February 8-29, 2013	Winter Storm
February 27, 2013	Winter Storm

### Incidents Reported to the New York State Watch Center

AFRCC-Alert Notice Incident (ALNOT)	2
AFRCC-Emergency Locator Transmitter (ELT's) Mission	66
AFRCC-Personal Locator Beacon Missions (PLB's)	16
AFRCC-Rescue/Medivac/Mercy Missions	1
Ag&Mkts Hotline	44
Air Conditioner / Heater	1
Air Quality Alert (AQI)	71
Air Sampling / Purification	1
Air Search Team (Fixed-Wing)	11
Airborne Reconnaissance (Fixed-Wing)	11
Aircraft Incident - no injury/casualty	167
Aircraft Incident - with injury/casualty	60
Amber Alert	44
Ambulances (Ground)	6
Animal Disease/Quarantine	1
Armed Conflict	128
Assistance	63
Batteries	2

BLDG 22 Facility Incident - Non Evacuation	21
Boat	4
Boil Water Advisory	200
Bomb Threat	148
Bucket Truck / Lift	1
Building Supplies / Services	2
Bulldozer - Wheel	1
Burn Ban	7
Bus	2
Chain Saws	23
Civil Disturbance/Protest	8
Civil Support Team (CST)	121
Command Vehicle	1
Communications Disruption/Outage	165
Communications Eqpt.	32
Construction Accident	63
Cots / Bedding	7
Cranes - Hydraulic Truck	8
Dam Failure	2
Damage Assessment	9



Damage Assessment - Structure	5	Geographic Information Systems (GIS)	4
Damage Report	144	HAZMAT - Incident	742
DART Team	5	HAZMAT Response	10
Debris Management Team	1	Heaters	3
Debris Removal Eqpt.	19	Heating/Transportation Fuel Reports	31
Debris Removal Team	6	Helicopter	49
DHSES Exec Hotline	57	Helicopters, Firefighting	2
DHSES Field Report	18	Housing	44
Disaster Medical Assistance Team (DMAT)-Basic	7	Hurricane	5
Disaster Mortuary Operational Response Team (DMORT)	1	Ice	3
Disaster Recovery Center (DRC)-Status/Activity	6	Ice Jam	67
DOCS Crew	74	Incident Command Post Activity	7
DOH Duty Officer Call	1,781	Incident Management Team	20
Dry Ice	2	Individual Assistance Disaster Assessment Team	8
Dump Truck - Off Road	1	Information - Intelligence	2,790
Dump Truck - On Road	7	Information Distribution	25
Earth Moving Equipment	2	Inhabitability / Collapse	434
Earthquake/Seismic	215	IT Support	19
Electrical Power Restoration Team	7	Land Subsidence (Slide)	6
EMAC Incident Management Assistance Team (IMAT)	15	Law Enforcement	2
EMAC-Status/Activity	8	Life Safety Code Violation	18
Engineering Services	11	Light Sets	2
EOC Planning Section Chief	5	Light Sets - Towers	70
EOC/ECC/DOC-Activity/Status	442	Logistics Support Mgmt.	1
Equipment	35	Maps	2
Evacuation	217	Mass Transit Accident	126
Evacuation Siren Outage	8	Medical Services	1
Executive Order	58	Medical Supplies	3
Exercise/Drill	405	Medicine	4
Explosion	189	Meeting Room Scheduling	1
Facilities - Storage	1	Missing Person	150
Facility Report	17	Mobile Communications Unit (Law/Fire)	1
FEMA Reports	362	Modular Bldg. / Housing	9
Fire	2028	NY Assembly/Senate Calls	4
Firefighting Support / Supplies	1	NYSEOC-Status/Activity	4
Flood	68	OCS Incident Response Team Hotline	15
Food	21	Office Supplies / Furniture	28
Forklift / Pallet Eqpt.	8	OPPC Burn Injury Report	3741
Fuel Tender / Eqpt.	21	OPPC Crossline Emails	18
Generators / Transformers	162	OPPC DO Line	666
		OPPC Fire Fighter Injury	126
		OPPC Hazmat	59



Other	154
Personal Care Supplies	2
Personal Protective Equipment (PPE)	3
Personnel	116
Personal Hygiene Items	8
Photographs / Video	1
Police Activity	207
Portable Pump	17
Preplanned Event/Mass Gathering	33
Press Release	189
PSC Load Reduction	25
Public Health Incident	5
Radiological - Alert	43
Radiological - General Emergency	140
Radiological - Site Area Emergency	53
Radiological - Unusual Event	90
Radiological Incident	86
Radiological Shipment	977
Radiological-TEST	93
Refrigeration Eqpt. / Svcs.	2
Rescue	222
Roadway Materials (sand, stone, etc.)	3
Sand Bags	21
Sandbag Filler	10
Sanitary Systems	2
Search and Rescue	35
Security Teams	5
SEOC Operations Branch Report	6
Sewage Treatment Eqpt. / Svcs.	1
Shelter	2
Sheltering	30
Smoke Condition	18
Snow Removal Equipment	18
Snowmobile	1
Space	4
State of Emergency	281
Storm Emergency Fire Units - SEFUs	4
Strike	13
Suspicious Package/Device	362
Swiftwater/Flood Search and Rescue	4

Team	
Tents	3
Test	1,764
Tractor Trailer	6
Traffic Control	11
Training	11
Transportation	33
Transportation Closure	6,096
Transportation Delay/Disruption	7,750
Transportation Escort	2
Transportation Waiver	6
Tropical Storm	22
Unknown Detected Substance	1
Utility Disruption/Outage-Gas, Electric	942
Variable Message Sign	1
Vehicle - 4x4	18
Vehicle Services	1
Vehicles - Mass Transportation	3
Vehicles - Specialty	28
Watch Center Equipment Failure	144
Watch Center Evacuation	2
Water - Drinking	32
Water Conservation	20
Water Main Break/Facility Incident	315
Water Pumps	108
Water Sampling / Purification	1
Water Tender, Firefighting (Tanker)	21
Water Trailers	58
Water Truck	2
WC Support Request	902
Weather Advisory	1,705
Weather Conference Call	101
Weather Information	2,185
Weather Warning	2,153
Weather Watch	529
Cumulative Total	44,888



### Incident Management Team Program

The NYS Incident Management Team (IMT) Section Chief participated in a planning meeting (conference call) for the New York Wildfire and Incident Management Academy at Brookhaven National Labs in Suffolk County (October 26–November 2, 2012).

The NYS IMT Section Chief met with the Team Leader for the Federal Emergency Management Agency (FEMA) Region II Incident Management Assistance Team (IMAT) regarding hurricane response issues impacting New York State and to discuss opportunities for the NYS IMT and FEMA Region II IMAT to work together to prepare for a hurricane scenario.

Despite much work and effort to conduct the 2012 New York Wildfire and Incident Management Academy (scheduled for October 26 to November 2, 2012) at Brookhaven National Labs in Suffolk County, the decision was made to cancel the remainder of the New York Wildfire and Incident Management Academy on October 27, and to demobilize all non-essential and non-local personnel on October 28 in anticipation of Superstorm Sandy's impact on the Long Island area.

From October 30 to November 11, 2012, the State's Incident Management Team was deployed to Nassau County in response to Superstorm Sandy. This was the largest continuous deployment of the NYS IMT within New York State since the Team was established in May 2004. The NYS IMT was supported by a Federal National Incident Management Organization (NIMO) team comprised of a full Type 1 Command and General Staff Team. Additionally, three Type 3 IMTs from the State of Indiana were combined into one 53-person Type 3 All Hazards IMT and assigned to Long Beach in Nassau County. The NYS IMT was relieved by and transitioned with a Type 3 IMT from Southwest Missouri.



The Western New York Type 3 IMT was deployed to Long Island to support the State's response to Superstorm Sandy. The Western New York IMT provided two separate "short teams" of approximately 8–10 persons each back-to-back for a week, initially working at the Joint Federal/State Staging Area at Republic Airport, then briefly with the NYS IMT in Nassau County, before finishing up supporting the Suffolk County Emergency Operations Center in Yaphank.

The NYS IMT was redeployed a second time to Breezy Point (Queens County) to support the State, New York City, and the Breezy Point Cooperative's response to Superstorm Sandy from November 23 to December 7, 2012 with members of the NYS IMT extending to work as part of a State Type 3 IMT for another week.

NYS IMT Program staff travelled out to Batavia in Genesee County to meet with the Western New York IMT leadership group to discuss the reimbursement process for Superstorm Sandy and discuss other program issues, including training requests and the need to develop standardized procedures for future deployments.



The NYS IMT Section continues efforts to expend 2009 and 2010 State Homeland Security Grant Program (SHSGP) funds earmarked for the IMT Program. The expenditure of these IMT grant funds is time-sensitive.

#### IMT Training Conducted

- Students attended an All-Hazards Incident Command System (ICS) Resource Unit Leader Course (L-963) held at the FDNY Training Academy (October 1-4, 2012).
- Twenty (20) students attended an All-Hazards ICS Planning Section Chief Course (L-962) held at the Orange County Department of Emergency Services (October 9-12, 2012).
- Thirteen (13) students attended an All-Hazards ICS Incident Commander Course (L-950) held at the Livingston County Center for Emergency Operations and Training Facility (October 22-26, 2012).
- Seventeen (17) students attended an All-Hazards Finance Administration Section Chief Course (L-973) at the Genesee County Fire Training Center (November 26-28, 2012).
- Fifteen (15) students attended an All-Hazards ICS Public Information Officer (PIO) course (L-952) at the State Preparedness Training Center (December 3-7, 2012).
- Twenty-three (23) students attended an All-Hazards ICS Logistics Section Chief course (L-967) at the Orange County Department of Emergency Services (December 10-14, 2012).
- IMT Program supported the delivery of the L-950 All Hazards Incident Commander Course for 25 students at the Orange County Department of Emergency Services in Goshen (January 7-11, 2013).
- IMT Program supported the first of eight FEMA Regional offerings of All-Hazards ICS Position Specific Courses scheduled in the first half of 2013. The L-975 All Hazards Finance/Admin Unit Leader Course was held in Saratoga County at the Malta Ambulance Corps with 15 students successfully completing the course (January 29-31, 2013).
- A member of the NYS IMT and an ICS Instructor provided support to the Pennsylvania Command and General Staff Academy held in Altoona, PA (February 25-March 1, 2013). The Academy sponsored each of the FEMA All Hazards ICS Position Specific Courses for the Command and General Staff positions.



### Logistics

NYSOEM Stockpile made the following equipment loans during this reporting period:

Date	Receiver	Item	Quantity
May 14, 2012	Cayuga County	6" Water Pump	1
		Hard Suction Hose, 6"	3 lengths
		Adapters, Fittings	Misc.
July 8, 2012	St. Lawrence County	Water Tankers, 5.5K Gal	4
August 2, 2012	Franklin County	Light Towers	2
August 28, 2012	Westchester County	Water Tankers, 5.5K Gal	4
		Water Tankers, 400 Gal	5
September 25, 2012	Montgomery County	Water Pump, 6"	1
		Hard Suction Hose, 6"	7 lengths
		Elbows, 6"	2
		Strainer for Hard Suction Hose, 6"	1
		Soft Discharge Hose	15 lengths
September 27, 2012	Warren County	Water Pump, 6"	1
		Hard Suction Hose, 6" lengths	3
		Strainer for Hard Suction Hose, 6"	1
		Soft Discharge Hose	2 lengths
October 2, 2012	Lake George Park Commission	Sandbagging Unit	1
October 15, 2012	Washington County	Light Towers	5
October 25, 2012	NYS Dept. of Environmental Conservation – Wildfire Management Academy	Chainsaws	10
October 28, 2012	Metropolitan Transportation Authority (MTA) (Croton on Hudson)	Cots	500
		MREs	1500
	Schoharie County Office of Emergency Management	Generator, 100kw	1
		Generator, 60kw	1
	Nassau County Office of Emergency Management	Trash Pump, 6"	2
		Sandbugger	1
		Hard Suction Hose, 10ft	4
		Soft Discharge Hose, 50ft	8
		Spare 6" Gaskets	12
		Chainsaws	50
		Chaps	50
		Safety Glasses	50
		Gas Cans	10
Helmet/Face piece	50		



Date	Receiver	Item	Quantity
October 28, 2012	City of Binghamton (Broome County)	Trash Pump, 4"	2
		Hard Suction Hose, 10ft	4
		Soft Discharge Hose, 50ft	8
October 29, 2012	Metropolitan Transportation Authority (MTA) (Croton on Hudson)	Cots	190
	Shinnecock Indian Reservation	MREs	420
		Generator, 10kw	2
October 30, 2012	Port Authority (JFK Airport)	Light Tower	1
October 31, 2012		Trash Pump, 4"	4
November 01, 2012	Village of Klynas (Orange County)	Hard Suction Hose, 10ft	4
		Generator, 58kw	1
		Generator, 58kw	1
	Lampighter (Orange County)	Generator, 100kw	1
	Port Authority (JFK Airport)	Generator, 200kw	1
November 02, 2012	Port Authority (JFK Airport)	Soft Discharge Hose, 50ft	4
	Village of Klynas (Orange County)	Generator, 10kw	5
	Village of Greenwood Lake (Orange County)	Generator, 45kw	1
	ACS Children's Center (New York City)	Generator, 45kw	1
	Old Field (Queens County)	Trash Pump, 4"	3
		Hard Suction Hose, 10ft	3
		Soft Discharge Hose, 50ft	3
Rockland County	Generator, 10kw	25	



## Planning

### Emergency Response Planning

#### *State Level*

New York State's accreditation under the Emergency Management Accreditation Program (EMAP) is undergoing a complete review. Recreditation requires documentation and compliance of the State's efforts to maintain its performance to the standards met during the initial accreditation process completed in 2006.



The EMAP accreditation process uses 63 standards to assess the State's level of preparedness. Providing written documentation to address each standard will be the key to successfully receiving recertification. As such, the EMAP recertification will be a significant demand on NYSOEM staff and DPC partner agencies as it will require the review, update, and, in some cases, the creation of several plans, policies and procedures. NYSOEM Planning is the lead on the accreditation process. A formal rollout to the DPC agencies is currently being scheduled. The on-site peer review process is anticipated by July 2013.

Staff continues to make progress on the FEMA-mandated Threat and Hazard Identification and Risk Assessment (THIRA) process. A small working group from NYS Office of Counter Terrorism (OCT) and NYSOEM facilitated the receipt of local THIRA information from all 62 counties in New York State. Staff also completed the introductory portion of the THIRA and set a timeline for submission to FEMA. NYSOEM and OCT staff hosted DPC agency partners on March 21 to outline the remainder of the process and obtain feedback and input on the working group's efforts. THIRA supports the development of the State Preparedness Report (SPR) and the application for the State's Homeland Security Grant Program (HSGP).

Through the State University of New York (SUNY), the State is now postured to begin its own catastrophic planning effort. Planning staff have met internally with program-level and Executive staff regarding the State's catastrophic planning efforts. Staff developed several planning taxonomies for consideration, pending Executive approval. Staff also identified core components and key constructs for new State response integration with a county government in response to issues associated with Winter Storm Nemo. Staff presented several constructs and graphical depictions to OEM leadership and several State agencies for consideration.

Planning staff continued its engagement in planning efforts with the NYS Division of Military and Naval Affairs (DMNA) to develop the Homeland Response Force (HRF), a National Guard Bureau initiative designed to build the capability in each FEMA region to quickly activate and deploy 350 military personnel. DMNA is the lead in facilitating this effort for the region and has consistently worked across several military elements to achieve this capability. OEM staff has nearly completed the State's civilian version of the plan to fully implement the HRF response capability into the State's suite of disaster plans.

Planning staff continued to support the Regional Catastrophic Planning Grant (RCPG) program. The base plans created under the RCPG are complete. The current focus remained aimed at planning for an Improvised Nuclear Device (IND), consolidating federal integration planning efforts, and consolidating a



high-level regional structure to tie in multiple federal/state/local Joint Field Offices (JFOs) under one regional unified coordination group structure. Agencies that wish to provide more representation were encouraged to contact the NYSOEM Planning Section.

Progress continued on the New York City Delaware Aqueduct System planning project. The aqueduct system is owned, operated and maintained by the NYC Department of Environmental Protection (NYCDEP) and serves as the prime municipal water supply for several Hudson Valley jurisdictions and New York City. The system is experiencing several areas of leakage and there are ongoing concerns of a potential failure of the system. The effort was stalled primarily due to the response and recovery to Hurricane Irene and Tropical Storm Lee. The effort is supported by NYSDOH –Bureau of Water Supply, NYCDEP, and emergency management officials from New York City and Ulster, Putnam, Orange and Westchester counties. Mid-summer workshops are being planned to take the next steps in the program.

The New York State Citizen Corps Program (CCP) continued to engage New Yorkers in all-hazards prevention, protection, response and recovery efforts through local Citizen Corps Councils and Community Emergency Response Teams (CERT). Planning staff sent CCP Fiscal Year (FY) 10 contracts to local participants and continued to ensure continuity of funding with NYSOEM Finance. Staff is working with the NYSOEM Training Section to identify and build a sustainable, vendor-supported CCP Train-the-Trainer platform using federal funding.



Staff continued work on establishment and implementation of a State-led Scientific Support Group (SSG). The SSG mission includes mechanisms to incorporate local, state and federal scientific and technical capabilities and resources into a unified setting. The SSG will replace past efforts of the Chemical, Biological, Radiological, Nuclear and Explosives (CBRNE) task force, and will serve as the State's response to obtain, collect and postulate radiation-based data for executive decision-making. Other project areas include provisions for State support to IND response activities and a local plan template for counties to use as a guide in their own efforts.

#### Local Planning / Training Assistance

It remains a core component of the DPC's mission to leverage its resources and expertise to help improve local disaster response capabilities to ensure that all forms of local emergency response assets have been included and accounted for in planning and preparation for disaster preparedness and response. During calendar year 2012, staff assisted with or reviewed a variety of plans for local governments, including:

- 36 local Comprehensive Emergency Management Plans
- Eight (8) Hazard Mitigation plans
- Two (2) Debris Management plans
- 17 specialty plans, e.g., state and county fairs, long term recovery, special event, strategic national stockpile, hospital preparedness
- 178 dam safety Emergency Action Plans



Additionally, staff participated in 42 exercises ranging from tabletop exercises to full scale drills, which included multi-agency participation at the local, county, state and federal levels.

In 2013, staff will continue to provide planning and exercise support and technical assistance to the local governments as needed. Currently, eight counties in western New York State and the City of Buffalo have asked for assistance with complete Comprehensive Emergency Management Plan (CEMP) revision. NYSOEM staff will also continue to assist local governments with the development and review of specialty plans, in particular, debris management, hazard mitigation, and long-term recovery. These three planning areas have received renewed attention in the wake of Hurricane Irene, Tropical Storm Lee, and Superstorm Sandy.

NYSOEM Regional staff will participate in and supporting three full-scale functional drills in 2013. Region III staff will be participating in Albany County's full-scale exercise, which will be held in April 2013. In addition, Region V staff will be participating in two week-long exercises titled "StormWest" and "Hurricane 2013," which will take place in western New York State. Both exercises will take place in the spring and conclude a three-year exercise tract. These exercises are designed to test the region's resilience to a Hurricane Irene and Superstorm Sandy scenario, followed closely by a secondary event much like Tropical Storm Lee and Nor'easter Athena. At the conclusion of the 2012 Hurricane and StormWest exercises, approximately 338 agencies and 13,600 participants from public and private sectors were either directly or peripherally engaged in exercise play. Participation in the 2013 exercises is anticipated to be equally robust.

OEM Regional staff also delivered or assisted with several training sessions covering a variety of emergency management topics. For example:

- Three (3) exercise design trainings;
- Six (6) recovery trainings;
- Four (4) planning trainings;
- One (1) Article 2-B training;
- One (1) new emergency manager orientation;
- 11 emergency operations center trainings;
- Six (6) leadership/management trainings;
- Two (2) Disaster LAN trainings; and
- Five (5) Public Officials Conferences – these conferences typically cover 2-B legal authority, planning, hazard mitigation, recovery, and any other emergency management topics

Additional trainings and exercises scheduled during the fall were canceled or postponed due to Superstorm Sandy.

In addition, NYSOEM Planning staff attended ten local planning meetings and conducted five presentations and webinars regarding the THIRA process.

Accordingly, the DPC recommends that the state continue to actively assist localities, enhance their ability to respond to disasters and examine ways to improve and expand such assistance. The DPC also recommends that the state continue to develop its own disaster response plans to prepare for instances where the state is required to assume direction of local disaster operations because an affected locality is itself unable to manage those operations.



### Regional Planning Assistance

Region I: Long Island staff provided planning assistance and guidance to local jurisdictions for a number of events in 2012, including the Barclays's Men's Professional golf tournament at Bethpage State Park attended by 120,139 spectators over a four-day period, the Jones Beach Air Show attended by more than 348,000 people on Memorial Day weekend, and the Belmont Stakes attended by 83,811 people. In addition, Long Island staff participated in coordinated planning efforts with federal, State and local law enforcement, public safety and security agencies for the 2012 Presidential Debate at Hofstra University.

New York City staff assisted in New York City planning and outreach efforts that included activities such as a Radiological Emergency Preparedness (REP) full-scale exercise, the Penn Station/FDNY/DOD CBRNE Drill, the New York Presbyterian Hospital bioterrorism tabletop exercise, and the NYC Penn Station/NY Rail Road Tunnel System (PS/NYRTS) Emergency Response Committee (ERC). Planning assistance also included other high-level coordination with private and public stakeholders. NYC staff also supported the NYC Office of Emergency Management through planned and unplanned activations by providing 24/7 staffing assistance at the NYC Emergency Operations Center (EOC). As of the close of 2012, staff continued to provide multi-regional long-term support of response and recovery efforts for Superstorm Sandy.

Region II: Eastern Hudson Valley staff worked with its four counties with ongoing reviews of CEMPs and associated annexes, and assisted with identifying enhancements, improvements and further areas for development. During the next year, staff will assist with ensuring that plans reflect current capabilities. Additionally, staff will work with counties to review and revise EOC activation procedures and develop and provide orientation workshops for agency representatives.

Region III: Capital District Zone comprises of 10 counties surrounding the Capital Region area. Capital District staff discussed and/or reviewed numerous plans and, at times, referred county emergency managers to the NYSOEM planning section for planning-specific inquiries and questions regarding approved changes. Plans reviewed and/or discussed during this time period included: Saratoga Springs CEMP, Saratoga County CEMP, Fulton County CEMP, Montgomery County CEMP, Montgomery Chempack plan, Albany County SNS plan, THIRA Rensselaer, Albany County CEMP, and Schenectady County CEMP. There are a small number of counties in this region that are preparing to rewrite their CEMP and will be starting this task within the next six months with Regional and NYSOEM HQ support. Capital District staff has also assisted with numerous exercises during the reporting period; these exercises included planning and ensuring that the objectives of their plans were followed during these exercises.



Region IV: Planning continues to be a high priority for the Region IV staff within the fourteen counties that the Region supports. Regional staff routinely attended LEPC meetings and meetings with other emergency management groups in support of local emergency managers and their All-Hazards Preparedness, Response, Recovery and Mitigation activities. Staff participated in planning meetings and initiatives with State, county and local officials to develop and integrate multi-agency, all-hazard emergency response and recovery plans and associated annexes into county and local CEMPs. Staff participated in the Area Maritime Security Committee activities in St. Lawrence, Jefferson and Oswego counties, Fort Drum emergency planning/force protection planning programs, and Counter Terrorism Zone (CTZ) 6 and 7 committee meetings and associated training activity. Additional activities focused on COOP, conducting county-specific emergency operations courses, reviewing capability assessments with supported counties, and a continued focus on emergency management training and planning needs with local jurisdictions.

Region V: Staff worked with 13 counties to conduct reviews of CEMPs, as well as COOP planning, provided assistance with updates, and offered recommendations on how to improve them. Over the course of the next year, they will be working with all of the Region's counties to revamp their approach to the county plans with an eye toward making them usable, operational, capability-based plans. Additionally, the City of Buffalo has asked for assistance with a complete rewrite of its plan during the next year.



### **Radiological Emergency Preparedness Program**

The purpose of the New York State Radiological Emergency Preparedness (REP) program is to minimize the health risk of the State's inhabitants in the event of a radiological emergency, e.g., an accident at a nuclear power plant that may result in the release of radiation above operating limits.

In conjunction with radiological county jurisdictions and power plant licensees, NYSDEM conducted three (3) full-scale REP exercises and one (1) tabletop exercise:

- July 24, 2012: a State-evaluated plume exercise was conducted for Nine Mile Point power plant.
- August 21, 2012: a federally evaluated plume exercise was conducted for Millstone power plant in Connecticut and affects Fisher's Island (Suffolk County).
- October 2, 2012: a federally evaluated plume exercise was conducted for the Indian Point power plant.
- September 24, 2012: a Hostile Action-Based (HAB) tabletop exercise was conducted for the R.E. Ginna power plant.

Numerous out-of-sequence drills, evaluated by FEMA during the reporting period, were conducted with radiological jurisdictions inside the 10-mile Emergency Planning Zone (EPZ). These drills involved medical service functions supporting radiological preparedness at hospitals within the EPZ, reception centers to support personnel and vehicle monitoring of evacuees, and public information meetings for outreach during exercises and events.

The REP Section attended two federal meetings:

- Nuclear Regulatory Commission (NRC) and FEMA annual meeting in Pittsburgh, PA (December 2012)
- Council of State Governments Meeting on High-Level Transuranic Waste Shipments in Knoxville, TN (May 2012)

The REP Section conducted four major interjurisdictional Power Pool meetings with the radiological jurisdictions, federal and State agency representatives, and commercial power plants licensees in New York State. These meetings occur quarterly each year in Albany and the radiological jurisdictions to discuss planning, exercise, events and program-related efforts.

The REP Section also coordinated three training sessions for State agencies, radiological jurisdictions and licensees:

- Radiological Planning and Exercise Controller/Evaluator courses provided by FEMA
- State emergency worker Personnel Monitoring Center (PMC) training conducted for State agencies in Oswego County
- Annual Emergency Action Level (EAL) training conducted for State agency representatives by power plant licensees (December 2012)



### Mitigation

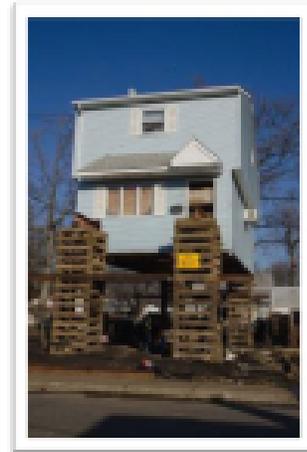
The Mitigation Section began meetings with FEMA to discuss the update of the NYS Hazard Mitigation Plan, which must be ratified by the DPC.

The Section also completed review of mitigation projects tied to Hurricane Irene and Tropical Storm Lee and forwarded the materials to FEMA.

The strategy for Hazardous Mitigation Grant Program (HMGP)-4020 and HMGP-4031, coordinated with FEMA Region II, was to focus on acquisition (both substantial-damage and non-substantial damage) and elevation of floodplain properties while also funding mitigation planning efforts necessary under the FEMA programs. Numbers to date: 19 planning grants (18 counties, one multi-jurisdiction plan) totaling \$3.33 million and covering 13.4 million New Yorkers, and 706 acquisition and buyout projects totaling \$91.3 million. These numbers should rise to more than 820 properties bought or elevated (with a total project cost of about \$107 million) by the final application deadline.

By comparison, the largest number of buyouts previously processed in a single grant was 220 properties (\$19.43 million) for HMGP-1630 in 2006-2007, accomplished with the same staffing levels.

While several viable projects remain, many of the communities submitting Letters of Intent (LOIs) were declared in DR-4083 and unable to focus on Irene and Lee applications while coordinating their Sandy response. State OEM has requested an extension to process these grants from among the \$248,846,286 requested in 194 Letters of Intent (LOIs).



## Training & Exercises

### State Office of Emergency Management

NYSOEM Training and Exercise (T&E) Section coordinated and managed emergency management and counter terrorism training programs and exercises. Staff delivered, participated in and/or coordinated the delivery of 79 training courses for 1,502 students.



Numerous training sessions were postponed or cancelled during this reporting period, as staff attention and effort was focused on the response and recovery from Superstorm Sandy.

76 applications for training courses at FEMA's Emergency Management Institute in Emmitsburg, MD were processed through the Training and Exercise Section during the reporting period.

313 applications for residential training courses at National Domestic Preparedness Consortium member training centers were processed through Training and Exercise Section during the reporting period.

### DPC Agency Executive Training Sessions

In 2012, from January to August, five (5) training sessions were conducted by DHSSES, NYSOEM and the National Center for Security and Preparedness (NCSP) specifically for DPC members, including Commissioners, Deputy Commissioners, and/or agency liaisons/representatives.

These training sessions were conducted in lieu of DPC semiannual meetings for 2012.

The training sessions were conducted as either (a) training focused on emergency management concepts and operations, or (b) as tabletop and/or functional exercises designed to simulate an actual event (e.g., winter storm, earthquake) in which participants were prompted to make decisions and participate in discussions as the event progressed.

- On January 3, 2012, an Agency Executive Training Session provided detailed training on emergency management concepts, New York State emergency management laws, function of the DPC, emergency operations center activities, and principle group meetings. This training session was presented to DPC agency Commissioners – another, similar training session was held for Deputy Commissioners and agency liaisons/representative (see below – May 7, 2012).
- On February 29, 2012, an Executive Leadership Tabletop Exercise trained participants in executive decision-making tactics during a simulated stressful environment in a no-fault, no-loss setting. Exercise “injects” were used to guide participants through the cascading impacts of a severe winter storm, which allowed for executive decision-making and discussions. Exercise participants were DPC agency Commissioners.



- On May 7, 2012, an Executive Training Session provided detailed training on emergency management concepts, New York State emergency management laws, function of the DPC, emergency operations center activities, and principle group meetings. This training session, similar to the one held on January 3, 2012 (see above), was presented to Deputy Commissioners and liaisons/representatives from DPC agencies.
- On June 29, 2012 an Executive Leadership Tabletop Exercise trained participants in executive decision-making tactics during a simulated stressful environment in a no-fault, no-loss setting. Also exercised were agency liaison/representative emergency operations center activities related to decision-making. Exercise "injects" were used to guide participants through the cascading impacts of a severe coastal storm impacting New York State, which allowed for executive decision-making and discussions. Exercise participants included Commissioners, Deputy Commissioners, and liaisons/representatives from DPC agencies, as well as key NYSOEM staff.
- On August 9, 2012, a Functional Exercise, presented by NCSF, involved a full activation of the State EOC. Executive decision making was exercised during a simulated stressful environment, as were agency liaison/representative and EOC staff actions. Exercise injects from a Master Scenario Events List were used to guide participants through the cascading impacts of an earthquake impacting northern New York State. Participants included Commissioners, Deputy Commissioners, and liaisons/representatives from DPC agencies, as well as NYSOEM staff.

#### State OEM Training Program

##### Courses included:

- Incident Command System (ICS) Intermediate (I-300) and ICS Advanced (I-400)
- Homeland Security Exercise and Evaluation Program (HSEEP)
- Local emergency operations center training
- State EOC Course
- Organizing and Managing the Local Hospital Command Center in New York State (Pilot)
- Disaster LAN
- Weapons of Mass Destruction training programs
- Counter Terrorism training programs,
- Medical Management of CBRNE courses
- Weapons of Mass Destruction (WMD) Tactical Operations courses
- Several of FEMA's Professional Development Series including Leadership and Influence, Effective Communications, and Decision Making and Problem Solving

Training staff developed and facilitated the Employee Orientation Workshop for new employees at NYSOEM. The workshop included presentations from Planning, Mitigation, REP, Training and Exercise, Recovery, Logistics and Finance. Each section presented a 15-minute segment on their program.

Training staff assisted NYSOEM Region V staff with the curriculum development of the Organizing and Managing the Local Hospital Command Center in New York State; thus far, there have been eight offerings for 240 students.



Since the implementation of the Statewide Learning Management System (SLMS), administrative staff spent much of their time assisting students in a "help desk" function, including analyzing whether an account already exists within the SLMS and NYS Directory Services. If an account cannot be located in SLMS or NYS Directory Services, staff assists students with creating an account. Staff also assists students in course enrollment and resetting passwords.

All T&E staff was active in Superstorm Sandy response and recovery efforts at the State EOC; some NYSOEM Training and Exercise staff was reassigned to field operations.

#### NYSOEM Exercise Program

NYSOEM Exercise staff directly or indirectly supported the following exercises and events:

- September 12, 2012: Indian Point radiological exercise (rehearsal for Oct. 2 federally evaluated exercise).
- September 19-20, 2012: Westchester County Communications Unit Leader functional exercise - in conjunction with OIEC.
- October 2, 2012: Indian Point radiological exercise (federally evaluated).
- October 18, 2012: Rockland County Rescue Entry and Counter Terrorism Team (REACT) full-scale exercise.
- October 23, 2012: Office of Cyber Security (OCS) monthly tabletop exercise.
- October 25, 2012: Monroe County Active Shooter seminar.
- October 27, 2012: Albany International Airport / FAA-mandated full-scale exercise.

Exercise staff members were also deployed to field assignments and State EOC assignments in support of Superstorm Sandy.



### New York State Preparedness Training Center

The New York State Preparedness Training Center (SPTC), located in Oriskany, NY, is managed and operated by DHSES and is supported by NCSF. The SPTC serves as a centralized training facility for New York State and as well as local and federal first responders from all disciplines. The SPTC provides first responders and officials with the knowledge, skills and abilities necessary to safely and effectively prevent, prepare for, respond to and recover from terrorist acts and other major/catastrophic incidents, such as natural disasters.



In addition to the courses that the SPTC sponsors for statewide and national audiences, many agencies and organizations use the SPTC facilities to train their personnel, including Oneida County Sheriff's Office, City of Utica Police Department, New York State Police, Mohawk Valley Police Academy, and other organizations.

The following table provides information on courses taught at the SPTC from January 2012 through February 2013.

Course Name	Date	No. of Participants
ORI-NYSP-SORT Training	1/3/2012	7
ORI-NYSP-Mobile Field Unit Training	1/4/2012	36
ORI-DCS-Technical Accident Investigation	1/9/2012	22
ORI-OMH-Peace Officer Training	1/9/2012	30
ORI-OS-Planning	1/10/2012	10
ORI-OCLEC-2012	1/10/2012	32
PGA-375	1/10/2012	29
ORI-NG-Meeting	1/11/2012	6
ORI-Rome-ERT Training	1/11/2012	12
ORI-Orwego CSO-ERT Training	1/12/2012	15
AWR-130-C	1/17/2012	26
ORI-OPPC-Oneida Co. Assessment	1/18/2012	8
ORI-NG-Security Force Site Survey	1/30/2012	16
ORI-Herkimer PD-ERT	1/23/2012	20
ORI-Oneida CSO ERT	1/24/2012	13
PGA-375	1/24/2012	25
ORI-OC-ODM	1/27/2012	10
ORI-SUNY ESF	1/31/2012	12
VNED/SC	1/31/2012	15



Course Name	Date	No. of Participants
ORI-Onaldis Co. 911 Training	2/6/2012	29
ORI-Utica Police Dept.-In Service Training	2/6/2012	14
ORI-DHSES-EVOC Meeting	2/7/2012	7
ORI-Onaldis Co. 911 Training	2/7/2012	9
PER-275 Law Enforcement Active Shooter	2/7/2012	26
ORI-Onaldis Co. 911 Training	2/8/2012	10
ORI-Utica Police Dept.-K9 Training	2/8/2012	14
AWR-147 Rail Car Incident Response	2/9/2012	37
AWR-147 Rail Car Incident Response	2/10/2012	35
ORI-Utica Police Dept.-K9 Training	2/10/2012	17
Indicators of the Terrorist Attack Cycle-BASIC	2/14/2012	24
ORI-Onaldis County Law Enforcement Coalition-2012	2/14/2012	18
ORI-Utica Police Dept.-K9 Training	2/14/2012	16
ORI-NY State Police-SOBT Training	2/15/2012	8
ORI-Onwego CSO-EBT Training	2/15/2012	8
Indicators of the Terrorist Attack CycleNT	2/16/2012	19
ORI-Utica Police Dept.-K9 Training	2/16/2012	8
ORI-HFM BOCES Active Shooter Education	2/17/2012	4
AWR-140-2 Radiological/Nuclear Awareness Part 1	2/21/2012	7
ORI-FBI-Tactical Training	2/21/2012	11
MGT-315 Enhanced Threat and Risk Assessment	2/22/2012	19
ORI-Onaldis County Sheriff Dept.-In Service	2/23/2012	16
ORI-Utica Police Dept.-K9 Training	2/24/2012	14
ORI-OPPC-Onaldis Co. Assessment	2/28/2012	11
PER-275 Law Enforcement Active Shooter	2/28/2012	26
MGT-305 Event Security Planning for Public Safety Officials	3/6/2012	33
AWR-136 Essentials of Community Cyber Security	3/7/2012	19
MGT-305 Community Cyber Security Exercise Planning	3/8/2012	14
PER-275 Law Enforcement Active Shooter	3/13/2012	32
MGT-307 Advanced Crisis Communications for Public Safety Communications Supervision	3/14/2012	35
AWR-130 Incident Response to Terrorist Bombings	3/15/2012	13
AWR-219 Screening of Persons by Observational Techniques	3/21/2012	35
AWR-219-1 Screening of Persons by Observational Techniques TTT	3/21/2012	32



Course Name	Date	No. of Participants
Triacetone Triperoxide Workshop	3/29/2012	48
EVOC Meeting	3/5/2012	7
NYSEMA Executive Board	3/6/2012	6
OPPC SLMS Regional Training	3/6/2012	29
ODM INT Incident Training	3/6/12-3/8	37
ODC ODML-EX Exercise	3/6-3/9	26
Oneida Co. CERT Training	3/7/2012	21
Division of Military and Naval Affairs Meeting	3/7/2012	10
NYS Sort Training	3/12/2012	7
Oneida Co. Law Enforcement Coalition	3/13/2012	30
City Scope Focus Group	3/15/2012	48
EMS Meeting	3/15/2012	8
NYS Juvenile Officer's Training	3/26-3/30	19
Mohawk Valley Police Academy EVOC	3/26-3/30	20
ODC Regional Meeting	3/28/2012	32
Fulton, Montgomery, Hamilton	3/30/2012	18
BOCES School Safety Meeting	3/30/2012	18
	3/30/2012	3
Schenectady PD Meeting and Tour	3/30/2012	18
Clandestine Lab Awareness AM	4/3/2012	5
Clandestine Lab Awareness PM	4/4/2012	8
WMD Awareness	4/4/2012	10
Critical Decision Making	4/5-4/6-12	24
Law Enforcement Active Shooter Emergency Response	4/10-4/11/12	23
MA/MLG/AR-15 Operation Course	4/13/2012	14
Medical Management Of CBRNE Events	4/14-4/15/12	20
State and Local Anti-Terrorism Training	4/17/2012	58
Vehicle Borne Improvised Explosive Device- Checkpoint	4/18-4/20/12	18
Law Enforcement Active Shooter Emergency Response TTT	4/23/-4/25/12	28
Law Enforcement Active Shooter Emergency Response	4/26-4/27/12	25
Secure Techniques for Onsite Preview	4/30/2012	28
Basic Data Recover and Acquisition	5/1-5/4/12	24
Use of Force Training	4/2-4/6/12	25
Clandestine Lab Training	4/3/2012	19
SORT Training	4/5/2012	5
Civil Disorder Training	4/9/2012	19
SORT Training	4/17/2012	6



Course Name	Date	No. of Participants
National Guard Meeting	4/10/2012	9
MVPA Academy Training	4/16/2012	21
Operation Impact Meeting	4/17/2012	16
EOC Meeting	4/17/2012	31
MVPA Academy Training	4/12-4/13-12	20
Emergency Svcs. Meeting	4/12/2012	2
HERF Meeting	4/19/2012	16
Information Meeting Sharing	4/20/2012	15
NYS Federation of Search and Rescue Board Meeting	4/21/2012	40
Herkimer Police Dept ERT Training	4/24/2012	14
School Violence Workshop	4/24/2012	9
Skwarn Training	4/26/2012	44
NYSP SORT	4/30/2012	6
SUNY Firearms Meeting	5/1/2012	10
PRD/RID Inservice	5/2/2012	7
Specialty Impact Munitions	5/1/2012	9
Distraction Device	5/3/2012	14
Chemical Munitions Instructor Certification	5/3/2012	29
Structure Clearing Strategies	5/3/2012	14
Tubular Assaults	5/3/2012	12
Distraction Device Instructor Certification	5/3/2012	21
Less Lethal Impact Munitions	5/3/2012	22
Single Officer Response to an Active Shooter	5/3/2012	12
Mechanical & Hydraulic Breaching	5/3/12	21
OPPC EVOG Meeting	5/8/12	4
Exercise Design	5/8/-5/12/12	12
Utica School District Safe Schools Initiative	5/7/12	1
HRF Exercise	5/10/-5/20/12	1086
Law Enforcement Safety and Survival Training	5/21-5/24/12	35
Incident Safety Officer Training	5/23/12	20
SUMS Demonstration	5/24/12	12
School Resource Coalition	5/24/12	25
Onesida Co. Sheriff's Award Ceremony	5/25/12	140
Onesida Co. EOC Training	5/30-5/31/12	44
Incident Safety Officer Training	5/30/12	14
Advanced Weather Spotter Training	5/31/12	29
Genetic Group	5/31/12	14
CC-301 Basic Data Recovery and Acquisition	5/1/12	24



Course Name	Date	No. of Participants
PCR-275	5/8/2012	29
PCR-275	5/30/2012	25
Intermediate Data Recovery and Analysis	6/4-6/8	23
New York State Police EVOC- Instructors	6/4-6/8	12
New York State Police Basic EVOC- E-Session	6/4-6/15	28
Jail Jail Evacuation II	6/5/12	24
OPPC Instructor Assessment	6/5/12	6
NYSEMA Exec. Board Meeting	6/5/12	5
EMS Operations Course	6/6/12	22
OPPC Incident Safety Officer	6/6/12	19
EVOC Meeting	6/6/12	6
Utica PD K-9 Unit	6/6/12	6
Dismounted Patrol Tactics/C Co-108 Infantry NY National Guard	6/8/12	51
New State Police EVOC- Recruits	6/11-6/15	12
Incident Safety Officer	6/11/12	17
Oranida County LE Coalition Meeting	6/12/12	33
Law Enforcement Active Shooter	6/12/12	28
How to Hunt Criminals and Terrorist Workshop	6/12/12	41
Surveillance and Intelligence Workshop	6/13/12	40
Illion Police ERT Training	6/14/12	8
Military Ordinance Recognition Training	6/14/12	15
New State Police EVOC- Recruits	6/18/12	28
New York State Police EVOC- Instructors	6/19/12	13
Incident Safety Officer	6/18/12	18
Madison Co. So EVOC	6/18/12	4
Incident Response to Terrorist Bombing	6/18/12	7
Tactical Emergency Casualty Care	6/19/12	63
Utica PD ERT In Service	6/20/12	9
School Resource Officer Coalition Meeting	6/21/12	18
Oranida County Sheriff's Office	6/21/12	4
Madison Co. So EVOC	6/21/12	4
Law Enforcement Active Shooter	6/25/12	25
NYSP Capital SORT In-Service	6/27/12	7
Oronidaga Co. ERT In-Service Training	6/28/12	13
New York State Police EVOC	6/25-6/29	12
Illion Police OCB Training	6/29/12	6
June Mobil		81
	OEM	37



Course Name	Date	No. of Participants
	Mobile- 1st qtr	99
Catskills PD EVOG	7/9/2012	13
Oneida County Sheriff's Office	7/9/2012	5
NYS EVOG-Instructors	7/9-7/13	12
NYS EVOG	7/9-7/20	28
Oneida County LE Coalition Meeting	7/10/2012	18
Bureau of EMS Meeting	7/11/2012	3
Inter Region Coordination Meeting OCM Region 4	7/12/2012	4
Hamilton College Safety EVOG	7/13/2012	5
Legal Aid Society Meeting-Tour 1 person	7/13/2012	0
DCIS Accident Investigation	7/16-7/20	21
NYS EVOG	7/16-7/20	12
Herkimer PD Tac Training Open Space Training	7/16/2012	8
COMLEX Meeting	7/17/2012	9
Inmate Classification Curriculum Panel Meeting	7/17/2012	12
Special Olympics Law Enforcement Conference	7/18/2012	27
NYS SORT Team	7/18/2012	8
Oneida County Sheriff/Case Review	7/23/2012	10
School Violence Meeting	7/23/2012	6
NYS Police Oneida Barracks	7/31/2012	4
Law Enforcement Active Shooter Emergency Response	7/10-7/11	32
AWR-L47 Rail Car Incident Response	7/18/2012	35
Wide Area Search and Rescue	7/24-7/26	40
Law Enforcement Active Shooter Emergency Response	7/24-7/26	19
AWR-150 WMD Awareness	7/25/2012	10
Surveillance Detection for Law Enforcement	7/31/2012	18
and Security Professionals	7/31/2012	18
	7/12/12	15
Mobile- Indicators of the Terrorist Attack Cycle- Basic	7/31/2012	18
Indicators of the Terrorist Attack Cycle- Basic	7/12/12	15
	8/1-8/2	11
New State Police EVOG- Recruits	8/6-8/17	27
New York State Police EVOG- Instructors	8/6-8/10	13
Law Enforcement Active Shooter Emergency Response	8/7-8/8	31
New York State Police- Vehicle Take Downs	8/9/12	14
Regional Planning Committee	8/9/12	1
Mike Hauck meeting with 3/309th Army reserve unit	8/12/12	12
New York State Police EVOG- Instructors	8/13-8/17	12
Oneida County Board of Legislators Public Safety Committee	8/13/12	13
Oneida County LE Coalition Meeting	8/14/12	27



Course Name	Date	No. of Participants
Disaster Preparedness for Hospitals & Healthcare Org's	8/14-8/15	36
Pipeline Security Class	8/15/12	26
Law Enforcement Active Shooter Refresher	8/16/12	12
School Violence Training - Utica School District	8/21/2012	40
Vehicle Bomb Improvised Explosive Device-Checkpoint	8/21-8/23	14
Oneida County Sheriff's Office Riot Control Training	8/22/12	20
Role Player Training	8/22/12	14
School Resource Officer Coalition Meeting/cancelled	8/22/12	0
EMS Special Situation Pilot Course- Set up	8/24/12	17
EMS Special Situation Pilot Course- Set up	8/24/12	17
EMS Special Situation Pilot Course	8-25-8-26	20
EMS Special Situation Pilot Course- Set up	8/24/12	17
EMS Special Situation Pilot Course	8-25-8-26	20
EMS Special Situation Pilot Course- Hot Wash	8/27/12	8
EMS Special Situation Pilot Course- Hot Wash	8/27/12	8
NCSF/SPTC Division Focus Group	8/27/12	14
EMS Special Situation Pilot Course- Hot Wash	8/27/12	8
NCSF/SPTC Division Focus Group	8/27/12	14
A2S2	8/28/12	26
Review of State Watch Center Protocols	8/30/12	6
Legal Aid Society Meeting	9/5/2012	16
IRS Criminal Division In Service Training	9/7/2012	21
Dept. Of Health EMS Meeting	9/7/2012	5
HazMat Conference	9/7-9/8/12	72
Office of Mental Health Peace Officer Training TIMES 6 WEEKS	9/10/2012	28
New York State Police EVOC - Instructors	9/10-9/14/12	11
New York State Police EVOC	9/10-9/21/12	25
FBI Buffalo HBT Training	9/10-9/11/2012	15
Law Enforcement Active Shooter Emergency Response	9/11-9/12/12	27
Oneida County LE Coalition Meeting	9/12/2012	32
DHSES Office of Cyber Security Meeting	9/13/2012	12
NYSENA Exec. Board Meeting	9/14/2012	5
Little Falls Police Department	9/17/2012	4
Inspection & Investigation of Commercial Vehicle Crashes	9/17/2012	31
New York State Police EVOC - Instructors	9/17/2012	11
School Resource Officer Coalition	9/20/2012	18
Oneida County Sheriff's Office / Meeting	9/20/2012	4
MGT-315 Enhanced Threat and Risk Assessment	9/19-9/20	34
Canandalgus LASER	9/24-9/25/12	19
Canandalgus LASER	9/27-9/28/12	27
Dewitt PD EVOC	9/24/2012	11



Course Name	Date	No. of Participants
Dewitt PD EVOC	9/25/2012	10
Dewitt PD EVOC	9/26/2012	8
Dewitt PD EVOC	9/27/2012	13
Onondaga Co. SWAT Basic School	9/27/2012	21
DOS Inmate C & C Panel Meeting	10/2/2012	11
Office of Bombing Prevention	10/2-10/4/2012	85
PER-213 Wide Area Search and Rescue	10/2-10/4/2012	34
A2S2	10/4-10/5/2012	29
Lost Person Behavior - SAR	10/5/2012	21
Crime Scene Protection -SAR	10/6/2012	11
Lost Person Behavior - SAR	10/6/2012	9
DEC Searcher 1 SAR	10/6/2012	11
Basic Wildland Skills SAR	10/6/2012	15
K-9 Disaster Response	10/6/2012	8
GPS Coordinator	10/6/2012	12
DEC Searcher 1 SAR	10/7/2012	10
MTA Only Law Enforcement Active Shooter Emergency Response	10/9-10/10	31
Oneida County LE Coalition Meeting	10/9/2012	30
New York State Police and DMVA EVOC Training	10/10/2012	21
Civil Support	10/11/2012	30
EADS US Air Force	10/15/2012	25
Incident Management Team Meeting	10/16/2012	4
Law Enforcement Active Shooter Emergency Response TTT	10/18-10/18	30
Instructor Development Workshop	10/18-10/19	36
School Resource Officer Coalition	10/18/2012	18
Oneida County Pre-Construction Meeting	10/18/2012	5
Suffolk County Vehicle Borne Improvised Explosive Device-Checkpoint	10/23-10/25	23
Emergency Vehicle Defensive Driving	10/23-10/25	19
DOS Meeting Bath Salts Task Force	10/25/2012	21
SOY WASH Meeting	10/25/2012	53
Homeland Security: Academia Meets Practice	10/27/2012	39
EVOC Instructor Course	10/29-11/2/2012	28
Office of Mental Health Training	10/29-10/31/12	8
ITAC - Taught by Syracuse PD at their location	10/23/2012	16
Oneida County Sheriff's Office	11/1/2012	12
US Army Reserve Training 3-309th	11/3-11/4/12	70
US Probation In-Service Training	11/5-11/6/12	21
EVOC Instructor Course	11/5-11/9/12	27



Course Name	Date	No. of Participants
PCR 275 Law Enforcement Active Shooter Emergency Response	11/7-11/8	24
AWR 213 Critical Infrastructure/Key Resource Awareness	11/13/2012	12
Oneida County LE Coalition Meeting	11/13/2012	34
PCR 275 Law Enforcement Active Shooter Emergency Response	11/13-11-15/12	24
AWR 213 Critical Infrastructure/Key Resource Awareness	11/14/2012	12
School Resource Officer Coalition Meeting	11/15/2012	23
MM Familiarization	11/16/2012	20
MM Familiarization	11/16/2012	20
US Probation In-Service Training	11/19/2012	6
MM Familiarization	11/16/2012	20
US Probation In-Service Training	11/19/2012	6
US Probation In-Service Training	11/20/2012	8
Utica Police ERT Training Building #3 Shoot house	11/21/2012	12
Suffolk County VEMD	11/27-11/29/12	26
EMS Triage And MCI Management	11/28-11/9/12	13
NYS Police Crowd Control	11/28/2012	39
ITAC - Colonia PD Mobile Delivery	11/5-11/19/12	87
PCR 275 LASER Mobile Delivery Buffalo	12/3/12-12/4/12	29
PCR 275 LASER Mobile Delivery Buffalo	12/5/12-12/6/12	32
All Hazards PIO Class	12/3-12/4/12	15
Law Enforcement Coalition Meeting	12/4/2012	38
Dewitt Police EVOG Training	12/5/2012	2
Social Media for Disaster Response and Recovery	12/6/2012	23
Utica Police In-Service Training	12/6/2012	24
NYSEMA Executive Board Meeting	12/6/2012	5
Utica Police In-Service Training	12/10/2012	11
PCR-275Law Enforcement Active Shooter Emergency Response	12/11-12/12	27
Utica Police In-Service Training	12/12/2012	22
Oneida County Sheriff's Office/ERT	12/13/2012	18
School Violence Prevention - Union College	12/12/2012	42
Utica Police In-Service Training	12/14/2012	22
FBI Homeland Response Team Training	12/17/2012	11
DAB County Construction Meeting	12/19/2012	5
Cityscape Meeting	12/20/2012	10
Utica Police In-Service Training	12/20/2012	22
	<b>Total</b>	<b>7,235</b>



#### New York State Office of Fire Prevention and Control

This report of firefighter training and education activities conducted by the NYS Office of Fire Prevention and Control (OFPC) in 2012 is presented to the Governor and Legislature pursuant to section 136 of the Executive Law. Included in this report is the report of hazardous materials emergency response training presented pursuant to section 136-a of the Executive Law and a summary of out-of-state training attended by firefighters and reported to the Office of Fire Prevention and Control, pursuant to section 72-g of the General Municipal Law.

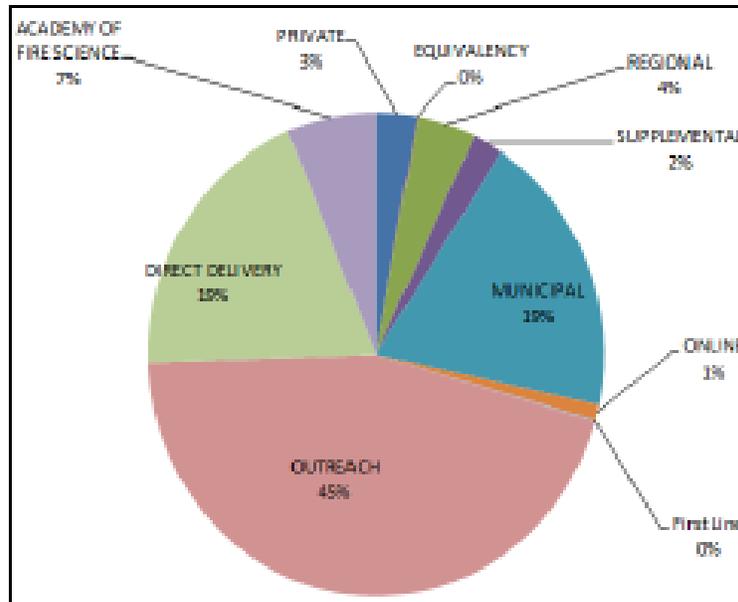
Annually, OFPC provides training to approximately 50,000 firefighters and other emergency responders, pursuant to section 136 of the Executive Law. OFPC has been conducting firefighter training for approximately 60 years. The scope and complexity of firefighter training has grown in conjunction with the increased responsibilities of New York State's fire service. Today, OFPC's fire training program consists of 200 different course titles with over 3200 course deliveries. Firefighter training and education is conducted for both career and volunteer fire departments throughout the State, serving approximately 100,000 firefighters in 1830 fire departments. This training is essential for safe and effective emergency response aimed at protecting the people, property and environment in the State of New York. For many fire departments, particularly volunteer fire departments, OFPC's firefighter training courses are the only formal training available.

The demand for firefighter training continues to increase annually, with local fire officials requesting a 57% increase for 2013 from 2012 allocations. This increase reflects the efforts of fire departments to be prepared to respond to natural and man-made disasters and incidents of terrorism, the commitment to reduce the number of firefighter injuries and deaths, and recruiting efforts by volunteer fire departments. It is essential that OFPC firefighter training programs remain current, relevant, reliable and available for new firefighters, experienced firefighters and fire officers. OFPC has active membership or leadership roles in following national organizations related to fire service training: the Fire and Emergency Service Higher Education Consortium (FESHE), the Training Resources and Data Exchange Organization (TRADE), and the North American Fire Training Directors Association (NAFTD).

OFPC uses a variety of delivery mechanisms to accomplish its training mission. Each of these mechanisms, outlined in this report, is designed to best serve the needs of career and volunteer fire departments, large and small, and represent a partnership of State, county and local government.

On the following page is an illustration of fire training courses by delivery method.





Above: Fire training courses by delivery method

Pursuant to Chapter 580 of the Laws of 2007, OFPC conducted web-based Firefighter I training courses into 2010 as part of a contract. This web-based format provided students the ability to complete course materials online, at their convenience, which would have otherwise taken 30 hours to complete in a classroom setting. Approximately 60 hours of hands-on skills instruction is then delivered by State fire instructors. Funding for a blended learning program was not available for 2012. OFPC is exploring a partnership with SUNY's Mohawk Valley Community College in piloting an Academy based program in on-line learning.

OFPC is increasing the use of the BOCES distance learning video broadcasting system as a firefighter course delivery method. Video broadcasting provides for course delivery over a wide geographic area to minimize student travel cost and time. This past year, eight firefighter training courses were conducted in St. Lawrence County and Steuben County through a partnership with the St. Lawrence County Fire Coordinators office and the St. Lawrence-Lewis BOCES. Efforts are ongoing to expand the number of video broadcast sites statewide.

The title of each training course conducted in 2012, the number of times the courses were conducted and the number of firefighters and related personnel who completed the courses is listed in the table below.



Course Title	Courses Conducted	Student Completions
Recruit Firefighter Training (RFFT) Fire Prevention Training	3	64
Accelerant Detection Canine Team Annual In-Service Training Workshop	1	13
Accident Victim Extrication Training	85	1,032
Advanced Hazardous Materials Technician	3	49
Advanced ICS for Command and General Staff Complex Incidents (I-400)	6	58
Aircraft Rescue And Firefighting	16	176
Alternative Fueled Vehicles And New Vehicle Technology	10	166
Apparatus Operator – Aerial Device	45	363
Apparatus Operator – Emergency Vehicle Operations	115	1,212
Apparatus Operator – Pump	112	855
Basic Structural Collapse Operations	29	296
Basic Structural Collapse Operations	3	97
Basic Wildland Fire Suppression	27	230
Basic Wildland Search Skills (DEC)	12	193
Bridge to Firefighter I	2	8
Campus Safety and Awareness for Chemical Suicide Incidents	4	64
Cargo Truck – Hazardous Materials Specialist	2	23
Chautauque County Weekend	1	105
Chemical Suicides: Information for the Responder	55	642
Command and Control of Incident Operations (NFA) (WAS FCO)	1	29
Company Officer Training Workshop	3	206
Concrete Breaching and Breaking	1	71
Conducting Live Fire Training Evolutions	41	362
Confined Space Rescue – Technician Level	14	61
Confined Space: Awareness and Safety	52	544
County Fire Coordinator Conference	1	64
Courage to be Safe; Firefighter Life Safety Initiatives	25	376
Decontamination Trailer Equipment Training	4	39
Decontamination	15	313
Defense Against Weapons Of Mass Destruction Awareness	20	167
DHSES, OIFPC and OEM Field Integration Training	1	90
Electric Vehicle Safety for Emergency Responders	66	1,329
Electrical Fire Cause Determination I	3	46
Electrical Fire Cause Determination II	3	42
Emergency Escape System Train-the-Trainer	11	77
Emergency Medical Technician Refresher	3	37
Emergency Medical Technician – Basic	2	9
Emergency Response to Ethanol Incidents	11	182
Emergency Response to Terrorism: Basic Concepts	2	6
Emergency Service Dispatcher – Basic	2	18



Course Title	Courses Conducted	Student Completions
Engine Company Operations	1	20
Enrollment to Basic Fire Fighter Training	1	18
Evaluator Training	7	95
Everything a Firefighter Wants to Tell a Code Official	2	51
Executive Skills Series (MLC/I) (NFA)	1	29
FASNY EMS Conference	1	265
Fire Alarm Basics	3	58
Fire Alarm Systems Workshop	5	59
Fire and Life Safety Educator I	1	11
Fire Behavior and Arson Awareness	61	781
Fire Behavior and Arson Awareness / Principles Of Fire Investigation	5	82
Fire Extinguisher Maintenance	2	13
Fire Marshals and Inspectors Program	1	100
Fire Officer I	40	439
Fire Officer I (NFPA 1021-2009 Ed.)	18	225
Fire Officer II	6	19
Fire Police	55	630
Fire Reporting Workshop – Version 5.0	8	101
Fire Safety and Response for Law Enforcement	2	6
Fire Safety During Construction and Demolition	1	53
Fire Safety For Direct Support Professionals (OPWDD)	236	3,720
Fire Safety Inspections at Correctional Facilities	2	10
Fire Scene Evidence Collection	2	22
Fire Service Instructor I	15	241
Fire Service Instructor II	4	49
Fire Service Women of New York State Training	1	70
Fire Sprinkler Plans Review	1	6
Fire Sprinkler Systems Workshop	3	58
Fire/Arson Investigation	3	48
Fire/Arson Investigation Seminar	2	367
Fire/Arson Investigation Specialty – Interviewing Techniques for the Fire Investigator	2	22
Firefighter Assist and Search Team (FAST)	96	929
Firefighter I (w/HMFRG)	196	1,994
Firefighter II	74	760
Firefighter Survival	185	1,429
First Line Supervisors Training Programs	8	147
First Receiver Decontamination	7	50
Flammable and Combustible Liquid Emergencies	4	55
Flammable Gas Emergency Response Workshop	5	31
Handling Elevator Emergencies	6	27



Course Title	Courses Conducted	Student Completions
Hazardous Materials First Responder Awareness	19	5
Hazardous Materials First Responder Operations	87	1,174
Hazardous Materials Incident Command	13	128
Hazardous Materials Incident Safety Officer	4	51
Hazardous Materials Staff Refresher Training	1	18
Hazardous Materials Technician – Basic	19	224
Hazardous Materials Technician Basic Refresher	30	323
Hazardous Materials Training Program	1	195
Health And Safety Officer (NFA)	3	44
Highway Safety for Emergency Responders	5	60
Hazardous Materials First Responder Operations – Annual Refresher	94	1,644
Ice/Cold Water Rescue – Technician Level	12	112
Introduction To ICS (ICS-100.B)	36	258
ICS for Single Resources and Initial Action Incidents (ICS-200.B)	24	80
Incident Command for Structural Collapse (NFA)	1	30
Incident Safety Officer (NFA)	54	519
In-Service Safety Training (OSHA Refresher)	3	146
Intermediate ICS for Expanding Incidents (I-300)	29	266
Intro to Unified Command for Multiagency and Catastrophic Incidents (IUCMCI)	1	27
Introduction to Fire Officer	41	634
Introduction to Statewide Learning Management System (SLMS)	24	260
Introduction to Statewide Learning Management System (SLMS)	5	52
National Incident Management System – Introduction (IS-700.A)	30	128
NIMS Multiagency Coordination Systems (MACS) (IS-701)	1	1
NIMS Public Information (IS-702)	1	1
NIMS Resource Management (IS-703)	2	2
NIMS Communication and Information Management (IS-704)	1	1
Juvenile Firesetter Intervention Specialist I	2	28
Leadership III – Strategies For Supervisory Success (NFA)	1	28
Leadership Accountability, Culture and Knowledge	1	47
Legal Issues for the Fire Service Instructor	4	44
Legal Issues for the Volunteer Fire Service	1	19
Live Fire Policy Training	1	16
Live Fire Training Safety	44	434
Med Structural Collapse Operations: Void Search and Rescue	6	89
Medium Structural Collapse Operations: Ext Shoring	5	46
Medium Structural Collapse Operations: Int Shoring	7	96
Medium Structural Collapse Concepts	7	75
Medium Structural Collapse Operations: Tools	8	59
Methamphetamine Labs and the Fire Marshal – What You Need to Know	3	714



Course Title	Courses Conducted	Student Completions
NYS OFFPC Peace Officer – Weapons/Officer Protection Training	1	12
NYS CME Based Recertification Program – EMT B Core Content	1	77
NYS Instructor's Authorization Training Program	2	130
On-Line Fire Reporting System Training	1	47
On-Scene Rehabilitation for Emergency Operations	4	52
Covengo County Weekend	1	90
Passenger Train Emergency – Awareness	3	25
Passenger Train Emergency Rescue Procedures	4	11
Personal Protective Equipment for the Hazardous Materials Ops Level Responder	3	25
Preparation for Initial Company Operations (PICO) (NFA)	1	23
Preparing for the Line of Duty Death	1	8
Principles of Building Construction: Combustible (NFA)	46	416
Principles of Building Construction: Noncombustible (NFA)	33	283
Principles of Fire Investigation	18	333
Principles of Instruction	23	140
Public Safety Critical Incident Management	2	19
Recognizing Clandestine Drug Lab Operations	36	934
Recruit Firefighter Training	4	61
Refresher Training (12 Hours)	8	88
Refresher Training (6 Hours)	31	306
Refresher Training (9 Hours)	29	358
Regional Fire Administrators Conference	2	48
Rehabilitation Practices for Fire Department Operations	1	24
Rescue Tech – Basic/Confined Space – Tech Level	1	17
Rescue Technician – Basic	63	529
Respiratory Protection Program	2	31
Rope Rescue – Operations Level	12	94
Rope Rescue – Technician Level I	7	45
Rope Rescue – Technician Level II	4	33
Sampling Techniques for the Hazardous Materials Technician	3	32
SCBA Confidence	43	268
Scene Support Operations	300	597
School Bus Rescue	10	234
School Bus Rescue Practical Skills	11	180
Selected Legal Issues for the Volunteer Fire Service – County Weekend	1	43
Strategy And Tactics For Initial Company Operations (NFA)	8	99
Swift Water Rescue – Technician Level	2	26
Swiftwater/Flood Rescue Technician	7	101
The Challenge of Pesticides and Poisons	3	10
The Rules Have Changed: Firefighters Guide to Lightweight Wood Construction	1	25



Course Title	Courses Conducted	Student Completions
Trench Rescue – Awareness Level	31	468
Trench Rescue – Operations Level	5	38
Trench Rescue – Technician Level	4	41
Truck Company Operations	60	510
Vehicle Arson Awareness Program (VAAP)	1	10
Vehicle Fire Investigation	3	39
Volunteer Fire Police Association Conference	1	170
Water Rescue – Awareness Level	49	1,050
Water Rescue – Operations Level	5	40
Water Supply Operations	23	107
What Am I Looking For? – Inspections, Testing, Maintenance of Fire Systems	1	53
Why Sprinklered Buildings Burn	2	28
WMD Detection Equipment Refresher Training	1	43
<b>Total</b>	<b>3218</b>	<b>39,213</b>

The number of training courses conducted in each county in 2012 and the number of firefighters and related personnel who completed the courses are listed below.

County	Courses Conducted	Student Completions
Albany	36	770
Allegany	17	245
Bronx	2	17
Broome	45	797
Cattaraugus	14	297
Cayuga	9	128
Chautauque	14	375
Chemung	20	277
Chenango	16	315
Clinton	14	266
Columbia	24	357
Cortland	15	299
Delaware	12	217
Dutchess	67	1,368
Erie	90	1,987
Essex	14	152
Franklin	26	465
Fulton	5	52
Genesee	21	276
Greene	12	198
Hamilton	5	46



County	Courses Conducted	Student Completions
Herkimer	3	109
Jefferson	33	565
Kings	2	36
Lewis	4	43
Livingston	14	170
Madison	1	27
Monroe	49	995
Montgomery	21	273
Nassau	38	1,967
New York	17	279
Niagara	41	796
Oneida	65	1,155
Onondaga	83	1,312
Ontario	23	377
Orange	78	1,585
Orleans	11	158
Cowago	26	423
Otsego	19	367
Putnam	15	250
Queens	17	491
Rensselaer	41	722
Rockland	31	681
Saratoga	35	711
Schenectady	32	822
Schoharie	27	477
Schuyler	164	4,573
Seneca	23	382
St. Lawrence	22	320
Steuben	20	300
Suffolk	78	1,742
Sullivan	36	702
Tioga	14	184
Tompkins	14	229
Ulster	34	724
Warren	34	594
Washington	12	228
Wayne	39	895
Westchester	148	2,582
Wyoming	13	286
Yates	19	341

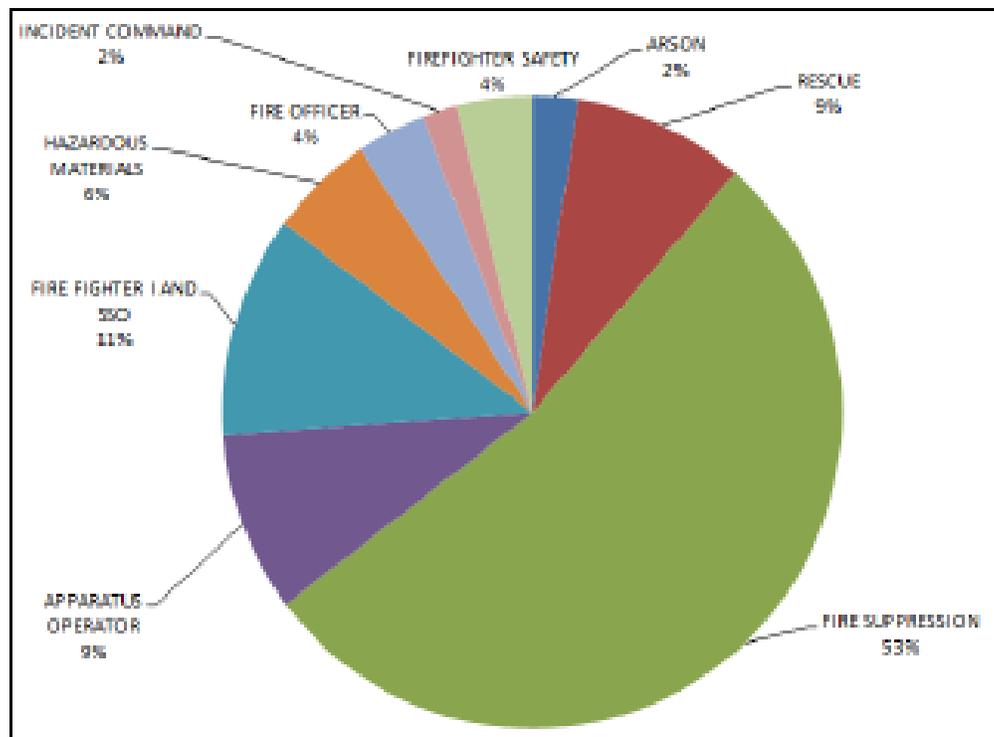


County	Courses Conducted	Student Completions
Out Of State	12	258
Non Chargeable	116	2,008

**Outreach Training**

OFFPC's Outreach Training Program is the primary means of providing basic firefighting skills training for volunteer firefighters. These courses (34 course titles) are delivered at local fire training sites, at the convenience of the local fire department to permit maximum participation by volunteer firefighters. These courses are taught by OFFPC's State fire instructors, who are fee-paid employees with specific educational qualifications to conduct firefighter training. OFFPC employs approximately 362 State fire instructors for training throughout the State. Of these, 337 instructors are assigned to 33 counties for outreach training course delivery at local fire departments and training centers (all but Nassau County, Suffolk County and the five counties in New York City).

An illustration of the types of outreach training courses is displayed below.



Above: Outreach course delivery



The number of State fire instructors assigned to a particular county is based on the county's training needs, previous training history and available State funding, but is not less than four per county.

Instructors receive training from OFPC to enable them to teach each State fire training course they are authorized to deliver. The instructor training sessions are conducted three times annually at the Academy of Fire Science.

Outreach fire training courses are scheduled by each county fire coordinator pursuant to section 225-a of the County Law and OFPC's regulations, 19 NYCRR Part 438. At the beginning of each State fiscal year, OFPC estimates the number of fire training courses that can be conducted statewide, based on its budget appropriation and assigns an allocation to each county based on previous training history, anticipated need, and available funds. The number of instructors varies based on the course content, safety requirements and the number of skills training exercises required by the course curriculum. County fire coordinators schedule fire training courses in their counties after consultation with local fire chiefs to determine needs, suitable dates, and locations. Course requests are then submitted to OFPC.

In the current fiscal year, OFPC received course hour requests exceeding 93,147 course hours or \$3,207,405, with the actual allocation to the counties of 62,560 course hours or \$2,108,897. As of February 1, 2013, OFPC was able to schedule, deliver and complete approximately 38,232 course hours that equates to \$1,963,673 expended, which is consistent with the previous year.

For State fiscal year 2013-2014, county fire coordinators have submitted requests for 3591 courses totaling over 98,200 course hours or \$3,310,322. Counties and local fire officials continually report to OFPC a backlog and waiting list for firefighters to access training courses.

Training allocations for State fiscal year 2013-2014, training course allocations for the past four State fiscal years and training course requests for State fiscal year 2012-2013 are listed, for each county, on the following pages.



County	Instructor Assigned 2012	Actual Use 2009/2010	Actual Use 2010/2011	Allocation 2011/2012	Actual Use 2011/2012	Allocation 2012/13	Actual Use 2012/13	Outreach Course Request 13/14	Outreach Hours request 13/14	Projected Allocation 2013/14
Albany	9	912	1381	1540	1691	1600	1422	68	2037	1600
Allegany	4	651	959	950	681	950	795	66	2039	950
Broome	6	1037	1348	1400	1139	1400	1353	135	3340	1400
Cattaraugus	4	688	561	900	909	950	889	32	1045	950
Cayuga	6	861	1140	1300	819	1300	1086	104	2340	1300
Chautauque	6	1085	1270	1200	991	1200	928	48	1477	1200
Chemung	5	761	882	970	681	970	678	30	921	970
Chemung	4	320	687	750	596	750	713	48	1007	750
Clinton	4	474	802	900	744	900	787	42	1148	1000
Columbia	5	743	924	950	881	950	1111	36	1111	1300
Cortland	4	700	564	880	756	880	747	46	1171	900
Delaware	3	408	684	750	361	750	709	35	1086	800
Dutchess	10	1200	1531	1650	1515	1650	1568	121	3436	1700
Erie	19	2538	2601	3850	2993	2900	3653	196	5286	3000
Essex	4	330	730	770	727	770	760	54	1250	800
Franklin	4	332	907	950	753	950	694	36	1062	950
Fulton	3	630	477	770	489	770	369	36	877	770
Genesee	6	556	868	900	795	900	1131	30	885	1200
Greene	4	627	762	800	801	750	924	55	1465	1100
Hamilton	2	248	261	450	117	450	301	7	275	450
Herkimer	6	981	848	880	647	880	941	29	1121	1000
Jefferson	7	800	987	1045	1002	1045	1095	85	1678	1100
Lewis	1	488	507	650	192	650	406	18	452	650
Livingston	4	589	831	880	488	880	502	31	1029	880
Madison	6	886	966	1000	760	1000	1007	42	1656	1200
Monroe	8	1447	1381	1600	1476	1600	1487	81	2846	1600
Montgomery	3	548	721	750	381	750	752	88	1408	800
Niagara	5	1590	1516	1550	1586	1600	1334	84	2051	1600
Oneida	6	1092	1151	1320	1456	1350	1863	96	2386	1900
Onondaga	7	1134	1532	1685	1491	1685	2007	105	2927	2100
Ontario	4	684	922	1100	1219	1300	755	41	1552	1300
Orange	13	1602	2126	2300	2489	2600	2647	130	4115	2700
Orleans	3	679	608	825	965	1000	551	41	1278	1000
Oswego	5	479	671	770	1037	770	1130	33	1128	1200
Otsego	4	331	298	700	481	700	633	39	996	750
Putnam	7	579	851	900	821	900	996	45	1739	1000
Rensselaer	8	1212	2091	2100	1536	2100	2117	96	2587	2200
Rockland	9	1526	1761	1450	1806	1800	1611	35	1730	1800
St. Lawrence	6	703	1236	1320	1137	1320	1136	66	1775	1350
Saratoga	6	1181	1262	1430	1540	1500	1748	78	2513	1900
Schenectady	6	870	631	1045	648	1000	902	35	1154	1000
Schoharie	4	344	331	660	380	660	699	43	829	800
Schuyler	4	355	532	664	448	660	424	24	572	660
Seneca	3	832	1002	1100	1097	1100	721	62	1527	1100
Steuben	6	531	588	800	651	800	750	39	1085	800



County	Instructor Assigned 2012	Actual Use 2009/2010	Actual Use 2010/2011	Allocation 2011/2012	Actual Use 2011/2012	Allocation 2012/13	Actual Use 2012/13	Outreach Course Request 13/14	Outreach Hours request 13/14	Projected Allocation 2013/14
Sullivan	5	1066	1341	1475	1660	1700	1123	64	1731	1700
Tioga	3	564	608	770	583	770	464	48	1155	770
Tompkins	4	510	685	770	870	770	557	22	868	770
Ulster	6	1219	1119	1350	1340	1350	1357	147	3107	1500
Warren	4	752	873	990	830	990	792	54	1107	990
Washington	4	736	808	890	517	890	498	47	1324	890
Wayne	3	516	714	800	639	800	571	79	1852	1000
Westchester	15	1751	2001	2200	1992	2200	2590	358	9596	2700
Wyoming	5	553	688	800	625	800	707	62	1341	800
Yates	4	325	708	800	648	800	561	26	687	800
<b>58 Hour Total</b>	<b>301</b>	<b>44300</b>	<b>54264</b>	<b>60899</b>	<b>53777</b>	<b>62560</b>	<b>58252</b>	<b>1591</b>	<b>98200</b>	<b>67400</b>

13/14 Req Are Based From 12/13



Student completions, by course, are listed below.

Course Title	Courses Conducted	Student Completions
Accident Victim Extrication Training	40	511
Advanced ICS for Command And General Staff Complex Incidents (I-400)	2	23
Aircraft Rescue and Firefighting	13	159
Apparatus Operator – Aerial Device	22	237
Apparatus Operator – Emergency Vehicle Operations	61	617
Apparatus Operator – Pump	82	661
Basic Structural Collapse Operations	11	179
Bridge to Firefighter I	2	8
Conducting Live Fire Training Evolutions	28	286
Confined Space: Awareness and Safety	18	207
Courage to be Safe; Firefighter Life Safety Initiatives	15	303
Defense Against Weapons Of Mass Destruction Awareness	6	86
Electric Vehicle Safety for Emergency Responders	60	1,164
Emergency Escape System T-6-T	6	33
Emergency Response to Terrorism: Basic Concepts	1	6
Fire Behavior and Arson Awareness	42	656
Fire Officer I	32	400
Fire Officer I (NFPA 1021-2009 Ed.)	11	126
Fire Police	18	249
Firefighter Assist and Search Team (FAST)	61	671
Firefighter I (W/HMFR0)	137	1,340
Firefighter II	50	595
Firefighter Survival	138	1,165
Hazardous Materials First Responder Operations (HMFR0)	23	161
HMFR0 – Annual Refresher	60	1,024
Introduction To ICS (ICS-100.B)	8	111
ICS for Single Resources and Initial Action Incidents (ICS-200.B)	7	39
Incident Safety Officer (NFA)	38	426
Introduction to Fire Officer	21	331
National Incident Management System – Introduction (IS-700.A)	3	24
Live Fire Training Safety	29	337
Principles of Building Construction: Combustible (NFA)	28	344
Principles of Building Construction: Noncombustible (NFA)	17	229
Principles of Fire Investigation	1	25
Principles of Instruction	6	96
Refresher Training (12 Hours)	6	56
Refresher Training (6 Hours)	27	160
Refresher Training (9 Hours)	26	277
Rescue Technician – Basic	38	392
SCBA Confidence	22	113
Scene Support Operations	76	521
Strategy and Tactics for Initial Company Operations (NFA)	3	15
Trench Rescue – Awareness Level	16	293
Truck Company Operations	39	399



Course Title	Courses Conducted	Student Completions
Water Rescue – Awareness Level	37	930
Water Supply Operations	17	307
<b>TOTAL</b>	<b>1404</b>	<b>14,081</b>

Nassau County and Suffolk County have their own fire training programs operated by vocational education and extension boards established by these counties pursuant to Article 23 of the Education Law. State fire training courses in these counties are delivered by instructors employed by the vocational education and extension boards and are conducted and scheduled in the same manner as programs conducted by career fire departments. The Fire Department of New York (FDNY) administers its own fire training programs tailored to meet the specialized needs that exist in the City of New York. OFFPC communicates with FDNY on firefighter training issues and provides curriculum support and, upon request, conducts training courses for FDNY.

A minimum of four State fire instructors are assigned to each county for student/instructor safety, evaluation of trainees' skills, and to maintain the student/instructor ratio required for live fire training exercises.

#### Municipal Training

##### Municipal Firefighter Training

Career firefighters must meet minimum basic and annual in-service training standards, pursuant to section 58-a of the Civil Service Law, section 209-w of the General Municipal Law and State firefighter training standards contained in 19 NYCRR Parts 426 and 427. The standards require that training curricula address operational and safety procedures specific to a career firefighter's department, and therefore, career fire departments generally conduct their own training utilizing department staff. In-house training permits the customizing of curricula and allows training to be conducted on all shifts. Career fire departments designate a Municipal Training Officer (MTO) to oversee and conduct the fire department's training program and may designate one or more Municipal Fire Instructors (MFI) to assist the MTO. OFFPC certifies career fire department basic and annual in-service fire training program curricula, certifies the MTOs and MFIs as meeting the requirements of 19 NYCRR Parts 426, 427 and 438, authorizes MTOs and MFIs to deliver State fire training courses and provides Candidate Physical Ability Tests (CPAT), which is a required component of the basic fire training program. OFFPC provides career fire departments with fire training course curriculum materials, including course lesson plans and student materials.

The title of each municipal training course conducted in 2012, the number of times the courses were conducted and the number of firefighters and related personnel who completed the courses are listed on the following page.



Course Title	Courses Conducted	Student Completions
Accident Victim Extrication Training	18	72
Apparatus Operator – Aerial Device	21	99
Apparatus Operator – Emergency Vehicle Operations	38	368
Apparatus Operator – Pump	28	123
Basic Structural Collapse Operations	10	68
Basic Wildland Fire Suppression	5	18
Conducting Live Fire Training Evolutions	9	8
Confined Space Rescue - Technician Level	8	27
Confined Space: Awareness and Safety	27	205
Courage to be Safe; Firefighter Life Safety Initiatives	7	42
Defense Against Weapons Of Mass Destruction Awareness	11	58
Electric Vehicle Safety for Emergency Responders	1	62
Enrollment to Basic Fire Fighter Training	1	16
Fire Behavior And Arson Awareness	13	92
Fire Officer I	8	39
Fire Police	6	111
Fire Service Instructor I	9	146
Firefighter Assist And Search Team (FAST)	30	205
Firefighter I (W/HMFRO)	46	541
Firefighter II	19	93
Firefighter Survival	33	125
First Line Supervisors Training Programs	8	147
Handling Elevator Emergencies	3	27
Hazardous Materials First Responder Operations (HMFRO)	38	814
HMFRO – Annual Refresher	8	67
Introduction To Incident Command System (ICS) (ICS-100.B)	10	8
ICS for Single Resources and Initial Action Incidents (ICS-200.B)	7	16
Incident Safety Officer (NFA)	13	61
Intermediate ICS for Expanding Incidents (I-300)	9	27
Introduction to Fire Officer	20	303
Live Fire Training Safety	10	8
Passenger Train Emergency Rescue Procedures	2	11
Principles of Building Construction: Combustible (NFA)	16	38
Principles of Building Construction: Noncombustible (NFA)	14	47
Principles of Fire Investigation	7	144
Principles of Instruction	5	27
Public Safety Critical Incident Management	2	19
Rescue Technician – Basic	20	68
SCBA Confidence	14	86
Scene Support Operations	19	34
Trench Rescue – Awareness Level	6	33
Truck Company Operations	17	60
Water Rescue – Awareness Level	5	37
<b>Total</b>	<b>595</b>	<b>4,598</b>



### First Line Supervisors Training

Career firefighters promoted to first line supervisor are required to attend a four-week training program in fire supervision at the New York City Fire Academy, pursuant to section 209-x of the General Municipal Law. This program provides uniform training for all career fire officers in the State. OFFPC approves the curriculum for this training program and reimburses the FDNY for the costs of conducting the program, including the provision of lodging and meals and reimbursement of travel costs, up to the amount provided for in OFFPC's budget appropriation. Each year, approximately 250 career fire officers receive training through the First Line Supervisors Training Program.

Pursuant to the contractual agreement with the FDNY, six courses were completed in calendar year 2012 and six courses are planned for 2013.

### Supplemental Training

Twenty-five counties have opted to supplement the number of training courses conducted by OFFPC using local and county resources. These courses are conducted primarily for volunteer fire departments by county fire instructors designated by the county fire coordinator. County fire instructors are authorized by OFFPC to deliver State fire training courses but are not State employees. Each county or fire department is responsible for the costs associated with conducting these courses. Courses are scheduled in the same manner as outreach training courses. OFFPC anticipates that all supplemental training course requests for 2013 will be fulfilled.

The title of each supplemental training course conducted in 2012, the number of times the courses were conducted and the number of firefighters and related personnel who completed the courses are listed below.

Course Title	Courses Conducted	Student Completions
Accident Victim Extrication Training	5	35
Apparatus Operator – Aerial Device	1	11
Apparatus Operator – Emergency Vehicle Operations	13	175
Apparatus Operator – Pump	1	7
Conducting Live Fire Training Evolutions	2	72
Confined Space: Awareness and Safety	2	35
Electric Vehicle Safety for Emergency Responders	2	10
Fire Behavior and Arson Awareness	3	23
Fire Officer I (NFPA 1021-2009 Ed.)	1	25
Fire Police	3	42
Firefighter I (W/HMFRD)	6	17
Firefighter II	2	15
Firefighter Survival	6	39
Hazardous Materials First Responder Awareness	1	1
Hazardous Materials First Responder Operations (HMFRD)	2	25
HMFRD Annual Refresher	3	30
Ice/Cold Water Rescue – Technician Level	2	21



Course Title	Courses Conducted	Student Completions
Incident Safety Officer (INFA)	3	32
Intermediate ICS for Expanding Incidents (I-300)	3	17
Live Fire Training Safety	2	73
Principles Of Instruction	2	14
Rescue Technician – Basic	2	38
Scene Support Operations	2	26
Trench Rescue – Awareness Level	1	12
<b>Total</b>	<b>68</b>	<b>795</b>

#### *Academy of Fire Science*

The New York State Academy of Fire Science is the residential, academic setting for fire and emergency service personnel, from across New York, to expand their knowledge, skills, and abilities through education and training as well as share their professional experiences. It is the only fire serviced based academy of its type in New York State, training approximately 4,381 emergency service providers in more than 197 classes annually.

The Academy of Fire Science offers training in a variety of academic disciplines including: fire suppression, fire department leadership and management, emergency medical services, hazardous materials, fire and arson investigation, fire prevention and code enforcement, incident management, technical rescue, and emergency response to terrorism.

A cornerstone program at the Academy of Fire Science is the Recruit Firefighter Training (RFFT) Program, which is conducted twice each year. This intensive 11-week (440 hours) program provides a cost effective way for career fire departments, that do not hire a sufficient number of firefighters at one time to conduct their own recruit firefighter training program locally, to ensure their firefighters meet the State's firefighter training standards.

Fire and emergency service personnel also receive continuing education and professional development at the Academy of Fire Science through seminars, workshops, conferences, and certification programs.

Advanced training in fire and arson investigation skills at the Academy of Fire Science includes the delivery of programs for fire personnel, law enforcement, and insurance industry special investigators in the areas of: principles of fire investigation; fire and arson investigation; advanced skills in electrical fire cause determination; fire scene photography; interviewing of witnesses; and fire scene evidence collection. Annual seminars are conducted for juvenile fire setter intervention and fire and arson investigation continuing education. Additionally, training is conducted in the field of canine accelerant detection, with an annual 20-hour recertification program for canine accelerant detection teams. A 300 hour course in canine accelerant detection is offered every other year for municipal agencies pursuing the addition of a certified accelerant detection canine team to their fire investigation unit. This program began in 1993 and has resulted in training certified canine teams for agencies throughout New York State as well as other states and Canada.

In 2009, the NYS Office of General Services (OGS) completed an engineering study of Academy of Fire Science buildings, the oldest of which was constructed in 1838. The study, which included an energy



audit, a review of the mechanical, electrical, HVAC, and structural systems, identified needed improvements so that OFPC can provide the State's firefighters with a residential training facility containing adequate housing and training environments that are conducive to learning.

Based upon the study's recommendations numerous capital improvements have been made on the facility and surrounding grounds since 2009 which include: installation of replacement windows, re-pavement of the various driveways, creation of additional parking spaces, replacement of various roofs, replacement of an underground grease trap, installation of above ground fuel tanks, upgrading of the computers in the computer lab including creating additional stations, replacement of electrical fixtures and replacement of classroom a/v equipment.

Additional projects that are in progress include: replacement of over 100 shower stalls, carpeting in five dormitories, replacement of classroom tile, replacement of the audio visual equipment in the auditorium, and installation of replacement insulated exterior doors. On the training grounds a new roof simulator was recently completed, a new roadway for a trench rescue simulator was developed and additional hazardous material props have been installed.

Future projects include additional replacement windows, an upgraded fire alarm system, additional parking lot resurfacing, building of a trench simulator, repair or replacement of the training grounds access foot bridge, an apparatus storage building, rehabilitation of the existing gymnasium building to convert to an indoor training facility, and a rappel training tower. The lack of available capital funding has reduced the speed at which these projects can move forward.

The title of each training course conducted at the Academy of Fire Science, the number of times the courses were conducted and the number of firefighters and related personnel who completed the courses in 2012 are listed on the following pages.



Course Title	Courses Conducted	Student Completions
RFFT Fire Prevention Training	2	48
Accelerant Detection Canine Team Annual In-Service Training Workshop	1	13
Accident Victim Extrication Training	5	100
Aircraft Rescue And Firefighting	1	17
Apparatus Operator – Emergency Vehicle Operations	2	51
Apparatus Operator – Pump	2	44
Basic Structural Collapse Operations	4	67
Breathing Apparatus Maintenance – Scott (2,3, 4,5)	1	0
Cargo Truck – Hazardous Materials Specialist	2	23
Chautauque County Weekend	1	105
Command and Control of Incident Operations (NFA) (WAS FOD)	1	29
Company Officer Training Workshop	1	70
Conducting Live Fire Training Evolutions	1	16
Confined Space Rescue – Technician Level	2	11
Confined Space: Awareness and Safety	3	47
County Fire Coordinator Conference	1	64
Courage to be Safe; Firefighter Life Safety Initiatives	2	31
Defense Against Weapons Of Mass Destruction Awareness	1	18
Electric Vehicle Safety for Emergency Responders	1	28
Electrical Fire Cause Determination I	2	36
Electrical Fire Cause Determination II	2	34
Emergency Medical Technician Refresher	3	37
Emergency Medical Technician – Basic	2	9
Emergency Response to Ethanol Incidents	2	15
Evaluator Training	1	25
Executive Skills Series (MLC/I) (NFA)	1	29
FASNY EMS Conference	1	265
Fire Alarm Systems Workshop	3	25
Fire and Life Safety Educator I	1	11
Fire Behavior and Arson Awareness / Principles Of Fire Investigation	4	71
Fire Extinguisher Maintenance	2	13
Fire Marshals and Inspectors Program	1	100
Fire Officer I (NFPA 1021-2009 Ed.)	1	14
Fire Officer II	5	19
Fire Reporting Workshop – Version 5.0	2	31
Fire Safety for Direct Support Professionals (DPWDD)	1	0
Fire Scene Evidence Collection	1	11
Fire Service Instructor I	6	95
Fire Service Instructor II	4	43
Fire Service Women of New York State Training	1	70
Fire Sprinkler Plans Review	1	8
Fire Sprinkler Systems Workshop	2	42
Fire/Arson Investigation	3	48
Fire/Arson Investigation Seminar	2	367
Fire/Arson Investigation Specialty - Interviewing Techniques for the Fire Investigator	2	22



Course Title	Courses Conducted	Student Completions
Firefighter I (W/HMFR)	4	76
Firefighter II	2	44
Firefighter Survival	5	53
Flammable and Combustible Liquid Emergencies	1	25
Flammable Gas Emergency Response Workshop	4	31
Hazardous Materials First Responder Operations (HMFR)	4	47
Hazardous Materials Incident Command	2	31
Hazardous Materials Technician – Basic	3	37
Hazardous Materials Training Program	1	195
Highway Safety For Emergency Responders	1	17
HMFR Annual Refresher	1	16
Ice/Cold Water Rescue – Technician Level	5	56
Incident Command for Structural Collapse (NFA)	1	30
In-Service Safety Training (OSHA Refresher)	3	146
Intro to Unified Command for Multiagency and Catastrophic Incidents (IUCMO)	1	27
Juvenile Firesetter Intervention Specialist I	2	28
Leadership III – Strategies for Supervisory Success (NFA)	1	28
Legal Issues for the Fire Service Instructor	1	16
Legal Issues for the Volunteer Fire Service	1	19
Live Fire Policy Training	1	16
Live Fire Training Safety	1	16
Med Structural Collapse Operations: Void Search and Rescue	1	21
Medium Structural Collapse Operations: Ext Shoring	2	33
Medium Structural Collapse Operations: Int Shoring	3	96
Medium Structural Collapse Concepts	2	48
NYS CME Based Recertification Program – EMT B Core Content	1	77
NYS Instructor's Authorization Training Program	2	130
On-Scene Rehabilitation for Emergency Operations	1	14
Orwego County Weekend	1	90
Preparation for Initial Company Operations (PICO) (NFA)	1	23
Preparing for the Line of Duty Death	1	8
Principles of Instruction	6	47
Recognizing Clandestine Drug Lab Operations	2	19
Recruit Firefighter Training	3	61
Regional Fire Administrators Conference	2	48
Rescue Tech – Basic/Confined Space – Tech Level	1	17
Rescue Technician – Basic	2	31
Rope Rescue – Operations Level	2	17
Rope Rescue – Technician Level I	2	10
Rope Rescue – Technician Level II	3	33
SCBA Confidence	2	31
Scene Support Operations	1	16
School Bus Rescue	1	29
Selected Legal Issues for the Volunteer Fire Service – County Weekend	1	43
Strategy and Tactics for Initial Company Operations (NFA)	4	70
Swiftwater/Flood Rescue Technician	3	46



Course Title	Courses Conducted	Student Completions
The Challenge of Pesticides and Poisons	1	0
The Rules Have Changed: The Firefighters Guide to Lightweight Wood Construction	1	25
Trench Rescue – Awareness Level	2	34
Trench Rescue – Operations Level	1	19
Trench Rescue – Technician Level	1	19
Truck Company Operations	2	31
Vehicle Fire Investigation	3	39
Volunteer Fire Police Association Conference	1	170
Water Rescue – Awareness Level	1	28
Water Rescue – Operations Level	3	28
<b>Total</b>	<b>197</b>	<b>4,591</b>



### Direct Delivery Training

Direct delivery fire training programs are specialized knowledge and skill courses delivered exclusively by OFPC fire protection specialists who have advanced training and skill levels in numerous subject areas including: hazardous materials; weapons of mass destruction; and fire and arson investigation. Direct delivery training courses are conducted at local training sites at night and on weekends to permit maximum participation by volunteer firefighters. For career departments, courses are conducted on the department's shift schedule to permit all departments' firefighters to participate. OFPC filled all 2012 requests and anticipate filling all 2013 course requests for hazardous materials, weapons of mass destruction, and fire and arson investigation training.

The title of each direct delivery training course conducted in 2012, the number of times the courses were conducted and the number of firefighters and related personnel who completed the courses are listed below.

Course Title	Courses Conducted	Student Completions
RFFT Fire Prevention Training	1	18
Accident Victim Extrication Training	21	314
Advanced Hazardous Materials Technician	2	49
Alternative Fueled Vehicles and New Vehicle Technology	7	109
Apparatus Operator – Aerial Device	1	16
Basic Structural Collapse Operations	1	17
Campus Safety and Awareness for Chemical Suicide Incidents	4	64
Chemical Suicides: Information for the Responder	34	642
Confined Space: Awareness and Safety	1	50
Decontamination Trailer Equipment Training	4	39
Decontamination	15	313
Defense Against Weapons of Mass Destruction Awareness	1	7
DHSES-OFPC and OEM Field Integration Training	1	90
Electrical Fire Cause Determination I	1	10
Emergency Escape System Train-the-Trainer	4	44
Emergency Response to Ethanol Incidents	9	167
Evaluator Training	5	56
Everything a Firefighter Wants to Tell a Code Official	2	51
Fire Alarm Basics	3	56
Fire Alarm Systems Workshop	1	16
Fire Behavior and Arson Awareness	1	10
Fire Behavior and Arson Awareness / Principles Of Fire Investigation	1	11
Fire Reporting Workshop – Version 5.0	6	70
Fire Safety and Response for Law Enforcement	2	6
Fire Safety During Construction and Demolition	1	53
Fire Safety for Direct Support Professionals (OPWDD)	295	3,720
Fire Scene Evidence Collection	1	11
Fire Sprinkler Systems Workshop	1	16
First Receiver Decontamination	7	50
Flammable and Combustible Liquid Emergencies	3	30



Course Title	Courses Conducted	Student Completions
Hazardous Materials First Responder Operations (HMFRO)	18	126
Hazardous Materials Incident Command	11	97
Hazardous Materials Incident Safety Officer	4	51
Hazardous Materials Staff Refresher Training	1	18
Hazardous Materials Technician – Basic	12	169
Hazardous Materials Technician Basic Refresher	90	929
HMFRO – Annual Refresher	20	453
I-300 (NFA)	1	0
Introduction to ICS (ICS-100.B)	5	60
ICS for Single Resources and Initial Action Incidents (ICS-200.B)	2	12
Intermediate ICS for Expanding Incidents (I-300)	5	70
Introduction to Statewide Learning Management System (SLMS)	24	260
Introduction to Statewide Learning Management System (SLMS)	5	32
National Incident Management System (NIMS) – Introduction (IS-700.A)	5	62
Medium Structural Collapse Concepts	1	0
Methamphetamine Labs and the Fire Marshal – What You Need to Know	3	714
On-Line Fire Reporting System Training	1	47
Personal Protective Equipment for the Hazardous Materials Operations Level Responder	9	25
Principles of Fire Investigation	10	164
Recognizing clandestine Drug Lab Operations	20	593
Refresher Training (8 Hours)	2	46
Refresher Training (8 Hours)	2	81
Respiratory Protection Program	2	31
Sampling Techniques for the Hazardous Materials Technician	3	32
School Bus Rescue	9	195
School Bus Rescue Practical Skills	11	180
The Challenge of Pesticides and Poisons	2	10
Trench Rescue – Awareness Level	2	72
Trench Rescue – Awareness Level	1	13
Vehicle Arson Awareness Program (VAAP)	1	10
Water Rescue – Awareness Level	4	55
What Am I Looking For? – Inspections, Testing, Maintenance of Fire Systems	1	53
Why Sprinklered Buildings Burn	2	28
WMD Detection Equipment Refresher Training	1	43
<b>Total</b>	<b>600</b>	<b>10,230</b>



### Hazardous Materials Emergency Response Training

OFPC has provided hazardous materials response training to firefighters for more than thirty years. Prior to 1982, hazardous materials training focused only on awareness of the hazards posed by hazardous materials and provided information on defensive tactics that could be employed by firefighters responding to hazardous materials incidents.

In 1982, Executive Law section 136-A was enacted, which directs the State Fire Administrator to develop a specialized hazardous materials emergency response training program. The OFPC hazardous materials emergency response curricula have been expanded to thirty-seven different courses from basic skills to advanced mitigation techniques. These courses are conducted for firefighters, police, emergency medical responders, industrial, and military personnel.



Hazardous materials emergency response training courses are conducted by OFPC fire protection specialists that are certified hazardous materials technicians and certified fire service instructors. Hazardous materials emergency response training was provided to firefighters and related personnel in 2012.

Basic hazardous materials emergency response training is included in the basic firefighting skills training course: Firefighter I. Sixteen hours of instruction in hazardous materials operations prepares firefighters to recognize the presence of hazardous materials and employ defensive tactics to protect themselves and the public.

Hazardous materials technician training provides firefighters with forty hours of instruction in the advanced skills necessary to utilize chemical protective clothing and employ offensive tactics to mitigate a hazardous materials incident. An advanced hazardous materials technician course provides an additional forty hours of hands-on training in advanced mitigation techniques.

The basic hazardous materials emergency response training and hazardous materials technician training conforms to federal occupational safety and health regulations pertaining to responders to hazardous materials incidents, the National Fire Protection Association standard for professional competence of responders to hazardous materials incidents and the state minimum training standards for firefighters.

OFPC's hazardous materials emergency response training included terrorism awareness prior to the bombing of the World Trade Center in 1993. Presently, thirteen different course titles are directly related to preparedness for, or response to, terrorist attacks. The response to incidents where terrorists use chemicals, biological agents, or radioactive materials as weapons often require the same incident response techniques as accidental releases of traditional hazardous materials.

The title of each hazardous materials emergency response training course conducted in 2012, the number of times the courses were conducted and the number of firefighters and related personnel who completed the courses are listed above (see Direct Delivery Training above) and separately listed below as the report on hazardous materials emergency response training.



Course Title	Courses Conducted	Student Completions
Advanced Hazardous Materials Technician	2	40
Decontamination Trailer Equipment Training	4	30
Decontamination	15	313
Defense Against Weapons of Mass Destruction Awareness	20	167
Flammable and Combustible Liquid Emergencies	4	55
Flammable Gas Emergency Response Workshop	4	31
Hazardous Materials First Responder Awareness	2	5
Hazardous Materials Incident Command	13	118
Hazardous Materials Incident Safety Officer	4	51
Hazardous Materials Training Program	1	195
Hazardous Materials Technician Basic Refresher	30	323
Hazardous Materials Technician – Basic	16	224
Recognizing Clandestine Drug Lab Operations	35	934
Respiratory Protection Program	2	31
The Challenge of Pesticides and Poisons	2	10
WMD Detection Equipment Refresher Training	1	43
Emergency Response to Terrorism: Basic Concepts	1	6
Hazardous Materials First Responder Operations (HMFR0)	66	1,174
HMFR0 Annual Refresher	94	1,644
First Receiver Decontamination	7	50
Sampling Techniques for the Hazardous Materials Technician	3	32
Chemical Suicides: Information for the Responder	34	642
Personal Protective Equipment for the Hazardous Materials Operations Level Responder	3	25
Cargo Truck – Hazardous Materials Specialist	2	23
Methamphetamine Labs and the Fire Marshal – What You Need to Know	3	714
Emergency Response to Ethanol Incidents	11	182
Campus Safety and Awareness for Chemical Suicide Incidents	4	64
Hazardous Materials Staff Refresher Training	1	18
<b>Total</b>	<b>404</b>	<b>7,162</b>



#### Fire and Arson Investigation Training

Fire and arson investigation skills direct delivery training is conducted for firefighters and law enforcement personnel throughout the State. Training programs address principles of fire investigation, introduction to arson investigation and forensic investigation of fires. These training programs are conducted at local fire training sites, basic police training academies and other criminal justice training sites.

Fire and arson investigation training courses are conducted by OFPC fire protection specialists who are certified fire investigators, certified peace officers and certified fire service instructors. Fire and arson investigation training was provided through direct delivery to firefighters and law enforcement personnel in 2012.

The title of each fire and arson investigation course conducted in 2012, the number of times the courses were conducted and the number of firefighters and related personnel who completed the courses listed above (see Direct Delivery Courses above).

#### Regional Training

Regional training involves highly technical subject matter, which requires that it be conducted by instructors with advanced level training and expertise. Courses are scheduled at the request of county fire coordinators and municipal training officers and are conducted at minimal cost to the fire department. Presently, only technical rescue courses are delivered through regional training.

#### Technical Rescue Training

Technical rescue training provides firefighters and other emergency responders with instruction in specific areas of technical rescue including: structural collapse rescue; trench rescue; confined space rescue; rope rescue and ice and swift water rescue. These courses are conducted at local and regional training sites by OFPC fire protection specialists and designated State fire instructors, who have subject specific technical training and experience and who are certified fire service instructors. Requests for technical rescue training are fulfilled based on availability of resources, with priority given to locations and agencies that are positioned to utilize the training to establish or enhance operational capability, and risk assessment.

Technical rescue training has been augmented in 2012 with a \$150,000 homeland security training grant.

OFPC has received technical rescue training course requests which exceed available resources and a backlog of course requests continues to exist. OFPC has taken action to address this shortfall, including: training and certifying additional State fire instructors to conduct basic level technical rescue training as part of the outreach training program; and recruitment of additional qualified State fire instructors. OFPC has also requested additional funding through the homeland security training grant program. Based upon the current rate of requests, OFPC estimates an additional \$300,000 and an increase of at least two FTEs would be required to address the backlogged courses and meet the ongoing needs.



For State fiscal year 2012-2013, county fire coordinators have submitted requests for over 460 technical rescue courses totaling more than 7062 course hours.

The title of each regional training course conducted in 2012, the number of times the courses were conducted and the number of firefighters and related personnel who completed the courses are listed below.

Course Title	Courses Conducted	Student Completions
Advanced ICS for Command and General Staff Complex Incidents (I-400)	1	18
Alternative Fueled Vehicles and New Vehicle Technology	1	57
Apparatus Operator – Emergency Vehicle Operations	2	23
Apparatus Operator – Pump	1	20
Basic Structural Collapse Operations	1	35
Basic Structural Collapse Operations	1	27
Company Officer Training Workshop	2	186
Concrete Breaching and Breaking	1	71
Confined Space Rescue – Technician Level	4	23
Electric Vehicle Safety for Emergency Responders	2	65
Emergency Service Dispatcher – Basic	1	9
Engine Company Operations	1	20
Evaluator Training	1	14
Fire Alarm Systems Workshop	1	18
Fire Officer I (NFPA 1021-2009 Ed.)	9	60
Fire Safety Inspections at Correctional Facilities	2	10
Firefighter Assist and Search Team (FAST)	4	53
Firefighter I (W/HMFR0)	9	20
Firefighter II	1	13
Firefighter Survival	5	47
Hazardous Materials First Responder Awareness	1	4
Health And Safety Officer (NFA)	9	44
Highway Safety for Emergency Responders	4	43
Hazardous Materials First Responder Operations – Annual Refresher	2	54
Ice/Cold Water Rescue – Technician Level	7	35
Intermediate ICS for Expanding Incidents (I-300)	11	152
Legal Issues for the Fire Service Instructor	9	28
Medium Structural Collapse Operations: Void Search and Rescue	9	68
Medium Structural Collapse Operations: Ext Shoring	2	13
Medium Structural Collapse Concepts	2	27
Medium Structural Collapse Operations: Tools	5	59
NYS-D/PC Peace Officer – Weapons/Officer Protection Training	1	12
On-Scene Rehabilitation for Emergency Operations	9	38
Passenger Train Emergency – Awareness	2	25
Principles of Building Construction: Combustible (NFA)	2	34
Principles of Building Construction: Noncombustible (NFA)	2	7
Principles of Instruction	4	36
Refresher Training (12 Hours)	1	32
Rehabilitation Practices for Fire Department Operations	1	24



Course Title	Courses Conducted	Student Completions
Rope Rescue – Operations Level	8	73
Rope Rescue – Technician Level I	4	35
SCBA Confidence	3	38
Strategy and Tactics for Initial Company Operations (NFA)	1	14
Swiftwater Rescue – Technician Level	2	26
Swiftwater/Flood Rescue Technician	4	55
Trench Rescue – Awareness Level	2	11
Trench Rescue – Operations Level	3	19
Trench Rescue – Technician Level	2	22
Truck Company Operations	2	20
Water Rescue – Operations Level	2	12
<b>Total</b>	<b>130</b>	<b>1,777</b>

#### *Firefighter Training Outside of New York State*

During 2012, fire chiefs reported to OFPC that firefighters attended training programs outside of the State, pursuant to section 72-g of the General Municipal Law. Firefighters attended a training program at the National Fire Academy in Emmitsburg, MD sponsored by OFPC; firefighters attended one of two national conferences conducted in Baltimore, MD and Indianapolis, IN; and firefighters attended professional educational programs and seminars sponsored by national fire service organizations, the U.S. Department of Homeland Security or other organizations.

#### *National Fire Academy*

The National Fire Academy is the primary training unit of the United States Fire Administration which is part of the U. S. Department of Homeland Security. Firefighters from New York State have the opportunity to attend the National Fire Academy for training targeted to middle and high level fire officers. OFPC partners with the National Fire Academy to increase the opportunities for New York State firefighters to receive National Fire Academy training.

#### *Professional Educational Programs and Seminars*

Many organizations conduct professional educational programs and seminars. A review of the programs and seminars reported to OFPC does not reveal any significant subject matter training shortfalls with OFPC's fire training programs and many of the instructors delivering these programs and seminars are from New York State and employed by OFPC as State fire instructors or subject matter experts.



Program Sponsor	Program Name	Program Description	Location	No. of Attendees
Cygnus Publications Firehouse Magazine	Firehouse Expo	Professional Conference	Baltimore, MD	133
	EMS Today	Professional Conference	Baltimore, MD	23
	Various Classes	Management	Baltimore, MD	11
National Fire Academy	Various Classes	Institution of Higher Education	Emmitsburgh, MD	7
	NYS Weekend	NYS Weekend	Emmitsburgh, MD	204
Penwell Publications, Fire Engineering Magazine	FDIC	Professional Conference	Indianapolis, IN	97
Fire Rescue Magazine	Fire Rescue International	Professional Conference	Las Vegas, Nevada	4
	Incident Response to Terrorist Bombings		New Mexico	10
		Institution of Higher Education	Orlando FL	3
			Ocean City, MD	1
			Anniston, AL	2
		New Orleans	5	
International Association of Fire Chiefs	Symposium in the Sun	Professional Conference	Clearwater FL	16
<b>Total</b>				<b>518</b>



## Technology

### NY-Alert

As of February 2013, NY-ALERT has 3.2 million subscriber accounts.

During the reporting period, NY-ALERT delivered more than 1.3 million messages via approximately 4.6 million telephone calls, more than 45,000 faxes, more than 217 million emails, and approximately 135 million text messages. In addition, the Emergency Alert System (EAS) was activated 55 times via NY-ALERT.



The "1-Alertz" mobile app allows the public to use the location of their personal communication device to find directions, hours of operation and other important safety information near their specific location. Since the launch of "1-Alertz" in October 2011, the app has been downloaded more than 313,000 times.

During Superstorm Sandy, the "1-Alertz" app was updated more than 3,000 times in order to provide updated shelter locations, evacuation routes and Disaster Recovery Center (DRC) locations in addition to nearly 8,200 other alerts that were disseminated during the event.

### Public Information

Staff used the NYSOEM and NY-ALERT websites, and the DHSES Twitter account, to impart live public safety information for weather-related emergencies. Staff coordinated with the Governor's Press Office in these efforts. Section staff continued to respond to inquiries from the news media and the public on a variety of emergencies, emergency management topics including the State's REP program, and personal and community preparedness.

Section staff also continued to support NY-ALERT, the State's alert and notification system. Staff has supported State and county operations by issuing safety information and offering technical assistance to counties in crafting messaging and then disseminating alerts to specific locations during emergencies.



### DPC MEMBER AGENCY REPORTS

#### Department of Agriculture and Markets

Below is a description of activities conducted by the NYS Department of Agriculture and Markets (Ag&Mkts) during the reporting period:

- Completed training activities, including National Incident Management System / Incident Command System (NIMS/ICS), Disaster LAN, State EOC training, and Radiological Emergency Preparedness (REP) courses.
- Established internal procedures and guidelines for agency staff to be notified of emergencies and activated to participate in State EOC activities; increased the number of staff available and trained to work in the State EOC.
- Participated in State and federally evaluated nuclear power plant exercises and drills; staff also participated in REP plan reviews and updates, as well as projects to enhance REP response capability to meet federal requirements and ingestion pathway consequences.
- Hosted four regional meetings to introduce and initiate local agriculture emergency preparedness planning. These meetings included a scenario-based exercise to contemplate roles, responsibilities, statutory authority, and response capability gaps. Participants included county emergency managers, Soil and Water Conservation District representatives, U.S. Department of Agriculture (USDA) Farm Service Agency representatives, USDA Animal Plant Health Inspection and Plant Pest Quarantine staff, Cornell Cooperative Extension agents, and local department of health representatives.
- Assisted in drought-related reporting and local agriculture irrigation assistance, as well as State emergency operations such as Superstorm Sandy; provided assistance to pet sheltering and feeding, agriculture and environmental assessment, debris quarantine management, and food safety and supply operations.
- Continued to assist in the Governor's NYS 2100 Commission initiatives to enhance fuel supply and station resiliency.
- Collaborated with NYSOEM and other DPC agencies to enhance preparedness and response capabilities during the New York State Fair and other mass gatherings at the State Fairgrounds.

#### Office of Children and Family Services

The New York State Office of Children and Family Services (OCFS) maintains a Continuity of Operations Plan (COOP) as well as a Ready Emergency Data (RED) Book to support mission essential agency wide operations. These plans are reviewed and updated bi-annually.

OCFS staff who volunteer to work at the State EOC are required to attend both the State EOC training course as well as the Disaster LAN training. Staff participated in NIMS/ICS training. This information is collected and reported annually in August for compliance.

OCFS served on a national team, from January 2012 through August 2012, to develop a National Reunification Framework to assist state and local governments in defining processes and protocols to facilitate the reunification of children with their families in the aftermath of a disaster.

OCFS partnered with NYSOEM, NYSDOH and the State Education Department (NYSED) to hold educational sessions for school administrators/personnel and child care providers located within 10



miles of nuclear power plants, on administering potassium iodide (KI) to children in the event of a radioactive release. The first session was held in Putnam County on May 1, 2012.

OCFS staff participated in numerous drills, exercises and trainings throughout the year.

- The Acting Deputy Commissioner for Administration and the agency's NYSOEM Liaison participated in a Multiagency Coordination Functional Exercise on June 29, 2012.
- OCFS remained in constant state of alert during the significant severe weather event on July 26, 2012. OCFS facilities in the targeted area actively prepared for the event with the activation of plans, procedures and protocols.
- During the TDI fire event in Columbia County (August 2012), OCFS reached out to all stakeholders located within a 15-mile radius of the incident site due to potential plume movement to reinforce safety concerns.
- OCFS staff participated in a full scale, level one activation exercise at NYSOEM on August 9, 2012. In addition to staffing the OCFS desk at the State EOC, OCFS participated in the Human Services Functional Branch.
- September 12, 2012: OCFS staff participated in a full-scale REP exercise radiological event at the Indian Point Energy Center in Westchester County.

The national child advocacy group Save the Children, on behalf of the National Commission on Children and Disasters, released a U.S. Programs Report Card in August 28, 2012 grading all 50 states on four criteria for protecting children during disasters. New York State has received an A for meeting all four standards.

OCFS staff attended the bi-yearly New York State Nuclear Safety Sub-Committee Power Pool Meeting on October 23-24.

In response to Superstorm Sandy, the agency's role as the co-lead for Disaster Recovery Centers (DRC), under the NYS DPC's Human Services Branch, the agency directed the overall state operations of DRCs across all 13 declared counties. A total of 63 DRCs were opened with a total cumulative number of visitors at 173,838 and counting. OCFS staff provided site management. At this date, 9 DRCs remain active. The first DRC opened on November 1, 2012 and the projected closure date for the remaining centers is April 30, 2013, unless a federal extension is granted. Staff was assigned to work at the State EOC for several weeks in two shifts, around the clock to assist in storm operations.

#### Department of Corrections and Community Supervision

Below is a description of activities conducted by the NYS Department of Corrections and Community Supervision (DOCCS) during the reporting period:

- Participated in various training activities including Disaster LAN training for EOC personnel, exercise design course (G-139), SLMS course.
- Conducted NIMS/ICS training for new supervisors and emergency responders, including NIMS/ICS 100, 700 and 800; DOCCS Correction Emergency Response Teams (CERT) conducted its annual NIMS/ICS training.
- Participated in federally-evaluated nuclear power plant exercises and drills including the September 12, 2012 Indian Point exercise. DOCCS also participated in the State-evaluated Nine



Mile Point plume exercise on July 24, 2012, which included several functional branches such as Human Resources, Transportation and Law Enforcement.

- Conducted a joint agency training exercise on May 17, 2012 involving approximately 120 first responders from DOCCS and agency personnel from the New York State Police. The training exercise was a success with interagency cooperation and assistance in responding to an incident where NIMS/ICS was tested per protocol.
- Provided equipment, resources and assets for the State's response to Superstorm Sandy. Activation for DOCCS started on Saturday, October 27, 2012 and concluded in December 2012, with demobilization lasting into January 2013.
- Reviewed and updated the DOCCS Continuity of Operations Plan (COOP) for 2012-2013.

#### Office of Counter Terrorism

The NYS Office of Counter Terrorism (OCT) participated in a number of State EOC activations over the reporting period. OCT staff supported NYSOEM's Planning section during EOC activations as authors of the Executive Situation Report (ESR). In the planning support capacity, OCT supported eight activations of the State EOC. OCT also provides a liaison to nuclear power plant exercises and other events as asked to by OEM. OCT staff members were sent to the Long Island Power Authority (LIPA) Operations Center in Hicksville, NY to help coordinate during severe weather events twice during the reporting period. OCT staff members are currently being trained to utilize advanced modeling software to better predict impacts from hazardous materials releases and anticipate building further capability in this area during the next reporting period.

OCT also serves as the lead agency for the Critical Infrastructure and Key Resources (CI/KR) Functional Branch under the State Comprehensive Emergency Management Plan (CEMP). As lead agency of this branch, OCT has held branch meetings and participated in planning and coordination meetings with OEM. The functional branch was activated for the second time in its current form during the response to Superstorm Sandy. During this activation, the Branch provided staffing over a twenty five day period to the EOC, New York Office and the Joint Field Office. A total of seven OCT-CI staff members worked directly for the Branch and two additional staff members were deployed to Long Island to support DHSES Executives. The branch worked to help solve fuel supply issues as well as coordinating with representatives from electric utilities in the EOC. Additional OCT staff served in the Logistics and Planning sections over the same time period in support of the response efforts. As part of recovery from the storm, OCT staff members are working with FEMA staff to help develop an infrastructure recovery and resiliency support strategy document and have provided input when asked to the Governor's Commissions.

#### Division of Criminal Justice Services

During the reporting period, the NYS Division of Criminal Justice Services (DCJS) agency liaisons participated in radiological and severe weather-related training exercises at the State EOC. DCJS increased the number of staff trained to staff the agency desk at the EOC from two to eight. It is a future goal to have twenty (20) staff trained.

During Superstorm Sandy, DCJS staffed its agency desk at the State EOC on a twenty-four hour basis with no lapses in coverage up to and through the moment of the agency's directed demobilization.



DCIS also provided up to twelve additional members to staff other units of the EOC such as Planning and Logistics. Staff compiled agency reports and other documents as directed and fulfilled requests from law enforcement agencies on Long Island for police equipment and personnel. All disbursed resources were accounted for and properly demobilized.

#### **Office of Cyber Security**

##### *Routine activations*

The NYS Office of Cyber Security (OCS) Geographic Information Systems (GIS) group, now of the Office of Information Technology Services GIS Program Office, routinely provide GIS and mapping support to the DPC. OCS provides continuous support of SEOM by updating software and data. In March of 2012, six OCS members of the NYS Incident Management Team (IMT) attended an IMT meeting in Oriskany. Two OCS GIS staff participated in a review of activities following Hurricanes Irene and Lee in April 2012. In May 2012, OCS provided NYSEOM with two GIS staff in support of severe weather in Seneca County. Two GIS technicians also supported the Nine Mile Point State observed exercise, and were then scheduled to work the Southern Tier severe weather event in July 2012. OCS support the response to the TCI fire event in Columbia County and the Northern Lights Exercise in August 2012. In September 2012, one GIS resource was deployed to the Indian Point rehearsal exercise in September and the subsequent federally evaluated exercise in October. In December of 2012, one GIS staff worked at NYSEOM for the December snow storm, and two GIS staff worked the February snow event.

##### *Superstorm Sandy and beyond*

Superstorm Sandy Response and follow up actions dominated the OCS calendar in late 2012 and early 2013. Two GIS staff deployed with the NYS IMT to the Nassau County EOC; two staff were deployed to Breezy Point; one GIS resource was stationed in the Manhattan Office for a week, while around-the-clock shifts were maintained for nearly four weeks at the State EOC. OCS coordinated GIS staff deployed to the State EOC from five other state agencies.

Following the Hurricane, GIS staff were called on to provide analysis and mapping for the NYS 2100 Commission and, to a lesser extent, the Ready and Respond commissions; OCS coordinated GIS contributions from eight agencies. The Critical Infrastructure Response Information System (CIRIS) supported by OCS played an important role by providing interactive mapping to the NYS 2100 Commission. OCS performed extensive GIS analysis in support of the Governor's office work on the gas station electric generator tax credit bill.

#### **Education Department**

The New York State Education Department (NYSED) participated in both DPC and internal after-action discussions related to Hurricanes Irene and Lee. Staff from the Office of P-12 and the State Archives continued to work with school districts and local governments impacted by Irene and Lee on recovery and mitigation measures.

NYSED responded to Superstorm Sandy by staffing the NYSED desk in the State EOC. Staff from the Office of P-12, Higher Education, Office of Cultural Education (State Archives, State Library, State Museum), and the Office of Professions (including, but not limited to the Board of Pharmacy) responded to specific needs of school districts, colleges, local governments, pharmacies, and cultural institutions (museums and libraries) impacted by Sandy. Recovery and mitigation work is still in progress. NYSED



staff that responded to the State EOC participated in an internal after-action discussion. Additional training, exercises, and succession planning for individuals working in the State EOC are being planned based on this discussion. A toll-free emergency contact telephone number was established for NYSED staff to call for information in the event of an emergency. All staff were provided with stickers with this telephone number to affix to the back of their NYSED identification badges.

NYSED is in the process of updating the continuity of operations plan (COOP) and an internal team is working to plan an exercise for staff associated with the COOP. Critical external contact information is being updated and/or confirmed as part of this process.

#### Empire State Development

Empire State Development (ESD) reviewed and revised their Master Business Continuity Management and Disaster Recovery Plan. The primary objective of ESD's Disaster Recovery Plan is to ensure that well defined procedures are in place to allow ESD to recover as quickly as possible from any unforeseen emergency or situation in which the ability to do business has been compromised and provide for the safety and well-being of ESD staff. Additionally this plan will:

- Provide the mechanism for reporting a crisis or emergency situation
- Ensure that employees have access to a documented conduit for information dissemination regarding a disaster
- Ensure that all employees understand their roles and responsibilities during an actual emergency
- Ensure that ESD can continue critical operations for the duration of the incident

ESD required departmental review and re-certification of each business units individualized Business Resumption Plan. This plan outlines the specific requirements, business processes and established action plans that must be available and carried out in order to continue business activity in the event of a crisis. As part of this initiative, key areas of responsibility were identified (outlined below) that department/group heads are accountable for:

- Identify a designated backup authorized to act on your behalf should you be unavailable
- Document critical functionality and processes within your department/group
- Identify and document key roles and responsibilities for each critical function your department/group performs
- Create and maintain a department/group specific employee call list for emergency notification purposes
- Identify staff members that will be required to report to designated Disaster Recovery Sites should it become necessary; and
- To update your department Business Continuity documentation and forward it to the taskforce when business processes or key roles change

ESD reviewed and updated all Agency Crisis Quick Reference Guides. These guides are posted in public areas and exits and contain emergency contact / notification and evacuation information which is location specific for dedicated employee work areas. Emergency procedures to follow are outlined in response to a variety of crisis events such as fire, medical emergency, bomb threats, suspicious mail, hostage situations or any other life threatening emergency. They also contain the location of Automated External Defibrillator (AED) devices and list staff that are trained in their use.



To supplement our Agency Disaster Preparedness Plan, ESD has established a Crisis Communication Guide which:

- Lists the members of the Emergency Preparedness Team (EPT)
- Lists other key crisis staff
- Contains the protocols and processes by which decisions are made regarding the potential closing of our agency offices during potential or actual times of crisis
- Lists various phone numbers and web links to be used for communication during times of crisis
- Outlines a series of phone and e-mail message templates that anticipate the range of messages that might be used to communicate with staff before and during potential or actual crises
- Contains preparedness guidance for press staff

In addition to establishing procedures for regularly scheduled review and updates to the disaster preparedness documentation, ESD Information Technology staff has conducted a variety of simulation and exercises to ensure that critical application and database systems can be restored in the event of a crisis or other event that precludes normal use or access.

ESD participated in several State OEM executive training exercises in 2012. These included sessions in May and June which outlined the role of the Division of Homeland Security and Emergency Management and a session on the operations of the State EOC. This included a simulated response to Hurricane impacting the Long Island and NYC areas.

In August 2012, Sam Hoyt of ESD's Western New York Office was named as a leader on the Governor's Regional Rapid Response Team for Western New York. These Teams will help coordinate regional responses to incidents and provide strategic level coordination for the State's response to local crisis.

In October and November 2012, ESD was an active participant at the State EOC and provided 24-hour staff coverage while activated due to Superstorm Sandy. Additionally, ESD provided administrative support and space in NYC to the Governor's Cabinet and the Department of Financial Services when their offices were unavailable after Superstorm Sandy.

#### Energy Research and Development Authority

NYS Energy Research and Development Authority (NYSERDA) staff participated in the Hurricane Irene/Tropical Storm Lee After Action Review (AAR), which was sponsored by NYSOEM and located at the National Guard facility in Latham, NY. NYSERDA incorporated various lessons learned from this event into institutional response and preparation plans.

Numerous NYSERDA staff and Executive Officers participated in several training exercises during the annual period including the "Northern Lights" exercise. Staff also attended training orientation at NYSOEM for the new computer system. DHSES Technology Staff were available at the State EOC to assist signing on to the new terminal, testing connectivity to NYSERDA's webmail system, and copying data that has been backed up to NYSERDA's designated file location.

NYSERDA staff participated in all federally mandated nuclear power plant exercises and drills held during the period including: the Nine Mile Point Plume Exercise, the Indian Point State Evaluated Rehearsal Exercise, and Indian Point Federally Evaluated FEMA Plume Exercise.



NYSERDA staff were activated for EOC staffing, participated in conference calls, or otherwise were altered to standby status for several severe weather events. These events included severe thunderstorms, high temperatures, Nor'easter and other winter season snow events, and Superstorm Sandy. Of particular note Superstorm Sandy and the long term activation of the State EOC on a 24 hour basis and other response activities during and in the aftermath of the event allowed ample opportunity to train staff and revise internal procedures as they related to this type of event.

From March 1, 2012 to October 31, 2012, New York State's Storm Relief Appliance Rebate Program wrapped up processing remaining rebate applications of those affected by Hurricane Lee and Tropical Storm Lee. These final rebates were a portion of a program that rebated more than 13,908 residential appliances and equipment totaling approximately \$6.7M in household rebates.

Following the 2011 and 2012 tropical storms and resulting flooding, NYSERDA targeted outreach to affected low income households, offering services through EmPower New York. Services include insulation, air sealing, appliance replacements and heating system upgrades. In order to ensure appropriate services to damaged homes, NYSERDA reviews FEMA and insurance documentation for each household requesting services. Additionally, NYSERDA requires contractors to evaluate health and safety conditions, such as mold or mildew, test the moisture content of wood in areas to be insulated, and measure the relative humidity in the home prior to installing measures that may be affected by high moisture levels.

During the period from March 1, 2012 through February 28, 2013, EmPower New York provided energy efficiency services to 93 dwellings affected by Tropical Storms Irene and Lee. After Superstorm Sandy, NYSERDA conducted extensive outreach to communities in the storm surge areas. 77 homes were accepted into EmPower New York and are receiving services. Approximately 80 additional applications are currently under review.

#### Department of Environmental Conservation

The NYS Department of Environmental Conservation (DEC) has an Emergency Management Unit which developed an agency emergency management policy and conducted implementation training for executive leaders and managers. DEC maintains a nationally qualified incident command "short" team (IMT Type 2) along with training new staff to replace those who retire. Several DEC IMT members are also assigned to the DHS/ES IMT.



DEC supported all radiological exercises as support to DOH. DEC police officers made daily assists to local and state agencies with emergency events that ranged from simple traffic accidents to complex active shooting incidents. DEC officers are often the first response to serious public safety incidents in the most rural areas of the state. All officers and field supervisors were trained in swiftwater rescue techniques typical of tropical storm or spring thaw flooding. Most DEC programs have strong working relationships with corresponding federal and other state agencies that support New York State during significant incidents or who may provide mutual aid to neighboring states.



April 2012 was exceptionally dry and numerous wildfires occurred in the southeastern sections of the state. Long Island experienced a 1,000-acre wildfire that destroyed three homes and one fire engine. A 480-acre fire occurred in Bear Mountain Park, Rockland County. DEC provided subject matter experts as well as firefighters for these and 83 other fires that spring. As the summer became exceptionally dry, a burning ban was extended through mid-October. DEC either directly extinguished or assisted local firefighters contain 67 wildfires over the summer. In addition, DEC continued to sponsor the New York Wildfire and Incident Command Training Academy in Suffolk County in late October that trains several hundred firefighters and first responders each year.

DEC had numerous staff assigned to Superstorm Sandy response and recovery. Staff operated rescue boats, conducted pumping operations, accomplished tree removal, supervised spill clean-up contracts and provided public safety as well as supporting local and state emergency operation centers and IMTs. DEC provided technical expertise and field assistance to the Paerdegat Basin oil spill (New York City), the TCI fire incident (Columbia County), and the Stena Primorsk grounding (Hudson River near Albany) as part of its daily response to 13,000 report oil spills per year.

#### Department of Financial Services

The NYS Department of Financial Services (DFS) participated in various emergency response and disaster planning activities during the past year, including those held by the New York State, New York City and Nassau County Offices of Emergency Management. DFS staff also attended training activities including NIMS/ICS, Disaster LAN, and COOP. Currently, 33 DFS agency staff are NIMS/ICS-trained, which ensures that the agency is NIMS-compliant. The Department is also part of the Public/Private Financial and Banking Information Infrastructure Committee (PBFIIC of the US Treasury). This group monitors the Financial Industry response to various types of disasters and conducts exercises related to industry response to these disasters. A recent exercise addressed a cyber-attack and its impact on clearing and settlement transactions for financial products.

DFS requires insurers to provide their Disaster Response Plans and Questionnaires, Business Continuity Questionnaires, and Pandemic Flu Surveys annually. From these documents, DFS identifies insurers with significant market share in the respective 63 counties of New York. When a disaster strikes, this information is used to identify insurers that insure most of the property in the affected counties.

Banking examinations as a matter of practice examine the institutions' Disaster Recovery and Business Continuity Plans.

Throughout the period following Sandy, The Department has maintained constant daily contact with the insurance industry. Immediately after the storm, the Department convened the Insurance Emergency Operations Center (IEOC). The IEOC is a joint effort that brings together the resources of both the industry and Department so our collective efforts can be focused on specific emergency situations. The IEOC enabled the Department to communicate directly and expeditiously with insurance carriers representing 90% of the market in storm-affected areas, giving DFS the opportunity to identify and address specific problems and troubleshoot any difficulties with the industry on a real-time basis. Following Sandy, the Department also worked with regulated institutions, citizens and with Federal counterparts to gauge impact in areas damaged by the storm and help insure prompt resumption of banking and other financial services in those areas.



To speed recovery in affected areas, DFS issued 20,000 temporary independent adjuster licenses to bring in professional adjusters from more than 20 different states. These temporary adjusters augment the approximately 12,800 independent adjusters already licensed in New York. DFS also notified insurers that homeowners should not be obligated to pay potentially large hurricane deductibles since Sandy did not have sustained hurricane-force winds when it made landfall in New York. In addition, the Department imposed a moratorium on cancellation or termination of insurance policies in storm affected areas for any reason, including non-payment of premium. DFS also promulgated emergency regulations requiring insurer claim investigations to begin within six days (instead of the normal 15 days after receiving notice of claim), shortened the time insurers have to provide claimants with decision on claims settlement, established a non-binding mediation program, instructed insurers to accept such items as homeowners' photos or videos to document losses, and required weekly reporting on every claim that has been extended past the initial 15-day window. DFS also developed a system of insurer report cards that reflect various data, including consumer complaints, as a means of ranking insurers' performance in responding to the needs of their customers.

Since insurance claim checks are issued jointly to the homeowner and that homeowner's bank or mortgage servicer, thus requiring the bank's endorsement of the check before the homeowner may access the funds. DFS reached agreement with major banks and mortgage servicers that enabled homeowners to get advance insurance settlement payments money more quickly.

Department personnel have visited scores of communities to provide direct help to consumers. The Department's Mobile Command Center (MCC) has made more than 100 visits to a storm affected community to offer help to New Yorkers. The Department has staffed more than 40 Disaster Assistance Centers (DACs), and is present at town meetings sponsored by many legislators, to provide help to consumers. The Department has fielded more than 12,300 calls on DFS's disaster hotline, which was in operation 24/7 after the storm and continues to be staffed seven days a week. The Department also staffed EOCs at New York State, New York City and Nassau County Office of Emergency Management.

#### Office of Fire Prevention and Control

The NYS Office of Fire Prevention and Control (OFFPC) provided training to approximately 30,000 firefighters and other emergency responders, pursuant to section 156 of the Executive Law (numbers are less in the Annual Training and Education Report as that report is due before all the training numbers are into OFFPC).

OFFPC has been conducting firefighter training for approximately 60 years. The scope and complexity of firefighter training has grown in conjunction with the increased responsibilities of New York State's fire service. In 2012-13, OFFPC's fire training program consisted of 200 different course titles with more than 3,200 course deliveries. Firefighter training and education was conducted for both career and volunteer fire departments throughout the state, serving approximately 100,000 firefighters in 1,830 fire departments. This training is essential for safe and effective emergency response aimed at protecting the people, property and environment in the State of New York. For many fire departments, particularly volunteer fire departments, OFFPC's firefighter training courses are the only formal training courses available.

OFFPC staff and teams responded in field operations to 87 emergency incidents throughout the State including the severe storms/tornado event in Chemung County, the TCI fire/hazardous materials incident in Columbia County, the Tamarack fire (40 structures involved) in Ulster County, a three-state



mutual aid fire in Port Jervis (Orange County), a 1,300-gallon ammonia leak in Seneca County, multiple brush fires in the Manorville area of Suffolk County with more than 120 fire departments involved, and Superstorm Sandy.

OFFPC's response to Superstorm Sandy focused on core missions and legislative responsibility to administer the New York State Fire Mobilization and Mutual Aid Plan and to deploy the New York State's Urban Search and Rescue Team – New York Task Force 2 (NYTF 2) – which preformed rescues for 311 persons and 19 pets, as well as support the overall DHSES mission. OFFPC provided staff to augment State OEM operations. Fire Protection Specialists filled roles in various EOC operational positions, field liaison positions, and as members of the NYS IMT. As the situation shifted from response and rescue mode to recovery, OFFPC also deployed the Damage Assessment Response Team (DART).

The majority of OFFPC's resources for Superstorm Sandy were in support of the New York State Fire Mobilization and Mutual Aid Plan. The plan was activated for 21 days: from October 27 through November 18, 2012. More than 260 deployment orders were issued during the activation and involved 247 fire departments, which represents the third-largest and second-longest activation in the 60-plus-year history of the Fire Mobilization and Mutual Aid Plan and demonstrated the capabilities of New York State's fire service. The response to Superstorm Sandy involved virtually all of OFFPC staff and interrupted normal operations for approximately a month. Office staff members filled assignments across the State, where they operated 24 hours daily providing direct services by assisting local fire departments, county and NYC officials in their response, rescues and recovery to storm-related emergencies.

#### Office of General Services

##### *EOC Staff Preparation*

As a result of lessons learned in 2011 in response to Hurricane Irene and Tropical Storm Lee, the NYS Office of General Services (OGS) expanded its list of employees designated to staff the agency's desk at the State EOC. The list expanded from about five to 34 – all were required to complete ICS/NIMS courses—ICS 100, IS 700 and IS 346.12—COOP, EOC and Disaster LAN training. By the time of Superstorm Sandy in October/November 2012, OGS was able to deploy staff to the EOC for the duration of activation without any staffing concerns.

##### *Superstorm Sandy Response*

OGS provided staff for the State EOC to support response operations.

- 24/7 staffing of the OGS desk from October 27 until November 16.
- Continued staffing OGS desk at reduced time schedules until December 19.
- Staffed OEM Finance and procurement services units.

Indicated below are several specific actions taken by various business units in OGS:

- Executive and other agency staff supported the Regional Operations Center (ROC) at 633 3rd Avenue and provided other executive-level decision making; for example, the closing of OGS downstate facilities and entering into an agreement with Suffolk County for the temporary use of the old warehouse facility in Central Islip.



- The OGS Public Information Office and Real Property Management & Facilities Unit facilitated the production and deployment of banners for the Governor Disaster Response Centers which were opened in several locations in the disaster area.
- The Human Resources Unit communicated with the Governor's Office of Employee Relations (GOER) regarding the closing of state buildings and facilities. With the support of OGS' Real Property Management and Facilities (RPM&F), HR coordinated the issuance of several NY-Alert messages on building closures to OGS building staff and tenants.
- The Support Services Group of the Administration Unit performed numerous transportation missions during response, recovery and the demobilization process. Items transported included:
  - Cots, blankets, pillows and air mattresses to local shelters, staging areas and emergency management offices.
  - Hospital beds from DOH stockpile in Guilderland to multiple locations in the New York City metropolitan area.
  - Meals Ready to Eat (MREs) to shelters and staging areas.
  - De-watering equipment such as four (4") pumps and four hose kits from the Oriskany Stockpile to JFK Airport and back.
  - Office supplies to Disaster Recovery Centers.
  - Surplus property inventory (chairs, cabinets and tables) to the State Donations Warehouse in Central Islip.
- OGS provided the Downstate Distribution Center (DDC)—our warehouse on Long Island—for use as a staging area in support of the Logistics Center at Republic Airport. This was one of the most critical shipping and receiving points during the disaster response and recovery period.
  - Also provided 24/7 staffing and operation of the DDC for an extended period.
- The Real Estate Planning (REP) Unit researched the availability of OGS-owned and leased spaces for use as temporary housing and warehousing purposes.
  - The unit affirmed the availability of warehouse space in the Hudson Valley and New York City metropolitan area.
  - Assisted agencies displaced from leased space to obtain temporary offices in OGS-owned buildings.
- OGS' Design and Construction Unit managed 90 Declared Emergencies across the state. Activities included:
  - Evaluation of unoccupied Arthur Kill Correctional Facility for use as a temporary shelter.
  - Declaration of an Emergency to facilitate the repair loose steel chimney at Chisholm State Office Building.
  - Coordinating the installation of temporary generators at the Superstorm Sandy Response Centers in Nassau and Suffolk counties.
  - Working on existing boilers and a temporary boiler at the Bayview Correction Facility.
  - Working on flood damage to existing generator and cleaning up water damaged South Beach Psychiatric Center.
- The Real Property Management and Facilities (RPM&F) Unit:
  - Provided direct building operations support to the State EOC.
  - Provided temporary portable air condition unit to the building to enhance environmental quality during the height of the emergency response.
  - Made HVAC adjustments to meet heating and cooling needs of occupants
  - Secured and assigned staff for the OGS desk in the EOC from the group of agency volunteers representing all business units.



- Responded to request to stage emergency response supplies at campus and Empire State Plaza. Parking space provided at Building 18 to support 10 to 15 tractor trailers delivering Superstorm Sandy response supplies. Additional locations were also surveyed.
- Made repairs to the minor damage sustained by the OGS managed State office buildings and facilities in the disaster area, in particular the Adam Clayton Powell and Shirley Chisholm buildings.
- Facilitated the reopening of all OGS managed state office buildings in the downstate region Monday, November 3.
- Provided Business Continuity support to the State Office of Children and Family Services by approving the temporary reuse of 4th and 18th floors of the Adam Clayton Powell State Office Building when the agency was displaced from its 80 Maiden Lane offices.
- Used NY-Alert to notify OGS building managers and tenant agency contacts of the closure of state offices, facilities and operations in New York City and Long Island.
- Worked with D&C and Long Island Power Authority to facilitate the restoration of power to the Duryea State Office Building.
- Secured a generator for the Duryea State Office Building to provide backup power.
- In conjunction with D&C, coordinated logistical and technical support (securing trailers, portable bathrooms, generators and electricians) for the establishment of ten Superstorm Sandy Response Centers. Response Centers were established in Broad Channel, Queens, Wantagh and Breezy Point, Nassau County. Additional Centers were planned but were not opened as they would have duplicated the services of the Disaster Recovery Centers which are coordinated by the State Human Needs Taskforce which were being established simultaneously.
- Provided gasoline from the Duryea Facility in Hauppauge to state agency employees during the gasoline rationing period.
- Campus operations transported two de-watering pumps from DHSES stockpile in Oriskany, Oneida County, to Binghamton State Office Bldg to mitigate potential flood impact to the building.
- Secured Public Service Commission and Long Island Power Authority (LIPA) contact to ensure expeditious recovery of electric power to impacted buildings.
- Provided staffing support for warehousing operations in Binghamton.
- Served on the Governor's Housing Task Force to provide assistance as needed.
- Served on the Governor's Mitigation and Recovery Task Force. Provided a list of potential mitigation projects to the Task Force.
- The Procurement Services Group (PSG) supported the EOC with alternate sources for equipment and supplies from statewide contracts.
  - Reviewed State contracts for various contractors and items.
  - Sent unit staff to OEM to provide direct assistance with procurement activities.
  - Helped to secure wooden pallets from the NYS Industries for the Disabled (NYSID) Johnstown New York warehouse.
- Legal Services provided legal guidance for the use of warehouse space; specifically, prepared and facilitated the legal requirements for Permit of Use of the former OGS warehouse in Central Islip. The warehouse was leased to Suffolk County and has been a key resource for the use of staging demobilized and donated items.
- The Finance Unit responded to request for contractors who could supply fuel—gas and diesel—in selected locations across the state.
  - Assigned staff to the Finance/Administration of the State EOC



- o Coordinated the documentation of disaster response and recovery costs.

#### *Support for Department of Health Disaster Preparedness Unit*

OGS continues to be the primary shipper for the DOH Disaster Preparedness Unit (DPU). We ship items from the DOH Guildenland Warehouse to the DDC in Brentwood as well as to multiple county locations throughout the state. This service that we provide was critical during the 2009 swine flu pandemic. DOH has segregated storage space at the DDC, which is tied to the "Strategic National Stockpile" (SNS) initiative. As a part of this initiative, the DDC would be staffed and prepared to receive medical assets within 12-hours of the activation, to assist the general population if a health-related manmade or natural disaster were to hit New York City, Long Island, Westchester County, Rockland County, or Orange County.

#### *OGS EOC, Building 18, State Campus*

To be prepared to respond to any and all emergencies, especially those that might affect the Corning Tower of the Empire State Plaza, in the fall of 2012 OGS established an EOC at Campus Building 18 on the Harriman Campus. The EOC is outfitted with 12 desktop computers and 12 telephones (landline). The space can also function as an Executive Business Continuity site and supplements previously designated business continuity space in the building.

#### *Mass Notification System at the Empire State Plaza*

Through the use a State Homeland Security Grant, OGS has installed 10 LCD monitors at strategic locations along the Concourse of the Empire State Plaza to augment code-specified emergency communication. This mass notification system as it is named, will keep state employees and plaza visitors notified of emergencies occurring within and adjacent to the Plaza. During non-emergency periods, the monitors display mass gathering and other major events occurring at the Plaza. As soon as an emergency occurs at the Plaza and the PIO and Unified Command determine that public messaging, the system is activated and is used solely for mass notification purposes. The system was successfully used following a recent water leak in the Corning Tower that resulted in the temporary displacement of more than 150 State Department of Health employees from several offices.

#### *Media Services Center*

The latest tool in our tool box for emergency response is the Media Services Center. The Media Services Center at OGS conducts the following disaster preparedness activities. These steps were followed as part of the State's response to Superstorm Sandy:

In preparation for storm / disaster response the MSC takes the following actions:

- Full-power generator load test, electrical transfer switch test and fuel tank level checks are performed at the Harriman Campus satellite teleport.
- Satellite Uplink Truck is put through routine operational checks, fueled and prepared for possible dispatch.
- Plans are prepared to re-allocate satellite bandwidth use to allow for rapid scaling up of Homeland Security's emergency communications carrier. Any previously booked clients are notified of possible changes to their normal satellite feed information.



- One videographer is dispatched to be pre-positioned in the expected impact area.
- Second videographer is put on standby for response to the impact area.

When the state moves from planning to response:

- Transmission engineering staffing is changed to cover 24 hours to respond to any issue with television or Homeland Security satellite operations.
- Any Engineer scheduled to operate from the south concourse is moved to the Harriman Campus satellite teleport to speed manual override in the event of remote control or automation failure and to monitor directly the state of incoming commercial power.
- Master Control staffing in the south concourse facility is increased from weekday coverage to 7 days for the duration of the response activities to support webcasting and post-production video needs.
- All of the updates to the public from the Governor, State Operations and Homeland Security are distributed via satellite transmission, live webcast and archived on-demand web video.
- Videographers document damage and the state response to the incident.

In the post-response phase:

- All MSC video content is logged and archived.
- Copies of all video gathered by other agencies are requested, logged and archived.
- Operational staffing is returned to the current standard schedule.

#### Department of Health

##### Planning

Based on lessons learned from the response to Hurricane Irene and Tropical Storm Lee, the NYS Department of Health (DOH) led a Coastal Storm Planning Group to update the Healthcare Evacuation Center (HEC) Plan that is the coordination entity for Healthcare Facility (HCF) evacuations in the New York City/Long Island area. DOH staff developed an Extreme Weather Annex to the Department's All Hazard Emergency Response Plan. DOH staff provided input to State Radiological Emergency Preparedness (REP) Plan. DOH staff developed updated COOP planning materials for a department-wide planning activity next year. DOH staff conducted a meeting of all New York State Burn Centers to review possible revisions to the State Burn Plan; a second draft was developed, distributed and is currently receiving feedback for inclusion to the next draft. DOH staff are active in the Human Services Functional Branch planning activities throughout the year. DOH began to establish the Healthcare Emergency Preparedness Coalition (HEPC) concept throughout the State; these are multi agency response organizations responsible for regional Emergency Support Function (ESF)-8 coordination during emergency response incidents.

##### Training

DOH Executive Staff participated in the DPC training series. DOH coordinated with the Centers for Disease Control and Prevention (CDC) and Federal Bureau of Investigation (FBI) to sponsor a Forensic Epidemiology course that will be delivered in the summer of 2013 and rolled out to all Regions the following year. DOH staff participated in National Incident Management System / Incident Command System (NIMS/ICS) and State OEM Disaster LAN courses. DOH staff attended State Power Pool training



and provided training on the State Potassium Iodide Policy to Monroe and Putnam County school nurses.

#### *Exercises*

DOH staff participated in six federally mandated nuclear power plant exercises, a drill at the Knolls Atomic Power Lab Kesselring site and a Tabletop Exercise (TTX) at Broome County. Local Health Departments (LHDs) throughout the State participated in Points of Dispensing (POD) exercises as part of the State Strategic National Stockpile (SNS) Plan. LHDs and HCF in the Western Region participated in the FEMA sponsored Hurricane Full Scale Exercise (FSE) and the State OEM sponsored Buffalo Storm West FSE. Hospitals exercised Medical Surge and Emergency Operation Center (EOC) coordination as part of their Emergency Operations Plans. DOH staff traveled throughout the State to conduct CHEMPACK sustainment activities to ensure that the CHEMPACK containers contain up to date Medical Countermeasures (MCMs).

#### *Response*

DOH staff responded to 10 State EOC activations including the TCI fire in Columbia County and Superstorm Sandy in which over 6,000 patients in HCFs were successfully evacuated in emergency conditions without any direct, negative outcomes. DOH staff were involved in developing risk communication messages to the public and flu mitigation strategies and guidance provided to HCFs to help respond to the severe flu season this year. DOH is the lead Agency for all ESF-8 activities during all emergency responses.

#### **Division of Homes and Community Renewal**

The NYS Division of Homes and Community Renewal (HCR) continues to work closely with State OEM in preparing for and supporting multi-agency, State-level activity during disaster events, exercises and training.

HCR has continued to expand the capability of a Disaster Preparedness Response Team by developing depth in staff trained to assist during disaster events at the State EOC, Disaster Assistance Centers and/or Disaster Recovery Centers. In addition, HCR representatives are active in support of various Human Services Branch committees, task force(s) and working groups. In support of these and other preparedness and response efforts, the HCR Training Section has developed and implemented a host of applicable manuals, guides & instructional documents.

HCR planning efforts include the development and maintenance of a Continuity of Operations Plan (COOP) as well as an IT Disaster Plan.

HCR serves as the State Housing Task Force Chair, and continues to coordinate the efforts of selected agencies and organizations in the development of a State housing strategy which will enable the State to more efficiently and effectively respond to the housing-related needs of those affected by a disaster and facilitate the receipt of Federal resources and support.

HCR provided staff to support the State response for Superstorm Sandy, including 24/7 State EOC support, ongoing Human Service Branch and subcommittee representation, liaison support to the JFO in



NYC, and the deployment of trained HCR representatives to each of the more-than 200 DRCs throughout the affected area.

HCR has administered the Homeownership Repair and Rebuilding Fund and Empire State Relief Fund to eligible grant program participants. The respective grants are designed to supplement FEMA Individual Household Program funds used to offset real property loss. In addition, a team of HCR staff has been trained and engaged in responding to nearly a thousand callers (to date) inquiring about grant fund program specifics and other related information.

HCR has developed several housing related programs designed to implement Community Development Block Grant / DR funds committed to the State for damaged areas related to Superstorm Sandy.

#### Office of Information Technology Services

##### Training

To ensure that the NYS Office of Information Technology Services (ITS) is NIMS-compliant, ITS has an ongoing process that documents the training requirements for NIMS and ensures staff complete it prior to the August deadline each year. Employees assigned to NIMS/ICS positions are required to complete either ICS-700 or ICS-100, depending on their role. Training lists are updated and certificates of completion retained as supporting documentation for the NIMSCAST survey.

##### Planning

ITS completed three quarterly COOP review and update cycles and is now completing the fourth quarter review and update. ITS updates NY-ALERT contact notification groups using an automated process on a weekly basis. As staff changes, ITS maintains its COOP/Disaster Recovery escalation process documents, which identifies the communication process flow, involved leaders, and teams necessary to respond to any hazard or emergency. The roles are organized using the NIMS/ICS structure.

ITS identified roles, using standard ICS terminology, to facilitate communicating with first responders in the event of an emergency or disaster. In August, ITS submitted its annual NIMS Compliance Assistance Support Tool (NIMSCAST) survey. As changes occur, ITS updates its critical contact information for all senior staff and agency decision makers involved in deploying resources to assist with incidents and disasters.

##### Response to Major Incidents

From October to December 2012, ITS trained staff, updated procedures, and created detailed EOC desk procedures, and distributed procedure binders to all appointed agency EOC liaisons. The binders include Disaster LAN instructions, detailed action steps for contacting staff, and instructions and forms for documenting technology requests for assistance. On January 13, 2013, ITS created a formal Superstorm Sandy After Action Report (AAR) with recommendations for improvements for senior management. Additionally, ITS continued to refine a Crisis Management Plan (CMP) to better prepare for the next disaster. A group of operational staff is in the process of reviewing and enhancing the CMP to incorporate deficiencies found during Superstorm Sandy.



#### Office of Interoperable and Emergency Communications

Radio and technical staff from the NYS Office of Interoperable and Emergency Communications (OIEC) were deployed, along with mobile communications assets to provide communication assistance to the New York State Watch Center during the following incidents:



- April 2012: Radio engineers and one Strategic Technology Reserve (STR) vehicle were deployed to the Harriman State Park in response to wildfires to support tactical operations for first responders.
- May 9-10, 2012: Radio engineers participated in the Northern Border Security Exercise in Monroe County. As an evaluator, the team reviewed exercise documentation (prior to the exercise) for the Northern Border Monroe County Marine Interdiction full scale exercise. Completed observations at various locations during the event were sent to evaluation moderator. Exercise participants included the U.S. Coast Guard, U.S. Customs Border Protection, Federal Bureau of Investigation, U.S. Department of Homeland Security, Northern Border Security, Monroe County Sheriff's Department, DEC, DHSES, and NYSF.
- June 11-15, 2012: Team members supported communication operations as part of the Wellenda tightrope event, which took place across the Niagara Gorge. The group was responsible for supporting communications for emergency services providers during the event. Communications included radio, video, satellite, point-to-point and IP telephone to support State Park Police on Goat Island, the Interagency Coordination Center in the City of Niagara Falls, and the State EDC in Albany.
- July 12, 2012: Radio and technical staff were deployed, along with mobile communications assets to provide communication assistance to the State Watch Center for a fire incident in the Lake Placid area.
- July 26, 2012: Radio and technical staff were deployed, along with mobile communications assets to provide communication assistance to the State Watch Center for a rain/tornado event in the City of Elmira and surrounding counties.
- July 30, 2012: Radio and technical staff were deployed, along with mobile communications assets to provide communication assistance to the State Watch Center for an Orange County 911 Center failure.
- From July to September 2012, staff participated in REP exercises with NYSOEM, DOH, Ag&Mkts, and other agencies in anticipation of a federally evaluated exercise on October 2, 2012. Staff functioned as Public Information Officer in the EDC and radio monitor of Radio Amateur Civil Emergency Service (RACES) program for these exercises.



- August 3, 2012: Radio and technical staff were deployed, along with mobile communications assets to provide communication assistance to the State Watch Center for the TC fire/hazardous materials incident in the Town of Ghent, Columbia County.
- August 11-17, 2012: The radio communications team provided support for the Maccabi Games in Rockland County. They served as a multi-agency intelligence center (fusion center) and provide a cache of VHF radios programmed on the Sheriff's department frequency. The games offer Jewish teens athletic, educational, cultural and social opportunities with Jews from around the world. Members were commended by Rockland County officials for their outstanding work.
- August 22 – September 4, 2012: Radio engineers provided communication equipment to support State Fire and other State agencies at the New York State Fair in Syracuse.
- September 19-20, 2012: A Communication Leader (COML) Exercise, conducted in Westchester County, provided hands-on situational training and advanced certification purposes. An additional 14 students were trained through this program. The New York State COML Credentialing Program continued to be developed by OIEC, in coordination with DHS OEC.
- February 11-17, 2013: Communications equipment was deployed in support of State's response to winter storm event.

#### *Superstorm Sandy*

At the direction of State OEM, OIEC undertook pre-landfall storm preparations to support operations in the State EOC and for potential forward deployment of assets and personnel in the field. These efforts included forward deployment, crews and assets, staffing for the State EOC for a period of up to two weeks, inventory, assembly, testing and staging of OIEC assets including mobile command vehicles and communication equipment. In addition, OIEC contacted key stakeholders and potential response contributors, including local, state, federal and private industry (wireless cellular carriers), and activated communication plans for state, federal, local and amateur networks.

OIEC deployed all available assets during Superstorm Sandy, including seven mobile command, communications and support vehicles, numerous mobile satellite and radio antennas and equipment, interoperable cross-channel radio equipment and repeaters, connectivity for VOIP telephones, and portable radios used by incident management team, local law enforcement and public safety personnel in the field, as well as portable radios used by emergency managers and agency liaison personnel at the State EOC in Albany.

For the first four weeks of activation, all OIEC staff and assets were devoted solely to the State's response to Superstorm Sandy. OIEC personal and assets were physically deployed among Suffolk and Nassau counties, as well as New York City. In addition, communications logistical coordination and technical assistance to all State and local agencies was provided by OIEC personnel stationed at the State EOC throughout the activation.

Recognizing that commercial wireless (cellular) carriers' wireless networks serve as a vital link for citizens in need of help, and more acutely as a means to assist response and recovery efforts among first responders during the disaster, OIEC established points of contact with the carriers and developed a



reporting process and schedule. OIEC also discussed pre-staging of mobile cell platforms a.k.a., Cells on Wheels (COWs), Cells on Light Truck (COLTs), and portable satellite data equipment, to mitigate local outages and the potentially support emergency operations in impacted areas. At peak, over 20 mobile cell platforms were put in service to support emergency operations in NYC and Long Island. OIEC worked closely with the wireless carriers on reporting and monitoring wide-scale service disruptions, restoration efforts and temporary service installation to assist State and local authorities. This is the first time that New York State has engaged in this type of disaster planning and response activity with the wireless industry.

#### **Department of Labor**

The NYS Department of Labor (DOL) has conducted ICS training for Executive Staff in May of 2012. DOL has been actively involved in improving Location Emergency Action Plans, including developing emergency procedures for tornados, flooding, active shooter, and suspicious mail. DOL has been involved in high-rise emergency procedures for its locations in New York City. DOL has also been working on alternate locations for its COOP and tested its IT disaster recovery plan. DOL uses NY-ALERT for employee notifications, as well as a toll-free emergency line.

In regards to state response, DOL continued training its state Emergency Operations Team – 25 employees that staff the State EOC during emergencies. DOL strengthened its ability to support Disaster Assistance Centers – DOL is one of the primary agencies that staff these centers. DOL also participated in the Human Services Branch meetings and REP exercises. The DOL Emergency Manager participated in the REP Core Concept course in January 2013.

During large scale emergencies such as Superstorm Sandy, DOL provides both DUA, Disaster Unemployment Insurance to state residents unemployed due to the disaster, and oversees the National Employment Grant (NEG), which assists with coordinating unemployed workers to employers looking to hire temporary help to support recovery efforts (clearing debris, etc). DOL has also offered various resources to support response efforts; the agency provides safety assistance for response and recovery efforts during emergencies.

#### **Office of Mental Health**

The NYS Office of Mental Health (OMH) is a member of the Human Services Branch of NYSOEM and, as such, participated in a schedule of regular meetings and planning activities related to the review and revision of emergency response plans tied to Mental Health, Mass Care and Sheltering. This included efforts on a major revision to the NYSOEM Mass Care plan in response to lessons learned from the Irene and Lee events of the previous year.

OMH staff assigned to responsibilities at the State EOC also participated in training activities including NIMS/ICS, Disaster LAN, and EOC training. OMH staff participated in both State observed and federally evaluated nuclear power plant exercises, including the August federally-observed Northern Lights nuclear plant response exercise.

Activation and deployment of OMH staff to the State EOC occurred on several occasions, including severe weather events in April and July 2012. Staff reported to both the OMH desk at the State EOC and participated in activities of the Human Services Branch Mass Care group on each occasion. OMH was also activated for Superstorm Sandy and participated in numerous roles in support of the OEM mission, including the evacuation and relocation of patients from multiple healthcare facilities and the staffing of



DRCs. More than 83 clinically licensed mental health staff provided services to more than 30 different DRCs during Superstorm Sandy.

OMH also provided mental health support services via the FEMA funded Crisis Counseling and Training Assistance Program (CCP) providing services to communities affected by disaster. OMH has oversight and administers the grant activities while local agencies are contracted for the provision of direct services. During this reporting period, OMH engaged in multiple Crisis Counseling Programs, including Project Hope, which assisted survivors in 13 counties impacted by Hurricane Irene, Project Renew supporting the counties in the Southern Tier affected by Tropical Storm Irene and, most recently, Project Hope assisting those in the Greater New York City metropolitan area most severely impacted by Superstorm Sandy.

#### **Metropolitan Transportation Authority**

The Metropolitan Transportation Authority (MTA) conducted various area evacuation, city-wide evacuation, mitigation, and special needs planning activities during the past year. MTA agencies' Winter Weather Operations, Hurricane, and Heat Plans were updated.

MTA agencies (Metro-North Railroad (MNR), Long Island Rail Road (LIRR), New York City Transit (NYCT) Subway, Buses, MTA Police and MTA Bridges and Tunnels) staff attended training activities including NIMS/ICS Train-the-Trainer courses, Disaster LAN, and the Texas Engineering Extension Service (TEEX) Enhanced Incident Management Command at the Emergency Operations Training Center located at Texas A&M University in College Station, Texas.

MTA agencies participated in DHSES Training and Exercise Planning Workshop at Albany in March 2012. MTA Emergency Operations Center was established with procedures and guidelines for agency staff to be trained in NIMS/ICS, Disaster LAN, and EOC Training. MTA's Emergency Operations Group is in the process of identifying positions in the agency that will provide first responders in the event of an emergency or that will support the agency's response to an event. MTA agencies have established emergency stockpile locations for resources to be utilized during emergencies. NIMS training lists are updated yearly to insure that employees receive the required NIMS/ICS training in compliance with NIMSCAST.

In May 2012, MTA conducted an Executive Hurricane Tabletop Exercise. MTA also participated in FEMA Region II National Level Exercise (NLE)/Cyber Regional Tabletop Exercise, and the Trojan Horse Exercise.

MNR staff participated in federally mandated nuclear power plant exercises and drills, including the October 2012 Indian Point full-scale exercise and February 2013 Park Avenue Tunnel Drill with FDNY. MTA Police Department and MNR participated in the Regional Mass Fatality Response System full-scale exercise in March 2012 at Dutchess County Emergency Response Facility.

MTA Police conducted Interoperability Communications Drills with various State law enforcement agencies.

MTA Police Officers and Bridge & Tunnel Officers are trained in Personal Radiation Detectors (PRD) and Active Shooter scenarios.



NYCT Subways conducted the following drills:

- FDNY Rescue Conveyor System Drill (Vernon-Jackson Ave Station)
- Staten Island Railway (Smoke/fire on train at the Stadium Station) Tabletop
- FDNY Battalion Chief-NYCT Liaison Officer Training at the Rail Control Center
- Bus drill (Bus collision) Tabletop
- FDNY Multi-Unit drill Union Square Station (Gap filler)
- FDNY Hurricane Tabletop (Coney Island) exercise
- FDNY Hurricane Tabletop (City Island) exercise
- FDNY Snow Storm Preparedness Tabletop (Manhattan College)
- FDNY Battalion Chief-NYCT Liaison Officer Training at the Rail Control Center

Department of Buses conducted Red Letter Drills monthly for the past year. LIRR conducted Winter Storm Operations and Hurricane Tabletop Exercises in December 2012.

#### Division of Military and Naval Affairs

The NYS Division of Military and Naval Affairs (DMNA) supported DHSES with military forces and capabilities from the New York Military Forces (Army National Guard, Air National Guard, Naval Militia, and the New York Guard).

DMNA participated in several National Guard Civil Support Operations during the reporting period to include:

- April 2012: military aviation support to Long Island wildfires
- July 2012: military aviation support for the City of Elmira tornado
- October 2012-February 2013: military support to Superstorm Sandy response efforts (see below)
- January-February 2013: winter storm preparedness



DMNA conducted several training exercises internal to DMNA and with external partners during the reporting period including:

- May 2012 Homeland Response Force (HRF) exercise in Oriskany (see below)
- Regional response exercises in Buffalo, Syracuse, Troy, Peekskill, Brooklyn and Suffolk County
- Capital District communications exercise
- Civil Support Team exercises and evaluations

In addition, DMNA worked with State and county partners to review and update response plans and posture to better prepare for support to civil authorities. The agency is currently updating its comprehensive Contingency Operations Base Plan and annexes in an effort to provide more responsive support.



### *Superstorm Sandy*

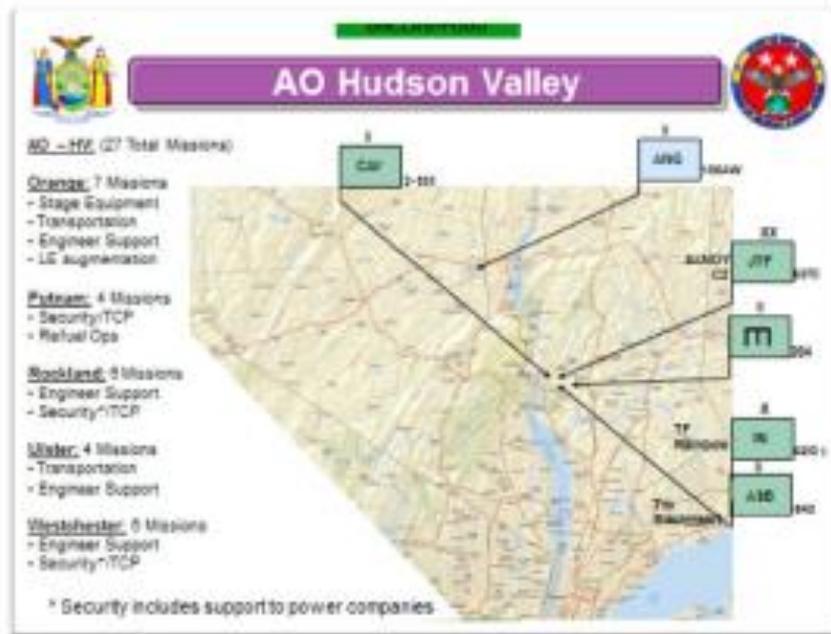
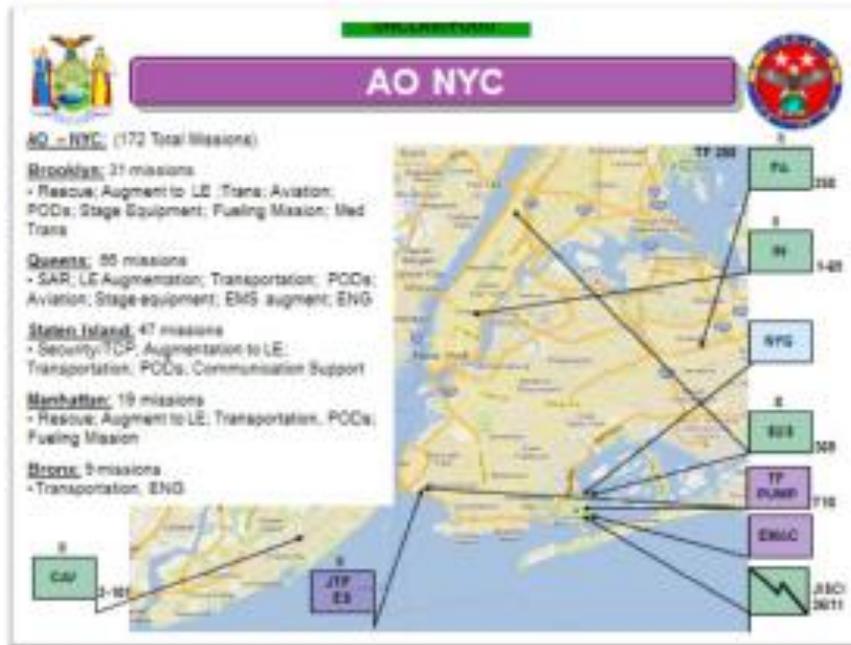
In support of the State's response to Superstorm Sandy, DMNA mobilized and deployed more than 3,800 Service Members of the NY Military Forces, 800 service members of Emergency Management Assistance Compact (EMAC) forces from nine states, and 630 Title 10 service members. DMNA deployed more than 1,400 vehicles to 13 counties in order to conduct over 270 missions in Long Island, New York City and the Hudson Valley, including pre-landfall evacuation, assisting local law enforcement (e.g., traffic control points), search and rescue, emergency debris clearance, security missions, aviation support, and points of distribution (e.g., water, blankets).

As part of a health-and-welfare-check program, military personnel, in conjunction with New York City health department officials, visited more than 100,000 apartment and housing units in New York City. DMNA also deployed C-17 and C-130 cargo aircraft, and UH-60 and CH-47 helicopters, to carry critical supplies and personnel. An Air Guard CH-130 search-and-rescue aircraft conducted a reconnaissance mission with Long Island officials one day after the storm, and Army Guard UH-60s transported local, state and federal officials as needed.

New York Army National Guard Aviation conducted 103 missions during the Superstorm Sandy response and flew 318 hours. In addition, the 105th Airlift Wing at Stewart Air National Guard Base acted as a Port of Aerial Debarcation (APOD) for utility repair trucks and crews flown in from the West Coast; approximately 100 items of equipment transported by Air Mobility Command Aircraft flown by the Air Force, Air Force Reserve, and Air National Guard were offloaded at the APOD.







DMNA also provided the following resources:

**Military Personnel:**

New York Guard (State Defense Force)	183
New York Naval Militia	203
New York Air National Guard	1,023
New York Army National Guard	3,824
Air National Guard from other states	83
Army National Guard from other states	726
<b>Total New York National Guard and NY Military Forces</b>	<b>5,235</b>
<b>Total National Guard from other states</b>	<b>811</b>
<b>Total National Guard and NY Military Forces</b>	<b>6,046</b>

**Supplies Distributed:**

Water (cases)	113,719
Gasoline (pumped)	200,000 gallons
Diesel (pumped)	77,000 gallons
Vehicles fueled	13,378
Meals	2,033,410
Blankets	119,300
Heaters	4,500
Medical Cots	600
Turkeys (for Thanksgiving holiday)	3,021
Pies (for Thanksgiving holiday)	1,000

**Homeland Response Force (HRF) Validation Exercise**

From May 14-20, 2012, soldiers and airmen of the National Guard's Homeland Response Force (HRF) participated in a large-scale "validation training" exercise at the State Preparedness Training Center in Oriskany, NY. Training elements included extraction, decontamination, medical triage, security and command elements in response to a Chemical, Biological, Radiological, Nuclear, and High Explosive (CBRNE) event.

The HRF was established by the U.S. Department of Defense to serve as a CBRNE Consequence Management Response force, and provides State governors with a response capability to assist first responders in saving lives and mitigating suffering in response to a CBRNE incident. Ten (10) HRFs align with each FEMA region to allow for closer and more familiar contact with civilian responders. The National Guard forces also provide a greater responsiveness to local authorities due to their closer geographical locations. The Region 2 Homeland Response Force directly supports FEMA Region II states and territories, including New York, New Jersey, Puerto Rico and the U.S. Virgin Islands.



The HRF consists of approximately 570 soldiers and airmen of the National Guard with expertise in search and extraction of disaster victims, incident site security, decontamination, medical treatment, and command and control.

#### Office of Parks, Recreation and Historical Preservation

The NYS Office of Parks, Recreation and Historic Preservation (OPRHP) participated in various planning and exercises during the past year. OPRHP staff also attended training activities including NIMS/ICS, Disaster LAN, COOP, and Catastrophic Disaster Planning and Response. OPRHP also maintains liaisons between DHSES, OEM and the TIG/ATIG.

OPRHP hosted several major events requiring multi-agency (and in one instance international coordination) planning and coordination:

May 2012: The Jones Beach Air Show included several aerial attractions including the Blue Angels, and attracted more than 300,000 spectators throughout the weekend.

June 2012: OPRHP hosted the Nik Wallenda high-wire walk across Niagara Falls, requiring planning and coordination with numerous DPC agencies as well as the U.S. Coast Guard, local emergency responders, and Niagara Falls Canada personnel.

June 2012: OPRHP hosted the Barclays Tour golf playoffs, which attracted more than 100,000 visitors.

OPRHP participated in multiple NYS OEM snow emergency activations, as well as NYSOEM exercises concerning nuclear power plant exercises. OPRHP maintained liaison with DHSES, NYSOEM, and the TIG/ATIG concerning the activation and response for Hurricane Irene and Tropical Storm Lee. The ongoing recovery efforts continue in coordination with FEMA to address disaster impacts of the related storms.

#### Office for People With Developmental Disabilities

During 2012-2013, the NYS Office for People With Developmental Disabilities (OPWDD) expanded its emergency response capabilities in a variety of ways, including completion of an Emergency Management committee charter which requires the development of regional operational procedures focused on an all hazards response.

OPWDD developed a process for deployment of teams specializing in fire safety, security and maintenance to stabilize properties following damage from weather related or other disasters. These teams are designed to provide additional response capabilities for major events in which the staff of a region are unable to meet needs. As part of this process, OPWDD stocked emergency vehicles with emergency response equipment and repositioned these vehicles and other resources throughout the state to facilitate swifter emergency deployment.

In order to increase communication capabilities, OPWDD repurposed existing portable radios and is utilizing them on an available radio channel frequency assigned to the agency. In order to further these efforts, OPWDD is exploring asset management software to assist in tracking materials, training, personnel and other resources before and during emergency activations.

OPWDD worked to increase the number of individuals trained to staff the State EOC and use Disaster LAN, as well as the number of agency staff trained in NIMS/ICS.



OPWDD participated in REP exercises and drills, including federally evaluated exercises. OPWDD also conducted tabletop exercises in the Finger Lakes and Western New York district to test emergency response capabilities and increase staff awareness of evacuation procedures and relocation information.

In terms of response, OPWDD deployed emergency response teams in advance of Hurricane Sandy and Winter Storm Nemo. These teams worked in impacted areas to stabilize properties, ensure that critical health and safety needs were met, and assisted in local agency EOC operations.

During Hurricane Sandy, these teams assisted in the evacuation of over 240 individuals from the campus in Brooklyn to the Queens campus, and assisted programs with returning to properties in the community following the storm.

#### **Port Authority of New York & New Jersey**

On February 12, 2013 the Executive Staff of the Port Authority of New York and New Jersey (PANYNJ) participated in a Disaster Response Workshop. The workshop focused on an agency-wide disaster and the implications that such an event would have on PANYNJ and its core mission as an intermodal transportation provider, as well as effects and ramifications that decisions and actions of the Port Authority would have on the response to event or incident (e.g., support to enhance the response to the communities dealing with the emergency and policy decisions to respond and support a regional emergency).

This workshop was the first of a series of emergency and disaster orientations that focused on the development of executive roles and responsibilities. The emphasis is on supporting the response to the emergency and/or event, and to simultaneously provide management and control of PANYNJ during a disaster.

The Port Authority developed a series of full-scale exercises that involved planning and preparedness for both PANYNJ and its surrounding communities. These exercises were conducted at JFK International Airport, Bayonne Bridge and LaGuardia Airport, and involved a substantial event requiring a parallel response from emergency resource internal and external to PANYNJ. These joint exercises provided an opportunity to enhance planning, training capabilities and exercise development. These exercises were not reserved primarily for the traditional first responders such as police, fire and emergency medical, but were inclusive of social service organizations, private non-profit and the private sector.

#### **Public Service Commission**

During the past year, the NYS Public Service Commission (PSC) staff attended training activities including NIMS/ICS Train-the-Trainer courses, Disaster LAN, and COOP. The PSC maintains a current list of staff trained in Disaster LAN and trains new staff to fulfill this function regularly throughout the year. The Department of Public Service (DPS) Emergency Plan, updated annually, specifies required ICS training for the designated and alternate emergency manager, incident coordinators and first line supervisors.

PSC Staff participated in various emergency drills throughout the year, including federally evaluated nuclear power plant exercises. Last year, PSC staff were involved in a State observed exercise at Nine Mile Point and a FEMA evaluated exercise at Indian Point.

PSC staff worked with electric utilities in New York State to improve the way outages are reported. Before the improvements, the Electric Outage Reporting System (EORS) could receive outage reports



from electric utilities during major events only (up to five times per day). Utilities across the State now submit outage data daily – every half-hour – allowing the PSC to maintain situational awareness at all times.

PSC staff issued reports on Hurricane Irene, Tropical Storm Lee and the October 2011 snowstorm. PSC monitored utility implementation of its recommendations and reviewed electric utility storm plans.

In addition, the PSC supported monitoring of New York State in the restoration response for numerous emergency events including Superstorm Sandy. At the peak of restoration following Sandy, approximately 150 DPS staff worked in some capacity to support Superstorm Sandy recovery efforts, including 24 staff working in four field locations and 32 staff working various shifts at the State EOC and the New York City Regional Operations Center.

PSC staff at the State EOC reported on utility outage and restoration information, provided reports to other State agencies, and responded to inquiries submitted through Disaster LAN.

#### **Department of State**

##### *Codes and Enforcement Division (DCEA)*

As a result of Hurricane Irene and Tropical Storm Lee, the Department of State (DOS) Codes and Enforcement Division (DCEA) began development and implementation of the Post-Disaster Building Assessment Program (PDAP). After Superstorm Sandy, staff members and volunteer code enforcement officials were deployed to Long Island to conduct thousands of building evaluations.

Participants in the PDAP, including code enforcement and local officials obtained NIMS/ICS training through DOS. Resources necessary for the PDAP's function have been identified and are being secured, such as highly-durable, water-resistant laptop computers, and a web-based communication program. DCEA is working on a software/database system with real-time emergency deployment geographic information system capability. DCEA is an active member of the National Emergency Managers Association (NEMA) and the New York State Emergency Managers Association.

DCEA provided support to the Ready Commission in developing a series of recommendations intended to increase the resilience of buildings through stronger building codes and related support services. Additionally, recommendations and options were developed to strengthen local enforcement of the state building code and to utilize enforcement practices to collect critical data regarding building damage from natural disaster events. Finally, proposals were developed to promote building resilience through public awareness and education, and to encourage individual building owners to voluntarily increase the resilience of buildings.

##### *Division of Community Services*

The Department of State's Division of Community Services worked within the network of Community Action agencies to organize relief efforts in every county of New York State. Division staff worked with these agencies to organize warming shelters, meal distribution, and refer displaced New Yorkers to emergency shelters. These efforts were coordinated daily. In addition, the Division circulated a daily emergency relief resource page that became the impetus for the DOS Sandy relief website. In addition Department of Community Services staff responded to calls coming from the DOS emergency center's



call desk, correspondence coming from the Governor's office, and from New Yorkers calling the consumer protection line looking for assistance.

The Office for New American's immigrant specialists were deployed to sites throughout the disaster zones. Staff worked in Nassau County, Staten Island, Brooklyn, and Queens (including the Rockaways). At each site, staff helped FEMA coordinate emergency efforts with a focus on intake and referral and emergency placement. Immigrant specialists assisted the federal government with information that helped to identify and direct services more appropriately. The immigrant specialist were on call to assist at the Disaster Center at Lehman College in the Bronx and worked at Nassau Community College where they helped set up tents, were stationed in warming and feeding sites, and assisted the New York City Human Resources Administration (NYCHRA) with client emergency intervention services.

#### *Community and Waterfronts*

Immediately following Hurricane Irene and Tropical Storm Lee, DOS, in consultation with the other agencies that comprised the Governor's Upstate Storm Recovery Task Force, assembled storm recovery progress updates and reported those updates every two weeks to the Chair of the Upstate Storm Recovery Task Force. DOS provided technical and financial assistance to 18 upstate communities affected by Hurricane Lee and Tropical Storm Lee. In November 2012, DOS staff began compiling lists of experts and provided other services in anticipation of the Governor's announcement to form three commissions to guide the State's response to Superstorm Sandy focusing on making New York State more resilient to future storm events.

DOS also began coordination with the National Oceanic and Atmospheric Administration (NOAA) and FEMA to prepare planning maps that depicted the extreme, high, and moderate risk areas along the New York State shoreline. These maps included the risk from flooding, sea level rise, and storm surge. Staff is currently coordinating with FEMA and other federal agencies to revise the federal Recovery Support Strategy to ensure it is consistent with New York State's long-term community recovery directions and needs. Prior to March 2012, DOS staff began working on guidance for communities to aid them in preparing plans to become more resilient to coastal hazards, like sea level rise. When Superstorm Sandy struck, work on the guidance accelerated and staff completed the "Guidance for Community Reconstruction Zone Planning."

#### *Division of Consumer Protection (DCP)*

The Division of Consumer Protection (DCP) facilitated the handling of power restoration complaints against LIPA received through the Governor's Superstorm Sandy Hotline. DCP also collaborated with PSC to respond to utility complaints received from consumers throughout the State immediately following Superstorm Sandy. DCP also partnered with the Division of Community Services and its network of Community Action Agencies to disseminate emergency resources and shelter information to all LIPA customers and other downstate consumers who called the DCP hotline, as well as those who reached out through the Governor's Superstorm Sandy Hotline.

DCP successfully implemented the Governor's Call Center Consolidation Project as of December 2012. The NYS Department of Taxation and Finance now handles all Level 1 calls for DCP and will partner with them directly following any future disaster situation.



#### *Division of Administrative Rules (DAR)*

The Division of Administrative Rules (DAR) updated its Business Continuity Plan (BCP) with the Office of Information Security to include information needed in the event of a disaster. The Division developed and continues to update DOS's Superstorm Sandy Emergency Relief resource webpage.

#### **Division of State Police**

New York Division of State Police (NYSP) staff participated in various planning, training and exercise activities during the past year, and also attended training activities including National Incident Management System / Incident Command System (NIMS/ICS) courses.

NYSP staff participated in federally evaluated nuclear power plant exercises and exercises, including the July 24, 2012 State-evaluated Nine Mile Point nuclear power plant exercise, and exercises (Sept. 12, Sept. 27 and Oct. 2) for the Indian Point nuclear power plant.

NYSP members staffed the State EOC when activated in 2012 for weather-related events on 12 occasions – twice for wildfire events, once for a hazardous materials fire, once for a rock slide, during the Wallenda event in Niagara Falls, and on New Year's Eve.



#### Office of Temporary and Disability Assistance

The NYS Office of Temporary and Disability Assistance (OTDA) supported recovery efforts for Hurricanes Irene and Lee, as well as actively supporting the response and recovery to Superstorm Sandy during this report period. OTDA chairs the Human Services Committee of the DPC. OTDA remains chair as the Committee becomes the Human Services Branch under the direction of NYSOEM during an activation. The Human Service Branch is historically one of the first branches activated and is the last branch to stand down long into the recovery operations of a disaster. As chair of the Human Services Branch, OTDA must maintain a constant presence within NYSOEM.

OTDA staff supported human services functions and coordinating with FEMA for DRCs. In conjunction with its partner agency, OICFS, OTDA led the DRC Coordination Group that successfully opened 63 DRCs for Superstorm Sandy, of which nine remained operational after more than 20 weeks following the federal Individual Assistance declaration. OTDA anticipates these centers will have supported more than 173,000 visitors by the end of April 2013. Although nine less DRCs were opened during Sandy than were opened in response to Irene and Lee, the volume through DRCs was the highest ever seen in the State.

OTDA is also the lead agency for the Unmet Needs group. Beginning last year, FEMA introduced a new process to handle unmet needs through the federally-funded Disaster Case Management (DCM) program. OTDA served an integral role in the planning and development of the grant application for DCM programs for Hurricane Irene, Tropical Storm Lee and Superstorm Sandy. From March 1, 2012 through June 7, 2012, OTDA facilitated the implementation of Phase I of DCM for Irene and Lee in 34 affected counties, which required coordination with FEMA, U.S. Department of Health and Human Services – Administration for Children and Families (HHS/ACF), Catholic Charities USA, and the U.S. Public Health Service. Local District Social Services Commissioners also played a pivotal role in implementing DCM. DCM is currently housed and overseen by DHSES. OTDA continues to support the negotiation of contracts and grants as well as training for the managing agency. The Unmet Needs group continues to stand ready to support NYSOEM in the implementation of DCM.

OTDA also led the implementation of the following plans to the State CEMP, including the Human Services Annex, the Disaster Assistance Center Plan, and Unmet Needs plans. Additionally, OTDA participated on many other human services functional groups including Mass Care and Housing.

As Chair to the Human Services Committee of the DPC, OTDA routinely facilitates Human Services Committee meetings and Group Leader meetings involving more than 20 agencies, both governmental and voluntary sector. These meetings occur minimally on a monthly basis to ensure coordination with partner agencies and a constant state of readiness.

OTDA also works jointly with partner agencies on the Emergency Repatriation program, which involves an agreement with the federal government jointly signed by DHSES and OTDA.

OTDA is working with DHSES to implement work plans and utilize funding from the 2009 and 2010 Investment Justifications associated with the State Homeland Security Grant Program (SHSGP) in addition to planning efforts related to building and supplying the regional stockpiles with resources from the investments. OTDA also maintains a warehouse which is currently housing the Human Services Stockpile and supports central receiving and distribution of resources to support disaster operations.



OTDA reviewed and updated its agency OEMP and COOP.

OTDA participates in NYS Forum meetings, which discusses activities involving Business Continuity in the face of natural disaster or emergency.

OTDA staff routinely participates in NIMS training and exercise opportunities that are offered throughout the year and annually provide updates regarding agency compliance with NIMS. These exercises include REP, Pandemic Influenza, the Empire series of exercises, and any other local exercises. OTDA also maintains policies and procedures related to functions administered as part of its disaster preparedness, health, safety and security programs. Intranet sites are maintained to provide resources and safety tips to employees and OTDA actively participates in NY-ALERT for employee emergency notifications.

#### Thruway Authority

The 2012-2013 period was an active one for significant weather events, and the NYS Thruway Authority (NYSTA) played a significant role in providing assistance statewide. Response to these events included:

- Mobilized staff and equipment resources to assist in the response for Superstorm Sandy. NYSTA resources also played a vital role in the deployment of statewide assets to the affected area. NYSTA provided more than 130 staff for recovery efforts. Staff liaison presence was maintained at NYSOEM for the duration of the activation and additional staff were provided in direct support of NYSOEM operations.
 
- Deployed more than 73 pieces of snow removal equipment and 80 personnel to Long Island to expedite cleanup from Winter Storm Nemo. This deployment lasted six days.
- Provided staff in support of resource planning and State EOC activations for other severe weather events over the year, including severe thunderstorm events in July and September.

In addition to supporting activations of the State EOC, NYSTA implemented its internal Operations Directive, which requires activation of an internal EOC (statewide and regionally as warranted) when severe or widespread significant weather events are forecasted. These EOCs are staffed by trained NYSTA and NYSF management personnel. NYSTA continues to maintain a cadre of trained individuals to serve in incident management roles directly for NYSTA and as liaisons for the agency to staff the State EOC when activated.

NYSTA continued its close working relationships with key state agency partners at DOT and DHSES to closely coordinate response to events impacting our transportation infrastructure. In addition, NYSTA continued its partnering efforts with organizations such as Transcom in the NYC metro area and the Niagara International Transportation Technology Coalition (NITTEC) in Western NY. In cooperation with these partners, NYSTA:



- Conducted joint tabletop exercises with Transportation and Emergency Response partners in each of NYSTA's four divisions.
- Participated on MAC and TIB conference calls to conduct pre-event planning efforts.
- Met with municipal and other partners to develop response protocols and establish contacts and working relationships.

In support of our winter maintenance program and severe weather preparation efforts, NYSTA developed a close working relationship with NWS staff throughout the State. NYSTA met with NWS staff prior to the 2012-2013 winter season to familiarize their staff with NYSTA operations and discuss forecasting needs and appropriate communications protocol for staff.

#### Canal Corporation

**Mohawk Dams:** The New York State Canal Corporation (Corporation) submitted a Section 406 Hazard Mitigation Proposal (HMP) to FEMA under DR-4020/4031 (Hurricane Irene/Tropical Storm Lee) for improvements to components of eight movable dams in Montgomery and Schenectady counties. These improvements will allow the Corporation to proactively remove dam components, which act as an obstruction in the Mohawk River in advance of a forecasted high flow event, and provide substantial flood mitigation. The Corporation, with assistance from DHSES, continues to work with FEMA to secure approval and funding for this HMP, estimated at \$30 million.

**Internal Procedures:** As part of the Mohawk Dam improvement effort, the Corporation has instituted a new operating procedure to adequately prepare for extreme high flow events in Montgomery and Schenectady counties. Although the structural improvements are not yet complete, these new procedures were tested over an elongated timeframe during Superstorm Sandy and proved to be effective. The Corporation began development of internal guidance documents for Corporation staff who are Duty Officers on 24-hour call. These documents cover topics such as earthquakes, flooding, structural failures, environmental releases, vessel accidents, vessel recovery, law enforcement investigation activity, utility interruptions, and mechanical breakdowns, among others. These documents are expected to be issued in mid-2013.

**Dam Safety:** The Corporation participated in an Emergency Action Plan (EAP) exercise for the Conklingville Dam, which simulated emergency conditions at a dam facility and allowed the downstream participants to rehearse actions which would be implemented if an actual emergency occurred. The Corporation submitted an annual certification to DEC that indicates all DEC-regulated dams are in compliance with DEC regulations. Additionally, the Corporation prepared and submitted engineering assessments, performed safety inspections, and updated EAPs for five DEC-regulated High-Hazard (Class C) dams. The Corporation performed structural inspections of 24 dams to identify possible deficiencies and necessary corrective actions. Additionally, the Corporation began reviewing and modifying inspection criteria to ensure all public safety related components are adequately inspected. The revised criteria will be issued in 2013.

**Earthquake Response:** Corporation staff, working with staff from NYSTA, began development of an earthquake response application to more quickly respond to potential impacts from earthquakes. This application was developed based on guidance from DOT regarding post-earthquake structural inspection recommendations for bridges and other structures. This application is expected to be implemented in early 2013.



**Flood Mitigation:** The Corporation submitted a request for Superstorm Sandy mitigation funding to develop Flood Warning Systems (FWS) for the Upper Hudson River, Mohawk River and Oswego River Basins. These FWS would lower the risk to flood prone communities by enabling the State, emergency managers and the public to view and understand the extent of forecasted flood conditions. Additionally, the ability of communities to prepare and protect lives, private property and critical public infrastructure can result in as much as a 30% reduction in damages. These FWS will consist of a series of networked stream and precipitation gages, enhancing flood forecast capabilities by NWS and the creation of basin-specific models to utilize this information to determine the timing and magnitude of flooding throughout the basins with flood inundation mapping to illustrate where flooding is forecast to occur. These FWS would be implemented by the Corporation in partnerships with appropriate local, State and federal agencies. The system will include a mechanism for disseminating information through various media on a real-time basis, providing advanced flood warning for 25 of New York State's most flood-prone counties with a population in excess of 2.6 million people in these basins.

**Training:** Selected Corporation staff attended various NIMS training courses and Owner's Dam Safety Training hosted by the Federal Energy Regulatory Commission's New York Regional Office.

#### Department of Transportation

The NYS Department of Transportation (DOT) established procedures and guidelines for agency staff to be trained in NIMS/ICS to ensure that DOT is NIMS-compliant. DOT identified agency staff to report to the State EOC in the event of an emergency, as well ICS structures in all 11 regions to support DOT response activities. Staff in those positions are required to complete the required ICS/NIMS training.



DOT participated in the following REP exercises and planning activities:

- Participated in nuclear power plant meetings, exercises and drills, including the federally-evaluated Indian Point nuclear power plant exercise, quarterly Nuclear Safety Sub-Committee Power Pool Meetings, Council of State Government National Security Administration Training Work Group.
- Worked with NYSOEM to organize PMC training at DOT's Mapleview facility in Syracuse.

DOT also participated in the presentations and training at the State EOC:

- NWS Spring and Summer Risks
- 2012 Hurricane Season Brief
- "Northern Lights" exercise
- Agency Executive training
- Disaster LAN

DOT is the chair of the Transportation Infrastructure Branch (TIB), which is defined in the Transportation Infrastructure Branch Annex to the State CEMP. The Branch was activated at the State EOC throughout Superstorm Sandy to provide its mission as laid out in the TIB Annex. During State EOC activations, DOT agency representatives compiled agency reports and provided situational awareness.

During Superstorm Sandy, DOT provided agency representation at the State EOC and staffed the TIB – these individuals worked with other agencies and NYSOEM to coordinate federal, State and local assistance to open roads, and clear and inspect infrastructure to restore travel on State and local roads. Staff around the state reported to county EOCs activated for this event. DOT responded with maintenance staff to clear and open roads, as well as let debris contracts to have contractors come in and clear debris that was beyond DOT's capabilities. DOT provided logistical support to NYSOEM from October 28 through December 7 to mobilize and demobilize equipment that was used during the event. DOT also worked with towns and counties on administration of the Federal Highway Administration Emergency Relief program that provided reimbursement on federal aid roads damaged by the event.

During Winter Storm Nemo (Feb. 8), DOT provided agency representation to the State EOC. DOT provided representatives to activated county EOCs and responded by clearing the State system. Along with NYSTA, DOT worked with towns and counties to provide requested assistance.

DOT also continued to provide logistical and mechanical support to State OEM to move assets and service stockpile equipment as needed.

#### Office of Victim Services

The NYS Office of Victim Services (OVS) participated in various training activities, including Disaster LAN and COOP. OVS has seen some turnover in staff assigned to NYSOEM and continues to evaluate appropriate staffing levels for various disaster scenarios.

As OVS is not an infrastructure agency, its role in any State EOC activation is generally limited to offering staffing support as requested. OVS offered staffing for the Superstorm Sandy response in the fall of 2012, but was not required to send staff. OVS's role in any activation would be as a result of a terror attack or mass casualty event that is not related to a natural disaster.

OVS is beginning to look at an overall continuity of operations and mass casualty response unit structure. OVS has a network of Victim Assistance Programs (VAPs) that provide direct services to victims of crime that it services. This network performs nearly all of its direct services to the victims of crime that the agency interacts with and it maintains a close working relationship with these programs.

#### American Red Cross

The American Red Cross (ARC) participated in numerous preparedness initiatives throughout the fiscal year. The partnership with NYSOEM in the Citizen Preparedness Program ended in August, one month after the contract expired. Through the life cycle of this program, all grant requirements were either met or exceeded. ARC continues with its preparedness mission to help ensure that New York State is a more disaster-resilient community.

Two AmeriCorps programs, one newly instituted and another renewed, help build capability and capacity for the organization and provide preparedness information to the communities of New York State.



More than six paid staff and volunteers participated in State EOC and Disaster LAN Training.

ARC participated in the June Executive Hurricane Exercise, followed by the Northern Lights State EOC exercise in August 2012 supporting the Human Services Branch with sheltering co-leads and staffing the agency desk.

ARC staff participated in both the State and federal REP exercises for Indian Point in September and October 2012.

ARC participated in Human Services Leadership and Steering Committee meetings throughout the year.



As a co-lead with DOH, ARC continues to work with State partner agencies in an effort to rewriting the state sheltering and feeding plan into one mass care plan.

ARC is incorporating restructuring that had taken place during this time period in to the rewriting of its State plan. This was to include the new State Disaster Coordinating Team instituted on July 1, 2012. The purpose of this team is to build capacity from the local Chapter right on up to the state level of ARC and provide short-time leadership in major responses.

ARC was requested to report to the State EOC for eight activations for the fiscal year. Three activations were for severe weather and three were for winter storms. One activation in April 2012 was for the wildfires that erupted in the lower Hudson valley and Long Island. ARC supported both the Human Services' sheltering group and its agency desk during the Feb 8, 2013 snowstorm.

ARC has switched from response to recovery for Sandy. ARC provided more than 11,000,000 meals and snacks, 3,000,000 recovery items, 29,000 overnight stays in 147 shelters, and 10,500 workers. ARC will work one-on-one with those impacted by Sandy and collaborate with other organizations in the recovery to Sandy.



## ACRONYMS

ARC	American Red Cross
BCP	Business Continuity Plan
CBRNE	Chemical, Biological, Radiological, Nuclear and Explosives
CCP	NYS Citizen Corps Program OR Crisis Counseling Program
CEMP	Comprehensive Emergency Management Plan
CERT	Community Emergency Response Team OR Correction Emergency Response Team (DOCCS)
CI/KR	Critical Infrastructure and Key Resources (CEMP functional branch)
CRIS	Critical Infrastructure Response Information System
CMP	Crisis Management Plan
COML	Communication Leader (exercise)
COOP	Continuity of Operations Plan
CPAT	Candidate Physical Ability Test
DART	Damage Assessment Response Team
DCM	Disaster Case Management program
DDC	Downstate Distribution Center (OIGS)
DPC	NYS Disaster Preparedness Commission
DPU	Disaster Preparedness Unit (DOH)
DRC	Disaster Recovery Center
EAP	Emergency Action Plan
EAS	Emergency Alert System
EMAC	Emergency Management Assistance Compact
EMAP	Emergency Management Accreditation Program
EMS	Emergency Medical Services
EOC	Emergency Operations Center
EORS	Electric Outage Reporting System (PSC)
ESR	Executive Situation Report
FAA	Federal Aviation Administration
FAST	Firefighter Assist and Search Team



FDNY	Fire Department of New York (City)
FEMA	Federal Emergency Management Agency
GIS	Geographic Information Systems
HMGP	Hazard Mitigation Grant Program
HMP	Hazards Mitigation Proposal
HRF	Homeland Response Force (National Guard Bureau)
HSEEP	Homeland Security Exercise and Evaluation Program
IMAT	Incident Management Assistance Team (federal)
ICS	Incident Command System
IMT	Incident Management Team (state)
IND	Improvised Nuclear Device
IT	Information Technology
JFO	Joint Field Office (state/federal/local)
LASER	Law (Enforcement) Active Shooter Emergency Response
LIPA	Long Island Power Authority
LIRR	Long Island Rail Road
LOI	Letter of Intent (hazard mitigation program)
MCI	Mass Casualty Incident
MFI	Municipal Fire Instructor
MTO	Municipal Training Officer
NCSP	National Center for Security and Preparedness
NFIP	National Flood Insurance Program
NIMO	National Incident Management Organization
NIMS	National Incident Management System
NLE	National Level Exercise
NOAA	National Oceanic and Atmospheric Administration
NRC	Nuclear Regulatory Commission
NWS	National Weather Service
NYCDEP	New York City Department of Environmental Protection
NYCHRA	New York City Human Resources Administration
NYCT	New York City Transit
NYTF	New York Task Force



PIO	Public Information Officer
PRD	Personal Radiation Detector
RACES	Radio Amateur Civil Emergency Service
RCGP	Regional Catastrophic Planning Grant program
REACT	Rescue Entry and Counter Terrorism Team
REP	Radiological Emergency Preparedness program
RFFT	Recruit Firefighter Training program
SBA	Small Business Administration
SHSGP	State Homeland Security Grant Program
SLMS	Statewide Learning Management System
SPTC	NY State Preparedness Training Center
SSG	Scientific Support Group
STEP	Sheltering and Temporary Essential Power program
STR	Strategic Technology Reserve (communications vehicle)
TEEX	Texas Engineering Extension Service
THC	The Nature Conservancy
THIRA	Threat and Hazard Identification and Risk Assessment
T-t-T	Train-the-Trainer
USDA	U.S. Department of Agriculture
VBIED	Vehicle-Borne Improvised Explosive Device
WMD	Weapon(s) of Mass Destruction

*New York State Agencies:*

Ag&Mkts	Department of Agriculture and Markets
DCJS	Division of Criminal Justice Services
DEC	Department of Environmental Conservation
DFS	Department of Financial Services
DHSES	Division of Homeland Security and Emergency Services
DMNA	Division of Military and Naval Affairs
DOCCS	Department of Corrections and Community Supervision
DOH	Department of Health
DOL	Department of Labor



DOS	Department of State DAR – Division of Administrative Rules DCEA – Codes and Enforcement Division DCP – Division of Consumer Protection
DOT	Department of Transportation
DPS	Department of Public Service
ESD	Empire State Development
GOER	Governor's Office of Employee Relations
HCR	Division of Homes and Community Renewal
ITS	Office of Information Technology Services
MTA	Metropolitan Transportation Authority
NYSERDA	Energy Research and Development Authority
NYSOEM	Office of Emergency Management
NYSED	Education Department
NYSP	Division of State Police
NYSTA	Thruway Authority
OCT	Office of Counter Terrorism
OCFS	Office of Children and Family Services
OCS	Office of Cyber Security
OFFC	Office of Fire Prevention and Control
OGS	Office of General Services
OIEC	Office of Interoperable and Emergency Communications
OMH	Office of Mental Health
OPRHP	Office of Parks, Recreation and Historic Preservation
OPWDD	Office for People With Developmental Disabilities
OTDA	Office of Temporary and Disability Assistance
OVS	Office of Victim Services
PANYNJ	Port Authority of New York and New Jersey
PSC	Public Service Commission
SUNY	State University of New York



*Radiological Emergency Preparedness Program*

EAL	Emergency Action Level (REP program-related)
EPZ	Emergency Planning Zone (REP program-related)
HAB	Hostile Action-Based exercise (REP program-related)
PMC	Personnel Monitoring Center (REP program-related)



# APPENDIX 2

## *Planning Process*

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**A.2a: Participant Guidance for State Agencies****New York State Hazard Mitigation Plan Update  
Guidance for Participants Providing Input**

Thank you for your assistance and participation in the New York State Hazard Mitigation Plan Update. The final, updated New York State Hazard Mitigation Plan is due to FEMA in November 2013 for review and must be approved by January 3, 2014, in order for New York State and local applicants to maintain eligibility for federal disaster funding programs – which has meant more than \$7.2 billion in funding for New York State applicants over the past three years.

To minimize the demands on your time, we are consolidating our requests for information into a series of questions, outlined below. We can gather your input/information in one of three ways:

1. via email (simply fill out your answers in the document below, using as much space as you need, and/or attach relevant information to your response and return it to [pousley@sidrc.com](mailto:pousley@sidrc.com))
2. via phone call (interview style – we'll take notes and provide a write-up for your approval)
3. via in-person meeting (also interview style – we'll take notes and provide a write-up for your approval)

We have broken our request into two main areas: Hazard & Risk Assessment and Mitigation Goals & Activities.

**Hazard & Risk Assessment**

As a partner in the Plan update process, your input is crucial to ensure that the Plan includes the most current and accurate information and data. The planning update process provides the opportunity to capture changes in hazard profiles and risk assessments based on hazard events that have occurred in the past three years.

FEMA requires that the plan address only natural hazards (not human-caused or technological). The hazards list proposed for the 2014 update includes the following:

- Flood
  - Riverine overbank flooding
  - Flash floods
  - Alluvial fan floods
  - Mudflows or debris floods
  - Ice-jam floods
  - Dam- and levee-break floods
  - Local drainage or high groundwater levels
  - Fluctuating lake levels
  - Coastal flooding
- Hurricane (including Tropical Storm and Coastal Storm)
- Coastal Erosion
- High Wind Events (Tornado and Straight-line Winds)



*New York State Hazard Mitigation Plan Update – Participant Input Guidance*

- Severe Winter Storm (including snow, ice and Nor'easter)
- Hailstorm
- Wildfire
- Drought
- Extreme Temperatures
- Earthquake
- Landslide
- Land Subsidence and Expansive Soils
- Avalanche
- Tsunami
- Climate Change

This list reflects the following changes from the 2011 Plan:

- Flood hazard – the definition has been broadened to include sub-types such as riverine overbank flooding, flash floods, alluvial fan floods, mudflows or debris floods, ice-jam floods, dam- and levee-break floods, local drainage or high groundwater levels, fluctuating lake levels and coastal flooding.
- Hurricane hazard – the definition has been broadened to include Coastal Storms
- High Wind events – this category will address both tornado and straight-line winds
- New hazards to be assessed in the plan include: coastal erosion, avalanche, tsunami, and climate change.

Each hazard will include:

- Hazard profile (characteristics, locations, previous occurrences, and potential for future events)
- Assessment of risk and vulnerabilities (by jurisdiction, and for state-owned and -operated facilities)
- Estimate of potential losses (by jurisdiction, and for state-owned and -operated facilities)
- Changes in development that could impact vulnerabilities related to the hazard

**If you have any information or data that support any of the hazards, we welcome your comments.**



*New York State Hazard Mitigation Plan Update – Participant Input Guidance***Mitigation Goals & Activities**

- **Mitigation projects** are brick-and-mortar projects that reduce or eliminate the vulnerability to a hazard. Capital investments and improvements fall under this category.
- **Mitigation activities, initiatives, and programs** are efforts that reduce or eliminate vulnerability to a hazard through outreach, public education, and other such programs. Also included are current laws, regulations, policies, and permitting intended to reduce a community's vulnerability to a hazard. For example, codes requiring construction activity in a flood zone to elevate structures above the Base Flood Elevation (BFE).

The current Plan update needs to capture all mitigation activities that have taken place over the past three years, and those planned (or that you would like to see happen) over the next three years (providing adequate resources are available).

**Mitigation Projects**

• **Current:** Please describe any physical (brick and mortar) projects in your jurisdiction that have been completed over the past three years or are currently underway to mitigate vulnerability and risk of damage to either buildings/facilities or your mission's target audience.

• **Future:** Please describe any physical (brick and mortar) projects in your jurisdiction that are planned to (or you would like to have) take place over the next three years to mitigate vulnerability and risk of damage to either buildings/facilities or your mission's target audience.

**Mitigation Activities, Initiatives & Programs**

• **Current:** Please describe any activities, programs, or initiatives that have been undertaken in the past three years or are currently underway to mitigate either your buildings/facilities or your mission's target audience.

• **Future:** Please describe any future activities, programs, and initiatives that are planned (or you would like to see happen) over the next three years to mitigate vulnerability and risk of damage to either buildings/facilities or your mission's target audience.

The following form has been provided for your convenience as a tool for summarizing your mitigation project information.



## MULTI-HAZARD MITIGATION ACTIONS

### Instructions

#### General Overview

This project planning sheet will be the method by which New York State identifies new mitigation actions being considered throughout the state. The information presented can be used as the basis for the State to prioritize its mitigation actions in the immediate future, and to determine additional measures it should undertake to improve its ability to identify and address risks.

States with a FEMA-approved Standard State Mitigation Plan can use a variety of funds and programs to achieve mitigation goals, including the Flood Mitigation Assistance (FMA) program, the Hazard Mitigation Grant Program (HMGP), and the State Hazard Mitigation Assistance Initiative (HMAI).

#### Instructions for submission

- Project mitigation actions must be submitted by close of business **Friday, September 6, 2013**, to be included in the 2014 State Multi-Hazard Mitigation Plan.
- Email completed forms to [Princess Ousley](mailto:POusley@aidrc.com).

#### Considerations

- 2011 New York State Multi-Hazard Mitigation Plan
- 44 CFR 201.4 Standard Hazard Mitigation Plan Criteria

#### Project Priority Definition

The mitigation strategy should identify a range of specific mitigation actions and projects being considered to reduce risks to new and existing buildings and infrastructure. Identified mitigation activities should be prioritized using the high, moderate, and low criteria.

**High Priority:** An action that should be implemented in the near future or immediately because it reduces overall risk to life and property.

**Moderate Priority:** An action that should be implemented in the near future due to political or community support or ease of implementation.

**Low Priority:** An action that should be implemented over time, but does not have the same sense of urgency or impact on hazard vulnerability as other higher priority actions.

Please contact Princess Ousley at [POusley@aidrc.com](mailto:POusley@aidrc.com) if you need technical assistance or have questions regarding mitigation activities.



### Project Description

The primary hazard is the one that is most significantly and directly impacted by this project. The secondary hazard is the one that is directly impacted by the project, but to a lesser degree than the primary hazard.

Primary Hazard:	<a href="#">Click here to choose a hazard</a>	Secondary Hazard:	<a href="#">Click here to choose a hazard</a>
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Project Prioritization:	<a href="#">Click here to choose a priority</a>	Project Phase:	<a href="#">Click here to choose a project phase</a>
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Agency Department / Program:	
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Project Title:	
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Project Timeframe:	<a href="#">Click here to choose a timeframe</a>
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<b>Project Summary</b>	
<p>Provide a brief project description to include risks, and/or vulnerabilities that this project is intended to reduce or mitigate.</p>	
<p>Please identify applicable federal, state or local laws, regulations and/or policies to which that this project adheres.</p>	
<p>Funding Source (Choose all that apply):</p>	<p>HMGP: <input type="checkbox"/> FMA: <input type="checkbox"/> HMAI: <input type="checkbox"/> Operational Budgets: <input type="checkbox"/></p> <p>Staff Time: <input type="checkbox"/> Other grants: _____</p>
<p>Funding Amount (Actual or estimate):</p>	



**Geographic Information System**

Does this project include an information technology (GIS) component, which includes data, mapping and/or modeling ("Yes" or "No")? Yes  No

If yes, please provide GIS point of contact information.

Name:	
Title:	
Email Address:	
Phone Number:	

Please contact Princess Ousley at [POusley@aidrc.com](mailto:POusley@aidrc.com) if you need technical assistance or have questions regarding mitigation activities.



**A.2b: Participant Guidance for Non-State Agencies****New York State Hazard Mitigation Plan Update  
Guidance for Participants Providing Input**

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- Hailstorm



- Wildfire
- Drought
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- Earthquake
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#### Mitigation Activities, Initiatives & Programs

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## A.2c: Meeting Notes

*Department of State (DOS); August 22, 2013*

### Attendees:

Barry Pendergass (DOS)

Princess Ousley

Kyrie Wagner

Fred Nuffer (OEM)

Courtney Shorter

Judy Wolf

Nancy Freeman

Tracy Smith

### General Introductory Discussion

- BP explained that DOS is a collection of functions; an arm of the executive office originally, still connected. Regarding Mitigation, DOS manages State building and fire code; supports local government planning functions. There was a statewide regional planning initiative several decades ago that didn't continue as a state umbrella due to NY being a home rule state with local governments having authority over regulation of land use, but regional planning initiatives did continue; now focused on economic development and sustainability. This creates cohesiveness, reducing hodge-podge funding.
- DOS provides training for local planning boards, town, village, city (not NYC); zoning boards, administrative programs.
- Has a Coastal Zone management program. Prior to last Oct, working on a framework to work with local communities, but then Sandy hit. Federal funding from HUD required a standardized framework statewide. Used local initiative to meet standardized framework. Local waterfront revitalization plans including saltwater communities as well as Hudson, Niagara, Finger Lakes, Canal waterfronts, etc.
- GIS products that show area of authority are on DOS web site.

### Guidance for NY Rising Community Reconstruction Plans

- Working on "Guidance for NY Rising Community Reconstruction Plans" – using guidance for assessment; simplified guidance available on [www.nysandyhelp.ny.gov](http://www.nysandyhelp.ny.gov)
- HUD money to pay for communities to do this plan. Communities impacted by Irene, Lee, Mohawk Valley floods. Future flood disasters, anticipate more communities will come into program.
- Hire consultants to work with local communities to identify priorities assets and make recommendations for mitigation.
- \$400 million in HUD/Sandy appropriation to pay for economic development and support for disadvantaged communities, but plans also looking at a variety of assets and recommending appropriate funding source for assets not necessarily suitable for HUD funding (e.g., DOT funding, USACE, etc).
- FN: Have actual applications come in? Or is it still in the planning stage?
  - BP: Just in past week, consultants selected. 102 separate communities currently, anticipate will be less than 50 in the end once combined.
- Dept of Housing and Community Renewal formally administers HUD funds
- Nine (9) consulting teams – group of consulting teams working together with diverse skills; all tentatively assigned communities, but not yet announced – all happening this week
- Not necessarily just coastal anymore. Anyone who met FEMA thresholds.



**Other programs**

- Building Code Office
- Brownfields reclamation planning and usage

**Additional Discussion**

- FN: DEC Coastal programs, how do DOS programs dovetail with that?
  - BP: For federal coastal area – Great Lakes, saltwater below Troy; have to be consistent with State Coastal. Trying to consolidate the current 44 policies to 13-14. Direct actions, funding or permit approvals (e.g., USACE permit gets reviewed by DOS). For example: USACE actions intended to reduce storm action.
  - DEC/AI Fuchs, etc – have contractual authority with USACE for coastal projects
  - DOS works with local governments – advocate for local planning involvement. Any USACE project has to include a local floodplain management plan. This has been interpreted liberally in the past, e.g., participation in NFIP is sufficient. DOS advocating for more thorough planning process/involvement.

**Community Reconstruction Program**

- Risk assessment each participating community.
- Community team plus consulting firms generate management ideas.
- First source for ideas is local HM Plan for recommendations [NOTE: This came from a suggestion made by Fred Nuffer in a Working Group meeting. State involvement in Working Group led to incorporation of local HM Plan into reconstruction initiative.]
- Management ideas sifted for practicality, beneficial outcome.
- Surviving ideas go through RA process again to assess benefit
- Ones that survive second round to be advanced for implementation go through a BCA. Memo in process on this. Ones that are capital projects will use FEMA BCA tool.
  - FN: That's been simplified for home elevations/acquisitions in past week. Will forward.
- BP: Would be interested in a B-C tool for non-capital projects (e.g., community changes to policy)
  - FN: NYSERDA is working on this. Maybe HM Plan Update team can research other states
  - NF: Actually, there's a new tool for social value we've run across (includes social, environmental, other factors). Will check and send.

**Local Building Codes**

- Local building officials are often affected by elections, which means frequent change over; often need training to understand how building codes apply, other regulations for which the locality has assumed enforcement.
  - E.g., may not understand floodplain regulations; Bill Nechamen provides a lot of education
- Coastal Erosion Hazard Area Act – can be delegated to local government (FN: talk to Sue on Fri about this)
- Ongoing need for outreach and education; DOS regularly fields questions, refers to DEC
- FN: As pointed out in past plans, NYS generally adopted International Building Codes, but because of program issues brought to DOS, DOS has shepherded specific requirements through the process to make NYS codes more strict (e.g., National codes require 1' above BFE; NYS requires 2' above BFE; discussions in place re: requiring 3' above BFE)



- NYC recently revised to 2' above BFE. NYC also relaxed zoning requirements on height limitations to allow homes to be raised above BFE without violating overall height restriction

#### Questions

- Is there a definition/determination of percent of state's population in coastal areas? Some type of data available re: population in vulnerable coastal areas?
  - BP: May have numbers somewhere, don't know how up to date they are
  - CEHA areas are defined areas – use to define exposure
    - BP: Good marker for erosion issues, but a lot of vulnerable population are on bay shores, not in CEHA
    - Irondequoit Bay is in CEHA due to friable soils, vulnerable to erosion
  - FN: Look at SLOSH models to determine maximum run-ups and use census data
    - NF: Also considered using HAZUS-MH, but doesn't do that type of hazard
    - FN: Definition of vulnerable population for coastal storms
    - BP: SLOSH not available for rivers and lakes
      - FN: SLOSH now available for Hudson River up to Troy, not lakes
- NF: You referenced planning projects and identifying community assets – any definition of community assets?
  - BP: Special emphasis on critical facilities, relied on FEMA definition for that and may have added some. Is in draft memo underway now re: Risk Assessment; encompasses social and environmental assets. Flood defense structure is not considered an asset in this definition – it's a site characteristic that is protecting the assets
- NF: Potentially some community assets might be state assets also? Or just internal to community?
  - BP: We are suggesting that jurisdictions look outside their geographic boundary to incorporate systemic risks (e.g., utilities, sewer, water district)
- Adaptation working group information sharing – thinking about how programs link together
  - FN: Once planning is completed, will recommendations be fed back to regional planning councils?
  - BP: Not explicit in the guidance, but was positively received and we want to encourage that
- FN: Local plans have not been mined to date – Mitigation has not had staff to do it
  - Recommendation – not only do this, but tie results of initiatives like Community Reconstruction back into HM plan vs. recreating the wheel
- DOS administers \$20 million/year in grant funding through Environmental Protection Fund (EPF). Apply through State's consolidated funding application. Communities not eligible for Community Reconstruction project due to impact threshold requirement may be eligible for other funding
  - Draft/final done by March – then make planning program available to other communities.
  - FN: Pots of money – some specific to e.g., flooding issues, redevelopment; might be good in Plan to define pots of money, what they can be used for, how it fits in with HM – e.g., EPF carved up by agencies, each prioritizes it themselves, many geared to flooding issues
- Changes in development or development impacts? Anything in past three years?



- NYS doesn't really grow that fast; population grows ~2%, but development density goes down; over the course of time, people are spreading over the landscape, impacts watersheds and worsens flooding due to impervious surfaces
- NF: How about coastal areas? Any spikes in development?
  - BP: No spike, but yes, continuing demand for coastal real estate; e.g., Fire Island got rebuilt quickly after Sandy
- DOS projects/activities over next three years?
  - Just finishing up climate action plan for the City of Albany. Want to use this as a template for other communities.
- NF: Last plan had a list of waterfront revitalization plans from 2010. Is there an updated list?
  - BP: Probably. Will look.
  - NF: Found a Feb 2013 list on the web. BP: Probably the most current info.
- NYSERDA projects underway – EMEP (environmental monitoring, evaluation and protection) – will be very helpful
  - NYSERDA has been a boon for agencies due to funding raised through utility surcharges. Funding initiatives, informational efforts in addition to brick & mortar projects
- Drought – water levels on Great Lakes extraordinarily low right now. May start affecting water supplies, etc. DEC will have info.
  - FN: Might want to identify and talk with DEC individual re drought as well
- Extreme precipitation events have gone up about 67% in NYS. Inland water bodies, inland rivers can't carry volume. Art DeGaetano at Cornell studies, climate science. Mark Lowery and Kristin Marcell will have info on this (DEC).
- Syracuse Univ, Buffalo, Cornell, Columbia – working on tapping into and funding studies
- NF: risingsea.net – study by Tansky 2008. Likelihood of Shore Protection in NYS. Table of land above 1m above Spring High Water with ratings. Valid info?
  - FN: Stay away from studies that haven't been vetted by state agencies. Could hold up approval process. Plan should be neutral on controversial topics.
  - BP: EPA – Jim Titus – climate change studies. Tansky fed Titus's work. NY Sea Grant.
  - FN: Focus on trying to identify communities at risk now and using info we've been able to gain from science studies predicting sea level rise and additional communities/populations at risk. Various agencies have studies that already identify/address that.
  - Mark Lowery will be able to point us to reviewed and approved studies/sources.
- Send copy of document created by team to BP. Also send BCA program update from FN.



*Department of Environmental Conservation (DEC); August 23, 2013***NYS Hazard Mitigation Plan Update****Meetings with Department of Environmental Conservation****August 23, 2013****Attendees:**

Alon Dominitz, PE

Amanda Burnett

Princess Ousley

Susan McCormick, PE

Nancy Freeman

Tracy Smith

Fred Nuffer (OEM)

Julie Lam

Judy Wolf

**Dam Safety – Alon Dominitz****General Introductory Discussion**

- AD: Copied FN on CRS form sent to FEMA a couple months ago? FN: Yes, I believe you did. AD: Is this part of CRS (Community Rating System)? FN: Separate thing. HM is stand-alone. CRS is strictly part of NFIP.
- AD explained the Bureau of Flood Protection & Dam Safety is a mix of regulatory (dam safety) and operational (flood control). Dam Safety reviews and inspects dams, reviews permit applications for construction of dams, activities to ensure safety. Includes proper emergency planning in event of failure. Flood Control section partners with USACE to build and operate various flood control facilities. By statute, requires local partner with USACE constructing. Stand finds local partner to do flood control project. Some state responsibility for maintaining and operation. Law change shifted to local responsibility, or state contracts with locals to do work.
- Over 100 flood control projects in NYS, over 5000 dams. In 2011 Plan.
- Flood control projects we're talking about are all USACE projects – there are others.
- JL discussed location data w/AD. Anything restricted? AD: We've been releasing it for years. FN: Are local EMs aware? AD: Have interacted a lot with FEMA Region 2 – don't know re county officials. FN: Will ask Dave.
- Dams themselves are a mix. FERC licensed, privately owned, publically/municipally owned, energy (hydro), state-owned.
  - JL: Have all been broken down/classified somewhere?
  - AD: 2/3 of dams have that field filled in.
- FN: Describe authorities you have.
  - AD: Inspect dams. Planning schedule. High hazard dams every 2 years; medium hazard dams every 4 years. Low hazard dams no regular inspection; usually in response to complaints. Larger ones we try to inspect on a minimum 10-year cycle. For past several years, we've met our inspection schedule goals; for past four, we've exceeded them.
  - Field component: Inspections are visual. In 2009 issued stricter requirements. EM Action Plans must be filed with DEC and local EMs. Inspection and maintenance plans must be provided upon request. Annual certifications required. Must demonstrate diligence in monitoring.
- Engineering standards must be met (e.g., spillway that passes certain size floods, stability, etc)
  - We review what we know, follow up on deficiencies
  - If not successful, will follow up with an enforcement case, usually settle with a consent order. Some in hearings. Had two recent positive orders that can be identified in the Plan (they're settled/public).
  - FN: Note force of powers – have successfully mitigated a hazard.



- AD: In process. Order has been issued with a schedule to get that done. If owner fails to follow order, DEC can carry it out (funding is available, ~\$1 million, to carryout work) and recoup costs.
  - FN: Important aspect: State has funds available to carry out that order (not just a paper threat)
- FN: Has State come up with funding recently to do work on its own dams?
  - AD: NY Works. ~\$11.5 or 14.5 million. DEC owns the most dams (~500) in the State. State owns about 68 high and 79 intermediate hazard dams.
  - All DEC high and intermediate hazard dams are being assessed. A couple are scheduled to be worked on this year. Some go into remedial action this fall, others completed next year. Currently identifying and prioritizing needs.
  - Tom Miller is person to contact if web site doesn't have enough detail
  - AD can provide web site address [JW note: AD could not find it].
- FN: There are other State dam owners. How deal with and address deficient dams?
  - AD: Canal Corporation is second largest State agency dam owner. Parks also has many. Dept of Corrections and other agencies have some as well.
  - FN: Reach out to them.
- FN: What is the process to validate federal inventory?
  - AD: Periodic process for doing that. Every two years, submit our inventory that meet certain criteria to USACE. USACE creates a national inventory of dams. Serves as a quality check on our own data.
- 2009 regulations require emergency action plans for all high-hazard dams. 96% of high hazard dams in NYS meet requirement. Excellent compared to rest of country. Verify figures – there is a document. [JW note: AD verified]
  - 400 high-hazard dams in NYS – 96% with plan
  - 681 intermediate hazard dams in NYS – 47% have plan. Need some effort to improve things in the intermediate hazard area.
- USDA built flood control projects with no state involvement. ~30 dams. Build with local county (typically soil and water conservation). DEC inspects, but no state ownership component.
- FN: Schoharie County – Gilboa Dam
  - DEC regulates them for dam safety. Significant concern for residents in Valley. Local press attention. NYC owner of dam. Concern during various flooding events.
  - Engineering reports whether dams meet criteria. This particular dam report (engineers tend to be conservative) showed that for the design event, stability factor <1, so dam could fail. For the record event, it came close to 1, so came close to failing according to analysis.
  - NYC has done interim anchoring project to improve stability. Started in 2005 or 2006. Completed after last update. There is also a longer-term project to improve stability.
  - Installed warning system and telemetry instrumentation within the dam to report possible movement of structure. Activated during Irene, was said to have saved lives.
- Dams with release warnings at dam (gates opening for releases, warns people fishing downstream, e.g., West Canada). This is the only one AD knows of with warning system tied to instrumentation in NYS.
- Crest gates – NYC DEP snow pack mitigation plan in some of their reservoirs. Plan 2011 negotiating with NYC and other partners outside NYS (PA, NJ, DE) to adjust reservoir levels within Delaware portion of water supply especially (systems for NYC). West of Hudson systems and especially Delaware – agreement among parties to release water before Spring runoff



depending on snow pack, water shed, calculations of snow pack water content, etc. Draw down reservoir in winter months to establish water level they can absorb.

- Crest gates – will become part of that program on Gilboa Dam.
- TS: What counties are you most concerned about with vulnerable populations?
  - AD: Every county has high hazard dams. Most in downstate area – denser populations, more water supply.
- FN: Any recent analysis of impact of dam break?
  - AD: EM Action Plans require inundation analysis
  - NF: Identify population impacted? Evacuation details?
  - AD: Varies plan to plan; not typically population at risk statistics, but there are maps
  - FN: If being done anywhere, likely Schoharie Valley
  - JL: Maps in plans on bookshelf you mentioned? Raw data?
  - AD: Some yes, some no
  - TS: Available here or electronically?
  - AD: Sent Dave DeMatteo two disks with information, mix of PDFs and other formats
  - AB: NYC dams – is it okay to have in plan?
  - AD: Public information – on NYC web site
  - AB: 2011 plan talks about programs. Any other initiatives underway or planned?
  - FN: Project priority list for \$11.5 (or \$14.5, whichever it is) million. Deadlines?
  - AD: Next year. Got more funding for flood control and coastal erosion. NY Works. All state money. Coastal erosion may go toward state share of federal projects. Sue McCormack can tell us (USACE Continuing Works)
- JL: GIS information?
  - AD: KMZ file is up to date; can send raw data if you want to make your own. Dan O may have it also.
- JL: Engineering standards – state or federal?
  - AD: Each state has its own standards. Federally suggested guidelines, but not 100% followed.

#### Coastal Erosion Management Section – Sue McCormick

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- Section is very small – three engineers as of three weeks ago, two prior to that
- Two sides: regulatory – Coastal Erosion Hazard Area (CEHA) which is permitting under Article 34 of ECL. Part 505 of 6 NYCRR. Other side is the work we do with Army Corps of Engineers.
- Anyone who wants to construct anything in erosion hazard area must come to DEC for permit
- 86 coastal communities in program; half managed by local building department (42); 44 are regulated by DEC.
- How determine in CEHA area?
  - Mapping – law provided to develop maps of CEHA with updates every 10 years. 1980s was the last map. 1.5 years ago, scraped up money to start map update. Two consultants making all new maps. Lakes Erie and Ontario done, but not public outreach component yet. Moving into public outreach phase. Increases restrictions on what can be done, so may encounter resistance/delay.
- Mapping is key to the program. Working with maps that are 30+ years old. Nothing digital. Mylar map with pencil lines. Can email JPGs of scan – grainy, unusable.



- Governor's 2100 Report/Resiliency Plan talks about CEHA, remapping need, need to strengthen the law and regulations.
- Regulations are very specific. Variance process, strict criteria to be granted a variance. Right now two staff are handling CEHA as a result of Sandy. General permit issued after Sandy for work in tidal wetlands and CEHA; 1400 applications came in under general permit; many projects are stretching the limits of the general permit – 30 consent orders under consideration in NYC
- Regulations themselves – Part 505 – in process of rewriting them, cleaning them up and hoping to strengthen to build resilient (e.g., piles above floodplain on addition). Started working on prior to Sandy, started resurrecting/rewrite yesterday. A good year away from first draft – anticipate late 2014 for draft. Lengthy process to get regulation revised. Late 2015, early 2016?
- JL: Sand dunes?
  - SM: other side of program is dealing with USACE shore protection program under the NYS Shore Protection Act. Law allowed State to partner with USACE on projects to protect shoreline. State as non-federal partner in USACE projects.
- Prior to Sandy, many projects. Many feasibility studies, e.g., South Shore Staten Island, Long Beach, Fire Island to Montauk Point (FIMP), Lake Montauk Harbor, Bayville and others. Project lined up in Seagate area of Coney Island and several inlet projects.
  - Budgetary constraints slowed projects for years. three months ago, went into high gear due to \$51 billion provided to USACE for shore protection projects. \$2.1 billion allocated to USACE for civil works NYS projects. 100% federally funded, no cost share.
- Three breaches in Fire Island by Sandy – two repaired right away. Changes made after '93 breach in West Hampton Dunes, took out 100s of homes on barrier islands took two years to close. Breach Contingency Plan outlined exactly what National Parks, State, USACE would do, how to respond. Post-Sandy, Cupsogue County Park and Smith County Park breaches took two months to repair. Third breach on Fire Island in wilderness area – will be monitored, but no duration specified. Has become a massive inlet into Great South Bay. Some engineers believe it should be closed – storm could impact Long Island. Natural Resources, Nature Conservancy and others believe it should be left open, habitat, flushing, etc. Law suits now threatened in both directions. Regulation recently found that must do full EIS, which Park Service has agreed to do, but has no money to complete. State has directed USACE to do everything necessary to be ready to close the breach at a moment's notice. Currently starving the west side of the breach, which is getting bigger.
- Feasibility studies – amending agreements with USACE and local partners to make them zero cost share agreements. On an expedited schedule to get them done.
- Construction and design will be cost shared (But will have 30 years to pay non-federal share – normally 100% up front. Awaiting OMB guidance on payback period.
- Timeline for ~8 projects, e.g., \$350 million South Shore of Staten Island – 13-mile stretch, sea walls, dunes, levees, bigger beaches. \$100 million Long Beach – protection for City of LB, Town of Hempstead, Nassau County, Point Lookout.



### Projects

- Oakwood Beach area of Staten Island – looking at wetlands as a buffer instead of 26' seawall. Notice to proceed on feasibility study will be issued next week. State paying for it. Nature Conservancy asked for it.
- Staten Island – Northern 13 miles Fort Totten to Oakwood Beach. 13-mile stretch feasibility – USACE aiming for 2014; 100% federal likely. Phase 2 another 10-mile stretch, mostly bluffs (stabilization).
- Housing Community Renewal (State agency) – offers buyouts to homeowners for wetlands. Need 80-90 more buyouts to make it happen. 187 have volunteered. Need ~300 total. Monies out of block grant.
  - Set up meeting with Housing Community Renewal?
- Waiting on maps from HCR – whole community Fox Beach, Oakwood Beach – streets obliterated. Biggest area in NY for buyouts – Sandy.
- NYC Coney Island – Public beach. USACE project built in 90s. Held up well in Sandy. After Labor Day, ~400k cu yds pumped onto beach to bring back to design condition. 150' wide, protected community. Very western tip = gated community called Seagate. Bulkheads destroyed, 100 homes destroyed. Project to build T-groins and replenish beach at Seagate. Now 100% federal construction and going to bid in October. Agreement with NYC and USACE, but 100% federal. Four T-groins, 130,000 cu yds sand relocating to fill in groin compartments.
  - Sue just updated summary today. Will send.
- No information online except CEHA. Sue to send link to USACE web site with project descriptions.
- Rockaways – city lots of emergency repairs; trap bags (geotextile). Boardwalk destroyed. Putting 3,500,000 cu yds sand back on Rockaways done Jan/Feb. Exploring permanent solutions – end of 2014. Study completion is 100% federal.
- Long Beach, Nassau County – feasibility study - # years, completed Spring 2014. Dune and beach system – western Long Beach to Port Lookout on Jones Inlet. May be 100% federal on construction.
- Sandy Relief Bill had categories:
  - Feasibility studies 100% funded
  - Authorized but unconstructed projects 100% funded?
  - Authorized and something = 100% study but shared construction – see the Interim Reports for these details.
- Sue to send:
  - Interim Reports #1 and #2 from USACE [done]
  - Coastal update [done]
  - USACE link [done]
- Entire island of Long Beach underwater after Sandy. Bill Nechamen working on inundation maps.
- Fire Island – barrier island moved as much as 70' north by Sandy. Almost all dunes lost. More overwashes during winter storms. Threatens mainland as well as communities on Fire Island. Increased flooding over winter.



- USACE emergency project pumping sand by Jan. Smith Point County Park. Robert Moses State Park.
    - Ask Parks & Rec about Robert Moses. Has done a lot of interim work – sand pumping – in April/May
- Middle Fire Island – to rebuild dune, must buy property. Will have unwilling sellers. May need to use eminent domain. Meetings with county and towns. Third phase of construction will take some time. Have formally requested USACE to take real estate.
- Westhampton emergency project – 90s big breach. Dunes and beaches in good shape after Sandy. 900k cu yds ocean sand to rebuild impacted dunes and beaches.
- West of Shinnecock Inlet – brought to pre-storm condition in late 2012; plans to bring to design condition in Fall 2013.
- Downtown Montauk – interim emergency project to provide protection; plan in process
- Lake Montauk Harbor – jetties in harbor causing erosion 40 years. Homeowners have sued to have DEC bring back beach.
- Hashamomuck – Segment of beach. No homes, beach eroded to county highway. Study to determine how to address/protect highway. Fast track USACE study – two years (normally takes 5-7)
- Asharoken – Spit that sticks into Long Island Sound, faces East. Historically hard hit. Study half done. Construction cost will be cost shared – village, state, USACE. Large dune structure – 600k cu yds sand from Sound.
- Bayville – Low lying; Bay on one side, Sound on other. Village floods. USACE halfway through study to see what to do to protect community. Will be cost shared – village, state, USACE.
- FIMP – 83 miles; comprehensive study to look at coastline. 1960 ongoing – very controversial, funding up and down over time. Sandy bill \$700 million to complete study and do construction. Required to have local partner; just got last week – Suffolk County just agreed to be local sponsor (no cost share for initial construction).
- “Building Resiliency” – whole agency theme – coastal, floodplain especially
- CEHA – any new construction in hazard area. One requirement must prove they’ll be safe from flood and erosion. Build to state building code (e.g., piles). Having issues with contractors – have gone after homeowners, now going after contractors themselves.
- Part of overall FIMP - \$500 million out of \$700 million is for mainland Long Island home elevations. 4400 homes (estimated) to be elevated under that program. Planning to prequalify contractors as part of that program. Anyone in 10-year floodplain would be offered elevation as part of FIMP plan.
- Some reconstruction going on, not allowed in CEHA. CEHA regs do not contain injunctive relief. All DEC can do to someone building without a permit is slap a penalty (\$1k/day). Law needs to be strengthened – higher penalties (e.g., \$10k/day/infracton), injunctive relief.
- NF: Checked 2011 maps
  - SM: CEHA maps have nothing to do with water. Based on natural protective features.



- 2012 LIDAR – Great Lakes; oblique and aerial imagery. USACE, USGS, NOAA did LIDAR studies post-Sandy. Should be in State GIS library. DEC didn't have recent ortho, so hired Pictometry – NYC, Westchester – ortho & obliques. Sue could share imagery.
- NF: Others sources of information. Things that exacerbate erosion, e.g., climate change. Source NF found was Titus NY Sea Grant Study & Tanski.
  - SM: GIS person recently did map showing # parcels property that would be added/removed from jurisdiction, with new maps (Great Lakes only)
  - SM to send any statistics re percent shoreline that could be erosive and eroding/has eroded over last 30 years.
    - Shoreline erosion rate analysis. Anything greater than 1' over 30-year span is mapped as a structural hazard area. Now finding areas of that on north shore of Long Island. Also Lake Ontario – areas that have increased significantly.
- Requested historical listing of erosion events – specific details re major events, pattern through time. Sue to send contact/info if she runs across/thinks of who.
- Study re: hot spot in Atlantic for sea level rise – Sue to send article. Cape Cod to northern NC. Sea level rise faster there than anywhere.
  
- FN: DEC Division of Water has a role in Drought, but don't know that anything's changed significantly since 2011. Drought Management Task Force that's supposed to be headed by OEM. Ask RL who that head is.
- DEC has strengthened its regulatory authority on water taking (supply management). Runoff into Great Lakes has decreased significantly over past several years – climate change vs. temporary blip? Any studies?
  - NWS – Brit Westerguard – studies? Definitive science?
  - Amanda Stevens – NYSERDA studies re climate change
- Health Department also sits on Drought Management Task Force.



*Department of Transportation (DOT); August 27, 2013*

**NYS Hazard Mitigation Plan Update  
Meeting with Department of Transportation  
August 27, 2013**

**Attendees:**

Elizabeth Lennon (DOT)	Lynn Weiskopf (DOT)	Courtney Shorter
Mary Anne Mariotti (DOT)	Amanda Burnett	Tracy Smith
Arthur Sanderson (DOT)	Princess Ousley	Judy Wolf

- Mary Anne oversees FHWA-ER and FEMA PA programs; Lynn and Elizabeth are Office of Planning Policy, including Sustainability & Mitigation; Art is Office of Design, including Climate Change considerations
- 2011 Plan information verified as still ongoing and valid
- Doing research re: risk assessment
- New investment strategy – preservation strategy; started two years ago; Sea Crest looking at all assets – bridge and highway are the main focus. Bridge preservation is emerging as strongest in terms of how addressing it. Bridge preservation forms. Funding is state and federal (limited, but there).
- DOT was active in the post-Sandy governor's commission – operations/mitigation – played an active role in 2100 Commission, report issued in Jan.
  - Floodwatch program
  - Bridge inspection program
- Took inventory for parts of department – what's already being done, identifying potential vulnerabilities
- Scour critical bridges – looking at how to address most critical
- Keeping up with operations addresses lots of issues
  - Funding is always an issue; constant prioritization
- DOT has strong EM response team – any hazard, 24/7 availability; intra-agency responses; repairs; opening roads
- Commissioner's interview – Ashto Center for Environmental Excellence Climate Briefing (international climate briefing newsletter) August 2, 2013, issue. (JW note: non-DOT employees cannot access newsletter on web site, sign-in required)
- Commissioner is head of Ashto Climate Change National Committee
- Strong recommendation from 2100 Report – continue with vulnerability assessments
- From 2011 Plan: "Research project to mitigate number of bridge impacts well underway" – any update? Discussion re: may have been truck impacts.
- Some discussion regarding whether to check with Long Island people re culverts – what doing post Sandy? Regular cleaning project? Daily work plans include cleaning and maintenance of culverts.
  - Suggestion for a project: using funding for consultant to do maintenance work due to resources lost over past few years
- Hazard mitigation usually focuses on repetitive areas. Can also look at funding sources (e.g., HMGP, PDM).
- Pull projects out of 2100 Commission Report
- Vulnerability assessment – identifying areas prone to flooding now and future due to climate change. Future planning projects to take climate change into account.



- New York State Flooding Vulnerability Study – started process of assessing vulnerability; process is finalized. Started work in Region 8 (Poughkeepsie) – gave them paper maps for verification. Looking for future protective risks.
- Hydronics – shows how Sandy event could happen annually in 2100
- Compiling past vulnerabilities and future; asking questions like “If flooding got worse, where would those locations be?”
- Product will be GIS layer showing locations for use by planners/designers for new projects
- New development areas on state highways
- Feeds into capital programming process – locations to be addressed – extreme weather vulnerabilities (e.g., Rte 20 at mall – flooding – attempt to be proactive in identifying areas)
- Regions know where they are, but not yet documented in plan form
- By next year, will have GIS layer to feed into process
- TS: List of areas identified available yet?
  - DOT: Yes a small portion. Can provide work plan, questions being asked.
- TS: Besides flooding, what are your second and third most significant hazards?
  - Intense inland precipitation – flooding
  - Sea level rise – flooding
- 2100 effort – looked at all types of hazards
- Landslides – work goes on to identify vulnerable slopes; statewide each region has a list of slope instabilities, plan in place to monitor.
  - Geotech engineers would have to provide a list/map (maybe GIS layers) – not online
- Retrofitting bridges for earthquakes
- Intense standards re: high wind events – past 10 years, changed design for sign structures
- Biggest flood vulnerability = intense coastal storm – will get worse with climate change and sea level rise.
- Get most damage from inland flooding.
- Not super vulnerable to coastal erosion – inundation is the biggest issue; most roads held up well after last storm.
- DOT suggestion: Consider interviewing NYC DOT
- NY Rising effort – up to 43 or 48 community plans to do inventories, risk assessments
  - Governor’s initiative, available online (guidebook, list of communities)
  - Kick-off meeting was in July – support from State DOS, DOT planning staff
  - Funding = CDBG? ~\$400 million; State resources to get plans in place
  - Post-Sandy funding to get prioritized
  - Deadline to complete is March 2014
- FHWA Pilot Program – Lake Champlain – vulnerability assessment; pilot; study of adaptation measures
  - USGS stream statistics model – Expanded Stream Statistics Tool – for rainfall intensities predicted with climate change
  - Nature Conservancy also involved
  - Determine stream flow for different risk storms
  - Planners/designers could use model for future year to determine future vulnerability
- #1 – Flood; #2 – Hurricane & Coastal Storm; #3 – Winter Storm, but more response than mitigation (make sure we have enough equipment, trained personnel, etc)
- DOT does a lot of work trimming trees to minimize storm damage



- Trying to prioritize scour-critical bridges (DOT will provide information)
- Third study: NY-NJ-CT Study – vulnerability assessment related to impacts from Sandy, tri-state/metropolitan area; Sandy and preceding storms, methods of rebuilding to deal with event; assess how infrastructure performed; selected 10 representative assets to examine in greater detail (e.g., moveable bridge, fixed bridge, tunnel, highway sections); take a detailed look at the engineering standards for these assets and come up with adaptation strategies.
- Have done a lot to upgrade/update communications technology – 301 traffic travel info – be able to provide current, detailed information. TMCs have come a long way – 24/7 coordination and response across the State. Built capacity for rideshare matching, etc. Working nationally on vehicle technologies.
- NYSERDA funding – Cornell study looking at down-scaled intense precipitation models – normally models are on a large scale (e.g., 200 miles x 200 miles); this study focuses down to the regional level within NYS (e.g., 50 miles by 50 miles). Allows update of design standards for 100-year event models. Aiming for end of 2015.
  - Needed to look at changes in design for bridges, culverts, etc.; need to help engineers determine future stream flows to design culverts, bridges. Expected to last 75-100 years. Want to accommodate flow at the end of their design life, not just the beginning.
- Asset/Risk Assessment – FHWA pilot – asset management plan
  - One requirement in federal legislation is to have a risk-based asset management plan in place by end of 2016.
  - NYS is a pilot state; consultant working on risk assessment, risk registry, as part of developing plan; should be in place by May 2014 – being written now
  - Work plan is online (FHWA web site)
- Herkimer flooding – FEMA kickoff meeting yesterday
  - Various sites, ~ 400 sites; quite a few sites where HM was done
  - Governor's executive order directed DOT to help out locals
    - Replace culverts, stream work, retaining walls to mitigate future problems, improving infrastructure/culverts; roads held up well.
  - Washouts, increased culvert size; working on local system was challenging (communication, etc).
  - DOT performed hydraulic analysis for local communities.
  - DOT was asked to assess sites; in many cases no action taken so far.
  - Early coordination is better; outreach efforts; region did a lot of coordination.
- Work with neighboring states
  - I-95 Corridor Coalition, CONEG, NASTO
  - Share best practices following extreme weather events (largely response oriented, but coordination is good)
  - Involves Operations DOT, local programs people – discussing recommendations to make at a federal level
- FHWA delegates bridge inspection to NYS DOT; biannual inspections
  - If bridge owners fails to respond to flags, DOT can close bridge regardless of ownership
- List of projects sent to Governor's office (Lynn to check and send)
- Mary Anne to send list of Public Assistance 406 hazard mitigation projects
- For GIS, Kevin Hunt can tell Julie what's available. Email any questions to Elisabeth.
  - There's also a NYS ITS GIS group that may be helpful
- NYSERDA does a lot of studies, has a pot of research money



- 2-3 years of climate change working group meetings; one product of meetings was LIDAR mapping along the coast, which is useful in mapping vulnerability models
- Large statewide effort – NYS Climate Action Plan (started in 2009; draft interim report 2011); looks at all sectors across the board (e.g., water resources, agriculture, technology, etc); infrastructure, mitigation included
  - Interim draft available on NYS DEC web site
- ClimaID report – also funded by NYSERDA
- Sea Level Rise Task Force – required by legislation
  - Report published Dec 2010
- DOT is also part of national research agendas; e.g., working on integrating climate change into pilot for risk-based asset management
- Establishing building blocks to support risk-based asset management (RBAM) and decisions made through RBAM
- Assets being tracked in GIS systems; bridge database includes all local bridges as well as state assets; culvert database also
  - Bridge = any span over 20'
  - Large culvert = 5' to 20' span
- Chosen for studies:
  - Coastal bridges in Long Island
    - Costly to replace
    - Time consuming to replace
    - Economically devastating to lose
    - Jones Beach area, Robert Moses Causeway to Fire Island; two combination bridges; Jones Inlet area, Loop Parkway, Meadowbrook Parkway
  - Highway segments
    - One near Indian Point (nuclear plant) and Camp Smith (military base), Route 6/202 intersection near Peekskill
    - Repetitive flood, more frequent (high tides seem to be getting higher)
    - Critical for evacuation route and access to two critical assets
  - Sawmill River Parkway
    - Regularly floods; carries 70,000 cars/day
- Statewide flooding vulnerability
  - Ask what happens if this road is closed for one day, two weeks, etc; detours available? Evacuation route? Etc.



*Office of Fire Protection and Control; August 27, 2013*

Notes:

**Office of Fire Protection and Control**

8/27/2013

**Meeting Attendees:**

- Andrew Dickinson
- Donald Fischer
- Judy Wolf
- Tracy Smith
- Princess Ousley

**Donald Fischer**

The Firewise program primarily addresses the wildland urban interface (where the woods stop and development begins). DEC's website should have more information. The program has been in existence elsewhere in the country for a long time, but is in the formation stage in New York State.

- Somewhat of an ad hoc committee of state agencies and some non-governmental partners.

The Firewise Communities program is an attempt to mitigate the hazard as far as fuel load goes. Clean up around your own house and neighbor's home. There is one in New York State in Cragmoor in Ulster County. Working with NFPA to push that program.

- Cragmoor is the first and only Firewise Community in New York State.
- Firewise from the NFPA is a program with a pretty good history, just began in New York State within the last two years.
- New York state building codes reference one of the ICC codes on wildfire protection.

What is the probability of future wildfire events? DEC gets into the fuel management part of it. Vulnerability by jurisdiction would be more DEC.

The Firewise program takes you outside of the building to tell you what you should do outside your building to protect it. It focuses slightly on building construction like using metal roofs and not using wood shingles/siding.

- Clean leaves and pine needles out of house. Property maintenance issues, really.
- Very limited; looking at defensible space.
- 30 feet from building you should have very few shrubs, no brush.
  - Grass is good open space.
  - 30-100 feet should be thinned out quite a bit.
- Looks park-like when done.



Firewise has been out there for years; however, been sparked in New York within last 3 years.

The agency involvement has gotten more serious because of Dave Russell, Forest Ranger with DEC, serving as the spark plug of the project. NYS has gotten a couple of grants and acquired a trailer, video tapes, pamphlets and handout material.

- The project has a huge community education component
- This summer was the first time we had an opportunity to really push it.
  - We put information out there and if there was an interest in the community then we went in and provided support. If there was no interest then we just provided the information.

Andrew Dickinson

There is a codes division within the State of New York that is in the Department of State. We inspect selected state agencies and all college campuses regardless if state or private.

- 20,000 state assets.
- 15-16,000 buildings a year.
- The college buildings and the office of general services

OFPC has three branches with training and operations as a part of inspections and investigations, which is 1/3 of organization.

Donald Fischer

How much overlap with training with DEC folks?

- Train together on wildfires.
- Co-work with their rescue course. Also with the wildlife and fire suppression course.
  - Rangers teach the course, but we developed it.
- Worked with them to create the program.
- DEC teaches the course and OFPC provides support (print workbooks, that sort of thing).
- Talking to DEC about updating the course. Written independent of Federal courses, which are 5-190 and 5-130.
  - What they call a "Crosswalk" – Wildland firefighting for structural firefighters.
  - Continue prioritization even in basic courses to have wildfire components in standards.
  - There are wildfire components in the career standards, but there is no volunteer standard. In the career standard, there are pieces in there about wildland training standard.
    - That is a career firefighter standard and not volunteer.
  - This is the first major update since 1984.
  - Recommends - small upgrades every 5-6 years.



Wish list related to past mitigation activities and looking forward in the next 3-5 years?

- 24,000 dollars a year annual grant recently turned into a 6-year grant.
  - Federal grant that comes to DEC
- Bulk goes to rural fire departments.
  - They get a very small piece of it to fund some of the training courses that particularly relate to wild fires.
- ICS training that we do as normal business is a project we would certainly want to continue.
- Continue to prioritize firefighter training and fire suppression equipment.
- Explore new training courses; incident command goal (from 2011 Plan) has probably been accomplished.
  - They are pushing out a lot of incident command courses.
  - Wildland-urban interface and specialized wildfire course, behavior course.

DEC operates a lot of campgrounds and has a lot of buildings in the woods. Syracuse School of Forestry has some remote facilities up in the Adirondack. Facility on Cranberry Lake Biologic Field Station. Pack Demonstration Forest in Warrensburg. Harriman 3-room sheds in the woods. There are a lot of buildings out there that are vulnerable (they are state property). With budget cuts, the department can only do the bare minimum.

Ready Set Go. Ready Set Go originated in Australia. If you are in wildfire season, and you are in an area that is prone to wildfires residents should have a back pack, emergency information, prescriptions whatever stuff you need. Full tank of gas and have backpack. When word comes, throw bag in the car and get going. Ready set go is just starting to happen.

Most important thing is to update our training program.

- Increasing the amount of education that Firewise provides.
- Multiple spots within the state that have communities that are at risk.
  - All around the state you are getting the "Mc Mansions" in the woods, they keep pushing in. One of the first things they want is seclusion, which means you keep all the trees and the brush so that no one can see their homes from the road. Fortunately a lot of New York State is hard woods and they don't burn well.
  - Andy Jacob would be a perfect person to talk to. He intimately knows the fuel composition of the entire state. Last fall went down and met with Fire Barrens Commission and spoke about risks.
    - It's in Long Island and flows into New Jersey.
    - Major wildfire in 1993 - 3000 acres.
      - Everything has pretty much grown back to what it was prior to the fire.
  - Last spring was extremely dry. Fire danger was extremely high. We had a few small fires, but they were jumped on quickly. Everyone learned from 1993.
    - Tamarac fire lost 40 structures
      - That was not in the wildland-urban interface.



- It was more rural New York.
- It was windy and dry; met climate conditions.
- That was Easter weekend of 2012. DEC would have the details. That is where you would see the DEC-local partnership.

Recent conversation this past winter: Met with National Guard about their response to wild fires. What support they could offer and resources they could put into the mix. They have in the past been helpful, but they wanted to be more forward leaning. It's a new initiative, but has no name. Andy Jacob met with them last. National Guard has people, trucks, and helicopters. They can count real exercises as trainings, and they are required to do trainings.



*Department of Environmental Conservation (DEC): Floodplain Management; August 28, 2013*

DEC

Floodplain Management Notes

Wednesday, August 28, 2013

**Meeting Attendees:**

- Bill Nechamen
- David Sherman
- Amanda Burnett
- Julie Lam
- Princess Ousley
- Courtney Shorter
- Tracy Smith
- Kyrie Wagner

Routine Program

**Flood Protection and Floodplain Management**

The Department works with communities throughout the State in finding ways to reduce or protect against physical and property damage caused by flooding. The DEC works on structural flood control projects to prevent flood waters from damaging communities, but the Department also helps communities establish sustainable floodplain management programs to mitigate the potential for flooding. The DEC works with communities participating in the National Flood Insurance Program (NFIP) to administer local regulations and building standards for flood damage prevention.

- Responsible for working with approx. 1490 municipalities (town, city or village) to ensure compliance with the national floodplain program. This is done through a FEMA program called Community Assistance Program State Support Services Element (CAP-SSSE).
- FEMA CAP-SSSE grants are implemented in a number of ways. DEC recipients receive help participating in the national flood insurance program, where DEC serves as a resource to them.
  - Community assistant contacts (CACs) work with municipalities and conduct reviews to determine how recipients are implementing the program.
    - 30-40 phone interviews and brief on-site visits a year
      - When scheduled, it is a telephone interview with community officials that might last an hour or so. Providing an overview of the program and determining the level of understanding.
      - We reach out to smaller communities that haven't heard from anyone in a long time.
      - Many communities don't realize they participate in the national flood plain programs and don't know what their responsibilities are.



- Workshops – DEC’s current work plan has them conducting 12 workshops a year.
  - In the past year roughly 18 have been conducted
  - Detailed program workshops for local building inspectors, the people who are actually on the ground doing permitting for local communities.
- DEC has a series of workshops that are accredited for code enforcement continuing education credits.
  - Workshops are some of the best outreach DEC can do because it provides face to face opportunities with a large number of community officials at one time. However, there are parts of the state that haven’t had a workshop in a while, e.g., more remote parts of the state like St. Lawrence County.
- Technical assistance is also provided to local officials, communities, developers, property owners and others through phone calls and emails. Approximately 800 a year.
  - Phone calls range from “Could you help me figure out if I am on a flood plain?” to “Why am I in a flood plain?” to “I have this development going into my community; I don’t have the experience to deal with this type of development, can you help me?”
- Local communities must have laws that comply with FEMA standards to participate in the National Flood Insurance Program (NFIP) and must also comply with state building code standards, which in some aspects are more restrictive than FEMA.
  - Whenever a municipality gets a new flood map, they are required by NFIP regulations to update their local law and adopt those maps. In some states, communities have automatic adoption so they don’t have to do anything. New York is a home rule state so they have to go through a local legislative process to adopt a map. Tremendous workload because of the nature of local governments in New York.
    - Counties don’t have land use authority. Counties don’t manage development, only towns, cities and villages do.
      - If FEMA releases a new flood map for a county, you may have 40 communities at one time that have to update their local laws.
        - For example, Oneida County is getting a new flood map for over 40 communities, and some are very rural communities.
  - Flood mapping side
    - No longer producing flood maps (Except for a few projects that are not quite finished, they are getting out of the business of producing flood maps for staffing reasons)
    - Works closely with FEMA on the community outreach side of flood mapping.



- Series of WebEx's and meetings with local communities to find out what their flooding issues are, where the development is or is probably going, where their flood maps may be adequate or inadequate.
- Part of that process is also a mitigation portion where looking at local mitigation plans and what plans they may have on going or in the thought process that the maps can help with. Then as maps are being developed there are periodic meetings with communities to let them know how process is going. Then when maps are delivered in preliminary form meet with them again to explain the maps, go over the maps, explain there is an appeals process and explain that, then have a series of public open houses where members of the public can come in and review their maps and get information about flood insurance. With the new flood insurance law those meetings moving forward are going to be very difficult.

### Response

- When a flood hits, DEC works closely with the FEMA JFO (Joint Field Office) on Community outreach
  - When Irene and Lee hit, they were treated as one event. FEMA staffed up their JFO and their NRIP staff focused on doing substantial damage estimates of structures. DEC partnered with them, so DEC borrowed staff from other parts of the Division of Water and went out and did quick substantial damage estimates. FEMA then processed the data and delivered to the communities.
- Sandy actions
  - Sandy was a much bigger event in terms of the number of structures and population effected, however it was geographically smaller.
    - DEC floodplain management adjusted the DEC role. Instead of inspecting buildings, DEC staff partnered with FEMA JFO and went to every municipality in Long Island plus a number in Westchester and Rockland County and had several meetings with agencies of the City of New York to go over what was required for rebuilding.
      - Went in with FEMA reservist and conducted 33-40 meetings. Each meeting had a DEC person and a FEMA person talking directly with local officials.
      - FEMA did go out afterwards and do substantial damage estimates on 5 communities that were particularly hard hit.

Q. Have you followed up since those two months of meetings? Yes, a series of follow-up meetings with FEMA staff have been conducted; however, there are communities that require additional outreach.

Q. Looking at risk assessment, any issues or concerns? Approximately 80% of the state's housing stock was built before 1980 and in some communities there are more. The estimate is that only 25% of



people in flood hazard areas have flood insurance. In the last plan, Dan O'Brien from SEMO did some really good number crunching related to the old buildings with basements that were built before 1980. Some can be updated because some of the mapping has been updated. Parcel property value.

**Q. What is DEC doing to tell people to get flood insurance?** DEC works primarily with local government officials. Local governments are charged with pushing out the information to the general public.

The DEC Flood Control Projects Section manages about 100 miles of USACE-built flood control projects, which consist of levees, flood walls, and some stream management projects. 1-2 years ago, we had a real backlog of maintenance because of state funding. State passed a New York Works program that has allocated 30 million dollars for upgrades for Corps of Engineers flood control projects, which is ongoing.

- \$3 million a year is needed on a permanent basis to keep up with maintenance

**Q. What would you like to see for the Floodplain Management section?** A letter of intent was sent to FEMA for outreach. HMGP allows funding for outreach, and training for local floodplain administrators. Funding would allow DEC the opportunity to work with county and regional planning agencies and hire contract help to put together a detailed state-wide training. DEC has 9 regional offices, and each office has 1-2 people in the flood programs. Regions have varying degrees of capability as it relates to the flood program. As a result, DEC field staff is somewhat spread out and unable to spend large amounts of time on community training.

Community Assistance Visits (CAV) would be considered a top priority. This would allow further one-on-one outreach with larger and smaller communities. It would also be helpful if as a part of local outreach, we could provide additional information on hazard mitigation opportunities.

**Q. What are ways to mitigate risk with buildings?** Elevating utilities would be a way to reduce risk. For example, making sure that the basement is free of any utilities that are necessary to the operation of the home. For many structures affected by a flood, you may get a foot or two of water surrounding the homes, but that completely fills the basement, which causes the furnace, water heater, and electricity to be destroyed. However the house itself does not suffer a lot of structural damage. This causes a huge expense and extends the time period in which people cannot get back into their homes after a disaster.

**Q. Are the majority of homes above the advisory base flood elevation level?** When you count square footage of the home, does it include the basement or does it start with the first level? The basement is defined under building codes, and under FEMA requirements for the national flood insurance program: a basement is any area of a structure that is below grade on all sides. If there is a basement, by definition a basement is on the lowest floor and that is what is used for insurance purposes. Building elevation standards for NFIP and building code compliance and for insurance rating is based upon the elevation of the lowest floor including the elevation of any basement floor.

The cost to elevate the home is \$80-90K per home in the Long Island area.



Q. So if we were to do a program that elevated utilities, what would be the estimated cost for structure? Spending \$20-30K per home to elevate utilities to remove them from the basement would save a lot of future damages.

Q. Have you identified the types of utilities you would be using? Heating, air conditioning, water heater, electric would be the main focus.

Q. Would you be moving the electrical up? Yes, elevating the meters, elevating the H-WAC and hot water heater. Once the wiring gets wet, if you don't have wiring designed to be underground/wet, you have to replace the wiring for the whole house.



*DEC: Hudson Estuary Program; August 28, 2013*

## Hudson Estuary Program

DEC

8/28/2013

## Meeting Participants:

- Kristin Marcell
- Nancy Freeman
- Amanda Burnett
- Courtney Shorter
- Tracy Smith
- Kyrie Wagner
- Princess Ousley

The program works with regional partners to manage the Estuary portion of the Hudson watershed from the Federal Dam at Troy down to the Battery in NYC using an ecosystem-based management approach. One thing it serves to do is integrate across different DEC programs and across DEC Regions 2, 3, and 4 and integrate activities that affect the Estuary. It also works very closely with communities in the Estuary watershed and other stakeholders, NGO's and academic stakeholders to help them make land use decisions that we think will benefit the long-term health of the Estuary. We fund a lot of research projects, we do a lot of public outreach, a lot of outreach to communities about land use decisions and their local water resources. In the last 5-6 years we've been able to focus on climate change as it becomes an issue more important to the state. We have also been able to move forward some interesting adaptations initiatives, they're not always branded as adaptation, but a lot of things that we've been doing for a while are considered very helpful for climate adaptation. Then we are doing things much more specific, addressing waterfront risks and coastal hazards such as in our project with the City of Kingston.

DEC Hudson Estuary Program has 12 goals in their Action Agenda. The goals can be found on their website at <http://www.dec.ny.gov/lands/4920.html>.

- Kristin Marcell works on the Climate Change Goal.

**Kingston Waterfront Flooding Task Force (Started in December)**

Scenic Hudson, the Hudson River National Estuarine Research Reserve, NYS Department of State and the Consensus Building Institute have been working with the Hudson River Estuary Program to design a waterfront flooding task force process for the City of Kingston, NY. The process allows Hudson River waterfront communities to select sea level rise and storm scenarios, undertake a simplified local flood vulnerability assessment, complete a site specific cost-benefit analysis for adaptation strategies to protect their waterfronts, and develop a roadmap for local adaptation to flood vulnerability. DEC contracting with Catalysis Adaptation Partners (CAP) to use their COastal Adaptation to Sea level rise Itool (COAST) to undertake the cost benefit analysis in the project. The final report is complete and a



public meeting to share results will happen in fall 2013. More information can be found at [www.kingstoncsc.org](http://www.kingstoncsc.org).

- The community selected their sea level rise and storm scenarios. They chose planning horizons 2060 and 2100. They chose the 100 year and 10 year storms; and they chose 36 and 68 inches for their long term sea level rise. We then used those storm scenarios and sea level rise scenarios in the COAST tool. The COAST tool uses the Army Corps of Engineers depth-damage function to estimate how much damage a specific structure would have under a certain water elevation, based on historical data the Corps has on how flooding has impacted different types of buildings over time. With that information and with some new high resolution elevation data (LiDAR) we collected last winter we're able to map which areas will be affected at a variety of water elevations. We used the depth-damage function and assessed tax values for properties to develop damage estimates at different water elevations. This was done for the different storm scenarios with sea level rise.

One of the outputs we got for the COAST model was a table that shows the water elevations under the different storm scenarios and a total damage costs, including discounting.

#### LiDAR

DEC funded the collection of high resolution elevation data (LiDAR) in 2012 through the NOAA Coastal Services Center. The collection covers the entire tidally-influenced shoreline of NYS from the federal dam at Troy to Long Island (except NYC which has recently collected this data) at 1 meter point spacing, sufficient to map sea level rise in one foot intervals. This data is being used in order to identify areas at greatest risk of coastal flooding, areas of potential tidal wetland migration, and to remap state-regulated Coastal Erosion Hazard Areas. All DEMs can be found on the NYS GIS Clearinghouse (<http://gis.ny.gov/elevation/DEM-1-Meter-NOAA.htm>) and NOAA's Digital Coast website.

#### Sustainable Shorelines Project

This project is developing guidance for communities on the tradeoffs among management options for controlling shoreline erosion, including relative costs, impacts on habitat functions, and resilience to storms and sea level rise. The project includes a series of green shoreline demonstration projects including the design of two ecologically-enhanced (or "green") shoreline treatments to control erosion on shorelines in Cold Spring and Nyack, NY. More information can be found at [www.bmmr.org](http://www.bmmr.org).

#### Assessing Flood Risk in a Changing Climate in the Mohawk and Hudson River Basins

The Estuary Program is funding researchers at SUNY School of Environmental Science and Forestry to characterize causes of flooding in the Mohawk and Hudson River valleys, including high precipitation, ice dams, and storm surge, and evaluate the relative contribution of upland watershed flow and storm surge to water levels on the main channel of the Hudson River. They will create a statistical framework for assessments of how future flood risk may change.



**Mapping of barriers (bridges, culverts and dams) that constrict stormwater to develop a method to prioritize their removal or replacement**

A climatologist (Art DeGaetano) and eco-hydrologist (Todd Walter) from Cornell are working with the Estuary Program staff and local Soil and Water Conservation District(s) to use local culvert information in hydrologic models, identifying which ones are undersized for predicted changes in runoff in three pilot watersheds in the Hudson Valley. This information will be used to prioritize which culverts, bridges or barriers should be replaced or upgraded to deal with future flood flows.

**Habitat Corridor Mapping in the Hudson Valley**

Cornell University is working with the Estuary Program to develop a landscape-scale habitat connectivity map based on changes in species distribution caused by climate change. This will help to prioritize land conservation for north-south corridors to allow wildlife migration as the climate changes. They will also conduct field work to establish indicators of climate change (plants, animals, ecosystems). They will also conduct outreach and technical assistance to communities on climate-related habitat conservation and open space planning.

**Long-term water level monitoring station in the Hudson estuary**

The Hudson River National Estuarine Research Reserve is leading an effort to install a long term water level monitoring station in the Hudson estuary near Kingston, in partnership with NOAA. Currently the only NOAA gage for the estuary is at the Battery. This station will help resolve water levels and tide stages for the estuary and track long-term sea level rise.

**Hudson Estuary Watershed Resiliency Project**

The Estuary Program is funding Cornell Cooperative Extension staff in Columbia, Dutchess, Greene, Orange and Putnam counties to conduct outreach to municipal and landowner audiences in target watersheds on flood resiliency. This effort will address the need for communities to enhance their understanding of stream dynamics, floodplain function and watershed planning to reduce their vulnerability to floods. The project will also evaluate the capacity of communities to respond to floods in a manner that ensures the long-term viability of stream systems and reduces future flooding impacts. Topics include the causes of flooding, the role of land use in flooding, benefits of wetlands and riparian buffers in flood mitigation and techniques to restore stream integrity after flood events. Outreach efforts will also include the provision of fact sheets regarding jurisdiction in streams, what agencies to contact during and after flood events, and resources to assist municipalities in planning to reduce flood vulnerability.

- Interviewing local officials to get a sense of what they are doing now so they can target their outreach efforts.

**SLAMM modeling in the Hudson Estuary**

Cornell University and Scenic Hudson are using the SLAMM (Sea Level Rise Affecting Marshes Model) to model potential marsh migration in the Hudson estuary to develop shoreline conservation priorities and assess the need for barrier removal to facilitate the landward migration of tidal wetlands as sea level rises. Loss of tidal wetlands can impact water quality especially in drought or heat extremes. Some communities get their drinking water from the Hudson River, including Poughkeepsie.

#### Climate Smart Communities Certification Program

The Hudson River Estuary Program is funding VHB (Vanessa Hangen and Brustlin) to develop a certification program for the NYS Climate Smart Communities program. The work is being piloted in four communities in 2013. The program track active Climate Smart Communities and recognize the most active communities. The project will design a roadmap for community climate action. A steering committee will advise on which actions will make a community a certified CSC. NYSERDA may base some of its programs on the certification process.



*NYS Canal Corporation; August 30, 2013*

## NYS Canal Corporation

August 30, 2013

## Meeting Participants:

- Howard Goebel
- Cathy Sheridan
- Fred Nuffer
- Tracy Smith
- Kyrle Wagner
- Princess Ousley

## Program Overview

The New York State Canal System is a navigable 324-mile inland waterway that spans upstate New York. The waterway connects the Hudson River with Lake Champlain, Lake Ontario, Cayuga Lake, Seneca Lake, and Lake Erie via the Niagara River.

The Canal System includes four Canals: the Erie, Champlain, Oswego and Cayuga-Seneca; canalized natural waterways, plus five lakes: Oneida, Onondaga, Cross, Cayuga and Seneca; short Canal sections at Ithaca and Watkins Glen; feeder reservoirs, canals and rivers not accessible by boat from the Canal; and Canal terminals on Lake Champlain. The Canal System passes through 25 counties and close to 200 villages, hamlets and towns. The system also includes some historic canal from the original Clinton's Ditch and the Enlarged Canal, and the 290-mile Canalway Trail system.

The New York State Canal Corporation is charged with operating and maintaining this historic canal system that first went into operation in its existing form in 1913. It's a very old and complex system with over 2,000 structures, including 57 navigation locks; 22 reservoirs and numerous dams and water control structures. In order to preserve its historic character, the system has not been modernized, and functions largely as it was originally designed 100 years ago.

This system unlike its predecessors is extremely prone to wet weather damage, especially under very extreme weather events. One of the biggest issues is impacts from major wet weather events, such as flooding that has caused major damage to Canal structures. The Canal System was constructed for navigation purposes, not as a flood control facility. The Canal Corporation has limited ability to operate the system for flood control. Actions taken by the Canal Corporation usually have a consequence. Actions which may minimize impacts in one location may cause damage to another location. The Canal Corporation operates the system within the limitations of the navigation system it was designed under.

**Q. How are you trying to resolve the problems you have with flooding?**

The Canal Corporation is consistently improving its data gathering and monitoring. Over the years there has been a dramatic improvement through the development of the Canal Infrastructure Management System (CIMS). One component of CIMS is it houses all Canal water



resource data, so the staff can access the database in the office or from a remote location. The data is updated routinely by Canal Corporation staff in the field, to provide a relatively real-time view of conditions.

One of the biggest issues is that damages to Canal infrastructure have occurred systematically and repetitively at a high cost. Regardless of whether an event is declared as a federal disaster, and if FEMA reimbursement occurs, the costs are high. The Canal Corporation has moved forward with several mitigations projects eligible for FEMA reimbursement to minimize the damage by modifying how Canal structures are operated. A significant amount of engineering has been accomplished from a structural standpoint; and from a hydrology and hydraulic standpoint to determine what modifications can be put into place which would substantially minimize the level of potential flooding damages that would occur on the canal system.

In addition to that, there's a tremendous benefit to the communities and property owners along the canal system.

Fred - An example, that has caused concern at the local level and damages specifically for the canal system. When you have floods you have lots of material coming down stream, trees and debris. Those trees and debris catch on some of the gates that control water levels for the boating purposes. If you have that material backing up, what you're having then is a back water effect that potentially can flood low-lying building structures and communities. So the work that they're doing is very specific in trying to mitigate that problem but again they've had millions of dollars of damages to those structures that the canal corporation must maintain. By doing some of the mitigation work that they're doing, hopefully, we will be able to reduce future damages to the infrastructure, that's NYS infrastructure, and hopefully there will be some resultant benefits to the communities that reside upstream and potentially downstream to some of the structures that are there.

Cathy –Coincidental benefits from these mitigation projects can be very large.

Howard – Damages which may not be readily captured are the economic loss to Canal customers. In 2011, due to Hurricane Irene and Tropical Storm Lee, the Canal System was closed for navigation system for 74 days. The Canal System is a transportation system as well as a tourism destination. Businesses that were relying on using the canal weren't able to as planned. The canal is used as the primary conduit for boats to get from the Great Lakes to their Winter Harbors. It's not just the damage of the structure but also the use of the system.

Cathy - an example of that would be Blount Small Ship Adventures that plan summer cruises in the Northeast and Great Lakes, and then winter cruises in the Caribbean and Central America. They end up canceling a portion of their season because their vessels were trapped in the closed portion of the system following Hurricane Irene and Tropical Storm Lee.

It could also affect cargo shipments. This year a considerable amount of agricultural product is being shipped on the Oswego Canal. Significant flooding has the potential to delay those and other commercial shipments.



**Review of the Natural Hazard List comments:**

Howard – While the Canal System is a riverine system, it's a canalized riverine system; the river is not free flowing. The Canal Corporation has dams every 10-15 miles to create a navigation system. Debris collection also contributes to flash flooding. Ice jam flooding, during the winter when the canals are closed, can occur at times in flood prone areas. A positive from the Canal Corporation's perspective is that it does occur when the navigation season is closed. So ice jamming is not directly impacting operations, even though the damage can occur. The dams on the Mohawk River that are prone to catching debris are fully removed from the river after the close of navigation. The river is returned back to flowing as a free flowing river once navigation is closed, around Thanksgiving each year. So it's an issue that has multi-facets to it relative to the natural hazard.

Cathy - An ice jam flood wouldn't necessarily affect the Canal Corporation or Canal structures; it may affect an adjacent community that's on the Canal system.

Howard – One of the hazards is the Canal Corporation owns a numerous high hazard dams, and is working with other state and federal agencies to ensure that they are maintained and operated in a manner that is consistent with the standard practices for dams. Any high hazard dam breach could have substantial the impacts.

- Flood – the issue of flooding varies throughout the Canal system; some areas are more flood prone than others. Any part of the system can be impacted, just certain parts are more prone than others.
- Drought – is an issue that is ongoing. Fortunately the droughts experienced in recent decades have been on a small enough magnitude that the Corporation has been able to manage them. If a drought does occur on a major level, which includes magnitude and duration, that would become a big problem because the navigation system couldn't operate.
  - The bigger challenge with droughts is that the Canal System is a water source of so many other entities (agriculture, water supply for other communities). The Canal Corporation has reservoirs that are used for various other uses; such as irrigation for golf courses, hydropower generation, and as sources of drinking water. Ultimately, if a drought persisted for long duration and magnitude the impacts could be extreme to numerous stakeholders.

**Projects:**

**Movable Dam Improvements - \$30 million - (pro-active mitigation)**



The Mohawk River portion of the Erie Canal is susceptible to damaging flooding between Locks E-8 (Scotia) and E-15 (Fort Plain) due to the inability to rapidly remove components of an almost 100-year old system of historic water control structures prior to a major flood event, as recently evidenced in 2006 (New York Severe Storms and Flooding, DR-1630 and DR-1670) and 2011 (Hurricane Irene, DR-4020 and Remnants of Tropical Storm Lee, DR-4031).

The water control structures used to create navigation pools on the Mohawk River are a system comprised of three primary components: 1) uprights, 2) lower gates and 3) upper gates. These components are installed prior to the opening of each navigation season to create a waterway conducive to navigation and fully removed at the end of the navigation season returning the river to a run-of-river waterway.

During the navigation season (May 1st through November 15<sup>th</sup>) only the upper gates are opened and closed to maintain targeted water levels at each location. The lower gates and uprights are presently unable to be rapidly removed during the navigation season due to structural and mechanical limitations. This results in considerable obstructions during high flows events, which is compounded since the uprights become blocked by enormous amounts of woody debris which further obstructs flow. These obstructions result in substantially higher peak water levels at each location than would be otherwise observed if the lower gates and uprights were removed and the debris accumulation was not present.

Types of damages due to these higher water levels include erosion, structural damage to buildings and navigation structures, electrical and mechanical damage to navigation structures, scour of navigation structures, erosion and closure of roadways and bridges, and water damage to homes and businesses. Additionally, the economic loss to business and communities along the Mohawk River / Erie Canal as a result of the damages is substantial.

#### Source of Funds

Federal Emergency Management Agency (FEMA) 406 Hazard Mitigation & New York State Thruway Authority General Reserve

#### Anticipated Program Use

The proposal is to modify the water control structures to remove the hydraulic obstruction associated with the lower gates and uprights, and to remove the ability for debris to accumulate at these locations. If implemented, a substantial reduction in peak observed water levels would be realized at each location by allowing this portion of the Erie Canal / Mohawk River to be returned to a run-of-river waterway prior to major wet-weather events during the navigation season. This proposal has two direct benefits: 1) maintain the long-term integrity of the structures with the elimination of the event-specific damages along the Mohawk River



portion of the Erie Canal and 2) substantial adjacent property damage reduction along this portion of the Mohawk River / Erie Canal.

As there is repetitive loss due to extreme weather events along the Mohawk River / Erie Canal, damages for the New York State Canal Corporation, due to events DR-1630, DR-1670, DR-4020 and DR-4031 amount to almost \$105 million. Additionally, the Canal Corporation is aware of damages from these same events to New York State Thruway Authority and New York State Department of Transportation facilities, in the area of influence of this system of dams. Considering the changing weather patterns and the likelihood of additional significant flooding events, using these values alone (without adjacent community damage costs, which are also significant), implementing this mitigation proposal to prevent future damages in the same or higher amounts is fiscally responsible.

The project will also have related benefits to minimizing flood damages in the Mohawk Valley to the surrounding communities, CSX railroad east-west line, New York State Department of Transportation highways (such as State Routes 5, 35 and 103), and New York State Thruway I-90, by substantially reducing water levels during flood events.

#### Further Background

This proposal has been approved by FEMA under the 406 Hazard Mitigation Program for events DR-4020 and DR-4031. This project is approximately 30% complete, and is expected to be fully implemented in late 2017.

#### **Flood Warning Systems - \$10 Million - (pro-active mitigation)**

##### Summary of Need

Flooding has long been a recurring problem for Upper Hudson, Mohawk and Oswego River Basin communities with events documented regularly since at least 1832 to present day. Of these, the most recent events occurred during the summers of 2006 and 2011 in the Mohawk and Upper Hudson River basins. These floods resulted in complete loss of structures at Canal locks, thousands of homes damaged or destroyed, and bridges and roads damaged or destroyed including portions of the New York State Thruway System. Damages to public infrastructure from the June-July 2006 floods, which resulted in Presidential Disaster Declaration DR-1630, approached \$400 million. FEMA estimates public infrastructure damages from Hurricane Irene and Tropical Storm Lee in 2011 (Presidential Disaster Declarations DR-4020 and DR-4031, respectively) will surpass \$1.7 billion.



There are no flood warning systems in these regions. This led to considerable uncertainty regarding how the State, local emergency managers and the public reacted to the recent floods as the events unfolded.

#### Source of Funds

Federal Emergency Management Agency (FEMA) 404 Hazard Mitigation, Community Development Block Grant – Disaster Relief, & New York State Thruway Authority General Reserve

#### Anticipated Program Use

Implementation of watershed-based Flood Warning Systems for the Upper Hudson River Basin (Champlain Canal), Mohawk River Basin (Erie Canal) and Oswego River Basin (Erie, Oswego, and Cayuga/Seneca Canals) would lower the risk to flood prone communities and the associated financial losses by enabling the State, emergency managers and the public to view and understand the real extent of forecasted flood conditions. Additionally, the ability of communities to appropriately prepare and protect lives, private property, public infrastructure and critical facilities can result in as much as a 30% reduction in damages by providing accurate forecasted flood conditions in advance of severe events and on a real-time basis.

The funding would be used as a direct grant for system design, gage installation and operation, model development, and creation and operation of the Flood Warning Systems. An operating funding component for this project would be needed throughout the life of the project.

#### Further Background

Flood Warning Systems for the three basins will consist of a comprehensive plan for basin-wide improvements in the measurements and methods needed for advanced predictions of flood stage and dissemination of this information, especially flood inundation mapping. These Flood Warning Systems will consist of a series of existing and new networked stream and precipitation gages; enhancing flood forecast capabilities by the National Weather Service (NWS) through their Advanced Hydrologic Prediction Service and the creation of basin-specific hydrodynamic models to utilize this information to determine the timing and magnitude of flooding throughout the basins with flood inundation mapping to illustrate where flooding is forecast to occur. The Flood Warning Systems would be implemented by the New York State Canal Corporation in partnerships with appropriate local, State and federal agencies. The system will include a mechanism for disseminating information to the NWS, State, emergency managers and the general public through various media on a real-time basis.



The proposed Flood Warning Systems would provide advanced flood warning for 27 of New York State's most flood prone counties with a population in excess of 2.6 million people in these basins. Without the present ability to permanently control flooding and reduce flood frequencies this system would assist the New York State Canal Corporation and other agencies with operational decision making prior to and during extreme flood events as well as substantially lowering the risks to communities and the financial losses associated with flooding in each basin.



*DEC Flood Control Program; September 3, 2013*

## Flood Control Program

DEC

Tuesday, September 3, 2013

## Meeting Participants:

- Stephen Len
- Alan Fuchs
- Kyrle Wagner
- Courtney Shorter
- Princess Ousley
- Tracy Smith

New project development

The Department of Environmental Conservation (DEC), Flood Control Division works with the federal government. By law, DEC has to serve as the non-federal partner for the federal government when they develop flood control projects in the state of NY.

- Projects typically start from a study, and then move to the design stage. If all components work out and if the benefits and costs work the project then goes into the construction phase.
- During that stage we also have to have for the design and construction, a local municipal partner and costs are shared with the feds and the local partner for construction.

Q. What is the percentage normally? Is it a 75/25 split?

When the U.S. Army Corps of Engineers (USACE) initially goes out and scopes out a project the first 100K is covered by the federal government. What they go out to determine is if there is federal interests to move forward. If there is federal interest identified then the USACE conducts a feasibility study.

- The feasibility study is 50/50 split between the federal government and the state
  - Locals must provide a letter of support.
    - The letter must confirm that the local government is in support of the state and federal government conducting the study.

The next phase is design and construction and that cost is shared between the state and federal government. It's typically a 65/35 split between federal and state costs. It can go higher than 35 percent if real-estate costs are higher.

- The federal government makes the local government get real-estate so the cost share could go as high as 50 percent.
- It's typically a 65/35 split and we would have to have a local cost sharing partner at that phase.
  - It's 50/50 split between the state and the local municipality.
  - Local municipality could be a county, city, village or a group of them as long as we have one lead.



Then when the USACE builds a project they turn everything over to the state. DEC is then responsible for operating and maintaining each project. The state turns certain portions over to the local community. The state keeps major repairs, but ordinary maintenance would then transfer over to the local partner. Both parties go out and inspect the project with the USACE or with the Federal government periodically.

- Prior to 1998 these projects stayed 100 percent with the state. So many of DEC's large flood projects have no local partners.

#### Completed Works

There are over 100 projects in NYS that DEC is responsible to oversee. Forty or so are projects with levees and floodwalls and there are a lot of operational features to them.

DEC's role is three parts: Operations of the projects, maintenance and repair of the projects and monitoring any changes to the project.

DEC has a permitting program to make sure the integrity of the project isn't comprised. Through the permitting program, DEC makes sure all work is done according to USACE requirements and are up to engineering standards.

#### **Q. Does DEC worry about levee breaks?**

Fortunately not too often, although with the flood in 2011 there was some overtopping and some projects that were damaged. It is DEC's responsibility that the levees are intact and maintained so that they will not breach.

We watch river conditions all of the time and we have OMM manuals for all of these projects.

#### **Q. Have you had more occurrences of breaches in the levee or overtopping?**

We have not had a breach in a levee. Back in Hurricane Agnes we had storm levees wash out but that was back in 1972. We're concerned that the stability of the projects is intact to handle their design. The USACE built these projects to withstand a design storm of a 100 year storm. We make sure that they'll pass that flow.

There are physical features that we have to operate on each project during the storm and that's done by our regional operation staff.

Generally we operate and maintain, so we have people out there mowing lawns, filling holes, doing whatever is necessary to maintain the project. During the storm we have people out there patrolling the levees. We also have equipment coming in and out to fix things during the storm if we think something is going wrong. After the storm we are assessing whatever the damage is and repairing it.

#### **Q. Are you concerned about any vulnerability to your state facilities? Do you have state facilities that you are responsible for?**



There are over 100 projects and over 40 of them have projects that we need to operate during the storm. Other ones we are concerned about but there's not much to do during a storm. After the storm we go back in to make repairs.

The bigger projects when we do operate those most of them are 30 plus years old. So there is a lot of aging infrastructure problems that we are now seeing with these projects. It's a constant battle to keep them up to current standards and make sure that they are going to function properly during a storm event. We are constantly trying to make upgrades to these projects. So for instance we talked about levees but we have a 160 miles of conduits; we have 19 pump stations (actual buildings with pumps and electrical). We also have 100 miles worth of levees and floodwalls, it like 83 miles of levees and 13 miles of flood walls across the state.

They have pipes through them, the concrete gets old and they start breaking down and cracking and we have to chip it out.

**Q. How often does DEC do inspections?**

Officially once a year with the USACE but we also inspect with the local community prior to the USACE inspection. Where there isn't a local community, DEC Regional staff are performing everyday maintenance on these projects.

**Q. Do you have state facilities that you are responsible for that have been damaged from storms?**

There has been a lot of damage within the last three years along the southern tier and in the Catskill's. We have a lot of erosion on our projects. Actually the last storm we just had in June did damage to the Herkimer.

**Q. What's the biggest flood issue?**

Inland - Riverine flooding from the Great Lakes and down the shore line.

#### Action Items

- Emailing list of projects
- Emailing a sample of projects sent to the CORP



*NOAA September 3, 2013*

## NOAA Meeting Notes

Tuesday, September 03, 2013

## Meeting Participants:

- Britt Westergard
- Steve DiRienzo
- Fred Nuffer
- Nancy Freeman
- Courtney Shorter
- Tracy Smith
- Kyrie Wagner

Anything you have that would enhance the climate section? We are looking for characteristics on trying to identify all the different kinds of impacts to climate change from extreme temps, drought, to flooding to sea level rise.

There's a national database on national precipitation records that's online. It's a link to the National Climatic Data Center. Albany has records dating back to the late 1920s and some dating back to the 1800's. The last major drought in this part of the world was 1964. There's been localized drought but that's the last major one. Check FEMA website as a source. If you look at the 1900's as a century until about 1964 it was rather dry across the northeast. 1800's were very wet in this part of the world, the 1900's were dry and we're back on the wet side of things now. That's just based on the precipitation records. Climate change is pretty common around here. Localized drought occurs every year but on a state level it is rare.

Q. Is there any other good source for information on Climate Change or any record types?

The NOAA Coastal Services have a sea-level rise mapper that will show inundation based off of sea-level rise. Also, there is the latest Climate Report from NCCDC. There was a Climate Town Hall Meeting in January. The group's goal was to downsize the Climate Report. It was being done by NYSERDA and the Syracuse Environmental Group.

Q. Are there any resources/tools available for drought?

The national drought monitor is really the best tool. The National Drought Monitor is a national collaboration which they refer to as a blending of arts and science. It's an attempt of an objective assessment of drought, and they have a whole archive section that goes back for a decade or two. There link [www.Drought.gov](http://www.Drought.gov) is updated every week.

Tsunami Info – (Gary Kontki) There is a Tsunami warning system in place and NYSERDA and the weather service relays warnings. The Wireless Emergency Alerts (WEA) alerts on the cell phone for Tsunami's, Blizzards, Flash Floods, Presidential Messages and Child Abductions.

What Are Wireless Emergency Alerts (WEA)?



WEA (formerly known as the Commercial Mobile Alert System (CMAS) or Personal Localized Alerting Network (PLAN)) is a public safety system that allows customers who own certain wireless phone models and other enabled mobile devices to receive geographically-targeted, text-like messages alerting them of imminent threats to safety in their area.

The technology ensures that emergency alerts will not get stuck in highly congested areas, which can happen with standard mobile voice and texting services. WEA was established pursuant to the Warning, Alert and Response Network (WARN) Act.

WEA enables government officials to target emergency alerts to specific geographic areas through cell towers. The cell towers broadcast the emergency alerts for reception by WEA-enabled mobile devices.

WEA complements the existing Emergency Alert System (EAS) which is implemented by the FCC and FEMA at the federal level through broadcasters and other media service providers. WEA and the EAS are part of FEMA's Integrated Public Alert and Warning System (IPAWS). Wireless companies volunteer to participate in WEA, which is the result of a unique public/private partnership between the FCC, FEMA and the wireless industry to enhance public safety.

**Natural Events** – When looking at the size and scale of the storms it important to realize that there have been storms that have covered the entire state. Maybe not the entire state or 100 percent at one time but if you are looking at multi-hazards they have covered the entire state. You can get a very large coastal storm and have rain, high wind and flooding in New York City and coastal erosion on Long Island and meanwhile it's producing snow in the Buffalo area with inland river flooding in between. That happened in the past. There have been giant winds storms from large winter storms that have knocked out power in majority of the state at a time when the temperature is like zero degrees so you can get widespread power outages in majority of the state. Also large winter storms have covered a large part of New York with heavy snow and blizzard or near blizzard conditions.

**Lake levels** – a couple of different things can happen with lake levels. One thing that can happen is that you can have flooding along the sides of the lake for a prolonged period of time. That is what happened with Lake Champlain in 2011, the lake was above flood levels for months (April-June).

On Lake Erie they have what you call seiche, where the water sloshes around like a bathtub. (Buffalo) There is a record of 200 people drowning in a famous seiche in 1844. With the wind from Sandy we had seiche's on Lake George, flooding from that and the village. In the Champlain the winds can move from the North and South so you can have seiches there as well.

Avalanche's occurred last year in Avalanche pass, with incidents of deaths.

Development of flood warning systems is mitigation.

**Action Items**



- NOAA - sending contacts
- NOAA providing general overview of agency



*Environmental Emergency Services, Inc.; September 4, 2013*Environmental Emergency Services, Inc

## Meeting Notes

Wednesday, September 4, 2013

**Meeting Participants**

- Mike Sprague
- Tracy Smith
- Amanda Burnett
- Kyrie Wagner
- Princess Ousley

Environmental Emergency Services, Inc., is a not-for-profit corporation that derives its funding from contributions made by Chemung, Schuyler and Steuben counties and the cities, towns, and villages within those counties. EES operates an automated Flood Warning Service (FWS) and provides a centralized point for real-time data/information collection, analysis, and distribution for Steuben, Schuyler and Chemung counties. This mission is carried out through cooperative activities with the Chemung, Schuyler and Steuben County Emergency Management Offices (EMOs), the National Weather Service (NWS), the New York State Department of Environmental Conservation (DEC), the U.S. Army Corps of Engineers (USACE) and the U.S. Geological Survey (USGS).

**Current capabilities include:**

- 30 rain gauges
- 12 river and stream gauges
- 7 full climate stations

The Flood Warning Service operates from a forecast center located in the Corning Fire Station. It is operated by trained volunteer staff. The center is normally activated by one of the following agencies: Steuben County EMO, Chemung County EMO, Schuyler County EMO or DEC Region 8 Flood Control. These agencies have emergency weather notification via the New York State Police Information network, through which they receive immediate notification of all-weather watches, warnings, bulletins, and statements. The criteria for activation include the following: NWS statement, automatic rain gauge alarm (1 inch/hour), river gauge threshold, and/or observer reports. A telephone call-up procedure is used to notify volunteers. The activation procedure is organized into four levels of response, reflecting the severity of the flooding situation.



The Flood Warning Service receives weather forecast, precipitation, and stream-level data from a variety of sources. Stream-level gauges and precipitation gauges are located throughout Chemung and Steuben counties and in upstream locations. These and other relevant data are available through the following sources.

**National Weather Service:** Severe weather forecasts, flood forecasts, rainfall amounts, and flash flood guidance information are received from the NWS. The FWS obtains this information through the Steuben and Chemung county EMOs, by phone, or by fax. Near real-time rain and river gauge data are available through NWS web pages on the internet.

**Flood Warning Service automated rain and stream gauges:** The FWS owns and maintains a network of automated rain and stream gauges located throughout Chemung, Schuyler and Steuben Counties. At this time, there are 4 automated river gauges and 17 precipitation gauges. Data from these automated gauges are fed by telemetry to the FWS. The data are collected, tabulated, and plotted by two computer data base program systems (ALERT and GAGER). These data are also relayed by telemetry to the NWS office in Binghamton for use in preparing NWS flood forecasts.

**Telemark river gauges:** River-level data is currently available from six Telemark gauges, four of which are located at the same points as the FWS river gauges. This data is accessed by telephone. Near real-time data from some of these gauges is posted on the internet.

**USACE Baltimore computer database:** Current and historical reservoir data for the Hammond, Tioga, Cowanesque, Almond, and Arkport dams are available from the USACE computer database and by telephone. The database also includes data from precipitation and river gauges in the COE and Susquehanna River Basin systems. The COE computer database can be accessed by a direct log-on procedure or through the internet.

**United States Geological Survey (USGS) internet database:** River stage and discharge data from river gauges in the Chemung River Basin in New York and Pennsylvania is posted on the internet and accessed through the USGS web page. This data is updated daily.

**Volunteers and emergency personnel:** Additional precipitation and river/stream data is available from volunteer rain and river staff gauge readers. An answering machine at the FWS forecast center is set up to receive this information and can be accessed remotely by telephone. Staff gauges are monitored by DEC operations staff and local emergency personnel during a flood. Water levels are reported to the DEC flood control office, the county EMO, and/or FWS.

**Data links available through EES website include:**



- Databwise Data System
  - Station List
  - Sensor List
  - Sensor Data Display
  - Tabular Report
  - Custom Report
  - Plot
  - Maps
  - Active Alarms
  - Historical Alarms
  - Animated Graphics
  - Display Time Zone
- Databwise Graphics (new!)
  - Real-time water levels at each gauge
- Hydrograph Summary Page
  - Susquehanna River Basin
    - North Branch
    - Chemung River
    - West Branch
    - Juniata
    - Lackawanna River
    - Main Stem - Towards to Conowingo Power Dam
    - Main Stem Small Streams
  - Delaware River Basin
    - Main Stem to Trenton
    - Lehigh River
    - Schuylkill River
    - Main Stem Small Streams
  - New Jersey Rivers
    - Passaic River
    - Raritan River
  - Potomac River Basin
    - Potomac River
    - Shenandoah River
    - Rappahannock and Rapidan Rivers
  - James and Appomattox River
    - James River
    - Appomattox River



- **County Precipitation Information**
  - County listings of rainfall amounts are routinely updated at half past the following hours: 8am...2pm... and 8pm EDT with 24-hour...6-hour... and 12-hour totals respectively.

Additional information can be found on EES webpage at [www.highwater.org](http://www.highwater.org)



### *NYSERDA September 5, 2013*

**NYS Hazard Mitigation Plan Update  
Meeting with NYSERDA  
September 5, 2013**

**Attendees:**

Chris Reahr (NYSERDA)

Nancy Freeman

Tracy Smith

Amanda Stevens (NYSERDA)

Princess Ousley

Judy Wolf

Mark Watson (NYSERDA)

Courtney Shorter

- General introductions: Mark and Amanda are project managers with the environmental research program; Amanda focuses on climate change and adaptation; Mark also oversees acid rain, ozone, mercury pollution, wastewater, biomass fuels, and biomass heating. Chris is with the energy efficiency group, including new construction program for buildings and the Cleaner, Greener program.
- NP: PO and I attended the Climate Change Working Group (CCWG) meeting and heard your presentation. We have all the handouts. Project status on the research mentioned. One item mentioned is "need research into better benefit-cost analysis (BCA) tools. Has that been proposed? Is it in development?"
  - AS: Don't have at the moment, was raised as a need. Will be going into research plan. Flood mapping/VIS tools may help along those lines. Some economic analysis.
- NP: Trying to capture projects, both underway and in development.
  - AS: The one I just mentioned in on the list of ongoing projects. Columbia & Stevens, Dewberry.
  - NP: Any other sources? I've pulled data from ClimAID; tables, etc. will reference as resources. Anything specific we should look at for a picture of vulnerability and areas of vulnerability for the State?
  - AS: Synthesis will give a good overview without too much detail.
  - MW: There will be section on climate change hazard. Look at appendix for economic analysis and BCA by sector. Will give some numbers.
  - NP: Chart by sector identifying vulnerability, specific criteria will probably reference that. Any other specific resources?
  - None beyond what was provided/already referenced, but will send if think of any additional.
- Question: When expect to have final draft done? Discussed timelines.
- NP: For project(s) mentioned regarding storm impacts over landscape; location/scale, modeling. Is there a defined scope of a project that would work to meet that? Project for modeling?
  - AS: Could be all: economic, etc. Mostly not very specific; broad knowledge haps brought to our attention as needing attention.
  - Even for the ones that are better defined: as part of the process, we'd reach out to proposers to expand on need – could make the final project narrower or more comprehensive.
- Need information just for the State? Or private entities as well?
  - NP: All of it.
  - Look at post-Sandy enhancement plan from Con Ed. June 20, 2013.
- CR: (1) Incentives for resiliency through Commercial New Construction Program. (2) Cleaner, Greener Communities Program



- Cleaner/Greener is a 2-phase program. First started two years ago. Develop plans to reduce greenhouse gas, improve sustainability. ~\$1 million in resources.
  - Plans are on NYSERDA web site.
- Phase 2 is a 3-part program: (1) incentives for municipalities updating plans, (2) helping municipalities update comprehensive plans, (3) increase opportunities for resiliency, decrease greenhouse gas, increase economic development. Competitive program, closed Aug 12. Another round next year. \$100 million total funding: \$90 million Round 2; \$30 million Phase 1. Regional greenhouse gas initiatives.
- Gas Station Program – help position gas stations. Install switch gear, be able to hook up generators, supply groceries, gas, etc., locally, especially downstate. Have to show ability to hook up generation within 24 hours.
  - NP: New state requirement?
  - CR: Believe so.
- MW: Look at NY Rising Community Reconstruction Program. Governor's web site. \$750 million.
- ClimaID
- NP: Anything specific to propose projects to assess impacts on water supply?
  - AS: Not on water supply. There's one on water quality.
  - Trying to provide funding for stream gauges that are losing federal funding.
- Current activity – okay to run by NYSERDA to make sure we're not missing anything significant.
  - NP: Would like to send rough draft of climate change
  - AS/MW: Yes



*Susquehanna River Basin Commission; September 5, 2013*

## Susquehanna River Basin Commission

## Meeting Notes

Thursday, September 5, 2013

## Participants

- Ben Pratt
- John Bala
- Amanda Burnett
- Kyrie Wagner
- Tracy Smith
- Princes Ousley

Program Overview

The SRBC is established through an agreement between the State of NY, Penn, Maryland and the Federal Government, all recognizing a common interest in the waters of the Susquehanna River Basin, and also recognizing the need to coordinate or to have a comprehensive management strategy for those water basins. The SRBC is established by a federal inter-state compact between those entities, similar to the Delaware River Basin which predates the SRBC by approximately 6-7 years. SRBC has regulatory authority in the basin over water withdrawal; that's both ground water withdrawal and surface withdrawal and also consumptive water use, which is water that is used withdrawn from the resource and not returned. It's either incorporated into a product, evaporated, or otherwise lost to the system overall (e.g. golf course irrigation).

SRBC also regulates the water use for tracking natural gas extraction. We do not regulate water quality but are very involved in monitoring water quality in the basin and doing different studies. They work a lot with EPA. We do maintain a water quality monitoring network that was established within the last 5 years mostly in response to the natural gas development in the basin and to try and evaluate the impact that the industry has on the basin. From a NY perspective, the basin starts in Cooperstown, NY and flows down into Pennsylvania, into Susquehanna County, Pen., Great Bend. It then flows back north to Bengumtin and picks up the Chenango and flows down to the Waverly where it meets the Chemung River for the Chemung Basin where eight or nine counties in the southern tier are in the SRB (Steuben, Arsego, Tioga, Broome, and a little bit of Delaware County). It's not the entire state of NY but our area of interest is specific to Susquehanna River and Susquehanna Basin which is the southern tier of NY State. One of the primary objectives is to protect property and reduce loss of life to the greatest extent possible when faced with flood hazards, so flooding is essential to our mission and our activities in flood hazard reduction. Over the years we have been involved in more of the non-structural aspect of flood hazard mitigation verses Corps activities, U.S. Army Corps of Engineering activities, which will be structural such as building levees. We focus on the non-structural and specifically in flood warning. We have maintained a partnership with the National Weather Service, USGS, the Army Corps of Engineers, NYS EM, Penn EM, and State agencies to facilitate flood forecast and warning in the basin, which has



been in place since the mid-80s. The partnership is probably as stressed as it has been in recent years mostly due to up unto FY10 we received an annual earmark to support the Flood Forecast and Warning System. When the feds decided not to support earmarks in the federal budget our budget was essentially cut to zero. That funding supports the stream gauge and rain gauging network, among other things, that provide data to the NWS that they can consume and parley into a forecast at a local gauge.

We would like to say we have one of the premier flood warning systems in the SRB because of the partnership that surrounds the flood forecasting system, the number of stream gauges and rain gauges, the fact that they are all transmitting data in real time, and due to our state of the art equipment. However, today SRB is faced with significant challenges. Facing a reduction in the stream gauge network in FY14.

Majority of the significant flood issues come from NY. The southern tier of NY, glacial outwash, sandy gravel, hilly terrain, flash flood hazards, riverine flooding, geographically the location is susceptible to tropical storms, heavy thunderstorms cause significant flash flood concerns. 2006 catastrophic flooding in the upper SB; 2011 TS Lee both had loss of life.

In forecasting drought and knowing where each one of those signatories is thinking is as far as we are on the drought stage. Drought is not well defined, hard to tell when we're in a drought. During hydrological conditions we convene our drought coordinating committee and begin to have an open dialogue to make sure we are all seeing the same thing or not and assessing current situation verses future needs in terms of the water resource overall.

Percentage breakdown it's more of flood hazard mitigation side but during times of drought we are focused on mitigating those hazards as well by working with our signatories in the compact.

Are there any brick and/or mortar projects that help reduce risks in that area?

Flood forecast and warning system and the gauge warning system is what we consider a brick and mortar project. It's not a levee, or flood wall...that's an ongoing effort. In the last year our focus has been on infrastructure and preserving that infrastructure.

A lot of what we do is captured in the 2011 plan.

Works with FEMA to promote the NFIP.

Not looking for mapping projects in NY. All available resources are needed to sustain the gauge network.



*NYS Parks, Recreation and Historic Preservation; September 9, 2013*

## NYS Parks, Recreation and Historic Preservation

Monday, September 09, 2013

**Meeting Participants**

- Marc Talluto
- John Orsini
- Amanda Burnett
- Princess Ousley
- Tracy Smith
- Joe Jones
- Fred Nuffer
- Courtney Shorter

**Program Overview**

NYS Parks, Recreation and Historic Preservation (PRHP) operates 214 state parks and historic sites across all of NYS, ranging from Niagara Falls, to Jones Beach on Long Island, Montauk Point and numerous parks and sites in between. The agency also manages 33 state historic sites under its jurisdiction as well. The agency hosted 60 million visitors across all of those facilities in 2012, with the largest attendance facilities being Niagara Falls, Jones Beach, and Robert Moses to name a few.

As part of operations the agency has just over 300,000 acres under its direct management as well as 3,000 buildings, 106 dams, 640 bridges, 29 golf courses, 76 swimming beaches, 53 swimming pools, 8,000+ campsites, 850 cabins, and a lot of infrastructure under its direct control and operation. The agency operates with 1,780 permanent staff and during the summer the agency hires an additional 4,000 seasonal staff. Staffing requirements fluctuate throughout the year depending on our operation.

The agency maintains its own police force, NYS Park Police, which has statewide jurisdiction. We also oversee various program areas. State parks are also responsible for recreational boating in NYS as well as commercial boating on sole NYS navigable waterways. We also oversees the NYS snowmobile program, which includes over 10,000 miles of snowmobile trails that we provide grant funding to, to ensure the safe operations of snow mobiles throughout NYS.

**Q. How are you affected by the natural disasters? What types of disasters mostly impact the Parks and Recreation?**

As a general rule the last few years Sandy, Lee and Irene, flooding was probably our single largest issue. With Sandy particularly our coastal beaches, coastal properties were hit hard, primarily Jones Beach and Robert Moses. Those areas are on the southern shore of Long Island, which was basically "NYS's chin" leading into Sandy. Our beaches were hit hard, our board walk on Jones beach was severely damaged and most of our property was fairly flooded. We had 11 counties that our facilities were in that



sustained some sort of damage. The vast majority of our damage was centered in Long Island (Nassau and Suffolk).

As an agency from Sandy we sustained about 120 million dollars' in damages. (We actually sustained close to 200 million dollars in damages to agency-owned property although some of the damages we sustained became the responsibility of other agencies to repair: for example, the Robert Moses Traffic circle, , and Ocean Parkway; although owned by State Parks they are managed by NYSDOT and DOT took responsibility of the cost of repairs so State Parks did not have to fund those. )

The rest of the damage, the damage to boardwalk of Jones Beach, beach loss and severe erosion on our beaches of Robert Moses, those were damages we had to absorb. We also had substantial tree damage throughout the lower Hudson Valley and Long Island. Thousands of trees were destroyed as a result of Sandy from winds.

From Hurricanes Irene and Lee those were more upstate, Upper Hudson Valley and Upper and Central NY - our biggest issue there was flooding and erosion. Additionally, on occasion State Parks has been exposed to instances of wildfire. Several years ago we had a major forest fire in Minnewaska State Park where over 3,000 acres were affected and it was probably a three week operation to get it under control. As a rule wildfires are more sporadic and spot treated and are usually reserved to several acres. Hamman State Park is a particular hot spot as it relates to forest fires for the agency. Forest fires are not necessarily a significant issue except on rare occasions.

Minnewaska Fire was three or four years ago and may be in the previous Hazard Mitigation plan. The fire was never a declared (federal) disaster.

Landslides – the occasion slopes slides (localized) but nothing on a large scale.

Q. Erosion: Was there specific places or issues with erosion that occurred upstate? Do you have more of a problem with the Great Lakes or mostly along rivers and streams?

Mostly rivers and streams, Chenango Valley being one of the big areas resulting from the Page Brook, which is a particularly flood prone area. Several years ago, after repetitive flood damage, we participated in (406) hazard mitigation for that area and we completely relocated a campground out of the flood area to higher ground. That was a classic example of our participation in 406 mitigation, which we are active participants with every disaster.

For Irene we did have erosion along Lake Placid in the Northern part of the state and we sustained some erosion on the coast of that lake. No buildings (totally) destroyed just some minor damage.

Action Items:

- Providing a brief description and statistics on the property PRHP is responsible for overseeing



*NYS Disaster Preparedness Commission; December 18, 2013***NYS DISASTER PREPAREDNESS COMMISSION MEETING**

December 18, 2013  
9:00 a.m.

DHSES Offices  
1220 Washington Avenue  
Building 7A  
1st Floor Conference Room

**AGENDA**

Pledge of Allegiance

Roll Call and Opening Comments      Jerome M. Hauer  
DPC Chair  
Commissioner  
DHSES

NYS Multi-Hazard Mitigation Plan  
Resolution Adoption      Andrew X. Feeney  
Deputy Commissioner  
DHSES  
  
Richard Lord  
Chief Mitigation Programs & Agency Preservation  
Officer  
DHSES

Federal Hazardous Materials Reporting  
Activity      Bryant Stevens  
State Fire Administrator

Erwin G. LaTourette  
Deputy Chief  
OFPC

NYS Homeland Security Strategy      Terry Hastings  
Senior Policy Advisor  
DHSES

Concluding Comments      Jerome M. Hauer  
DPC Chair

Adjourn



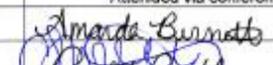
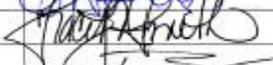
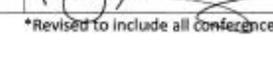
A.2d: Sign-In Sheets

**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014**  
**NYSOEM Planning Team Weekly Meeting**  
**SIGN-IN SHEET**

Meeting Date: September 11, 2013 Metropolitan Transportation Agency

NAME	AGENCY	SIGNATURE
Judy Walker	MTA	Attended via conference call
Kevin Jones	MTA	Attended via conference call
John Decker	MTA	Attended via conference call
Jules Flynn	MTA	Attended via conference call
Alok Saha	MTA	Attended via conference call
Jared Katseff	MTA	Attended via conference call
Laura Shabe	MTA	Attended via conference call
Elisa Picca	MTA	Attended via conference call
Romolo Desantis	MTA	Attended via conference call
Donald Look	MTA	Attended via conference call
John Hinge	MTA	Attended via conference call
Steven Hansen	MTA	Attended via conference call
Kim Smith	MTA	Attended via conference call
Ryan Frigoo	MTA	Attended via conference call
Sean Ryan	MTA	Attended via conference call



Collette Ericsson	MTA	Attended via conference call
Daniel Horn	MTA	Attended via conference call
Amanda Burnett	AI	
Courtney Shorter	AI	
Tracy Smith	AI	
Princess Ousley	AI	

\*Revised to include all conference participants



**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014**  
**NYSOEM Planning Team Weekly Meeting**  
**SIGN-IN SHEET**

Meeting Date: September 11, 2013 Metropolitan Transportation Agency

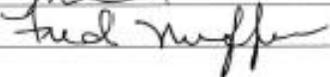
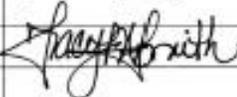
NAME	AGENCY	SIGNATURE
Judy Walker	MTA	Attended via conference call
Amanda Burnett	AI	<i>Amanda Burnett</i>
Courtney Shorter	AI	<i>Courtney Shorter</i>
Tracy Smith	AI	<i>Tracy Smith</i>
Joe Jones	AI	
Nancy Freeman	AI	
Princess Ousley	AI	



**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014  
 NYSOEM Planning Team Weekly Meeting  
 SIGN-IN SHEET**

Meeting Date: August 29, 2013

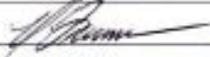
NYS Canal Corporation / Thruway Authority

NAME	AGENCY	SIGNATURE
Howard Goebel	NYS Canal Corporation / Thruway Authority	
Fred Nuffer	OEM	
Juliana Lam	AI	
Nancy Freeman	AI	
Kyrie Wagner	AI	
Amanda Burnett	AI	
Princess Ousley	AI	
Courtney Shorter	AI	
Tracy Smith	AI	
Judy Wolf	AI	
CATHY SHERIDAN	NYSTA/NYSCC	



**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014  
 NYSOEM Planning Team Weekly Meeting  
 SIGN-IN SHEET**

Meeting Date: August 29, 2013 Department of Environmental Conservation

NAME	AGENCY	SIGNATURE
Mark Lowery	DEC	Attended via conference call
Nancy Freeman	AI	
Kyrie Wagner	AI	
Amanda Burnett	AI	
Princess Ousley	AI	
Courtney Shorter	AI	
Tracy Smith	AI	



**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014  
 NYSOEM Planning Team Weekly Meeting  
 SIGN-IN SHEET**

Meeting Date: August 28, 2013

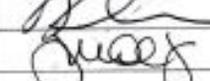
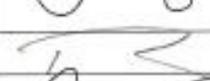
NYSDEC Hudson River Estuary Program

<b>NAME</b>	<b>AGENCY</b>	<b>SIGNATURE</b>
Kristin Marcell	NYSDEC Hudson River Estuary Program	Attended via conference call
Judy Wolf	AI	
Nancy Freeman	AI	<i>Nancy Freeman</i>
Amanda Burnett	AI	<i>Amanda Burnett</i>
Julie Lam	AI	
Princess Ousley	AI	
Courtney Shorter	AI	<i>Courtney Shorter</i>
Tracy Smith	AI	<i>Tracy Smith</i>
Kyrie Wagner	AI	<i>Kyrie Wagner</i>



**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014**  
**NYSOEM Planning Team Weekly Meeting**  
**SIGN-IN SHEET**

Meeting Date: August 27, 2013 NY Office Fire Prevention and Control

<b>NAME</b>	<b>AGENCY</b>	<b>SIGNATURE</b>
Andrew Dickinson	OFPC	
Donald Fischer	OFPC	
Judy Wolf	AI	
Amanda Burnett	AI	
Princess Ousley	AI	
Courtney Shorter	AI	
Tracy Smith	AI	



**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014  
 NYSOEM Planning Team Weekly Meeting  
 SIGN-IN SHEET**

Meeting Date: August 23, 2013

Department of Environmental Conservation (DEC)

<b>NAME</b>	<b>AGENCY</b>	<b>SIGNATURE</b>
Alon Dominitz	DEC	<i>Alon Dominitz</i>
Stephen Len	DEC	
Sue McCormick	DEC	<i>Sue McCormick</i>
Kristin Marcell	DEC	
William Nechamen	DEC	
Mark Lowery	DEC	
Fred Nuffer	OEM	<i>F. Nuffer</i>
Judy Wolf	AI	<i>Judy Wolf</i>
Nancy Freeman	AI	<i>Nancy Freeman</i>
Amanda Burnett	AI	
Julie Lam	AI	<i>Julie Lam</i>
Princess Ousley	AI	<i>Princess Ousley</i>
Courtney Shorter	AI	
Tracy Smith	AI	<i>Tracy Smith</i>
Kyrie Wagner	AI	



**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014  
 NYSOEM Planning Team Weekly Meeting  
 SIGN-IN SHEET**

Meeting Date: August 27, 2013

Department of Transportation

NAME	AGENCY	SIGNATURE
Elisabeth Lennon	DOT	<i>Elisabeth Lennon</i>
Judy Wolf	AI	<i>Judy Wolf</i>
Nancy Freeman	AI	
Amanda Burnett	AI	<i>Amanda Burnett</i>
Julie Lam	AI	
Princess Ousley	AI	<i>Princess Ousley</i>
Courtney Shorter	AI	<i>Courtney Shorter</i>
Tracy Smith	AI	<i>Tracy Smith</i>
Kyrie Wagner	AI	<i>Kyrie Wagner</i>
Arthur Sanderson	DOT	<i>Arthur Sanderson</i>
Lynn Weiskopf	DOT	<i>Lynn Weiskopf</i>
Mary Anne Mariotti	DOT	<i>Mary Anne Mariotti</i>



**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014  
 NYSOEM Planning Team Weekly Meeting  
 SIGN-IN SHEET**

Meeting Date: September 9, 2013

New York Parks, Recreation & Historic Preservation

NAME	AGENCY	SIGNATURE
Mark Talluto	NYPRHP	Attended via conference call
Amanda Burnett	AI	<i>Amanda Burnett</i>
Princess Ousley	AI	<i>Princess Ousley</i>
Tracy Smith	AI	<i>Tracy Smith</i>
Joe Jones	AI	<i>Joe Jones</i>
Nancy Freeman	AI	
Fred Nuffer	OEM	<i>Fred Nuffer</i>
Courtney Shorter	AI	<i>Courtney Shorter</i>



**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014**  
**NYSOEM Planning Team Weekly Meeting**  
**SIGN-IN SHEET**  
 Meeting Date: September 5, 2013      New York State Energy Research and Development Authority

NAME	AGENCY	SIGNATURE
Amanda Stevens	NYSERDA	Attended via conference call
<del>Amanda Burnett</del>	<del>AI</del>	<del>Attended via conference call</del> unable to attend
Princess Ousley	AI	<i>[Signature]</i>
Tracy Smith	AI	<i>[Signature]</i>
Kyrie Wagner	AI	<i>[Signature]</i>
Nancy Freeman	AI	<i>[Signature]</i>
Courtney Shorter	AI	<i>[Signature]</i>
Judy Wolf	AI	<i>[Signature]</i>







**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014  
 NYSOEM Planning Team Weekly Meeting  
 SIGN-IN SHEET**

Meeting Date: August 29, 2013

Office of Emergency Management

<b>NAME</b>	<b>AGENCY</b>	<b>SIGNATURE</b>
Dave DeMatteo	OEM	<i>Dave M. DeMatteo</i>
Amanda Burnett	AI	<i>Amanda Burnett</i>
Princess Ousley	AI	<i>Princess Ousley</i>
Courtney Shorter	AI	<i>Courtney Shorter</i>
Tracy Smith	AI	<i>Tracy Smith</i>
Kyrie Wagner	AI	<i>Kyrie Wagner</i>



**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014  
 NYSOEM Planning Team Weekly Meeting  
 SIGN-IN SHEET**

Meeting Date: August 28, 2013

Department of Environmental Conservation (DEC)

NAME	AGENCY	SIGNATURE
William Nechamen	DEC	<i>William Nechamen</i>
Amanda Burnett	AI	<i>Amanda Burnett</i>
Julie Lam	AI	<i>Julie Lam</i>
Princess Ousley	AI	<i>Princess Ousley</i>
Courtney Shorter	AI	<i>Courtney Shorter</i>
Tracy Smith	AI	<i>Tracy Smith</i>
David Sherman	DEC	<i>David Sherman</i>
Kyne wagner	AI	<i>Kyne Wagner</i>



**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014  
 NYSOEM Planning Team Weekly Meeting  
 SIGN-IN SHEET**

Meeting Date: September 3, 2013  
 (DEC)

Department of Environmental Conservation

NAME	AGENCY	SIGNATURE
Steve Len	DEC	<i>Steve Len</i>
Amanda Burnett	AI	
Princess Ousley	AI	
Courtney Shorter	AI	<i>[Signature]</i>
Tracy Smith	AI	<i>[Signature]</i>
<i>ALAN FUCHS</i>	<i>DEC</i>	<i>[Signature]</i>



**NEW YORK STATE HAZARD MITIGATION PLAN UPDATE 2014  
 NYSOEM Planning Team Weekly Meeting  
 SIGN-IN SHEET**

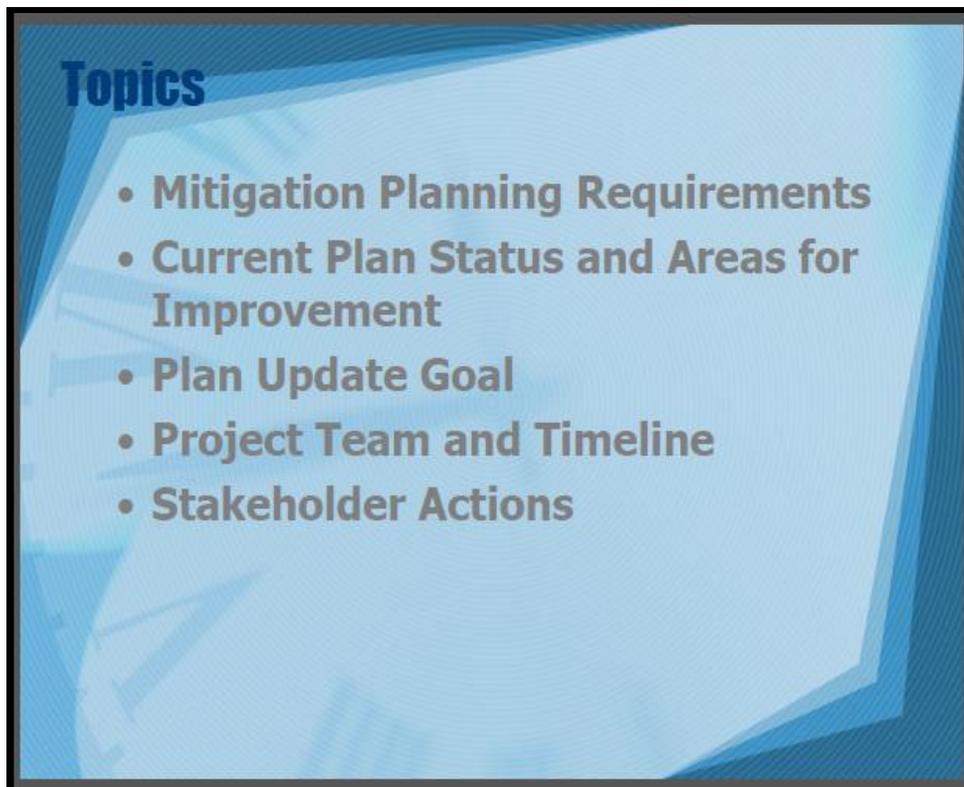
Meeting Date: September 3, 2013

National Weather Service

<b>NAME</b>	<b>AGENCY</b>	<b>SIGNATURE</b>
Britt Westergard	NOAA	Attended via conference call
Steve DiRienzo	NOAA	Attended via conference call
Fred Nuffer	NYSOEM	<i>Fred Nuffer</i>
Judy Wolf	AI	
Nancy Freeman	AI	<i>Nancy Freeman</i>
Amanda Burnett	AI	
Julie Lam	AI	
Princess Ousley	AI	
Courtney Shorter	AI	<i>Courtney Shorter</i>
Tracy Smith	AI	<i>Tracy Smith</i>
Kyrie Wagner	AI	<i>Kyrie Wagner</i>



**A.2e: Presentation Slides State**



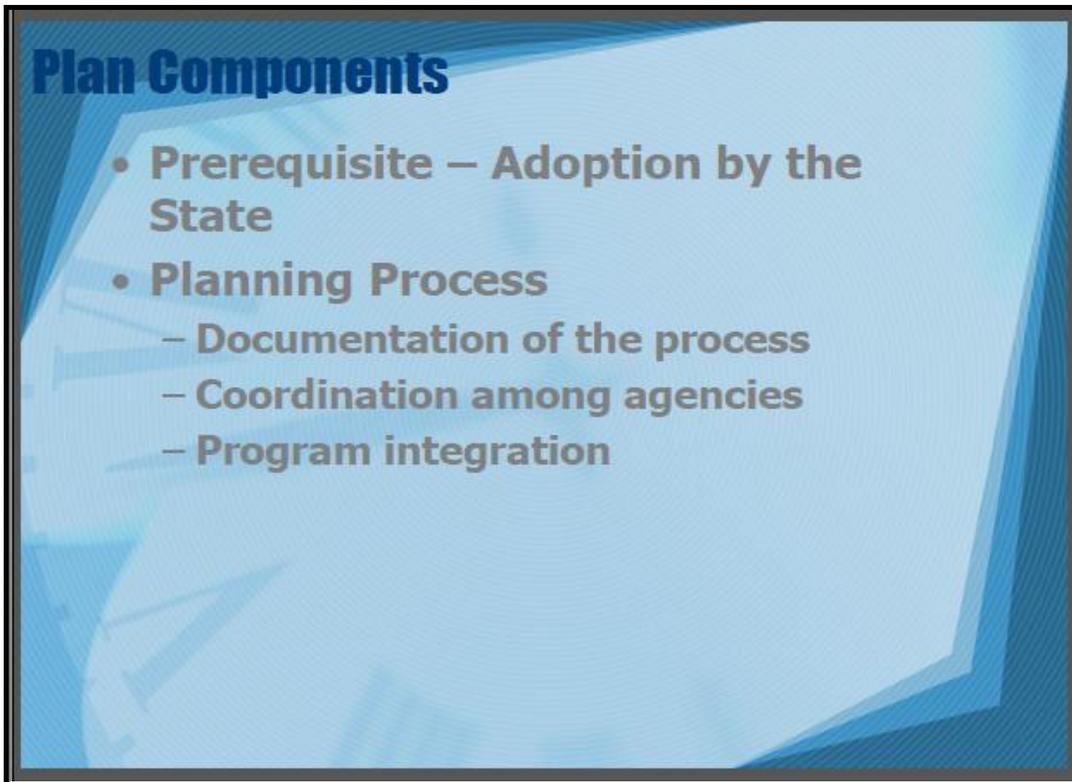
## **Federal Mitigation Plan Requirements**

- **Disaster Mitigation Act of 2000 (P.L. 106-390)**
- **44 CFR, 201.4 – Standard State Hazard Mitigation Plan (HMP)**
- **Three-year update cycle**

## **Plan Update Goals**

- **Meet federal regulations for state mitigation planning**
- **Document New York's progress in identifying and mitigating natural hazards**
- **Serve as a resource to local jurisdictions, stakeholders and the public in the planning process**
- **Maintain State and local eligibility for federal funding – mitigation and public assistance (406 mitigation projects)**





**Plan Components**

- **Prerequisite – Adoption by the State**
- **Planning Process**
  - Documentation of the process
  - Coordination among agencies
  - Program integration



**Plan Components**

- **Risk Assessment**
  - Identifying Hazards
  - Profiling Hazards
  - Assessing Vulnerability
    - by Jurisdiction (County level)
    - State facilities
  - Estimating Potential Losses
    - by Jurisdiction (County level)
    - State facilities

## **Plan Components**

- **Mitigation Strategy**
  - Hazard Mitigation Goals
  - State Capability Assessment
  - Local Capability Assessment
  - Mitigation Actions
  - Funding Sources

## **Plan Components**

- **Coordination of Local Mitigation Planning**
  - Local funding and Technical Assistance
  - Local Plan Integration
  - Prioritizing Local Assistance
- **Plan Maintenance Process**
  - Monitoring, Evaluating, and Updating the Plan
  - Monitoring Progress of Mitigation Activities

## Severe Repetitive Loss (SRL) Strategy

- Supported through mitigation activities
- Considered in policies, programs and capabilities
- Addressed in risk assessment
- Describes specific actions taken to reduce the number of SRL properties
- Identifies current and potential sources of federal, state, local or private funding to implement SRL activities

## Realignment of *NATURAL* Hazards\*

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• <b>Flood</b> <ul style="list-style-type: none"> <li>– Riverine, Mudflows, Dam/ Levee Break, Coastal</li> </ul> </li> <li>• <b>Hurricane</b> <ul style="list-style-type: none"> <li>– Tropical, Coastal</li> </ul> </li> <li>• Coastal Erosion</li> <li>• High Wind Events           <ul style="list-style-type: none"> <li>– <b>Tornado</b>, Straight-line</li> </ul> </li> <li>• Severe <b>Winter Storm</b></li> <li>• <b>Hailstorm</b></li> </ul> | <ul style="list-style-type: none"> <li>• <b>Wildfire</b></li> <li>• <b>Drought</b></li> <li>• <b>Extreme Temperatures</b></li> <li>• <b>Earthquake</b></li> <li>• <b>Landslide</b></li> <li>• <b>Land Subsidence &amp; Expansive Soils</b></li> <li>• <b>Avalanche</b></li> <li>• <b>Tsunami</b></li> <li>• <b>Climate Change</b></li> </ul> |
|--|--|

*\*Red font denotes hazards addressed in the 2011 plan*



## Information Needs

- What has your agency been doing in relation to mitigation in the past three years?
- What mitigation activities does your agency have underway (or planned) over the next three years?



## Examples of Mitigation Activities

- New codes, laws, rules, regulations, policy changes
- Programs & initiatives
- Capital investments/improvements
- Integration of mitigation considerations into planning efforts
- Participation in interagency working groups focused on mitigation issues
- Public education

## **Project Team**

- **New York Office of Emergency Management**
- **Stakeholder Agencies, Departments and Organizations**

## **Action Steps with Stakeholders**

- **Review 2011 New York State Hazard Mitigation Plan**
- **Provide input related to:**
  - **Strategy and goals/objectives**
  - **Hazard profiles and characteristics**
  - **Risk and vulnerability assessments**
  - **State facilities**
  - **Loss exposure**
  - **Mitigation activities**

### **Input – Survey Monkey**

- Approximately how many buildings does your agency have responsibility for, either campus/complex or stand-alone?
- Approximately how many of your facilities sustained damage during Irene, Lee or Sandy?
- How many of your facilities were destroyed in Irene, Lee or Sandy?
- In what county/counties were the majority of your damages sustained?

### **Input – Survey Monkey**

- What was the total approximate dollar amount of your damages?
- Were/are mitigation actions performed or proposed as part of your repair/replacement projects?
- Do you have facilities that would benefit from mitigation actions?
- Have you applied for 404 (HMGP), 406 or other funding for these projects?



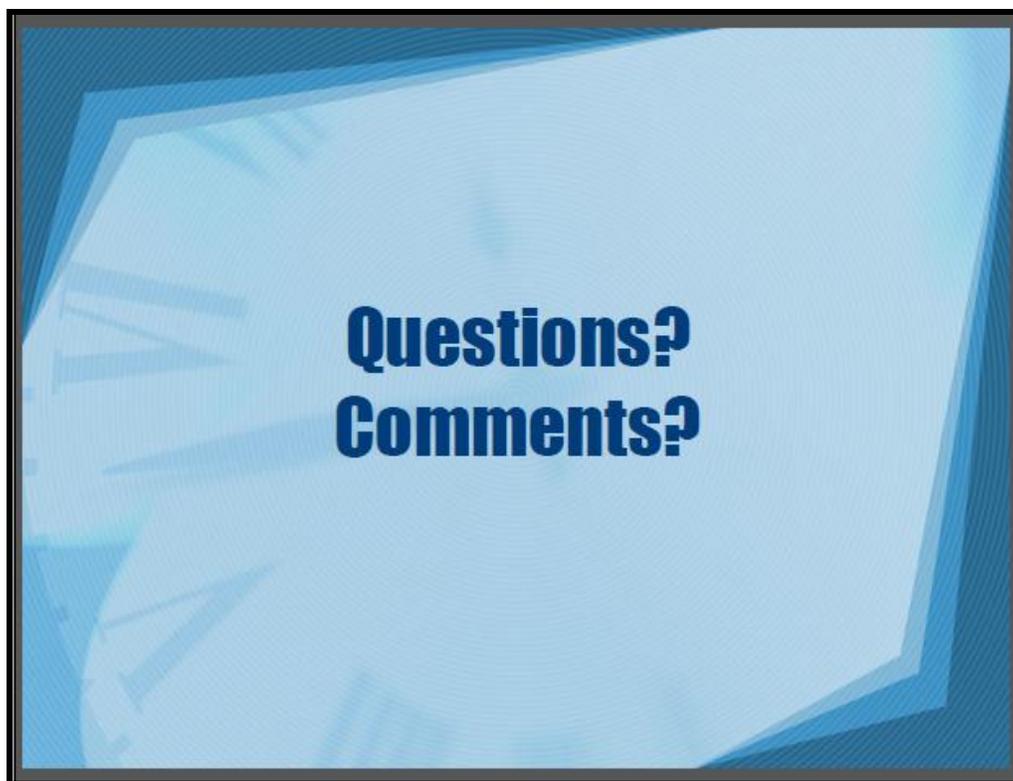
## Timeline

- OEM Plan Update Team outreach to participants (ongoing until 9/6)
- First draft of 2014 updated Plan provided to FEMA reviewers and posted for stakeholder review & input (goal: 10/1)
- Final draft of 2014 updated Plan provided to FEMA reviewers (11/15)
- Final Plan approved (by 1/4/14)

## Next Steps

- Follow-up email from Outreach Coordinator Princess Ousley (pousley@aidrc.com)
  - Webinar recording
  - PowerPoint slides with Speaker Notes
  - Input/participation guidance
- Survey Monkey questions
- Action & Activities matrix provided for review, update and approval (by 9/11)
  - One week turn-around requested; all due by 9/17
- First draft posted for review (~10/1)



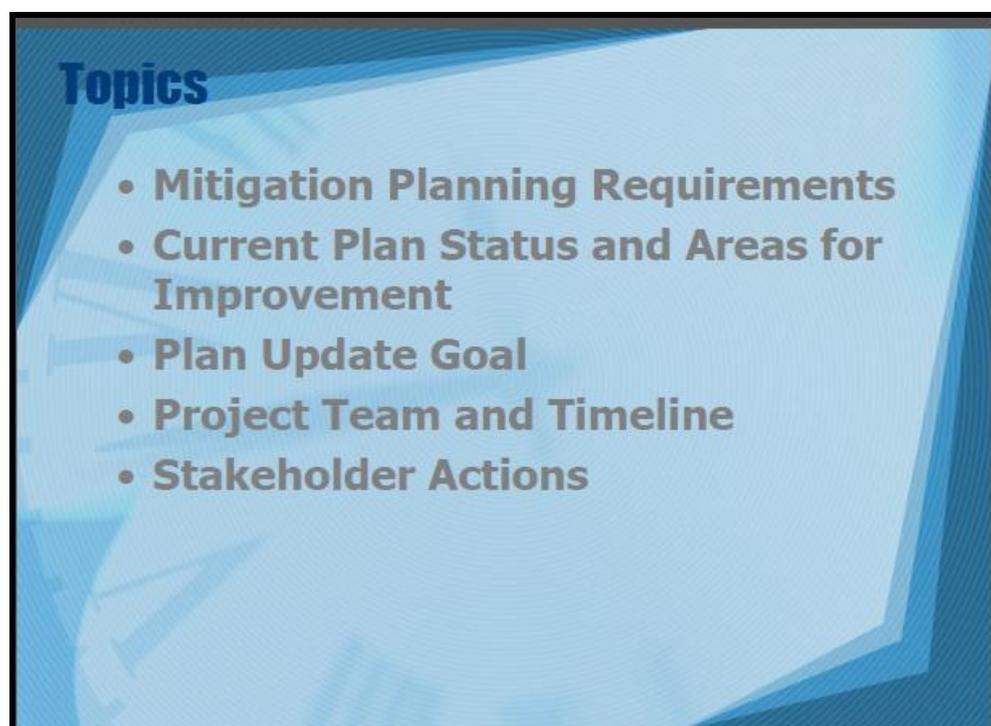


## A.2f: Attendee List

State Agency Attendee List			
Name	Job Title	Company Name	When registered
Judy Wolf	Project Manager	Adjusters International, Inc	Thursday, August 29, 2013 4:33 pm
Nancy Freewman	Contractor	Adjusters International, Inc	Thursday, September 5, 2013 9:44 am
Princess Ousley	Hazard Mitigation Team	Adjusters International, Inc	Thursday, August 29, 2013 4:38 pm
William Wagner III	Mitigation Plan Consultant	Adjusters International, Inc / Early Alert, Inc.	Wednesday, September 4, 2013 6:16 pm
Amy Phoenix	Office Manager	DHSES	Thursday, September 5, 2013 9:57 am
Steven Fukino	J3 Director of Domestic Operations	DMNA	Tuesday, August 27, 2013 9:29 am
Julie Nemeth-Weisser	Assistant Director for Administration	DOS	Thursday, September 5, 2013 8:40 am
Cathleen Carlisle	Senior Hazard Mitigation Planner	FEMA	Thursday, September 5, 2013 9:26 am
Nicole Aimone	Hazard Mitigation Planner	FEMA	Thursday, September 5, 2013 9:19 am
Howard Goebel	Canal Hydrologist	New York State Canal Corporation	Thursday, September 5, 2013 9:42 am
Mark Chaffee	Captain	New York State Police	Tuesday, August 27, 2013 9:55 am
Sharon Cates-Williams	Deputy Commissioner	NY State Education Department	Thursday, September 5, 2013 9:57 am
Gary Monitz	Hazard Mitigation Specialist	NYC OEM	Tuesday, September 3, 2013 3:11 pm
Heather Roiter	Mitigation Program Manager	NYC OEM	Tuesday, September 3, 2013 3:03 pm
Melissa Umberger	Hazard Mitigation Specialist	NYC OEM	Tuesday, September 3, 2013 3:14 pm
Ronald Rausch	Deputy Commissioner	NYS Department of Agriculture and Markets	Tuesday, September 3, 2013 12:19 pm
Christian Bonvin	Utility Supervisor	NYS Dept of Public Service	Wednesday, September 4, 2013 5:05 pm
Stephen Crozzoli	Facilities Planner 3	NYS DOCCS	Thursday, September 5, 2013 8:40 am
Melissa Pinke	Emergency Management Supervisor	NYS DOL	Tuesday, September 3, 2013 9:48 am
Sam Zhou	Acting Regional Director	NYS DOT	Wednesday, September 4, 2013 12:19 pm
Radworth Anderson	Director, Security ID & Emergency Management	NYS Office of General Service	Tuesday, September 3, 2013 3:15 pm
Steven Moskowitz	Director of Emergency Preparedness and Response	NYS Office of Mental Health	Wednesday, August 28, 2013 11:14 am
Don Hughes	Director Facilities Management	NYS OPWDD	Monday, August 26, 2013 3:31 pm
mark hixon	superintendent of maintenance	NYS Thruway Authority	Thursday, September 5, 2013 9:49 am
Douglas Bernhard	Asst. Director Div of Operations	NYSDEC	Tuesday, August 27, 2013 11:21 am
Michael Primeau	Director	NYSDOH	Wednesday, September 4, 2013 3:21 pm
Nikhil Natarajan	Deputy Director	NYSDOH	Wednesday, September 4, 2013 3:22 pm
Elisabeth Lennon	Environmental Coordinator	NYSDOT	Friday, August 30, 2013 9:16 am
Stan Brownell	Facility Manager	NYSERDA	Thursday, August 29, 2013 2:29 pm
Derek Holtzclaw	Associate Commissioner for Financial Management	Office of Children and Family Services	Wednesday, August 28, 2013 11:57 am
Raymond Farina	Director	Office of Children and Family Services	Wednesday, August 28, 2013 1:17 pm
Gerard McCarty	Director	Port Authority of NY&NJ	Saturday, August 24, 2013 3:37 pm



**A.2g: Presentation Slides Non-State**



## **Federal Mitigation Plan Requirements**

- **Disaster Mitigation Act of 2000 (P.L. 106-390)**
- **44 CFR, 201.4 – Standard State Hazard Mitigation Plan (HMP)**
- **Three-year update cycle**

## **Plan Update Goals**

- **Meet federal regulations for state mitigation planning**
- **Document New York's progress in identifying and mitigating natural hazards**
- **Serve as a resource to local jurisdictions, stakeholders and the public in the planning process**
- **Maintain State and local eligibility for federal funding – mitigation and public assistance (406 mitigation projects)**



## **Plan Components**

- **Prerequisite – Adoption by the State**
- **Planning Process**
  - Documentation of the process
  - Coordination among agencies
  - Program integration

## **Plan Components**

- **Risk Assessment**
  - Identifying Hazards
  - Profiling Hazards
  - **Assessing Vulnerability**
    - by Jurisdiction (County level)
    - State facilities
  - **Estimating Potential Losses**
    - by Jurisdiction (County level)
    - State facilities

**Plan Components**

- **Mitigation Strategy**
  - Hazard Mitigation Goals
  - State Capability Assessment
  - Local Capability Assessment
  - Mitigation Actions
  - Funding Sources

**Plan Components**

- **Coordination of Local Mitigation Planning**
  - Local funding and Technical Assistance
  - Local Plan Integration
  - Prioritizing Local Assistance
- **Plan Maintenance Process**
  - Monitoring, Evaluating, and Updating the Plan
  - Monitoring Progress of Mitigation Activities

## Severe Repetitive Loss (SRL) Strategy

- Supported through mitigation activities
- Considered in policies, programs and capabilities
- Addressed in risk assessment
- Describes specific actions taken to reduce the number of SRL properties
- Identifies current and potential sources of federal, state, local or private funding to implement SRL activities

## Realignment of *NATURAL* Hazards\*

- **Flood**
  - Riverine, Mudflows, Dam/ Levee Break, Coastal
- **Hurricane**
  - Tropical, Coastal
- Coastal Erosion
- High Wind Events
  - **Tornado**, Straight-line
- Severe **Winter Storm**
- **Hailstorm**
- **Wildfire**
- **Drought**
- **Extreme Temperatures**
- **Earthquake**
- **Landslide**
- **Land Subsidence & Expansive Soils**
- Avalanche
- Tsunami
- Climate Change

*\*Red font denotes hazards addressed in the 2011 plan*



## Project Team

- New York Office of Emergency Management
- Stakeholder Agencies, Departments and Organizations

## Timeline

- OEM Plan Update Team outreach to participants (ongoing until 9/6)
- First draft of 2014 updated Plan provided to FEMA reviewers and posted for stakeholder review & input (goal: 10/1)
- Final draft of 2014 updated Plan provided to FEMA reviewers (11/15)
- Final Plan approved (by 1/4/14)



## Information Needs

- What has your agency been doing in relation to mitigation in the past three years?
- What mitigation activities does your agency have underway (or planned) over the next three years?



## Examples of Mitigation Activities

- New codes, laws, rules, regulations, policy changes
- Programs & initiatives
- Capital investments/improvements
- Integration of mitigation considerations into planning efforts
- Participation in interagency working groups focused on mitigation issues
- Public education

## **Action Steps with Stakeholders**

- **Review 2011 New York State Hazard Mitigation Plan**
- **Provide input related to:**
  - Strategy and goals/objectives
  - Hazard profiles and characteristics
  - Risk and vulnerability assessments
  - State facilities
  - Loss exposure
  - Mitigation activities

**A.2h: Attendee List**

Non-State Webinar Attendee List			
Name	Job Title	Company Name	When registered
Beth Lucas	Senior Planner	Broome County Planning	Monday, August 26, 2013 8:57 am
Crystal Gross	Microcomputer Specialist	Cattaraugus County DPW	Monday, August 26, 2013 10:23 am
David Walowsky Jr	State Design Engineer	USDA-NRCS	Monday, August 26, 2013 11:08 am
David Zatlín	Director of Emergency Recovery	Nassau County OEM	Monday, August 26, 2013 9:04 am
Fred Rion	Emergency Preparedness Administrator	Monroe County OEM	Monday, August 26, 2013 12:30 pm
James Kalohn	Planner	Sch'dy County Gov't	Monday, August 26, 2013 3:38 pm
Jessica Verfuss	Assistant Director	Tompkins County Emergency Response	Monday, August 26, 2013 3:40 pm
Jim Lieberum	District Manager	Warren County SWCD	Wednesday, August 28, 2013 8:08 am
Jonathan Pease	Deputy Director	Washington County Department of Public Safety	Tuesday, August 27, 2013 9:03 am
Pamela DiCarlo	Code Enforcement	Village of North Syracuse	Tuesday, August 27, 2013 3:46 pm
Peter deVries	Supv. Hydrologist	US Geological Survey	Tuesday, August 27, 2013 3:04 pm
Seamus Leary	Deputy Commissioner	Orange County	Tuesday, August 27, 2013 11:21 am
Thomas Remmert	Dep. Dir. of Emergency Management	Albany County Sheriff's Office	Monday, August 26, 2013 11:53 am
Ken Davidson	Emergency Manager	Dutchess County	
Jonathan Schultz	Director of Emergency Management	Niagara County	
John Maguire	Budget Analyst	Nassau County OEM	
J.T. Glass		Erie County	
Kristin Card-Griffin	Deputy Director Administration / LEPC Chairperson	Chemung County	
Britt Westergard		National Weather Service	
Rick Lord	Chief of Mitigation Programs	Division of Homeland Security and Emergency Services	
Marlene White			
Nancy Freeman	Contractor	Adjusters International, Inc	
Judy Wolf	Project Manager	Adjusters International, Inc	
William Wagner III	Mitigation Plan Consultant	Adjusters International, Inc / Early Alert, Inc.	

OEM Team  
AI Team



# APPENDIX 3

## *Hazard Profile Data Supplement*

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<b>Flood</b> .....	<b>pg. 2-87</b>
<b>Hurricane</b> .....	<b>pg. 88</b>
<b>Severe Winter Storm</b> .....	<b>pg. 89</b>
<b>Earthquake</b> ..	<b>pg. 90-129</b>
<b>Landslide</b> .....	<b>pg. 130-140</b>



# FLOOD DATA

## NFIP Analysis by Municipality

*The following series of NFIP maps were extracted from the 2011 Hazard Mitigation Plan to demonstrate the level of NFIP analysis that can be done at the municipality level geography. The 2014 State Hazard Mitigation Plan does similar analysis but was only updated to the county level geography. The inclusion of the data here serves as a resource for local planning and to demonstrate the type of analysis that can be done at the local level.*

**Figure A.3-1** provides a spatial representation of the distribution of NFIP policies broken down by Municipality across New York State. New York City and Long Island have the largest number of policies. Outside of New York City and Long Island, the Town of Amherst in Erie County has the highest number of policies.

**Figure A.3-1: National Flood Insurance Program Number of Policies by Municipality**

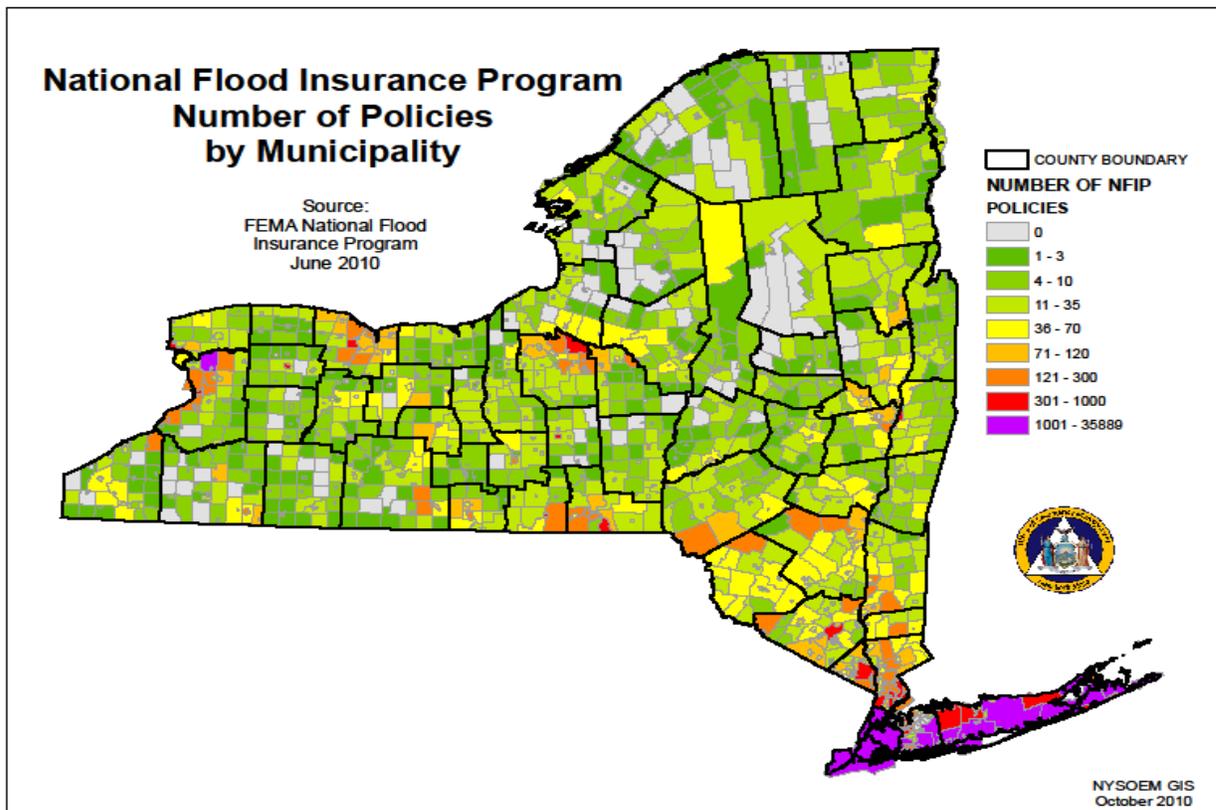


Figure A.3-2 provides a spatial representation of the distribution of total dollar amount of NFIP policy coverage broken down by Municipality across New York State.

Figure A.3-2: National Flood Insurance Program Total Insurance in Force by Municipality

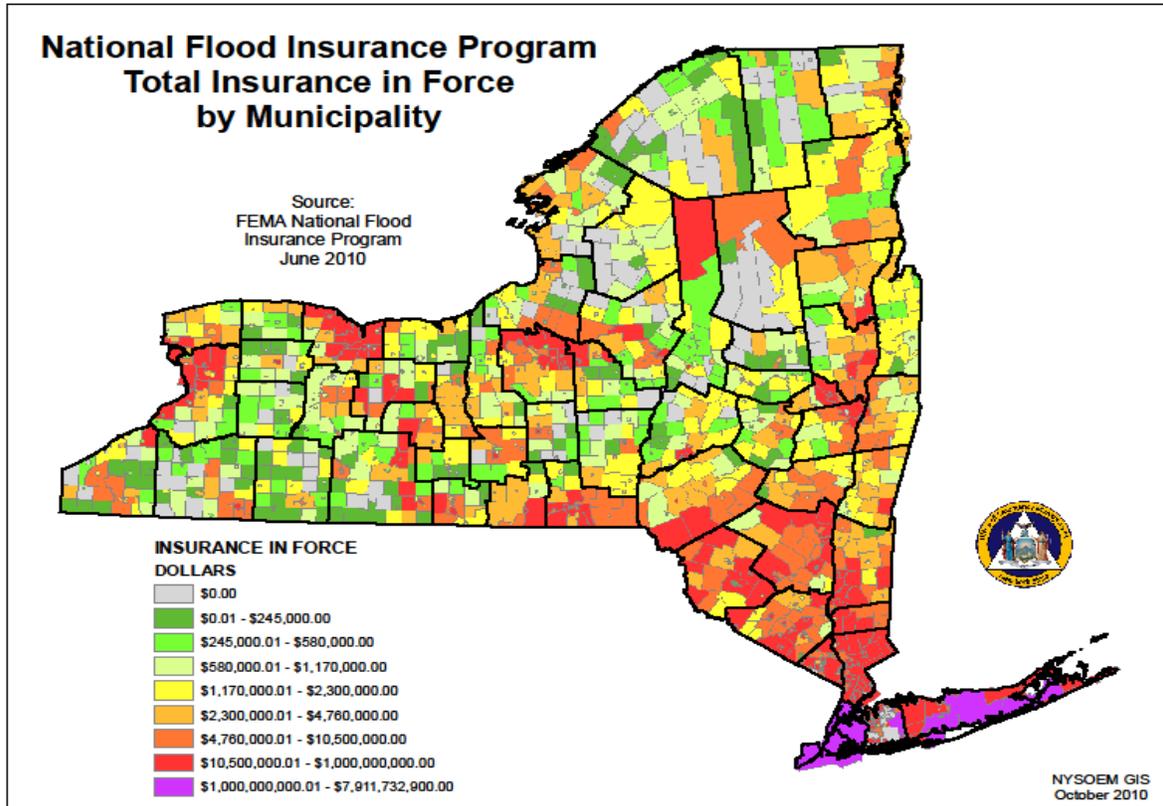


Figure A.3-3 provides a spatial representation of the change that has occurred between 2007 and 2010 in the total dollar amount of NFIP policy coverage in Municipalities across New York State.

Figure A.3-3: National Flood Insurance Program Change in Total Insurance in Force 2007-2010 by Municipality

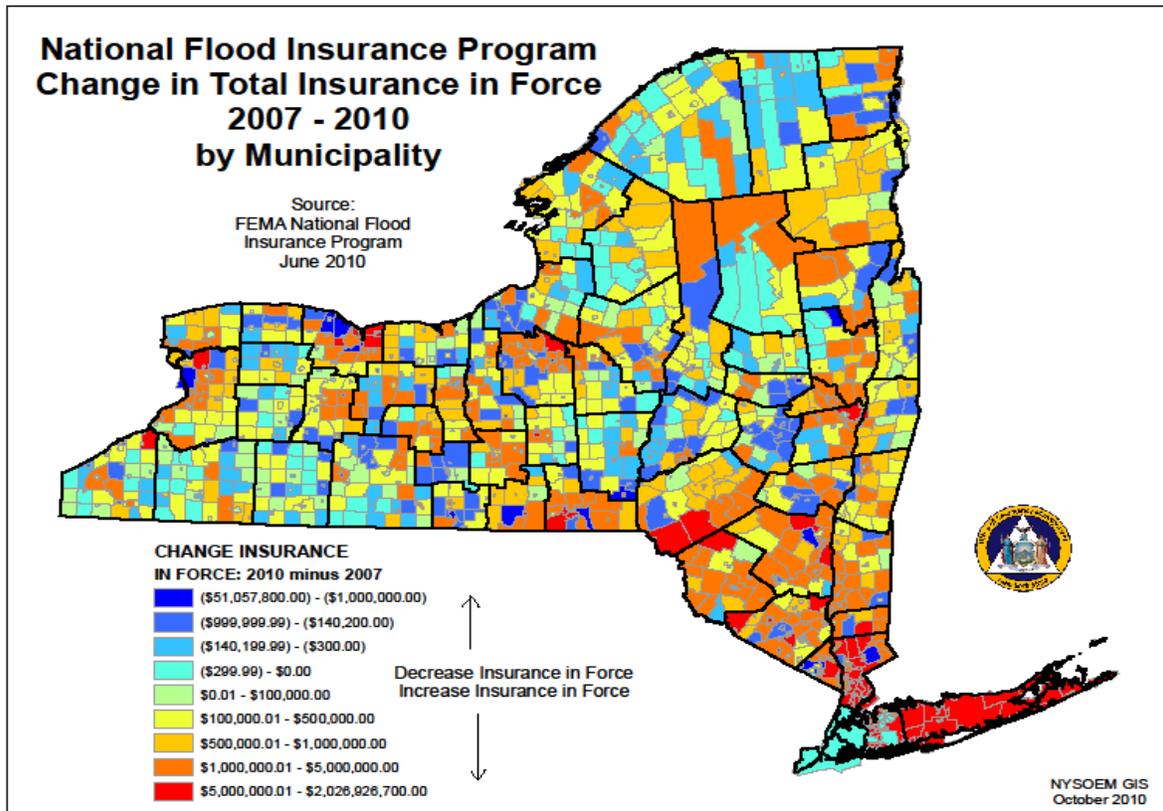


Figure A.3-4 provides a spatial representation of the distribution of total number of NFIP claims filed broken down by Municipality across New York State between 1978 and 2010.

Figure A.3-4: National Flood Insurance Program Total Claims by Municipality 1978-2010

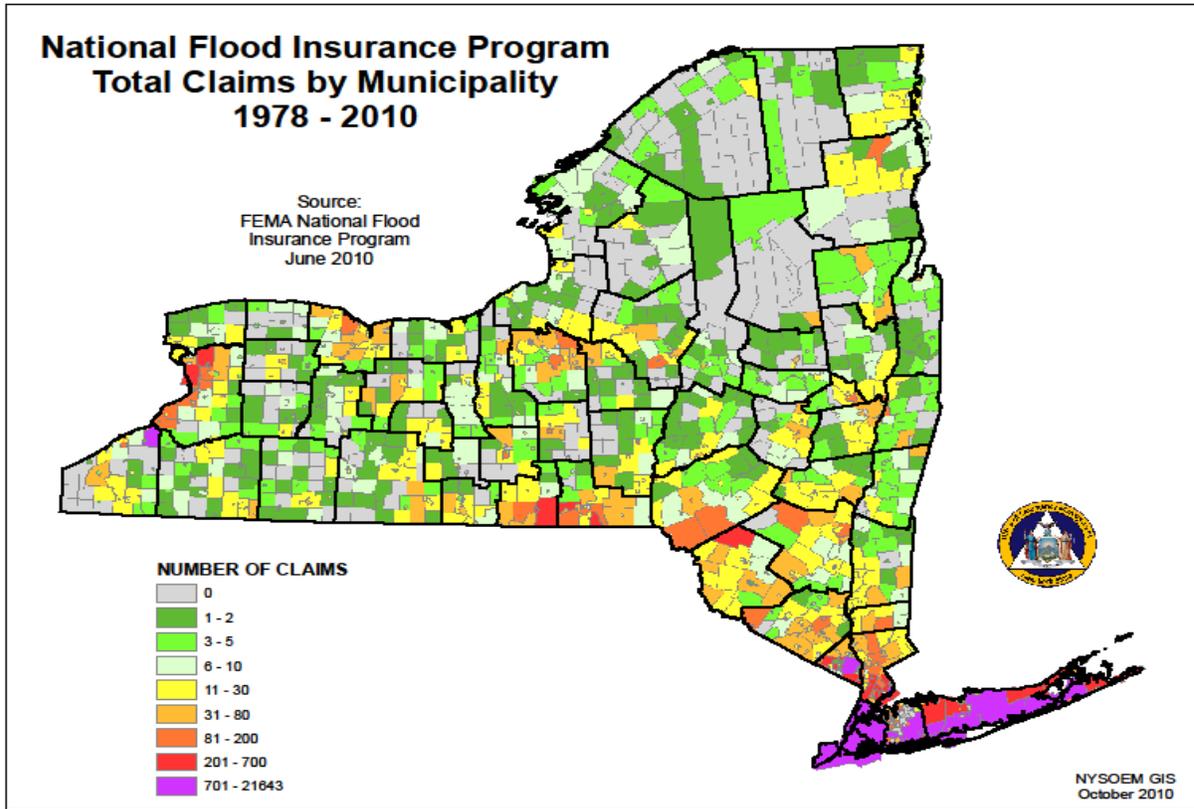


Figure A.3-5 provides a spatial representation of the distribution of the total value of NFIP policy claims paid by Municipality across New York State between 1978 and 2010.

Figure A.3-5: National Flood Insurance Program Claims Total Payment by Municipality 1978-2010

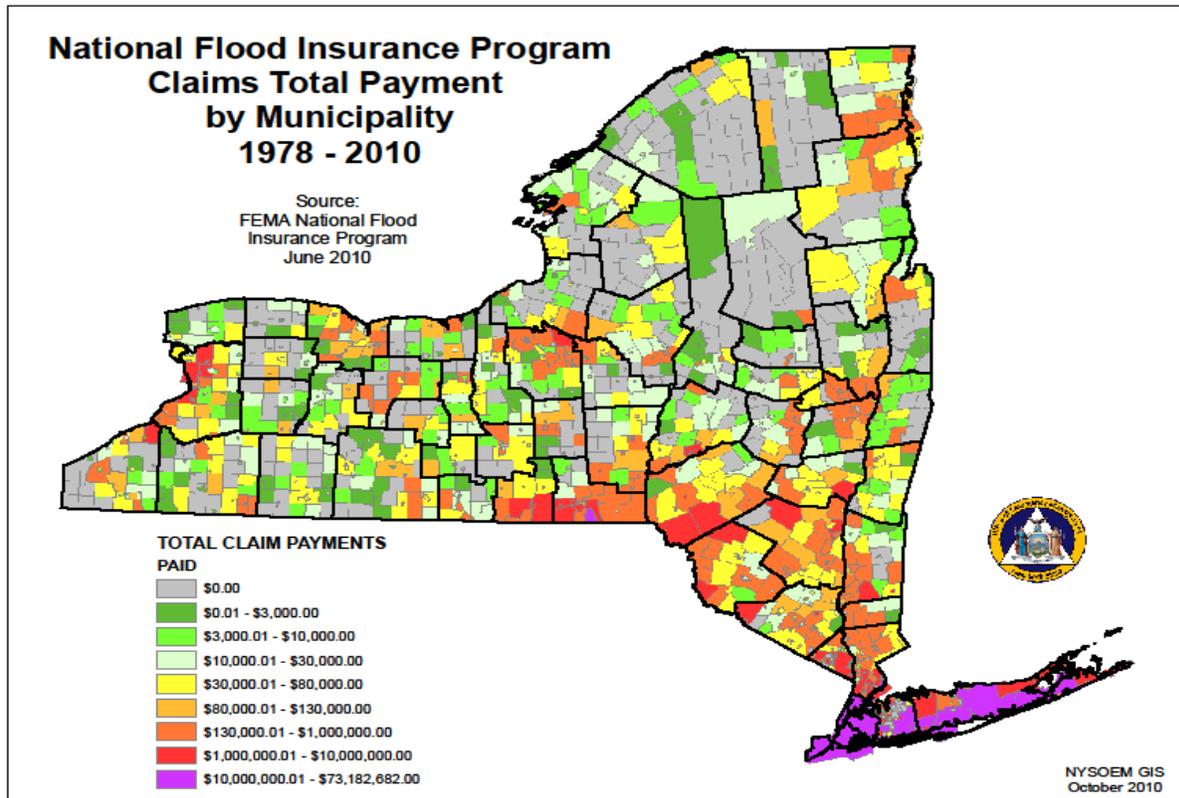


Table A.3-1: Repetitive Loss Properties as of 07/31/2013

County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
<b>ALBANY</b>	Albany, City Of	219176.61	56214.62	275391.23	21183.94	13.00	6
	Altamont, Village Of	7251.33	0.00	7251.33	3625.67	2.00	1
	Bethlehem, Town Of	117073.46	0.00	117073.46	14634.18	8.00	4
	Cohoes, City Of	6084.42	4389.54	10473.96	5236.98	2.00	1
	Colonie, Town Of	635190.20	365747.28	1000937.48	21759.51	46.00	13
	Guilderland, Town Of	31475.44	20722.72	52198.16	26099.08	2.00	1
	Menands, Village Of	37499.46	0.00	37499.46	18749.73	2.00	1
	New Scotland, Town Of	132139.35	11266.28	143405.63	35851.41	4.00	1
	Rensselaerville, Town Of	16681.27	327.10	17008.37	8504.18	2.00	1
	Voorheesville, Village Of	41146.90	4214.75	45361.65	11340.41	4.00	1
<b>ALLEGANY</b>	Almond, Town Of	5957.32	0.00	5957.32	2978.66	2.00	1
	Almond, Village Of	11119.20	0.00	11119.20	3706.40	3.00	1
	Amity, Town Of	184071.68	0.00	184071.68	92035.84	2.00	1
	Andover, Town Of	4,072.28	1,221.19	5,293.47	2,646.74	2	1
	Andover, Village Of	12,377.39	1,771.35	14,148.74	3,537.19	4	2
	Grove, Town Of	4,019.27	339.18	4,358.45	2,179.23	2	1
	Scio, Town Of	5,190.81	1,290.65	6,481.46	3,240.73	2	1
	Seneca Nation Of Indians	739,425.48	220,102.92	959,528.40	3,900.52	246	84
	Wellsville, Town Of	17,549.05	11,450.25	28,999.30	4,142.76	7	2
	Wellsville, Village Of	13,955.53	6,799.03	20,754.56	5,188.64	4	2
<b>BRONX</b>	New York, City Of	174,323,654.04	32,386,730.96	206,710,385.00	19,458.76	10,623	4,189
<b>BROOME</b>	Binghamton, City Of	4,788,457.40	816,539.12	5,604,996.52	56,616.13	99	40
	Binghamton, Town Of	831,192.88	0	831,192.88	415,596.44	2	1
	Chenango, Town Of	320,365.10	29,582.36	349,947.46	20,585.14	17	8
	Colesville, Town Of	713,939.56	47,450.17	761,389.73	25,379.66	30	14
	Conklin, Town Of	15,468,638.99	2,521,910.19	17,990,549.18	47,343.55	380	140
	Deposit, Village Of	849,555.62	67,542.13	917,097.75	26,973.46	34	16
	Dickinson, Town Of	370,582.39	64,757.45	435,339.84	36,278.32	12	6
	Endicott, Village Of	1,898,022.23	720,649.62	2,618,671.85	81,833.50	32	9
	Fenton, Town Of	323,157.18	40,542.72	363,699.90	19,142.10	19	8
	Johnson City, Village Of	1,901,730.64	491,536.04	2,393,266.68	40,563.84	59	27
	Kirkwood, Town Of	3,496,856.66	759,245.24	4,256,101.90	41,321.38	103	37
	Lisle, Town Of	80,522.12	12,800.00	93,322.12	46,661.06	2	1
	Maine, Town Of	42,354.60	16,224.28	58,578.88	29,289.44	2	1
	Nanticoke, Town	19,788.54	42,151.85	61,940.39	30,970.20	2	1



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Of						
	Sanford, Town Of	128,436.66	4,881.79	133,318.45	19,045.49	7	3
	Union, Town Of	8,503,945.57	1,553,689.80	10,057,635.37	40,719.17	247	87
	Vestal, Town Of	5,622,798.76	886,599.51	6,509,398.27	37,845.34	172	69
	Whitney Point, Village Of	15,008.98	20,407.41	35,416.39	17,708.20	2	1
	Windsor, Town Of	406,023.19	104,259.93	510,283.12	31,892.69	16	8
	Windsor, Village Of	5,757.96	5,323.20	11,081.16	2,770.29	4	2
<b>CATTARAUGUS</b>	Allegany, Village Of	33,317.83	0	33,317.83	8,329.46	4	2
	Cold Spring, Town Of	33,125.67	0	33,125.67	16,562.83	2	1
	East Otto, Town Of	160,722.12	52,645.04	213,367.16	23,707.46	9	4
	East Randolph, Village Of	1,130.00	1,284.04	2,414.04	1,207.02	2	1
	Farmersville, Town Of	8,503.02	4,335.75	12,838.77	6,419.39	2	1
	Great Valley, Town Of	16,860.41	1,083.88	17,944.29	8,972.15	2	1
	Olean, Town Of	26,209.28	0	26,209.28	13,104.64	2	1
	Portville, Town Of	159,917.43	46,152.09	206,069.52	14,719.25	14	5
<b>CAYUGA</b>	Aurelius, Town Of	7,348.03	0	7,348.03	3,674.02	2	1
	Brutus, Town Of	11,591.11	232	11,823.11	5,911.56	2	1
	Cato, Town Of	97,090.70	1,370.00	98,460.70	8,205.06	12	5
	Ledyard, Town Of	4,778.37	0	4,778.37	2,389.19	2	1
	Meridian, Village Of	30,371.40	3,829.15	34,200.55	11,400.18	3	1
	Moravia, Village Of	31,434.36	0	31,434.36	15,717.18	2	1
	Union Springs, Village Of	14,104.80	406.2	14,511.00	2,418.50	6	2
<b>CHAUTAUQUA</b>	Chautauqua, Town Of	5,996.36	13,629.98	19,626.34	3,925.27	5	2
	Dunkirk, City Of	82,923.28	14,408.85	97,332.13	7,487.09	13	6
	Dunkirk, Town Of	1,013.27	5,079.84	6,093.11	3,046.56	2	1
	Ellicott, Town Of	8,576.35	6,467.36	15,043.71	2,507.29	6	3
	Fredonia, Village Of	201,602.90	165,426.59	367,029.49	15,292.90	24	11
	Hanover, Town Of	3,095,791.06	1,072,171.76	4,167,962.82	6,877.83	606	183
	Jamestown, City Of	10,376.53	502	10,878.53	5,439.27	2	1
	Lakewood, Village Of	1,796.66	632.59	2,429.25	1,214.63	2	1
	North Harmony, Town Of	7,696.22	3,580.24	11,276.46	2,819.12	4	2
	Poland, Town Of	4,520.13	130.54	4,650.67	2,325.34	2	1
	Portland, Town Of	5,417.98	0	5,417.98	2,708.99	2	1
	Sheridan, Town Of	6,456.68	0	6,456.68	3,228.34	2	1
	Silver Creek, Village Of	153,052.77	429,421.87	582,474.64	20,802.67	28	11
<b>CHEMUNG</b>	Ashland, Town Of	131,095.75	21,173.61	152,269.36	15,226.94	10	5
	Baldwin, Town Of	390,143.85	52,462.46	442,606.31	55,325.79	8	4
	Big Flats, Town Of	43,035.17	12,643.03	55,678.20	11,135.64	5	2



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Catlin, Town Of	30,316.23	0	30,316.23	15,158.12	2	1
	Elmira Heights, Village Of	17,510.30	1,291.15	18,801.45	3,133.58	6	3
	Horseheads, Town Of	11,735.22	0	11,735.22	5,867.61	2	1
	Southport, Town Of	22,785.99	70,186.69	92,972.68	13,281.81	7	3
	Wellsburg, Village Of	65,556.89	0	65,556.89	32,778.45	2	1
<b>CHENANGO</b>	Afton, Town Of	197,058.31	2,500.00	199,558.31	33,259.72	6	3
	Afton, Village Of	275,023.09	14,492.64	289,515.73	28,951.57	10	5
	Bainbridge, Town Of	439,158.94	56,154.74	495,313.68	29,136.10	17	8
	Bainbridge, Village Of	551,952.03	0	551,952.03	34,497.00	16	8
	Coventry, Town Of	11,307.74	0	11,307.74	5,653.87	2	1
	Greene, Town Of	694,254.57	378,159.26	1,072,413.83	59,578.55	18	7
	Greene, Village Of	1,534,148.49	99,677.94	1,633,826.43	38,900.63	42	17
	Guilford, Town Of	29,497.31	13,558.71	43,056.02	21,528.01	2	1
	Norwich, City Of	667,882.73	200,081.38	867,964.11	22,841.16	38	17
	Norwich, Town Of	351,722.83	109,700.28	461,423.11	76,903.85	6	2
	Oxford, Town Of	133,532.65	15,232.25	148,764.90	12,397.07	12	5
	Oxford, Village Of	88,520.52	10,144.66	98,665.18	12,333.15	8	4
	Sherburne, Town Of	25,396.41	3,936.28	29,332.69	7,333.17	4	2
	Sherburne, Village Of	73,691.13	11,149.98	84,841.11	14,140.19	6	2
	Smyrna, Town Of	6,945.14	0	6,945.14	3,472.57	2	1
<b>CLINTON</b>	Ausable, Town Of	24,915.25	8,595.79	33,511.04	16,755.52	2	1
	Black Brook, Town Of	51,258.22	7,086.00	58,344.22	7,293.03	8	3
	Champlain, Town Of	94,916.89	19,126.37	114,043.26	10,367.57	11	4
	Champlain, Village Of	53,900.60	13,907.00	67,807.60	6,780.76	10	5
	Chazy, Town Of	16,429.48	2,070.44	18,499.92	9,249.96	2	1
	Ellenburg, Town Of	107,111.25	10,000.00	117,111.25	58,555.63	2	1
	Mooers, Town Of	15,428.09	3,009.21	18,437.30	9,218.65	2	1
	Peru, Town Of	269,074.60	0	269,074.60	44,845.77	6	3
	Plattsburgh, City Of	57,000.14	18,835.41	75,835.55	37,917.78	2	1
	Plattsburgh, Town Of	257,349.97	0	257,349.97	51,469.99	5	2
	Saranac, Town Of	8,812.35	0	8,812.35	2,937.45	3	1
<b>COLUMBIA</b>	Ancram, Town Of	1,839.85	2,217.00	4,056.85	2,028.43	2	1
	Copake, Town Of	60,152.76	8,226.01	68,378.77	11,396.46	6	3
	Hillsdale, Town Of	17,259.08	0	17,259.08	5,753.03	3	1
	Kinderhook, Town Of	21,884.30	567.97	22,452.27	11,226.14	2	1
	Kinderhook, Village Of	368,286.07	0	368,286.07	92,071.52	4	2
	Livingston, Town Of	52,476.71	4,688.78	57,165.49	6,351.72	9	3
	Mineola, Village	19,383.09	145,948.77	165,331.86	18,370.21	9	4



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Of						
	New Lebanon, Town Of	207,067.83	678,553.55	885,621.38	19,252.64	46	5
	Stockport, Town Of	153,859.74	17,995.86	171,855.60	15,623.24	11	5
	Stuyvesant, Town Of	334,400.71	38,934.53	373,335.24	41,481.69	9	4
	Valatie, Village Of	12,825.03	0	12,825.03	6,412.52	2	1
<b>CORTLAND</b>	Cortland, City Of	121,546.16	3,857.17	125,403.33	5,225.14	24	11
	Cortlandville, Town Of	79,986.88	0	79,986.88	15,997.38	5	2
	Marathon, Village Of	50,624.75	1,426.44	52,051.19	7,435.88	7	3
	Mcgraw, Village Of	70,929.45	6,343.77	77,273.22	8,585.91	9	3
	Truxton, Town Of	86,200.89	0	86,200.89	14,366.81	6	3
<b>DELAWARE</b>	Andes, Town Of	85,420.48	26,319.16	111,739.64	18,623.27	6	3
	Andes, Village Of	17,754.66	0	17,754.66	4,438.67	4	2
	Colchester, Town Of	997,622.28	191,767.48	1,189,389.76	19,823.16	60	21
	Davenport, Town Of	33,533.49	0	33,533.49	16,766.74	2	1
	Delhi, Town Of	29,283.96	2,540.92	31,824.88	7,956.22	4	2
	Delhi, Village Of	49,181.08	3,664.74	52,845.82	8,807.64	6	2
	Deposit, Town Of	143,121.80	0	143,121.80	15,902.42	9	3
	Fleischmanns, Village Of	215,772.92	12,752.20	228,525.12	28,565.64	8	3
	Hamden, Town Of	17,305.46	35,000.00	52,305.46	8,717.58	6	2
	Hancock, Town Of	1,101,085.18	165,340.04	1,266,425.22	20,761.07	61	20
	Hancock, Village Of	52,811.33	1,888.58	54,699.91	10,939.98	5	2
	Margaretville, Village Of	919,229.78	127,616.97	1,046,846.75	31,722.63	33	12
	Middletown, Town Of	189,226.80	21,121.55	210,348.35	13,146.77	16	6
	Sidney, Town Of	641,908.56	32,138.94	674,047.50	25,924.90	26	12
	Sidney, Village Of	8,907,493.16	2,301,641.52	11,209,134.68	58,686.57	191	90
	Walton, Town Of	85,493.12	12,472.80	97,965.92	19,593.18	5	2
	Walton, Village Of	623,789.12	508,783.99	1,132,573.11	53,932.05	21	9
<b>DUTCHESS</b>	Beacon, City Of	144,699.88	0	144,699.88	24,116.65	6	3
	Clinton, Town Of	74,268.01	0	74,268.01	18,567.00	4	2
	Dover, Town Of	257,584.22	52,705.85	310,290.07	14,775.72	21	7
	East Fishkill, Town Of	1,038,532.99	179,188.05	1,217,721.04	21,363.53	57	21
	Fishkill, Town Of	208,200.39	56,167.74	264,368.13	20,336.01	13	4
	Fishkill, Village Of	571,298.41	488,881.97	1,060,180.38	62,363.55	17	8
	Hyde Park, Town Of	87,674.35	12,681.63	100,355.98	20,071.20	5	2
	Lagrange, Town Of	182,729.06	9,010.16	191,739.22	11,983.70	16	7
	Milan, Town Of	8,981.63	429.48	9,411.11	4,705.56	2	1
	Pawling, Town Of	29,379.08	0	29,379.08	9,793.03	3	1
	Pawling, Village Of	979,030.84	531,295.53	1,510,326.37	188,790.80	8	3
	Pleasant Valley, Town Of	736,000.73	125,396.02	861,396.75	30,764.17	28	10



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Poughkeepsie, City Of	135,121.35	6,965.54	142,086.89	10,149.06	14	6
	Poughkeepsie, Town Of	72,362.03	23,001.08	95,363.11	15,893.85	6	2
	Red Hook, Town Of	273,803.34	42,000.00	315,803.34	39,475.42	8	3
	Rhinebeck, Town Of	13,128.28	0	13,128.28	6,564.14	2	1
	Rhinebeck, Village Of	5,562.50	0	5,562.50	2,781.25	2	1
	Wappinger, Town Of	187,269.64	10,000.00	197,269.64	32,878.27	6	3
	Wappingers Falls, Village Of	3,679.83	0	3,679.83	1,839.92	2	1
<b>ERIE</b>	Alden, Town Of	39,750.50	11,614.90	51,365.40	25,682.70	2	1
	Amherst, Town Of	191,011.40	65,883.08	256,894.48	6,760.38	38	18
	Angola, Village Of	22,645.85	5,300.00	27,945.85	13,972.93	2	1
	Aurora, Town Of	79,790.68	5,886.08	85,676.76	12,239.54	7	2
	Blasdell, Village Of	95	48,923.01	49,018.01	12,254.50	4	1
	Boston, Town Of	27,027.93	8,415.15	35,443.08	5,063.30	7	2
	Brant, Town Of	6,052.43	1,510.50	7,562.93	1,890.73	4	1
	Buffalo, City Of	221,713.41	162,845.77	384,559.18	10,119.98	38	13
	Cheektowaga, Town Of	187,920.31	283,808.25	471,728.56	26,207.14	18	7
	Clarence, Town Of	116,043.87	4,673.36	120,717.23	20,119.54	6	3
	Concord, Town Of	37,782.66	15,275.00	53,057.66	13,264.42	4	2
	Depew, Village Of	15,211.04	6,592.38	21,803.42	4,360.68	5	2
	East Aurora, Village Of	2,819.89	385.35	3,205.24	1,602.62	2	1
	Eden, Town Of	9,523.03	0	9,523.03	4,761.52	2	1
	Elma, Town Of	20,243.97	5,849.85	26,093.82	2,899.31	9	4
	Evans, Town Of	163,117.71	43,735.85	206,853.56	10,887.03	19	6
	Farnham, Village Of	36,500.00	7,000.00	43,500.00	21,750.00	2	1
	Grand Island, Town Of	17,047.00	3,401.91	20,448.91	2,921.27	7	3
	Hamburg, Town Of	535,926.98	197,971.85	733,898.83	14,390.17	51	21
	Hamburg, Village Of	71,976.40	13,338.33	85,314.73	21,328.68	4	2
	Lackawanna, City Of	6,907.79	6,784.48	13,692.27	3,423.07	4	2
	Lancaster, Town Of	65,270.06	42,099.62	107,369.68	11,929.96	9	3
	Newstead, Town Of	16,463.85	0	16,463.85	8,231.93	2	1
	Orchard Park, Village Of	26,731.27	872.11	27,603.38	13,801.69	2	1
	Sloan, Village Of	4,548.89	2,124.36	6,673.25	3,336.63	2	1
	Springville, Village Of	21,134.31	0	21,134.31	4,226.86	5	2
	Tonawanda, City Of	10,252.00	2,190.00	12,442.00	6,221.00	2	1
	Tonawanda, Town Of	5,366.30	21,397.16	26,763.46	3,345.43	8	3



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	West Seneca, Town Of	82,210.52	17,252.64	99,463.16	8,288.60	12	6
<b>ESSEX</b>	Chesterfield, Town Of	159,531.62	0	159,531.62	31,906.32	5	1
	Elizabethtown, Town Of	85,803.88	24,195.94	109,999.82	13,749.98	8	3
	Jay, Town Of	855,906.07	160,170.76	1,016,076.83	26,738.86	38	17
	Keene, Town Of	376,036.41	57,022.45	433,058.86	54,132.36	8	3
	Newcomb, Town Of	48,894.40	8,600.16	57,494.56	11,498.91	5	2
	North Elba, Town Of	31,452.61	2,130.74	33,583.35	16,791.68	2	1
	Schroon, Town Of	18,242.83	0	18,242.83	4,560.71	4	2
	Westport, Town Of	0	10,135.95	10,135.95	5,067.98	2	1
	Willsboro, Town Of	65,040.13	15,426.59	80,466.72	16,093.34	5	2
<b>FULTON</b>	Gloversville, City Of	31,614.59	216,217.75	247,832.34	41,305.39	6	3
	Johnstown, City Of	50,883.06	837.13	51,720.19	5,172.02	10	4
	Mayfield, Town Of	19,302.19	2,325.28	21,627.47	5,406.87	4	2
<b>GENESEE</b>	Alexander, Village Of	28,297.65	0	28,297.65	14,148.83	2	1
	Alexander, Town Of	91,466.15	8,776.33	100,242.48	11,138.05	9	3
	Attica, Village Of	133,615.03	94,717.96	228,332.99	22,833.30	10	4
	Batavia, City Of	15,652.07	1,457.10	17,109.17	5,703.06	3	1
	Batavia, Town Of	18,607.86	0	18,607.86	9,303.93	2	1
<b>GREENE</b>	Athens, Town Of	86,348.45	1,278.65	87,627.10	43,813.55	2	1
	Athens, Village Of	108,572.78	62,072.26	170,645.04	28,440.84	6	2
	Cairo, Town Of	23,772.31	7,694.87	31,467.18	5,244.53	6	3
	Catskill, Town Of	2,319,446.68	714,319.30	3,033,765.98	91,932.30	33	9
	Catskill, Village Of	857,354.94	407,991.88	1,265,346.82	84,356.45	15	5
	Coxsackie, Village Of	172,988.72	42,698.59	215,687.31	30,812.47	7	3
	Hunter, Town Of	62,334.02	11,072.09	73,406.11	5,646.62	13	5
	Hunter, Village Of	59,103.84	13,334.54	72,438.38	14,487.68	5	2
	Jewett, Town Of	104,651.19	437.5	105,088.69	9,553.52	11	5
	Lexington, Town Of	632,943.76	109,508.93	742,452.69	27,498.25	27	9
	Prattsville, Town Of	696,695.41	89,029.60	785,725.01	34,161.96	23	7
	Tannersville, Village Of	6,913.19	600.45	7,513.64	3,756.82	2	1
<b>HAMILTON</b>	Hope, Town Of	49,787.30	27,629.73	77,417.03	12,902.84	6	3
<b>HERKIMER</b>	Dolgeville, Village Of	38,718.17	3,000.00	41,718.17	5,959.74	7	3
	Ilion, Village Of	209,722.90	0	209,722.90	6,553.84	32	15
	Little Falls, City Of	48,877.12	0	48,877.12	24,438.56	2	1
	Manheim, Town Of	35,768.48	5,860.81	41,629.29	20,814.65	2	1
	Middleville, Village Of	108,916.04	46,437.24	155,353.28	25,892.21	6	3
	Mohawk, Village Of	33,526.97	8,739.70	42,266.67	14,088.89	3	1
	Newport, Village	62,916.59	11,000.00	73,916.59	36,958.29	2	1



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Of						
	Stark, Town Of	18,949.61	0	18,949.61	6,316.54	3	1
<b>JEFFERSON</b>	Antwerp, Town Of	14,649.38	0	14,649.38	4,883.13	3	1
	Brownville, Town Of	264,796.55	0	264,796.55	132,398.28	2	1
	Carthage, Village Of	8,481.06	2,723.57	11,204.63	3,734.88	3	1
	Clayton, Village Of	4,186.87	2,111.50	6,298.37	3,149.19	2	1
	Lorraine, Town Of	9,184.67	0	9,184.67	4,592.34	2	1
	Wilna, Town Of	31,028.19	0	31,028.19	6,205.64	5	2
<b>LEWIS</b>	Castorland, Village Of	0	20,040.49	20,040.49	10,020.25	2	1
	Denmark, Town Of	9,539.34	0	9,539.34	4,769.67	2	1
	Greig, Town Of	22,672.41	2,046.00	24,718.41	12,359.21	2	1
	Leyden, Town Of	4,706.36	0	4,706.36	2,353.18	2	1
<b>LIVINGSTON</b>	Caledonia, Town Of	10,912.33	307.59	11,219.92	5,609.96	2	1
	Dansville, Village Of	12,504.37	125.48	12,629.85	4,209.95	3	1
	Livonia, Town Of	23,772.43	1,138.33	24,910.76	6,227.69	4	1
<b>MADISON</b>	Canastota , Village Of	9,376.30	0	9,376.30	4,688.15	2	1
	Cazenovia, Village Of	10,339.31	13,434.00	23,773.31	4,754.66	5	2
	Chittenango, Village Of	23,044.33	3,800.00	26,844.33	6,711.08	4	2
	Madison, Town Of	18,213.12	0	18,213.12	9,106.56	2	1
	Oneida, City Of	69,047.81	10,613.30	79,661.11	13,276.85	6	3
	Sullivan, Town Of	201,063.01	53,286.13	254,349.14	18,167.80	14	7
<b>COUNTY</b>	Brighton, Town Of	8,154.00	1,742.18	9,896.18	4,948.09	2	1
	Chili, Town Of	11,486.29	0	11,486.29	2,871.57	4	1
	Gates, Town Of	4,161.89	0	4,161.89	2,080.95	2	1
	Greece, Town Of	187,107.93	13,672.17	200,780.10	25,097.51	8	3
	Hamlin, Town Of	24,747.55	1,550.65	26,298.20	6,574.55	4	2
	Henrietta, Town Of	8,541.62	0	8,541.62	4,270.81	2	1
	Irondequoit, Town Of	14,155.81	3,654.35	17,810.16	8,905.08	2	1
	Ogden, Town Of	89,263.03	20,000.00	109,263.03	54,631.52	2	1
	Parma, Town Of	23,171.64	0	23,171.64	11,585.82	2	1
	Penfield, Town Of	314,815.11	0	314,815.11	22,486.79	14	6
	Perinton, Town Of	83,623.13	0	83,623.13	11,946.16	7	3
	Pittsford, Town Of	87,144.21	15,982.98	103,127.19	14,732.46	7	3
	Rochester, City Of	19,605.48	14,690.78	34,296.26	4,899.47	7	1
	Spencerport, Village Of	101,374.67	0	101,374.67	33,791.56	3	1
	Webster, Town Of	8,230.50	0	8,230.50	4,115.25	2	1
	Wheatland, Town Of	384,616.75	70,021.72	454,638.47	32,474.18	14	2
<b>MONTGOMERY</b>	Amsterdam, Town Of	14,498.33	10,500.00	24,998.33	12,499.17	2	1
	Canajoharie, Town Of	10,937.41	4,332.69	15,270.10	7,635.05	2	1
	Charleston, Town	312,300.98	15,230.76	327,531.74	46,790.25	7	2



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Of						
	Florida, Town Of	3,434.97	0	3,434.97	1,717.49	2	1
	Fonda, Village Of	943,145.29	31,826.34	974,971.63	44,316.89	22	10
	Fort Plain, Village Of	78,132.13	167,770.12	245,902.25	20,491.85	12	6
	Fultonville, Village Of	356,596.80	666,968.43	1,023,565.23	93,051.38	11	5
	Minden, Town Of	26,481.12	7,000.09	33,481.21	16,740.61	2	1
	Mohawk, Town Of	17,312.97	0	17,312.97	8,656.49	2	1
<b>NASSAU</b>	Atlantic Beach, Village Of	3,991,424.88	420,483.67	4,411,908.55	43,682.26	101	42
	Bayville, Village Of	7,210,337.63	1,046,281.84	8,256,619.47	18,266.86	452	152
	Brookville, Village Of	10,000.00	17,500.00	27,500.00	13,750.00	2	1
	Cedarhurst, Village Of	1,458,185.24	168,300.94	1,626,486.18	26,233.65	62	26
	Centre Island, Village Of	146,276.35	0	146,276.35	16,252.93	9	4
	East Rockaway, Village Of	13,240,395.98	1,275,218.77	14,515,614.75	31,972.72	454	192
	Flower Hill, Village Of	3,486.15	2,000.00	5,486.15	2,743.08	2	1
	Freeport, Village Of	105,266,362.19	14,120,373.28	119,386,735.47	34,594.82	3,451	1,214
	Glen Cove, City Of	1,277,516.90	358,997.61	1,636,514.51	28,710.78	57	20
	Great Neck Estates, Village Of	137,128.09	97,142.40	234,270.49	19,522.54	12	5
	Great Neck, Village Of	571,889.58	127,138.85	699,028.43	16,256.48	43	12
	Hempstead, Town Of	221,973,594.94	29,084,987.03	251,058,581.97	37,505.02	6,694	2,598
	Hempstead, Village Of	108,479.82	17,781.94	126,261.76	14,029.08	9	2
	Hewlett Bay Park, Village Of	456,776.92	10,967.86	467,744.78	38,978.73	12	4
	Hewlett Harbor, Village Of	3,631,346.72	640,168.25	4,271,514.97	64,719.92	66	26
	Hewlett Neck, Village Of	200,865.46	21,800.00	222,665.46	44,533.09	5	2
	Island Park, Village Of	38,391,427.28	5,388,341.49	43,779,768.77	43,823.59	999	340
	Kings Point, Village Of	408,469.17	75,510.66	483,979.83	21,042.60	23	8
	Lake Success, Village Of	6,803.20	0	6,803.20	2,267.73	3	1
	Lattingtown, Village Of	66,693.91	668.83	67,362.74	16,840.69	4	2
	Lawrence, Village Of	3,137,033.61	809,742.27	3,946,775.88	44,849.73	88	38
	Long Beach, City Of	75,795,999.93	6,493,986.74	82,289,986.67	32,667.72	2,519	978
	Manorhaven, Village Of	50,649.75	741.04	51,390.79	10,278.16	5	2
	Massapequa Park, Village Of	5,815,730.59	799,739.87	6,615,470.46	41,606.73	159	57



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Matinecock, Village Of	3,617.00	200	3,817.00	1,908.50	2	1
	Muttontown, Village Of	10,217.66	8,774.09	18,991.75	9,495.88	2	1
	North Hempstead, Town Of	561,222.28	142,296.59	703,518.87	15,293.89	46	19
	Old Brookville, Village Of	12,760.67	3,738.48	16,499.15	8,249.58	2	1
	Old Westbury, Village Of	10,399.96	9,432.53	19,832.49	4,958.12	4	1
	Oyster Bay Cove, Village Of	10,695.96	7,554.00	18,249.96	3,041.66	6	2
	Oyster Bay, Town Of	94,308,229.34	15,424,408.38	109,732,637.72	49,969.33	2,196	734
	Plandome Manor, Village Of	67,486.01	0	67,486.01	9,640.86	7	3
	Plandome, Village Of	49,052.47	0	49,052.47	24,526.24	2	1
	Port Washington North, Village	10,940.07	13,573.70	24,513.77	4,085.63	6	3
	Rockville Centre, Village Of	136,315.91	13,544.63	149,860.54	24,976.76	6	3
	Roslyn Harbor, Village Of	3,420.95	2,250.00	5,670.95	2,835.48	2	1
	Roslyn, Village Of	72,948.84	0	72,948.84	18,237.21	4	1
	Saddle Rock, Village Of	107,053.09	20,974.39	128,027.48	32,006.87	4	2
	Sands Point, Village Of	441,393.30	60,643.77	502,037.07	27,890.95	18	8
	Sea Cliff, Village Of	118,313.44	22,266.36	140,579.80	10,813.83	13	5
	Thomaston, Village Of	16,843.40	3,464.39	20,307.79	4,061.56	5	2
	Valley Stream, Village Of	1,013,884.88	34,058.97	1,047,943.85	14,161.40	74	30
	Woodsburgh, Village Of	38,558.60	0	38,558.60	19,279.30	2	1
<b>NIAGARA</b>	Niagara, Town Of	33,226.14	1,822.82	35,048.96	8,762.24	4	2
	Pendleton, Town Of	97,598.82	0	97,598.82	48,799.41	2	1
	Royalton, Town Of	26,474.55	0	26,474.55	3,309.32	8	1
<b>ONEIDA</b>	Clinton, Village Of	9,568.13	0	9,568.13	4,784.06	2	1
	Kirkland, Town Of	190,469.54	83,007.59	273,477.13	6,836.93	40	13
	New Hartford, Town Of	8,718.46	0	8,718.46	4,359.23	2	1
	New York Mills, Village Of	993,745.63	34,049.74	1,027,795.37	57,099.74	18	9
	Oneida Castle, Village Of	19,514.71	116.28	19,630.99	9,815.50	2	1
	Rome, City Of	202.26	2,909.68	3,111.94	1,555.97	2	1
	Sylvan Beach, Village Of	122,313.55	4,641.82	126,955.37	11,541.40	11	4
	Utica, City Of	34,388.45	12,628.00	47,016.45	5,877.06	8	4
	Vienna, Town Of	22,419.57	0	22,419.57	5,604.89	4	2
	Westmoreland,	23,726.63	7,240.84	30,967.47	7,741.87	4	2



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Town Of						
	Whitesboro, Village Of	827,877.27	30,189.71	858,066.98	12,085.45	71	29
	Yorkville, Village Of	729,835.72	321,597.14	1,051,432.86	80,879.45	13	5
<b>ONONDAGA</b>	Cicero, Town Of	500,549.62	44,292.60	544,842.22	10,477.73	52	23
	Dewitt, Town Of	693,070.74	434,445.62	1,127,516.36	34,167.16	33	8
	Elbridge, Town Of	17,734.68	5,000.00	22,734.68	5,683.67	4	2
	Lafayette, Town Of	3,948.58	0	3,948.58	1,974.29	2	1
	Lysander, Town Of	53,101.40	1,870.36	54,971.76	9,161.96	6	3
	Manlius, Town Of	33,703.71	4,757.47	38,461.18	7,692.24	5	2
	Skaneateles, Village Of	19,604.53	1,504.00	21,108.53	10,554.27	2	1
	Syracuse, City Of	17,110.02	2,695.06	19,805.08	4,951.27	4	1
<b>ONTARIO</b>	Canandaigua, Town Of	17,260.93	0	17,260.93	8,630.47	2	1
	Gorham, Town Of	19,678.47	10,474.27	30,152.74	10,050.91	3	1
	Hopewell, Town Of	58,231.41	5,586.84	63,818.25	15,954.56	4	2
	Naples, Village Of	153,789.37	63,567.31	217,356.68	31,050.95	7	1
	Richmond, Town Of	167,107.16	0	167,107.16	20,888.40	8	4
	South Bristol, Town Of	9,431.33	0	9,431.33	4,715.67	2	1
<b>ORANGE</b>	Blooming Grove, Town Of	585,242.83	229,273.36	814,516.19	19,393.24	42	14
	Chester, Town Of	475,000.54	103,512.90	578,513.44	20,661.19	28	7
	Cornwall, Town Of	60,900.65	3,802.86	64,703.51	21,567.84	3	1
	Deer Park, Town Of	1,621,501.97	381,591.61	2,003,093.58	31,795.14	63	22
	Florida, Village Of	102,538.92	188,569.86	291,108.78	58,221.76	5	2
	Goshen, Town Of	249,826.39	30,344.34	280,170.73	23,347.56	12	4
	Goshen, Village Of	143,729.29	12,875.02	156,604.31	17,400.48	9	4
	Greenwood Lake, Village Of	110,733.21	34,027.21	144,760.42	9,047.53	16	6
	Hamptonburgh, Town Of	363,075.02	99,054.40	462,129.42	23,106.47	20	5
	Middletown, City Of	98,996.74	89,261.16	188,257.90	14,481.38	13	5
	Monroe, Town Of	265,110.77	17,134.73	282,245.50	16,602.68	17	6
	Monroe, Village Of	427,936.11	174,091.57	602,027.68	18,813.36	32	11
	Montgomery, Town Of	11,934.90	0	11,934.90	5,967.45	2	1
	Montgomery, Village Of	170,711.47	232,844.25	403,555.72	67,259.29	6	2
	New Windsor, Town Of	149,269.56	116,707.99	265,977.55	29,553.06	9	4
	Newburgh, City Of	151,592.01	76,108.19	227,700.20	32,528.60	7	3
	Newburgh, Town Of	77,287.54	0	77,287.54	9,660.94	8	3
	Port Jervis, City Of	380,166.54	22,893.16	403,059.70	14,394.99	28	12
	Tuxedo, Town Of	895,262.69	317,869.49	1,213,132.18	67,396.23	18	7
	Unionville, Village	37,700.52	6,137.70	43,838.22	14,612.74	3	1



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Of						
	Wallkill, Town Of	125,577.56	15,385.69	140,963.25	12,814.84	11	3
	Warwick, Town Of	17,333.31	445.69	17,779.00	4,444.75	4	2
	Warwick, Village Of	173,787.97	15,562.65	189,350.62	11,834.41	16	5
	Washingtonville, Village Of	2,405,503.24	345,207.68	2,750,710.92	19,647.94	140	42
	Woodbury, Village Of	8,951.46	0	8,951.46	4,475.73	2	1
<b>ORLEANS</b>	Carlton, Town Of	7,193.47	0	7,193.47	3,596.74	2	1
<b>OSWEGO</b>	Gilbertsville, Village Of	34,697.56	0	34,697.56	17,348.78	2	1
	Altmar, Village Of	47,713.70	0	47,713.70	9,542.74	5	1
	Constantia, Town Of	47,924.69	3,400.82	51,325.51	10,265.10	5	2
	Hastings, Town Of	12,321.74	0	12,321.74	6,160.87	2	1
	Oswego, City Of	211,552.82	106,594.64	318,147.46	79,536.87	4	1
	Oswego, Town Of	12,752.10	2,065.50	14,817.60	7,408.80	2	1
	West Monroe, Town Of	77,807.53	3,460.71	81,268.24	7,388.02	11	5
<b>OTSEGO</b>	Butternuts, Town Of	15,171.65	0	15,171.65	7,585.83	2	1
	Decatur, Town Of	32,953.60	12,106.54	45,060.14	22,530.07	2	1
	Laurens, Village Of	15,054.26	0	15,054.26	7,527.13	2	1
	Maryland, Town Of	30,471.54	0	30,471.54	5,078.59	6	3
	Milford, Town Of	27,368.44	0	27,368.44	13,684.22	2	1
	Oneonta, City Of	30,053.93	5,036.37	35,090.30	5,848.38	6	3
	Oneonta, Town Of	334,177.03	29,249.19	363,426.22	30,285.52	12	5
	Otego, Town Of	33,643.61	0	33,643.61	8,410.90	4	2
	Otego, Village Of	475,853.29	71,901.37	547,754.66	54,775.47	10	5
	Richfield, Town Of	153,206.21	800	154,006.21	25,667.70	6	3
	Unadilla, Town Of	377,383.06	63,281.39	440,664.45	73,444.08	6	3
	Unadilla, Village Of	1,034,230.90	32,132.91	1,066,363.81	20,909.09	51	25
	Worcester, Town Of	17,590.84	0	17,590.84	8,795.42	2	1
<b>PUTNAM</b>	Carmel, Town Of	52,883.31	81,264.61	134,147.92	5,832.52	23	9
	Cold Spring, Village Of	831,273.39	31,324.58	862,597.97	86,259.80	10	5
	Kent, Town Of	5,930.49	345.47	6,275.96	3,137.98	2	1
	Patterson, Town Of	8,622.01	7,304.65	15,926.66	3,981.67	4	2
	Philipstown, Town Of	305,177.20	35,315.54	340,492.74	30,953.89	11	4
	Putnam Valley, Town Of	1,063,589.27	160,722.19	1,224,311.46	47,088.90	26	9
	Southeast, Town Of	6,444.67	0	6,444.67	3,222.34	2	1
<b>RENSELAER</b>	Brunswick, Town Of	23,683.65	695	24,378.65	12,189.33	2	1
	Hoosick Falls, Village Of	170,673.23	8,596.94	179,270.17	14,939.18	12	3
	Nassau, Town Of	1,117,194.59	78,312.34	1,195,506.93	62,921.42	19	8



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Nassau, Village Of	229,701.31	11,530.02	241,231.33	120,615.67	2	1
	Poestenkill, Town Of	55,501.81	30,532.35	86,034.16	43,017.08	2	1
	Rensselaer, City Of	148,398.33	15,947.58	164,345.91	10,271.62	16	6
	Sand Lake, Town Of	9,420.31	0	9,420.31	4,710.15	2	1
	Schaghticoke, Town Of	111,979.84	48,058.15	160,037.99	11,431.29	14	4
	Troy, City Of	657,971.96	40,950.27	698,922.23	58,243.52	12	5
<b>ROCKLAND</b>	Chestnut Ridge, Village Of	83,403.69	48,641.85	132,045.54	5,078.67	26	9
	Clarkstown, Town Of	3,379,552.21	1,367,112.76	4,746,664.97	14,211.57	334	115
	Grand View-On-Hudson, Village	406,736.63	31,217.61	437,954.24	39,814.02	11	5
	Haverstraw, Town Of	54,445.11	14,747.92	69,193.03	5,322.54	13	6
	Hillburn, Village Of	26,303.44	1,130,967.11	1,157,270.55	165,324.36	7	2
	Montebello, Village Of	212,542.30	38,420.29	250,962.59	19,304.81	13	6
	New Hempstead, Village Of	30,359.21	49,567.23	79,926.44	4,995.40	16	6
	New Square, Village Of	0	6,100.00	6,100.00	2,033.33	3	1
	Nyack, Village Of	1,930,728.83	41,928.01	1,972,656.84	73,061.36	27	8
	Orangetown, Town Of	904,850.80	419,086.29	1,323,937.09	13,239.37	100	35
	Piermont, Village Of	1,794,046.50	255,267.58	2,049,314.08	41,822.74	49	15
	Ramapo, Town Of	158,659.87	141,384.13	300,044.00	3,798.03	79	33
	Sloatsburg, Village Of	231,828.13	120,896.08	352,724.21	14,108.97	25	8
	South Nyack, Village Of	300,842.12	166,956.31	467,798.43	35,984.49	13	4
	Spring Valley, Village Of	305,539.60	158,374.74	463,914.34	7,137.14	65	19
	Stony Point, Town Of	398,117.90	4,010.82	402,128.72	50,266.09	8	4
	Suffern, Village Of	1,013,145.19	1,235,148.10	2,248,293.29	24,981.04	90	28
	Upper Nyack, Village Of	173,683.40	21,483.88	195,167.28	48,791.82	4	2
	Wesley Hills, Village Of	74,697.60	96,096.59	170,794.19	4,379.34	39	14
	West Haverstraw, Village Of	1,357.07	6,646.30	8,003.37	4,001.69	2	1
<b>SARATOGA</b>	Ballston Spa, Village Of	19,496.36	0	19,496.36	9,748.18	2	1
	Charlton, Town Of	16,924.18	9,167.59	26,091.77	13,045.89	2	1
	Clifton Park, Town Of	90,515.24	19,964.47	110,479.71	10,043.61	11	4
	Halfmoon, Town Of	45,981.98	3,635.00	49,616.98	7,088.14	7	3
	Mechanicville, City Of	44,404.23	672.41	45,076.64	6,439.52	7	2



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Saratoga, Town Of	18,523.91	239.98	18,763.89	4,690.97	4	2
	Stillwater, Town Of	69,821.28	5,538.36	75,359.64	5,023.98	15	3
	Waterford, Town Of	1,365,806.03	750,333.42	2,116,139.45	36,485.16	58	17
	Waterford, Village Of	799,781.15	100,142.45	899,923.60	18,365.79	49	16
<b>SCHENECTADY</b>	Duanesburg, Town Of	412,943.44	20,000.00	432,943.44	108,235.86	4	2
	Glenville, Town Of	198,333.29	32,066.53	230,399.82	25,599.98	9	3
	Niskayuna, Town Of	279,847.03	0	279,847.03	12,720.32	22	9
	Rotterdam, Town Of	623,605.80	57,355.48	680,961.28	52,381.64	13	6
	Schenectady, City Of	886,573.15	162,149.99	1,048,723.14	21,848.40	48	14
	Scotia, Village Of	145,058.54	16,991.34	162,049.88	13,504.16	12	6
<b>SCHOHARIE</b>	Blenheim, Town Of	78,425.87	0	78,425.87	39,212.94	2	1
	Cobleskill, Village Of	42,247.42	0	42,247.42	21,123.71	2	1
	Esperance, Town Of	775,718.91	127,477.94	903,196.85	34,738.34	26	10
	Esperance, Village Of	398,623.34	108,387.92	507,011.26	39,000.87	13	6
	Fulton, Town Of	16,475.00	0	16,475.00	8,237.50	2	1
	Gilboa, Town Of	27,143.92	6,822.81	33,966.73	8,491.68	4	2
	Middleburgh, Town Of	553,412.28	115,948.77	669,361.05	27,890.04	24	9
	Middleburgh, Village Of	846,592.09	155,534.89	1,002,126.98	13,542.26	74	25
	Richmondville, Village Of	175,283.47	5,100.00	180,383.47	60,127.82	3	1
	Schoharie, Town Of	292,173.99	71,035.99	363,209.98	72,642.00	5	2
	Schoharie, Village Of	881,767.78	126,639.21	1,008,406.99	50,420.35	20	9
	Wright, Town Of	4,291.58	155.86	4,447.44	2,223.72	2	1
<b>SENECA</b>	Covert, Town Of	14,100.00	0	14,100.00	7,050.00	2	1
	Fayette, Town Of	21,481.02	5,000.00	26,481.02	13,240.51	2	1
	Ovid, Town Of	78,770.73	10,125.46	88,896.19	22,224.05	4	2
	Seneca Falls, Town Of	47,230.42	6,366.55	53,596.97	8,932.83	6	3
<b>ST. LAWRENCE</b>	Gouverneur, Village Of	16,400.94	0	16,400.94	2,733.49	6	2
	Louisville, Town Of	13,569.63	4,723.11	18,292.74	9,146.37	2	1
<b>STEBEN</b>	Addison, Town Of	10,495.49	6,500.00	16,995.49	8,497.75	2	1
	Addison, Village Of	97,239.69	16,120.53	113,360.22	18,893.37	6	3
	Avoca, Town Of	6,053.78	0	6,053.78	3,026.89	2	1
	Campbell, Town Of	99,322.17	56,767.25	156,089.42	31,217.88	5	2
	Erwin, Town Of	2,326.70	5,607.30	7,934.00	3,967.00	2	1
	Howard, Town Of	43,900.34	11,791.95	55,692.29	18,564.10	3	1
	Painted Post,	34,895.79	6,160.07	41,055.86	20,527.93	2	1



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Village Of						
	Tuscarora, Town Of	32,346.06	1,256.44	33,602.50	8,400.63	4	2
<b>SUFFOLK</b>	Amityville, Village Of	31,872,303.21	4,575,411.31	36,447,714.52	49,996.86	729	241
	Asharoken, Village Of	1,361,164.12	233,298.14	1,594,462.26	28,990.22	55	20
	Babylon, Village Of	25,609,171.10	4,226,853.66	29,836,024.76	41,438.92	720	225
	Babylon, Town Of	51,706,274.29	7,448,121.44	59,154,395.73	35,592.30	1,662	526
	Belle Terre, Village Of	42,465.55	23,400.00	65,865.55	16,466.39	4	1
	Bellport, Village Of	246,982.13	8,916.55	255,898.68	15,052.86	17	6
	Brightwaters, Village Of	166,260.36	10,515.22	176,775.58	12,626.83	14	7
	Brookhaven, Town Of	34,364,742.48	3,521,700.31	37,886,442.79	30,927.71	1,225	431
	East Hampton, Town Of	1,593,988.77	120,047.21	1,714,035.98	12,985.12	132	53
	East Hampton, Village Of	444,902.05	0	444,902.05	40,445.64	11	4
	Greenport, Village Of	482,287.89	3,049.10	485,336.99	24,266.85	20	6
	Huntington Bay, Village Of	929,775.49	52,229.36	982,004.85	35,071.60	28	11
	Huntington, Town Of	1,941,974.38	270,389.55	2,212,363.93	19,237.95	115	38
	Islip, Town Of	52,328,546.39	7,469,315.15	59,797,861.54	41,758.28	1,432	512
	Lake Grove, Village Of	4,031.86	9,877.30	13,909.16	3,477.29	4	2
	Lindenhurst, Village Of	34,769,249.15	5,769,427.01	40,538,676.16	31,064.12	1,305	380
	Lloyd Harbor, Village Of	78,027.82	5,000.00	83,027.82	27,675.94	3	1
	Nissequogue, Village Of	116,259.88	5,685.98	121,945.86	12,194.59	10	4
	North Haven, Village Of	42,085.74	7,664.21	49,749.95	8,291.66	6	3
	Northport, Village Of	383,897.58	67,713.23	451,610.81	34,739.29	13	4
	Ocean Beach, Village Of	18,544,397.07	2,623,943.50	21,168,340.57	47,569.30	445	151
	Old Field, Village Of	65,035.96	5,434.50	70,470.46	11,745.08	6	2
	Patchogue, Village Of	4,255,172.42	457,732.98	4,712,905.40	42,079.51	112	44
	Poquott, Village Of	52,228.02	9,093.93	61,321.95	30,660.98	2	1
	Port Jefferson, Village Of	186,309.06	134,684.81	320,993.87	16,894.41	19	7
	Quogue, Village Of	3,705,748.92	620,463.67	4,326,212.59	36,662.82	118	46
	Riverhead, Town Of	3,296,261.31	524,623.66	3,820,884.97	19,104.42	200	72
	Sag Harbor, Village Of	607,429.35	145,508.25	752,937.60	20,349.66	37	12



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Saltaire,Village Of	1,489,092.94	70,449.71	1,559,542.65	42,149.80	37	13
	Shelter Island, Town Of	700,433.52	101,393.17	801,826.69	27,649.20	29	10
	Smithtown, Town Of	143,263.71	74,232.10	217,495.81	5,304.78	41	17
	Southampton, Town Of	26,305,239.62	3,959,256.22	30,264,495.84	33,478.42	904	341
	Southampton, Village Of	1,308,917.71	89,978.66	1,398,896.37	31,086.59	45	18
	Southold,Town Of	4,030,870.06	323,065.07	4,353,935.13	17,556.19	248	89
	West Hampton Dunes, Village Of	12,345,047.21	1,657,746.81	14,002,794.02	44,033.94	318	97
	Westhampton Beach, Village Of	8,457,468.33	1,348,204.60	9,805,672.93	36,050.27	272	89
<b>SULLIVAN</b>	Bethel, Town Of	6,671.33	0	6,671.33	3,335.67	2	1
	Callicoon, Town Of	210,750.08	157,299.90	368,049.98	15,335.42	24	6
	Cochecton, Town Of	274,487.56	20,000.00	294,487.56	32,720.84	9	4
	Delaware, Town Of	94,722.25	19,524.67	114,246.92	8,788.22	13	6
	Fallsburg, Town Of	23,983.06	5,190.69	29,173.75	7,293.44	4	2
	Forestburgh, Town Of	2,601.00	5,380.00	7,981.00	1,995.25	4	1
	Fremont, Town Of	236,782.57	7,733.52	244,516.09	34,930.87	7	3
	Highland, Town Of	479,147.71	0	479,147.71	79,857.95	6	2
	Jeffersonville, Village Of	326,502.53	10,085.62	336,588.15	10,518.38	32	9
	Liberty, Town Of	18,135.44	6,651.95	24,787.39	6,196.85	4	2
	Lumberland, Town Of	27,869.13	0	27,869.13	13,934.57	2	1
	Mamakating, Town Of	109,705.14	12,446.88	122,152.02	6,786.22	18	6
	Monticello, Village Of	11,986.41	14,897.80	26,884.21	2,688.42	10	3
	Neversink, Town Of	295,102.45	18,235.82	313,338.27	28,485.30	11	5
	Rockland, Town Of	4,910,461.95	990,068.73	5,900,530.68	24,585.54	240	80
	Thompson, Town Of	34,132.20	7,146.98	41,279.18	3,752.65	11	5
	Tusten, Town Of	555,983.80	178,892.77	734,876.57	36,743.83	20	8
	Wurtsboro, Village Of	6,600.13	0	6,600.13	2,200.04	3	1
<b>TIOGA</b>	Barton, Town Of	669,932.97	40,411.97	710,344.94	27,320.96	26	8
	Candor, Town Of	94,792.18	0	94,792.18	31,597.39	3	1
	Newark Valley, Town Of	69,245.73	0	69,245.73	23,081.91	3	1
	Newark Valley, Village Of	49,849.63	12,705.05	62,554.68	20,851.56	3	1
	Nichols, Town Of	1,566,513.07	133,369.79	1,699,882.86	33,331.04	51	24
	Owego, Town Of	11,471,808.10	2,258,967.89	13,730,775.99	61,850.34	222	91
	Owego, Village Of	13,024,944.60	1,629,647.48	14,654,592.08	37,479.78	391	155
	Spencer, Town Of	9,814.03	0	9,814.03	4,907.02	2	1



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Tioga, Town Of	1,883,998.44	202,936.00	2,086,934.44	34,782.24	60	23
<b>TOMPKINS</b>	Caroline, Town Of	8,240.12	10,008.24	18,248.36	4,562.09	4	1
	Ithaca, City Of	21,255.15	5,779.37	27,034.52	4,505.75	6	2
	Ithaca, Town Of	40,917.52	0	40,917.52	8,183.50	5	1
	Lansing, Town Of	198,450.12	6,340.50	204,790.62	11,377.26	18	8
<b>ULSTER</b>	Denning, Town Of	41,033.55	18,290.63	59,324.18	29,662.09	2	1
	Ellenville, Village Of	463,637.47	12,718.74	476,356.21	39,696.35	12	6
	Esopus, Town Of	43,899.30	2,692.71	46,592.01	11,648.00	4	2
	Gardiner, Town Of	219,363.11	47,400.32	266,763.43	33,345.43	8	3
	Hurley, Town Of	360,251.27	29,498.10	389,749.37	43,305.49	9	4
	Kingston, City Of	713,717.77	176,044.34	889,762.11	18,931.11	47	18
	Lloyd, Town Of	1,125,750.48	143,023.38	1,268,773.86	70,487.44	18	3
	Marbletown, Town Of	9,207.70	0	9,207.70	4,603.85	2	1
	Marlborough, Town Of	148,107.88	43,297.43	191,405.31	27,343.62	7	3
	New Paltz, Town Of	604,793.55	94,222.09	699,015.64	30,391.98	23	10
	New Paltz, Village Of	1,000,140.79	12,562.18	1,012,702.97	168,783.83	6	2
	Olive, Town Of	28,419.05	0	28,419.05	4,059.86	7	3
	Plattekill, Town Of	62,363.99	41,720.89	104,084.88	26,021.22	4	1
	Rochester, Town Of	266,244.07	19,455.24	285,699.31	19,046.62	15	6
	Rosendale, Town Of	352,371.33	38,067.97	390,439.30	39,043.93	10	4
	Saugerties, Town Of	753,729.05	111,641.37	865,370.42	45,545.81	19	9
	Saugerties, Village Of	1,174,921.23	110,359.03	1,285,280.26	38,947.89	33	14
	Shandaken, Town Of	2,374,933.10	323,752.20	2,698,685.30	27,537.61	98	38
	Ulster, Town Of	3,113,469.36	480,598.37	3,594,067.73	29,950.56	120	38
	Wawarsing, Town Of	1,405,946.88	78,628.57	1,484,575.45	39,067.78	38	18
	Woodstock, Town Of	33,487.55	669.98	34,157.53	5,692.92	6	3
<b>WARREN</b>	Johnsburg, Town Of	55,217.38	0	55,217.38	27,608.69	2	1
	Lake George, Town Of	4,960.66	0	4,960.66	2,480.33	2	1
	Queensbury, Town Of	16,308.22	0	16,308.22	4,077.05	4	2
<b>WASHINGTON</b>	Cambridge, Village Of	8,588.49	0	8,588.49	4,294.25	2	1
	Salem, Town Of	2,476.87	0	2,476.87	1,238.43	2	1
	Whitehall, Town Of	9,236.20	3,162.82	12,399.02	3,099.76	4	2
<b>WAYNE</b>	Galen, Town Of	55,537.03	2,240.54	57,777.57	19,259.19	3	1
	Huron, Town Of	45,873.15	0	45,873.15	11,468.29	4	2
<b>WESTCHESTER</b>	Ardsville, Village Of	316,963.54	1,334,619.90	1,651,583.44	14,237.79	116	32
	Bedford, Town Of	185,254.28	24,967.83	210,222.11	14,014.81	15	7
	Briarcliff Manor, Village Of	1,024,175.76	162,596.61	1,186,772.37	24,724.42	48	12



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Bronxville, Village Of	3,083,489.04	1,580,230.74	4,663,719.78	59,791.28	78	22
	Cortlandt, Town Of	841,801.19	303,697.32	1,145,498.51	30,144.70	38	10
	Croton-On-Hudson, Village Of	18,485.45	0	18,485.45	9,242.73	2	1
	Dobbs Ferry, Village Of	11,969.66	902.47	12,872.13	6,436.07	2	1
	Eastchester, Town Of	239,682.18	65,215.61	304,897.79	8,469.38	36	10
	Elmsford, Village Of	1,770,154.93	662,308.12	2,432,463.05	21,151.85	115	27
	Greenburgh, Town Of	2,022,308.29	3,933,055.04	5,955,363.33	36,761.50	162	45
	Harrison, Town Of	2,354,695.78	468,947.69	2,823,643.47	10,305.27	274	80
	Hastings-On-Hudson, Village Of	26,051.51	77,495.59	103,547.10	9,413.37	11	4
	Irvington, Village Of	1,359,758.97	672,486.98	2,032,245.95	127,015.37	16	7
	Larchmont, Village Of	2,167,885.90	254,636.91	2,422,522.81	21,438.25	113	37
	Lewisboro, Town Of	44,806.31	9,093.05	53,899.36	6,737.42	8	3
	Mamaroneck, Town Of	1,167,073.59	387,804.89	1,554,878.48	9,310.65	167	51
	Mamaroneck, Village Of	14,531,093.84	7,120,089.97	21,651,183.81	27,829.29	778	229
	Mount Kisco, Village Of	136,170.79	86,234.87	222,405.66	24,711.74	9	4
	Mount Pleasant, Town Of	1,025,039.37	139,542.89	1,164,582.26	23,766.98	49	12
	Mount Vernon, City Of	183,983.81	64,451.49	248,435.30	15,527.21	16	7
	New Castle, Town Of	221,983.20	165,185.37	387,168.57	12,905.62	30	13
	New Rochelle, City Of	3,854,336.72	885,812.71	4,740,149.43	19,668.67	241	81
	North Castle, Town Of	25,769.17	13,099.22	38,868.39	3,533.49	11	4
	North Salem, Town Of	8,214.00	5,350.00	13,564.00	4,521.33	3	1
	Ossining, Town Of	21,951.99	8,478.35	30,430.34	15,215.17	2	1
	Ossining, Village Of	221,881.71	204,873.68	426,755.39	30,482.53	14	4
	Peekskill, City Of	278,040.79	111,363.32	389,404.11	27,814.58	14	5
	Pelham Manor, Village Of	45,854.79	40,014.48	85,869.27	7,155.77	12	4
	Pelham, Village Of	13,728.98	15,627.50	29,356.48	5,871.30	5	2
	Pleasantville, Village Of	44,825.46	7,422.70	52,248.16	8,708.03	6	2
	Port Chester, Village Of	540,122.82	203,881.04	744,003.86	14,588.31	51	15
	Pound Ridge, Town Of	53,469.18	0	53,469.18	13,367.30	4	2
	Rye Brook, Village Of	772,467.77	132,134.32	904,602.09	14,829.54	61	25
	Rye, City Of	26,352,129.80	3,003,200.75	29,355,330.55	35,453.30	828	226



County Name	Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
	Scarsdale, Village Of	1,144,406.84	202,450.56	1,346,857.40	11,223.81	120	38
	Sleepy Hollow, Village Of	9,304.82	2,654.96	11,959.78	2,391.96	5	2
	Somers, Town Of	51,607.78	11,096.66	62,704.44	6,967.16	9	4
	Tarrytown, Village Of	454,075.34	10,668.61	464,743.95	51,638.22	9	2
	Tuckahoe, Village Of	28,405.12	2,840.00	31,245.12	5,207.52	6	3
	White Plains, City Of	202,717.66	245,621.03	448,338.69	13,186.43	34	13
	Yonkers, City Of	5,420,055.54	2,420,260.88	7,840,316.42	34,538.84	227	81
	Yorktown, Town Of	103,772.16	40,493.53	144,265.69	4,508.30	32	7
<b>WYOMING</b>	Arcade, Village Of	225,665.99	82,102.86	307,768.85	30,776.89	10	5
	Warsaw, Village Of	0	5,336.80	5,336.80	2,668.40	2	1

Table A.3-2: Severe Repetitive Loss as of 07/13/2013

County Name	Community Name	Payments	Payments	Payments	Payment	Losses	Properties
<b>ALBANY</b>	Colonie, Town Of	339840.91	301983.01	641823.92	37754.35	17	3
<b>ALLEGANY</b>	Seneca Nation Of Indians	34293.63	7011.56	41305.19	8261.04	5	1
<b>BRONX</b>	New York, City Of	5035415.56	705336.10	5740751.66	25743.28	223	42
<b>BROOME</b>	Binghamton, City Of	263406.91	225918.17	489325.08	69903.58	7	1
	Conklin, Town Of	2656741.58	803281.99	3460023.57	58644.47	59	15
	Kirkwood, Town Of	200928.25	41032.62	241960.87	48392.17	5	1
	Union, Town Of	913,467.33	69,170.03	982,637.36	49,131.87	20	5
	Vestal, Town Of	250,243.09	41,788.53	292,031.62	41,718.80	7	2
<b>CHAUTAUQUA</b>	Hanover, Town Of	315,492.58	152,478.40	467,970.98	12,315.03	38	6
<b>CHENANGO</b>	Norwich, Town Of	351,722.83	80,905.05	432,627.88	108,156.97	4	1
<b>DELAWARE</b>	Colchester, Town Of	134,893.10	43,010.43	177,903.53	17,790.35	10	2
	Deposit, Town Of	81,667.07	0.00	81,667.07	20,416.77	4	1
	Hancock, Town Of	215,843.48	1,396.31	217,239.79	24,137.75	9	2
<b>DUTCHESS</b>	Dover, Town Of	63,519.53	35,039.88	98,559.41	19,711.88	5	1
	East Fishkill, Town Of	309,245.20	72,378.67	381,623.87	54,517.70	7	2
	Fishkill, Town Of	88,976.68	22,312.21	111,288.89	27,822.22	4	1
	Pleasant Valley, Town Of	302,369.80	108,466.71	410,836.51	31,602.81	13	3
	Poughkeepsie, Town Of	57,871.12	23,001.08	80,872.20	20,218.05	4	1
<b>ERIE</b>	Aurora, Town Of	72,869.70	5,886.08	78,755.78	15,751.16	5	1
	Buffalo, City Of	67,738.13	22,669.59	90,407.72	18,081.54	5	1
	Evans, Town Of	31,212.77	21,503.94	52,716.71	13,179.18	4	1
	Hamburg, Town Of	109,202.22	46,200.66	155,402.88	25,900.48	6	1
<b>ESSEX</b>	Chesterfield, Town Of	159,531.62	0	159,531.62	31,906.32	5	1
<b>GREENE</b>	Lexington, Town Of	97,647.62	20,472.48	118,120.10	23,624.02	5	1



County Name	Community Name	Payments	Payments	Payments	Payment	Losses	Properties
<b>MONROE</b>	Wheatland, Town Of	309,116.87	59,395.45	368,512.32	33,501.12	11	1
<b>NASSAU</b>	Bayville, Village Of	697,621.09	172,910.71	870,531.80	18,521.95	47	9
	Cedarhurst, Village Of	63,579.33	29,328.21	92,907.54	15,484.59	6	1
	East Rockaway, Village Of	732,712.67	160,642.20	893,354.87	34,359.80	26	5
	Freeport, Village Of	16,902,637.38	3,182,798.87	20,085,436.25	28,983.31	693	124
	Glen Cove, City Of	459,272.11	232,395.19	691,667.30	53,205.18	13	3
	Great Neck, Village Of	45,968.08	13,900.61	59,868.69	14,967.17	4	1
	Hempstead, Town Of	22,033,368.10	3,747,851.80	25,781,219.90	34,605.66	745	137
	Hewlett Harbor, Village Of	441,715.91	160,378.70	602,094.61	60,209.46	10	2
	Island Park, Village Of	6,991,039.56	1,410,942.53	8,401,982.09	38,018.02	221	36
	Lawrence, Village Of	175,926.20	3,496.75	179,422.95	44,855.74	4	1
	Long Beach, City Of	6,552,847.57	1,671,113.33	8,223,960.90	37,898.44	217	42
	Massapequa Park, Village Of	908,834.79	283,960.31	1,192,795.10	34,079.86	35	4
	Oyster Bay, Town Of	21,797,910.94	4,764,309.62	26,562,220.56	48,471.21	548	92
	Sands Point, Village Of	66,126.01	2,508.27	68,634.28	17,158.57	4	1
	Valley Stream, Village Of	29,647.37	550	30,197.37	5,032.90	6	1
<b>ONEIDA</b>	Sylvan Beach, Village Of	40,470.75	0	40,470.75	10,117.69	4	1
<b>ONTARIO</b>	Naples, Village Of	153,789.37	63,567.31	217,356.68	31,050.95	7	1
<b>ORANGE</b>	Blooming Grove, Town Of	308,762.58	146,531.71	455,294.29	30,352.95	15	3
	Chester, Town Of	390,636.92	103,512.90	494,149.82	23,530.94	21	4
	Deer Park, Town Of	298,184.40	29,680.87	327,865.27	25,220.41	13	3
	Hamptonburgh, Town Of	180,064.51	67,680.48	247,744.99	17,696.07	14	2
	Monroe, Town Of	208,819.93	6,064.55	214,884.48	26,860.56	8	2
	Monroe, Village Of	174,771.51	47,937.25	222,708.76	44,541.75	5	1
	Port Jervis, City Of	36,639.74	0	36,639.74	12,213.25	3	1
	Tuxedo, Town Of	231,742.99	0	231,742.99	46,348.60	5	2
	Wallkill, Town Of	58,616.04	14,287.26	72,903.30	12,150.55	6	1
	Warwick, Village Of	57,090.07	0	57,090.07	14,272.52	4	1
	Washingtonville, Village Of	887,030.69	158,712.05	1,045,742.74	24,319.60	43	5
<b>PUTNAM</b>	Philipstown, Town Of	50,653.85	26,981.71	77,635.56	19,408.89	4	1
	Putnam Valley, Town Of	33,977.99	0	33,977.99	8,494.50	4	1
<b>RENSSELAER</b>	Hoosick Falls, Village Of	52,101.61	8,596.94	60,698.55	15,174.64	4	1
<b>ROCKLAND</b>	Clarkstown, Town Of	697,979.06	191,837.35	889,816.41	27,806.76	32	6



County Name	Community Name	Payments	Payments	Payments	Payment	Losses	Properties
	Orangetown, Town Of	46,868.12	19,990.03	66,858.15	13,371.63	5	1
	Piermont, Village Of	84,066.28	89,830.60	173,896.88	24,842.41	7	1
	Sloatsburg, Village Of	106,084.63	5,900.00	111,984.63	22,396.93	5	1
	South Nyack, Village Of	202,914.15	164,377.12	367,291.27	52,470.18	7	1
	Spring Valley, Village Of	171,892.06	106,123.30	278,015.36	9,929.12	28	3
	Suffern, Village Of	263,883.63	39,189.28	303,072.91	20,204.86	15	3
<b>SARATOGA</b>	Waterford, Village Of	270,569.64	37,162.15	307,731.79	25,644.32	12	2
<b>SCHENECTADY</b>	Glenville, Town Of	73,099.15	32,066.53	105,165.68	21,033.14	5	1
	Schenectady, City Of	212,825.33	7,853.71	220,679.04	20,061.73	11	2
<b>SCHOHARIE</b>	Esperance, Town Of	87,907.81	18,287.72	106,195.53	26,548.88	4	1
<b>SUFFOLK</b>	Amityville, Village Of	6,901,758.62	1,235,429.06	8,137,187.68	47,585.89	171	32
	Babylon, Village Of	6,001,482.84	1,393,898.22	7,395,381.06	39,975.03	185	35
	Babylon, Town Of	14,390,180.10	2,782,711.08	17,172,891.18	36,772.79	467	83
	Brookhaven, Town Of	6,620,877.93	621,697.17	7,242,575.10	39,361.82	184	37
	East Hampton, Town Of	156,043.64	6,331.50	162,375.14	16,237.51	10	2
	Huntington, Town Of	292,466.36	26,844.90	319,311.26	22,807.95	14	3
	Islip, Town Of	9,344,329.02	1,822,277.82	11,166,606.84	44,845.81	249	46
	Lindenhurst, Village Of	10,487,722.33	2,351,929.18	12,839,651.51	30,864.55	416	73
	Northport, Village Of	113,439.93	0	113,439.93	18,906.66	6	1
	Ocean Beach, Village Of	3,635,538.39	548,405.06	4,183,943.45	57,314.29	73	17
	Patchogue, Village Of	333,996.53	93,523.56	427,520.09	106,880.02	4	1
	Riverhead, Town Of	489,182.54	48,215.51	537,398.05	38,385.58	14	3
	Sag Harbor, Village Of	251,206.74	91,731.35	342,938.09	38,104.23	9	2
	Southampton, Town Of	2,727,737.96	715,776.93	3,443,514.89	46,533.99	74	14
	Southold, Town Of	575,828.17	59,647.89	635,476.06	24,441.39	26	5
	West Hampton Dunes, Village Of	933,879.46	95,448.47	1,029,327.93	32,166.50	32	6
	Westhampton Beach, Village Of	1,690,823.26	158,745.67	1,849,568.93	48,672.87	38	8
<b>SULLIVAN</b>	Callicoon, Town Of	46,574.02	0	46,574.02	11,643.51	4	1
	Rockland, Town Of	579,591.54	77,801.53	657,393.07	21,206.23	31	6
	Tusten, Town Of	60,144.32	22,343.14	82,487.46	20,621.87	4	1
<b>TIOGA</b>	Owego, Town Of	720,454.63	71,645.31	792,099.94	88,011.10	9	3
	Owego, Village Of	482,840.56	60,043.99	542,884.55	33,930.28	16	4
	Tioga, Town Of	545,642.89	41,489.05	587,131.94	41,938.00	14	4
<b>ULSTER</b>	Kingston, City Of	146,858.61	23,483.31	170,341.92	21,292.74	8	1



County Name	Community Name	Payments	Payments	Payments	Payment	Losses	Properties
	New Paltz, Village Of	747,286.25	0	747,286.25	186,821.56	4	1
	Plattekill, Town Of	62,363.99	41,720.89	104,084.88	26,021.22	4	1
	Shandaken, Town Of	326,367.03	46,332.47	372,699.50	28,669.19	13	3
	Ulster, Town Of	1,129,510.01	250,537.81	1,380,047.82	40,589.64	34	7
	Wawarsing, Town Of	456,648.26	0	456,648.26	114,162.07	4	2
<b>WESTCHESTER</b>	Briarcliff Manor, Village Of	685,683.07	101,577.16	787,260.23	25,395.49	31	7
	Cortlandt, Town Of	187,719.35	40,606.45	228,325.80	15,221.72	15	1
	Eastchester, Town Of	58,879.15	10,715.39	69,594.54	6,326.78	11	1
	Elmsford, Village Of	303,954.49	105,086.75	409,041.24	34,086.77	12	2
	Greenburgh, Town Of	515,988.91	132,551.22	648,540.13	28,197.40	23	4
	Harrison, Town Of	504,450.27	52,354.50	556,804.77	14,652.76	38	6
	Larchmont, Village Of	204,432.39	10,527.09	214,959.48	15,354.25	14	3
	Mamaroneck, Town Of	137,886.42	0	137,886.42	27,577.28	5	1
	Mamaroneck, Village Of	3,600,901.93	526,499.16	4,127,401.09	28,662.51	144	26
	Mount Pleasant, Town Of	76,874.68	28,182.68	105,057.36	17,509.56	6	1
	New Rochelle, City Of	301,693.66	67,658.68	369,352.34	14,205.86	26	4
	Port Chester, Village Of	182,498.49	18,626.73	201,125.22	20,112.52	10	2
	Rye Brook, Village Of	117,978.85	22,615.02	140,593.87	35,148.47	4	1
	Rye, City Of	12,658,088.65	1,410,097.13	14,068,185.78	50,787.67	277	47
	Scarsdale, Village Of	306,617.55	92,570.75	399,188.30	13,306.28	30	4
	Yonkers, City Of	651,707.64	63,333.22	715,040.86	23,065.83	31	6

### Property Exposure Analysis in a 100-Year Floodplain

*This section from the 2011 Hazard Mitigation Plan (HMP) demonstrates the method of calculating property exposure analysis in the floodplain that can be done at the municipality level geography. The 2014 State Hazard Mitigation Plan does similar analysis but was only updated to the county level geography. The same method of using parcel points and market value was used in the 2014 State Hazard Mitigation Plan with updated data for various hazard sections. The inclusion of the data here serves as a resource for local planning, and to demonstrate the type of analysis that may be done at the local level.*

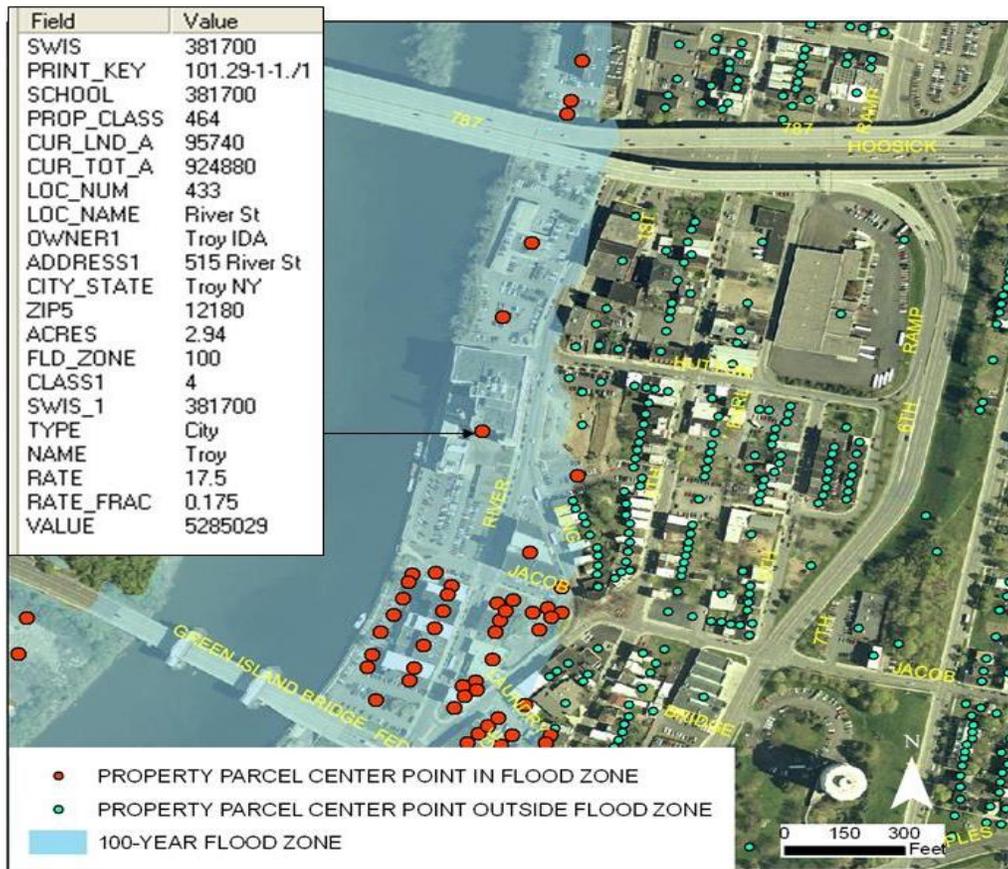
This Section in Chapter 3.4 remains unchanged from the 2008 Hazard Mitigation Plan update. Even though the data has not been updated to reflect newer mapping and additional properties that now may lie within the 100 year flood plain it still provides an excellent general indication of the extent and distribution of a communities flood risk that is useful for mitigation planning



Figure A.3-6: 100-Year Floodplain Property Exposure Analysis

## 100-Year Floodplain Property Exposure Analysis

A major effort of the 2008 State Hazard Mitigation Plan – Risk Assessment has been the GIS-based analysis of property within a 100-year floodplain. Using the NYS Real Property System (RPS) GIS layer of property parcel center points and FEMA's "Q3" digital flood maps, the total number, type and estimated value of property within a 100-year floodplain was calculated and summarized for 1002 New York State municipalities (based on availability of RPS and Q3 data). While this information provides only property exposure as opposed to flood damage or estimated dollar losses, it nonetheless provides a general indication of the extent and distribution of a community's flood risk that is useful for mitigation planning. The below example shows property parcel center points in an area of Troy, NY that fall in or out of the 100-year floodplain. The sample parcel record shows the property to be owned by the Troy Industrial Development Authority (IDA). The property class is 464 (Commercial – Office Building). The estimated property value is \$5,285,029 based on an assessed value of \$924,880 (CUR\_TOT\_A) divided by 0.175 (RATE\_FRAC) from the State Equalization Rate for the City of Troy of 17.5%.



The following series of property exposure analysis maps were extracted from the 2011 Hazard Mitigation Plan to demonstrate the level of exposure analysis that can be done at the municipality level geography. The 2014 State Hazard Mitigation Plan does similar analysis but was updated to the county level geography. The inclusion of the data here serves as a resource and to demonstrate the type of analysis that can be done at the local level.

Figure A.3-7: The Number of Residential Properties in a 100 Year Flood Zone by Municipality

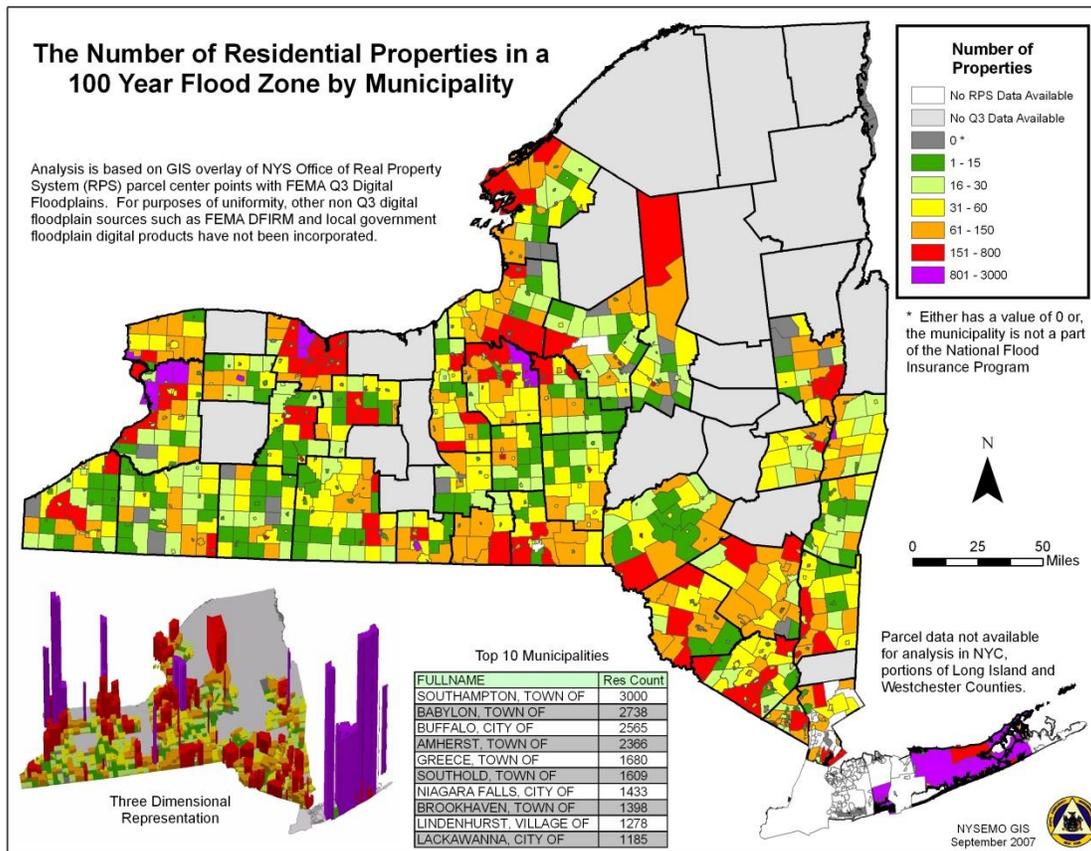


Figure A.3-8: Municipal Per Capita Residential Property Value in a 100 -Yr Flood Zone by Municipality

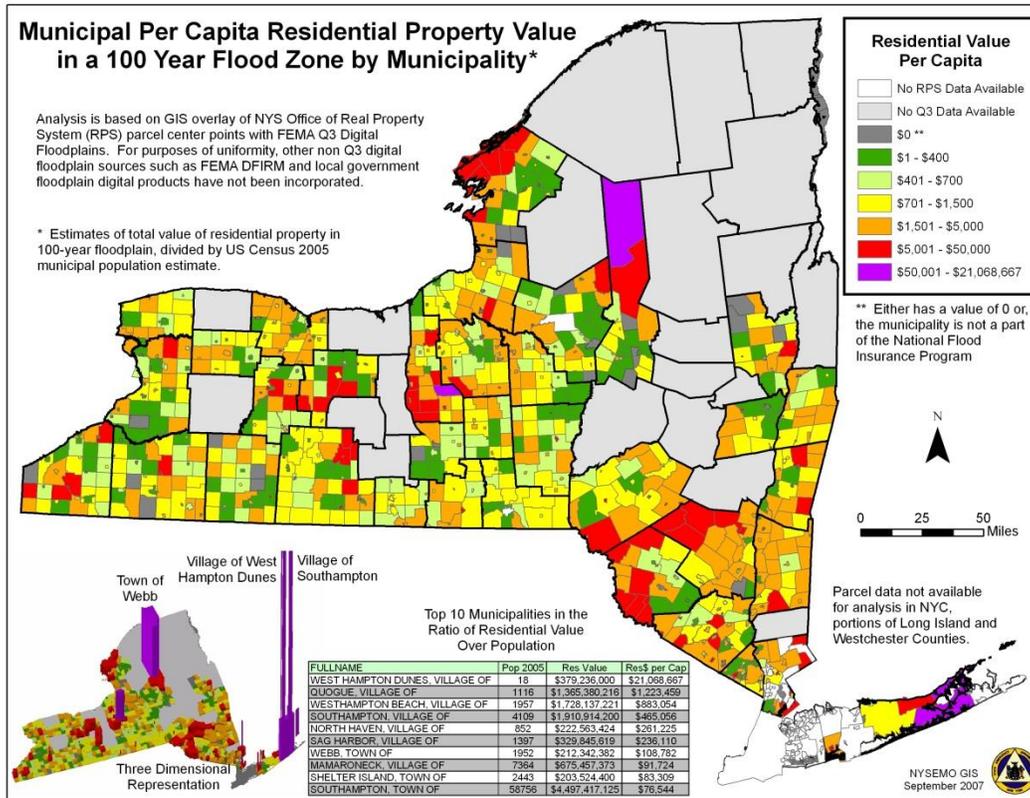


Figure A.3-9: Municipality Per Capita Total Property Value in a 100 Yr Flood Zone by Municipality

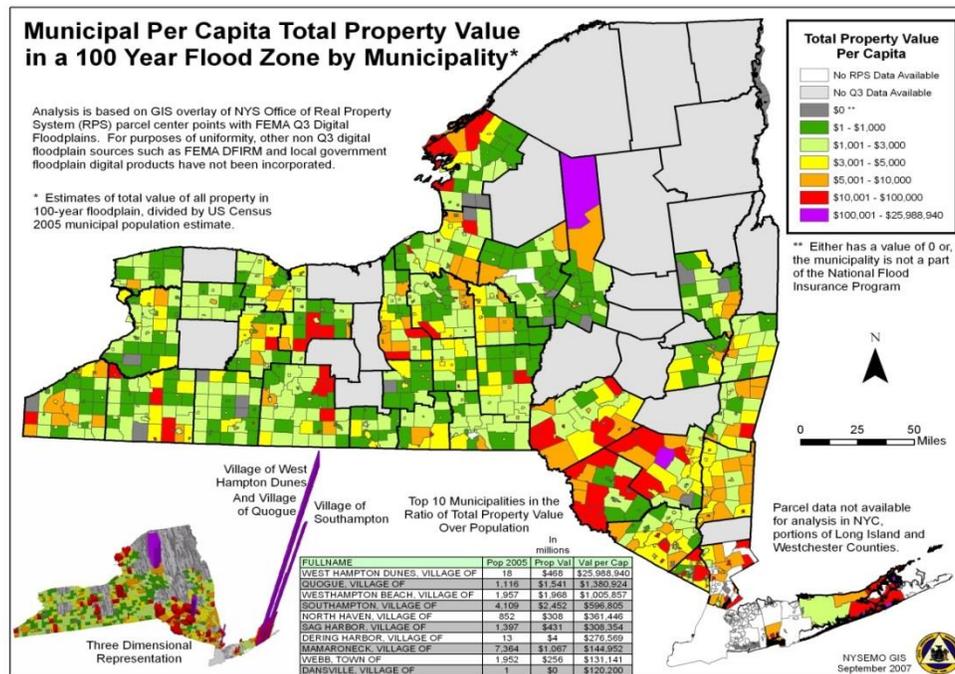


Figure A.3-10: Total Value of Residential Property in a 100-Yr Flood Zone by Municipality

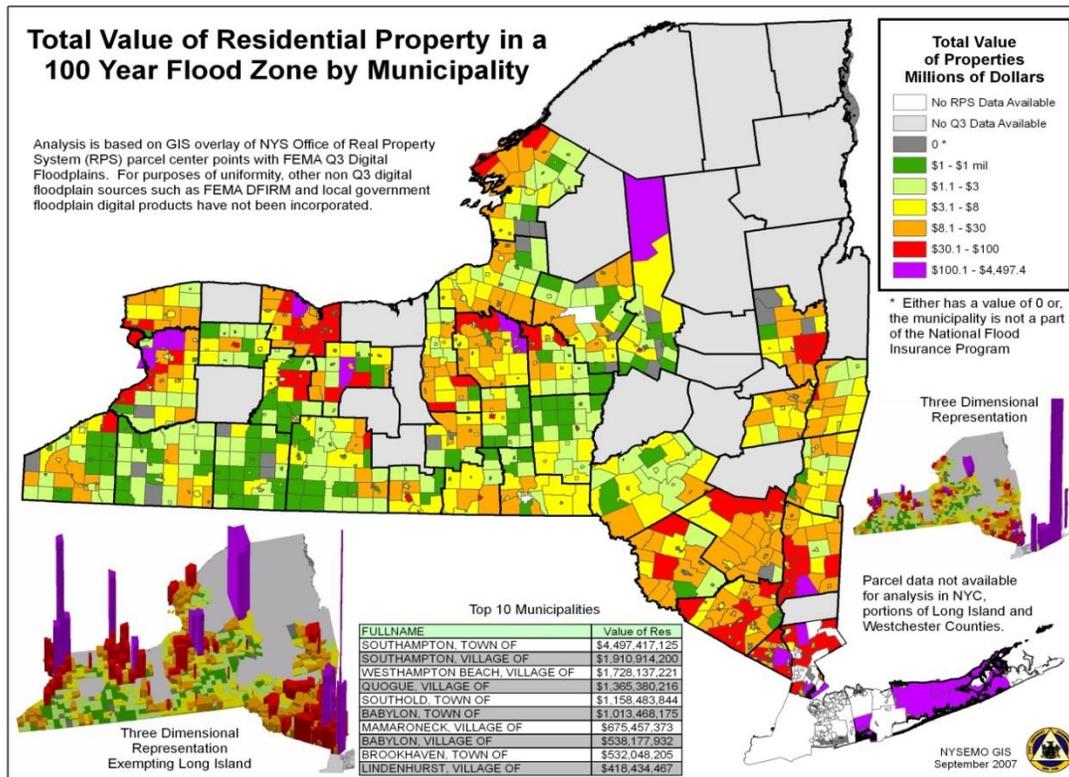
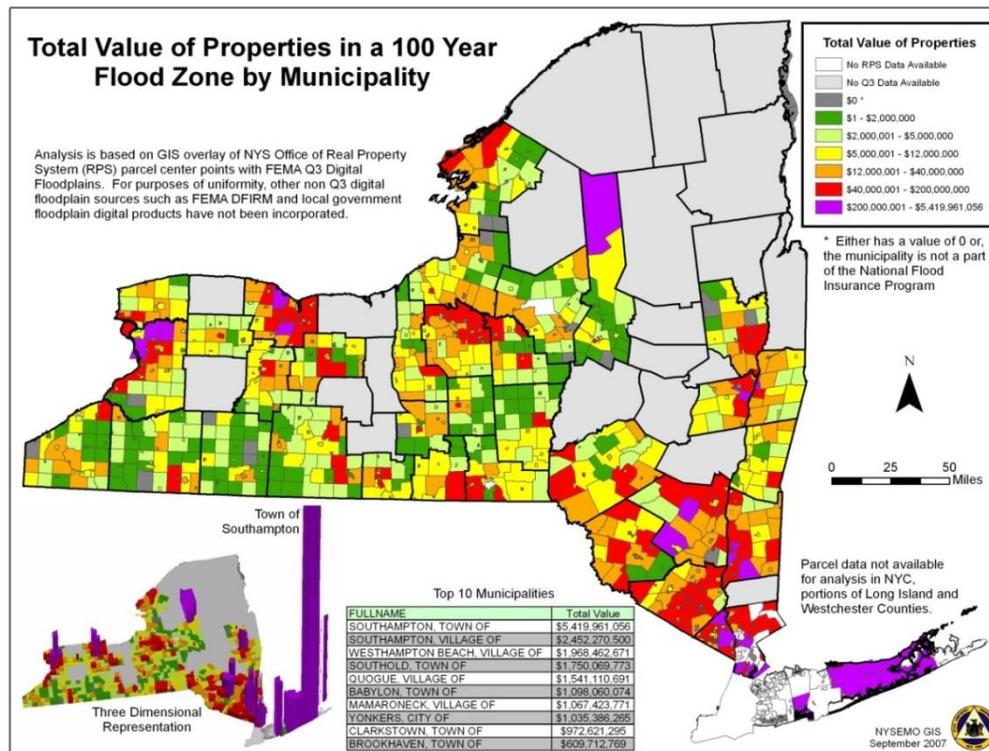


Figure A.3-11: Total Value of Properties in a 100-Yr Flood Zone by Municipality



The following individual county maps of residential property exposure in 100-year floodplains were extracted from the 2011 Hazard Mitigation Plan to demonstrate the level of exposure analysis that can be done at the municipality level geography. The 2014 State Hazard Mitigation Plan does similar analysis but was updated to the county level geography. The inclusion of the data here serves as a resource and to demonstrate the type of analysis that can be done at the local level.

Figure A.3-12: Albany County, NY Residential Property Exposure in 100-YR Floodplains

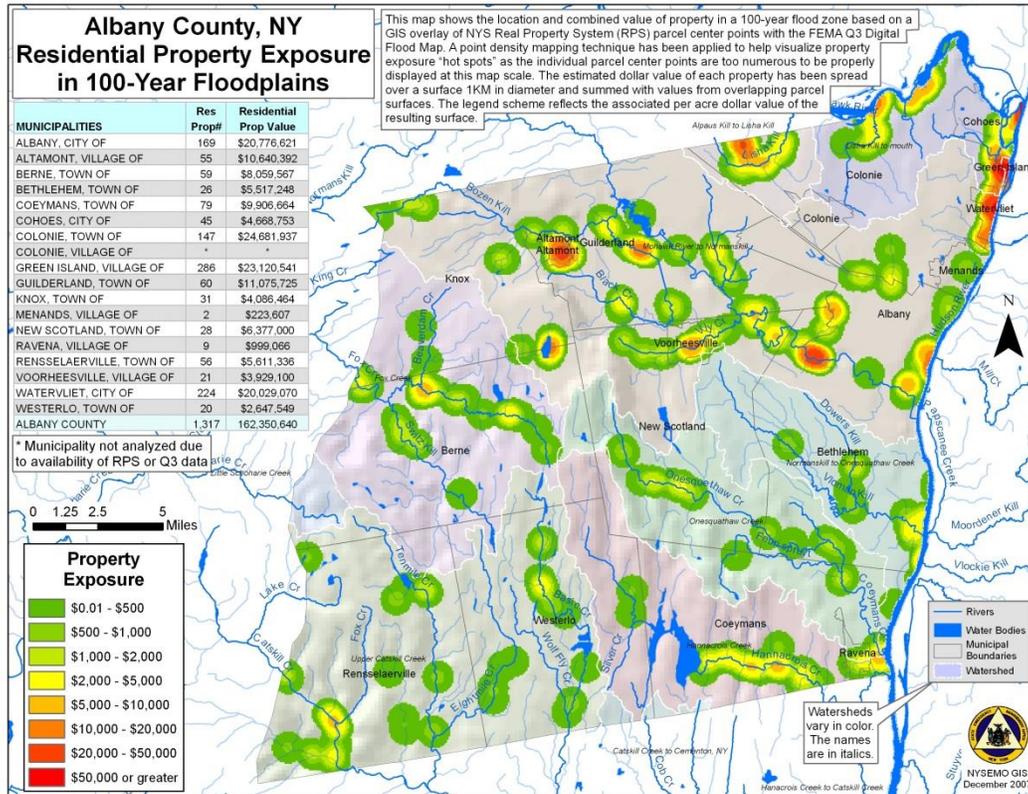


Figure A.3-13: Albany County, NY Residential Property Exposure in 100-Yr Floodplains

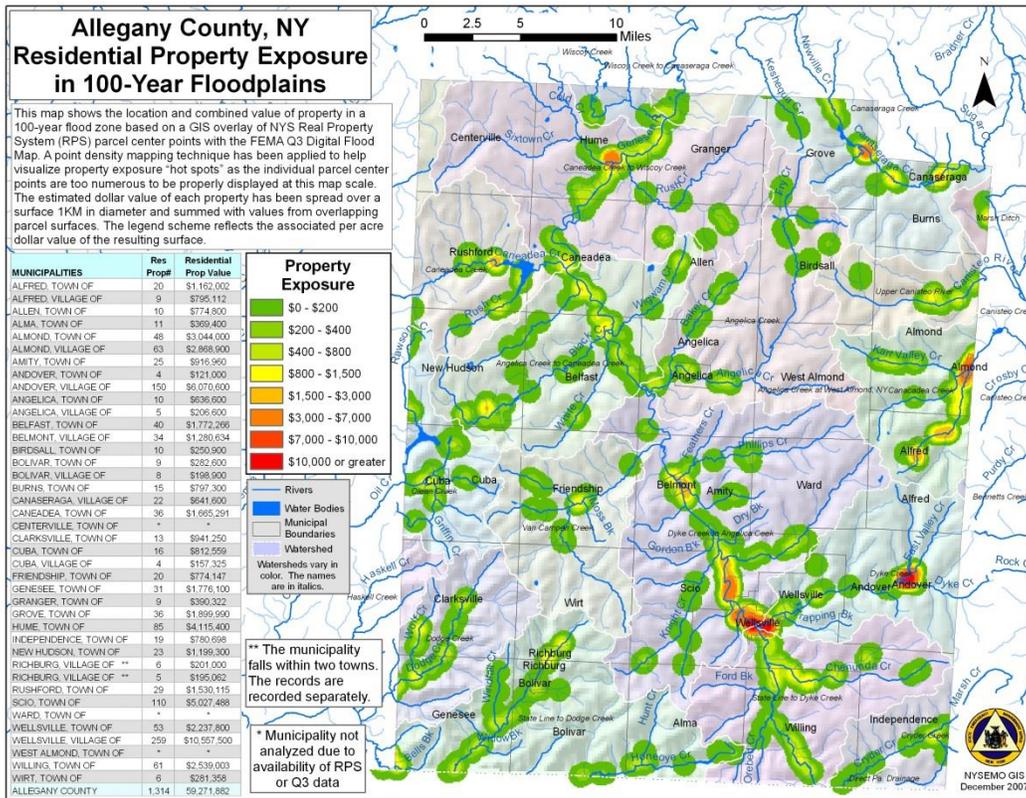


Figure A.3-14: Broome County, NY Residential Property Exposure in 100-Yr Floodplains

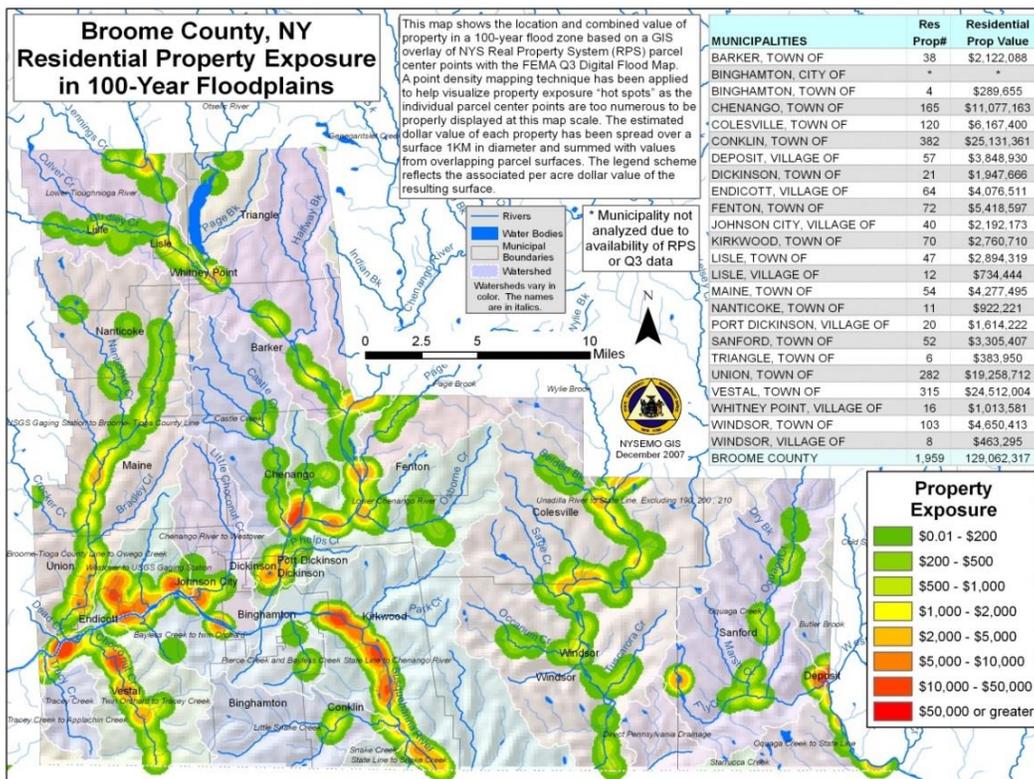


Figure A.3-15: Cattaraugus County, NY Residential Property Exposure in 100-Yr Floodplains

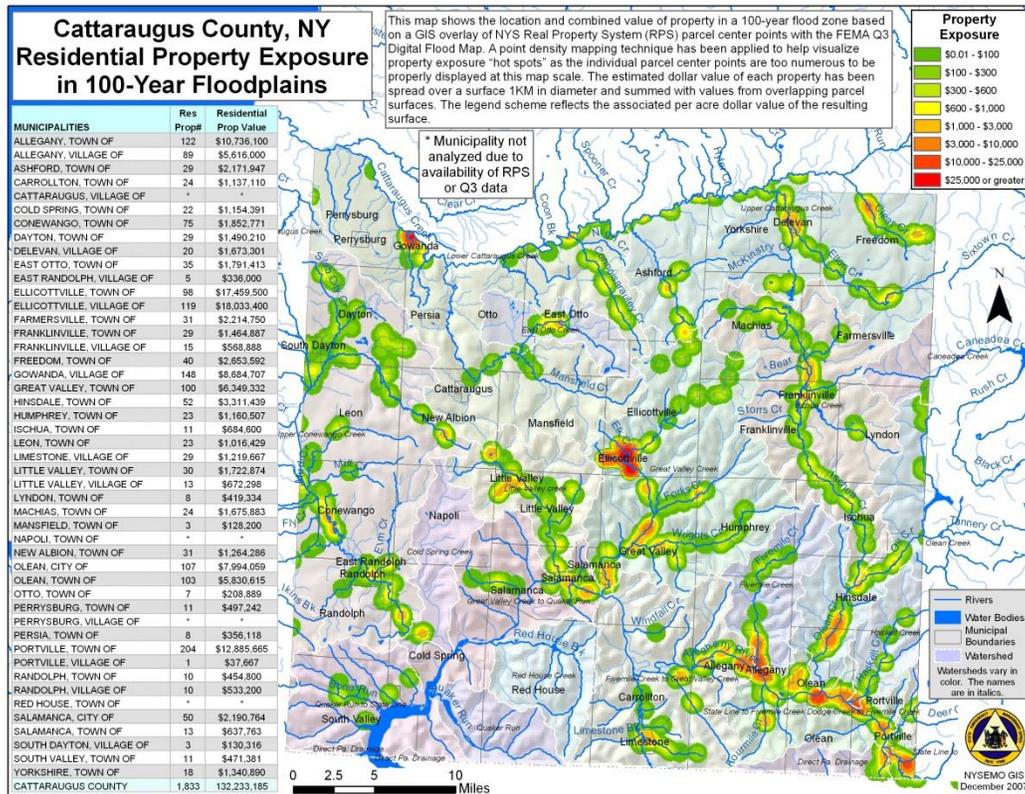


Figure A.3-16: Cayuga County, NY Residential Property Exposure in 100-Yr Floodplains

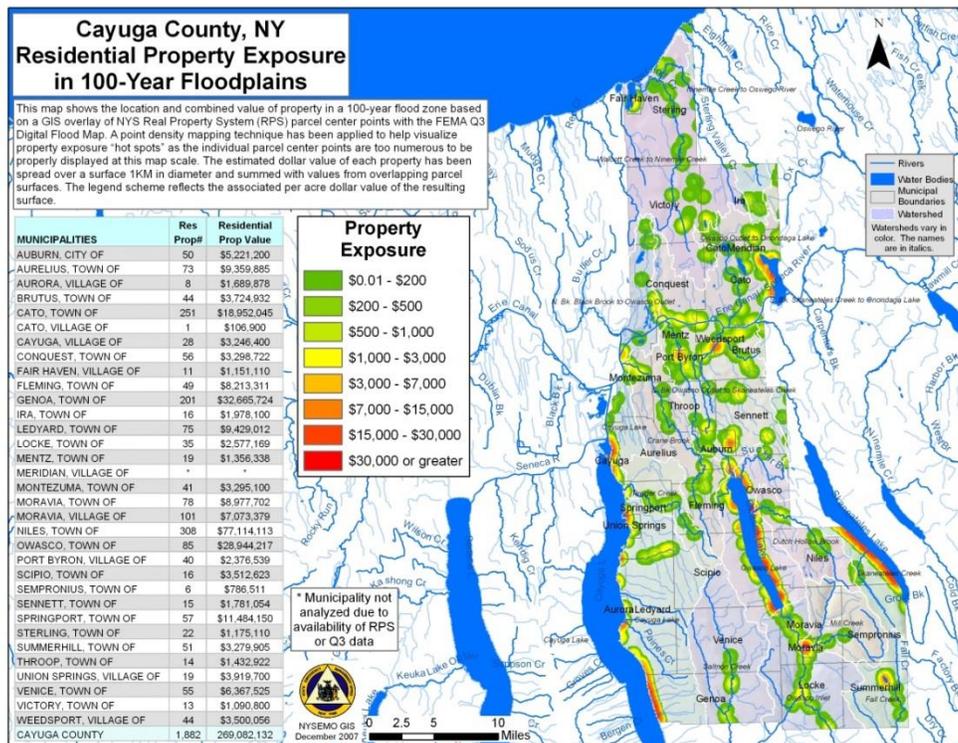


Figure A.3-17: Chautauqua County, NY Residential Property Exposure in 100-Yr Floodplains

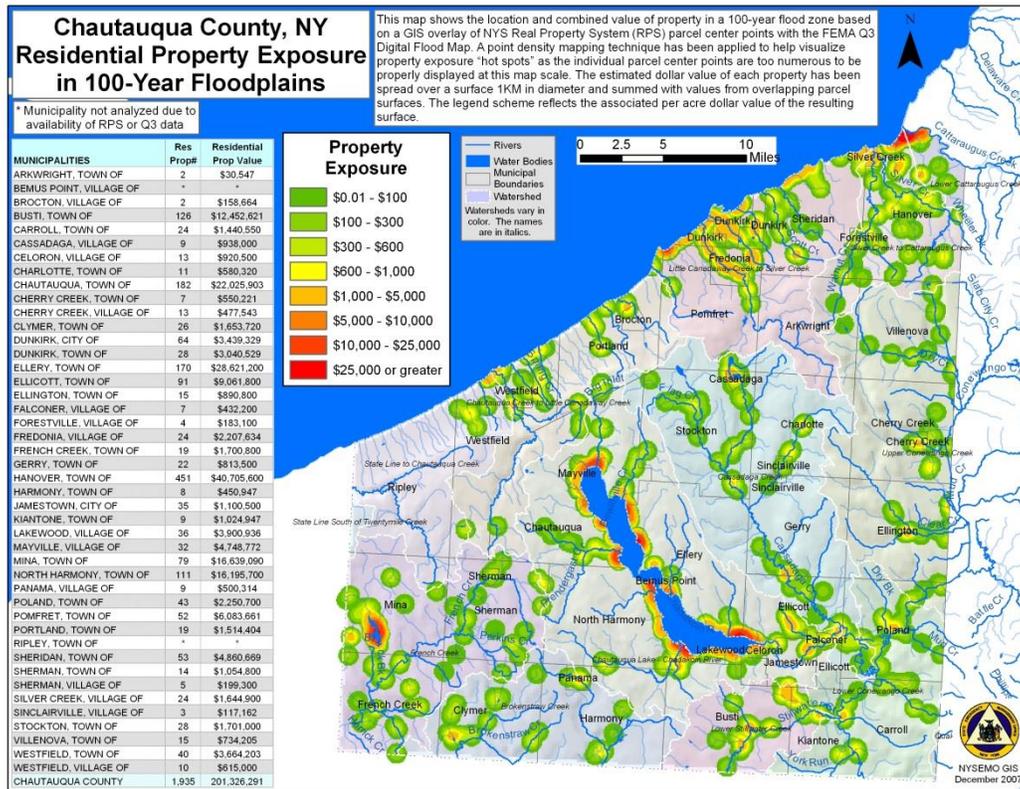


Figure A.3-18: Chemung County, NY Residential Property Exposure in 100-Yr Floodplains

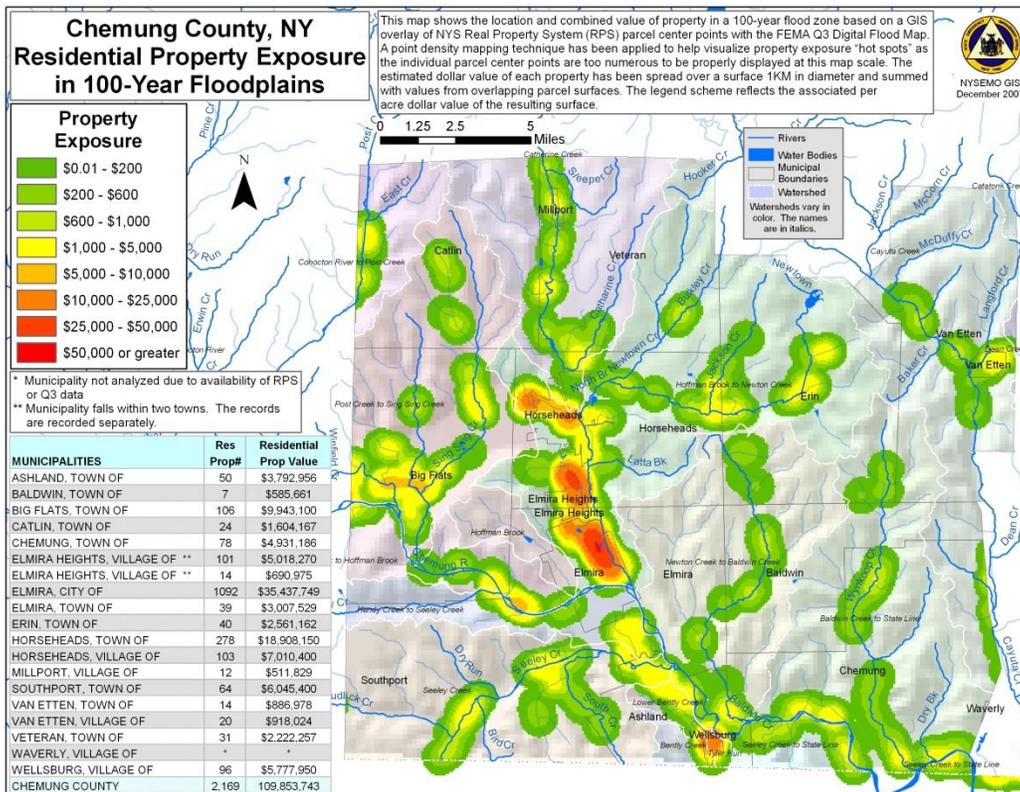


Figure A.3-19: Chenango County, NY Residential Property Exposure in 100-Yr Floodplains

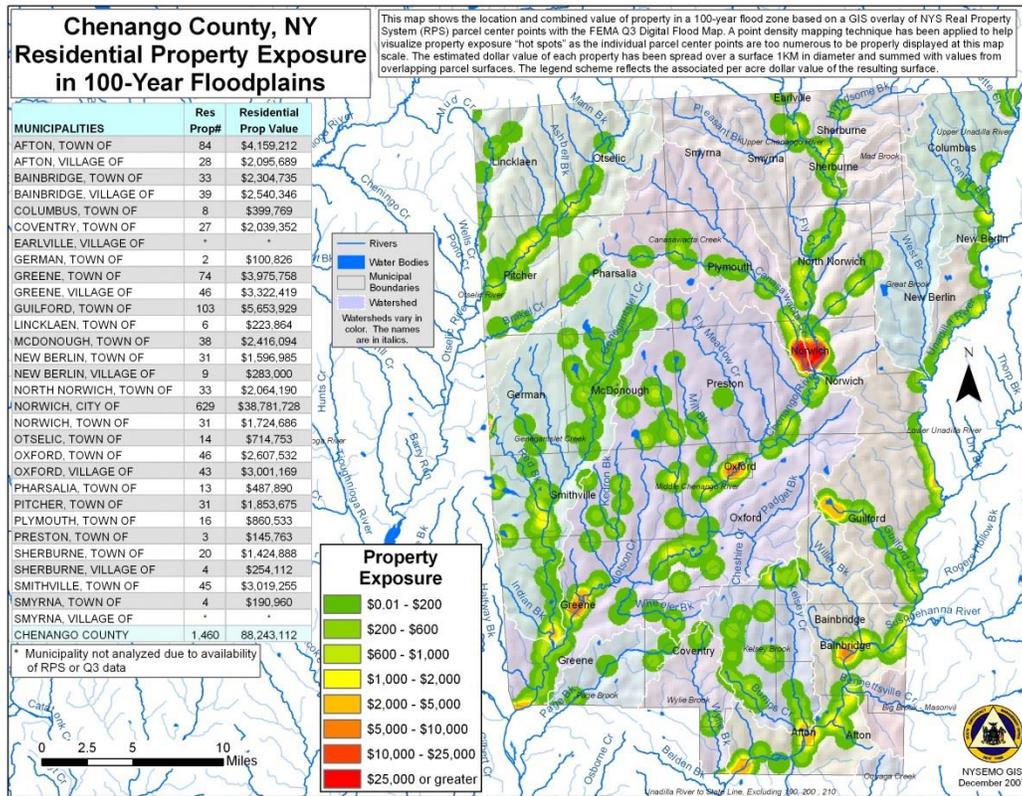


Figure A.3-20: Columbia County, NY Residential Property Exposure in 100-Yr Floodplains

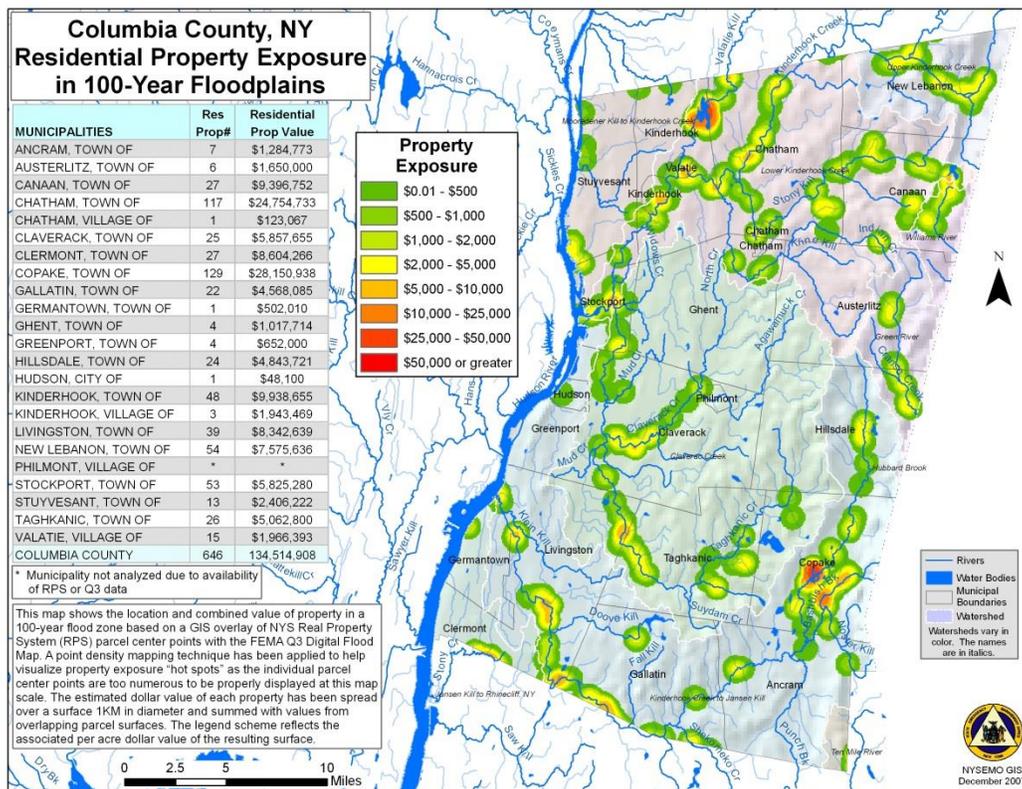


Figure A.3-21: Cortland County, NY Residential Property Exposure in 100-Yr Floodplains

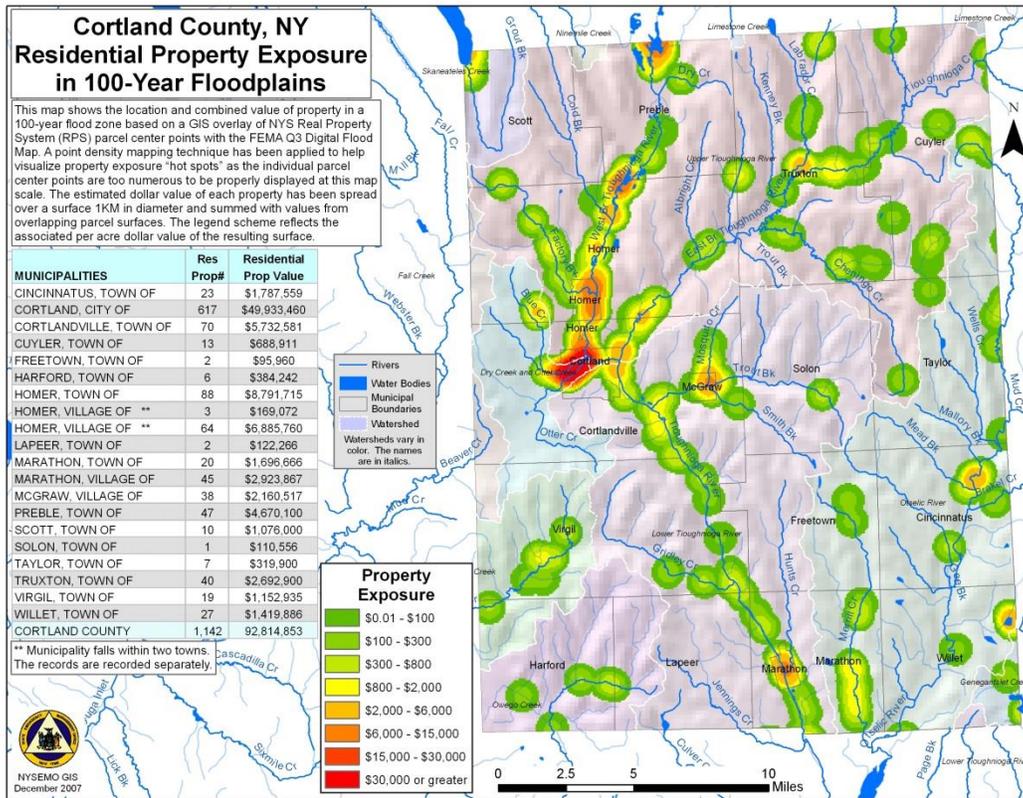


Figure A.3-22: Delaware County, NY Residential Property Exposure in 100-Yr Floodplains

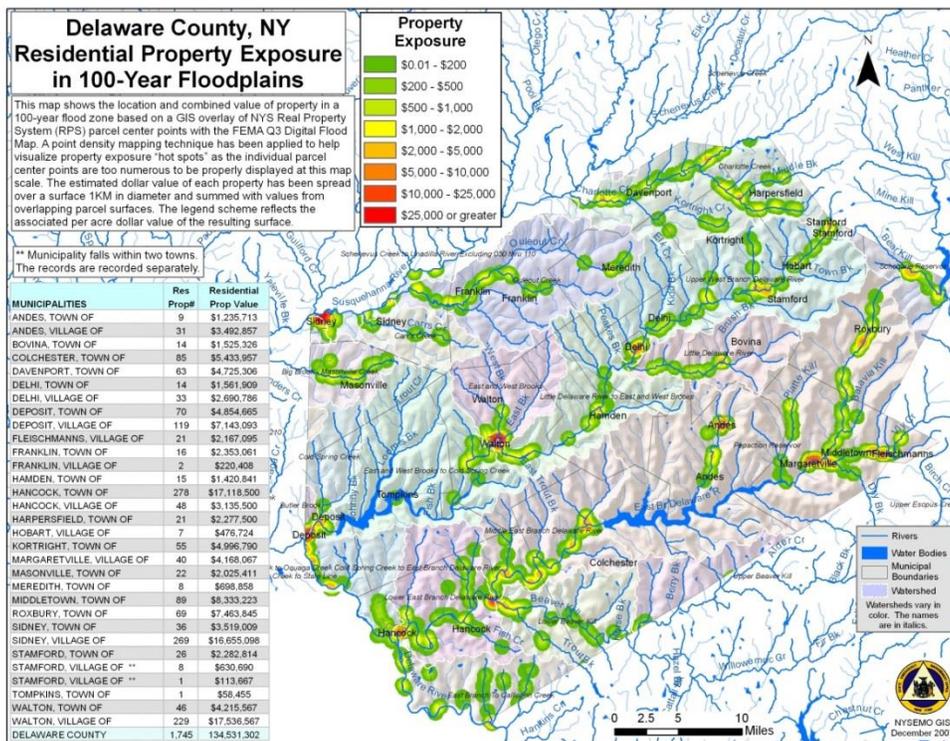


Figure A.3-23: Dutchess County, NY Residential Property Exposure in 100-Yr Floodplains

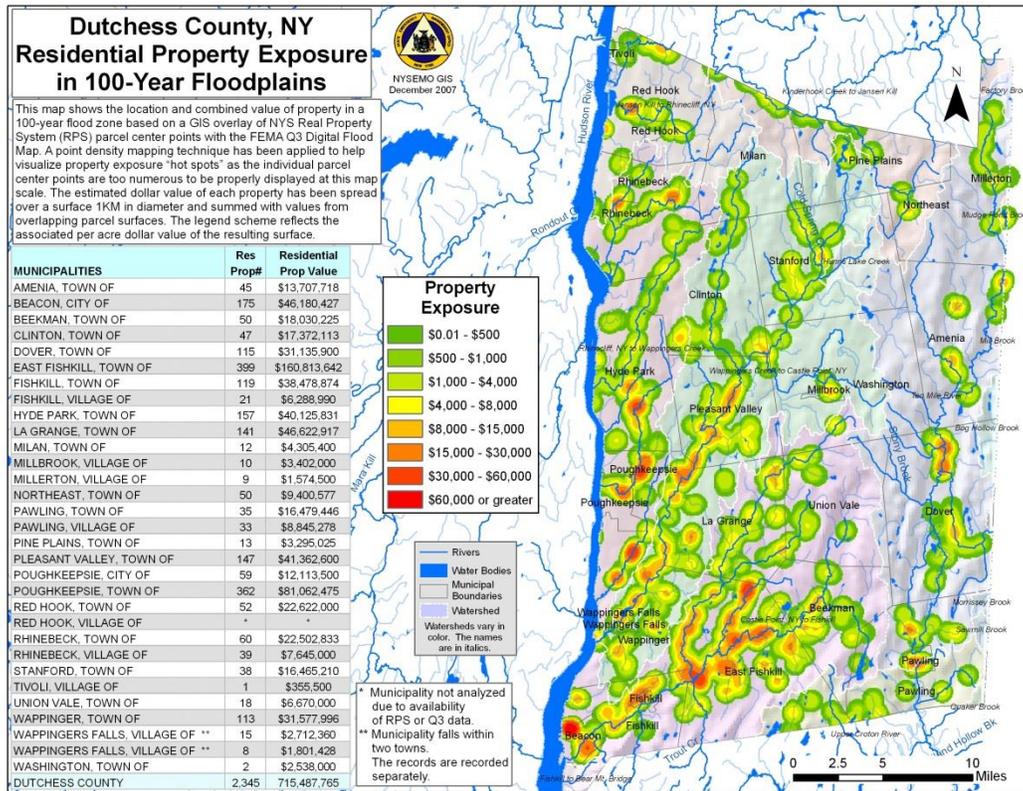


Figure A.3-24: Erie County, NY Residential Property Exposure in 100-Yr Floodplains

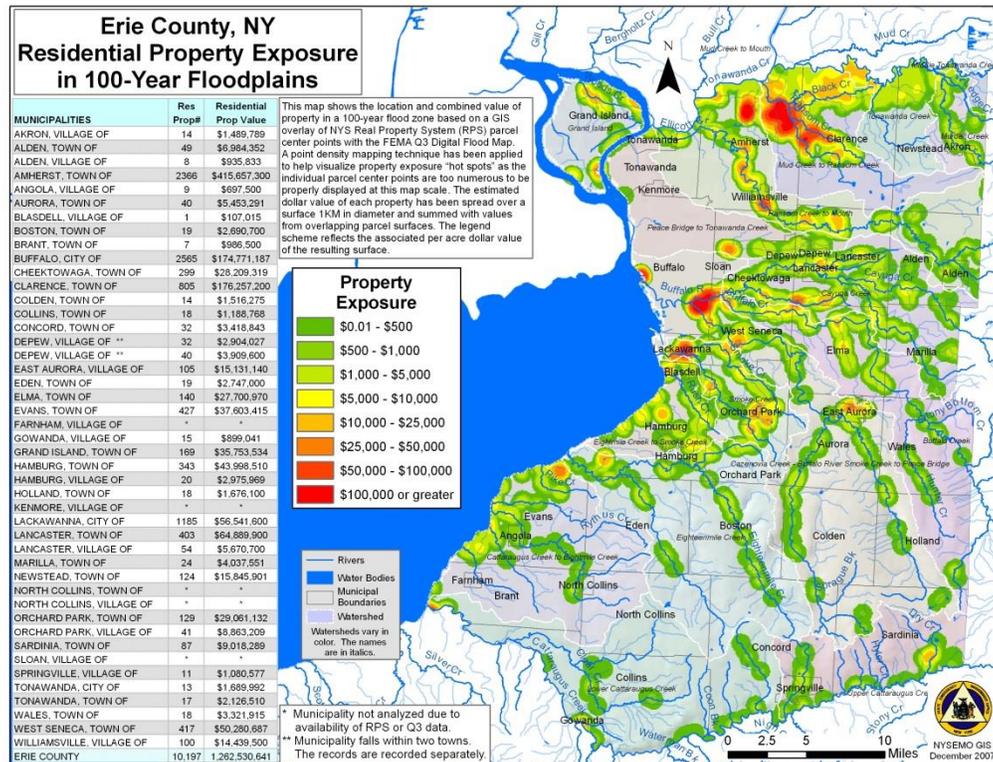


Figure A.3-25: Genesee County, NY Residential Property Exposure in 100-Yr Floodplains

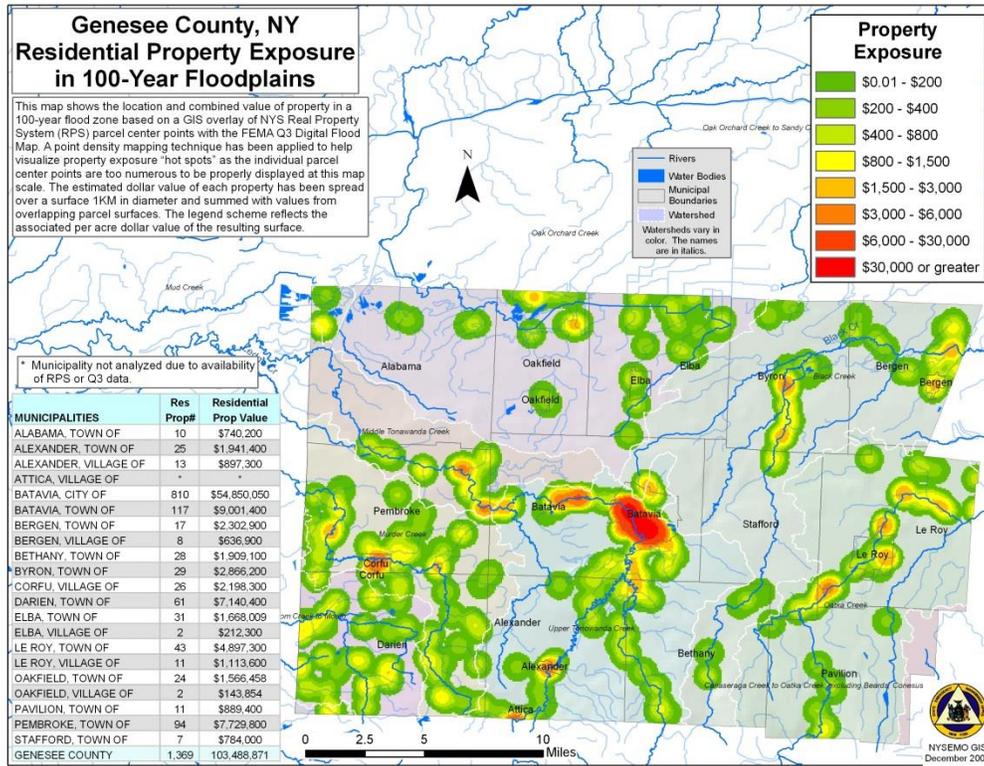


Figure A.3-26: Herkimer County, NY Residential Property Exposure in 100-Yr Floodplains

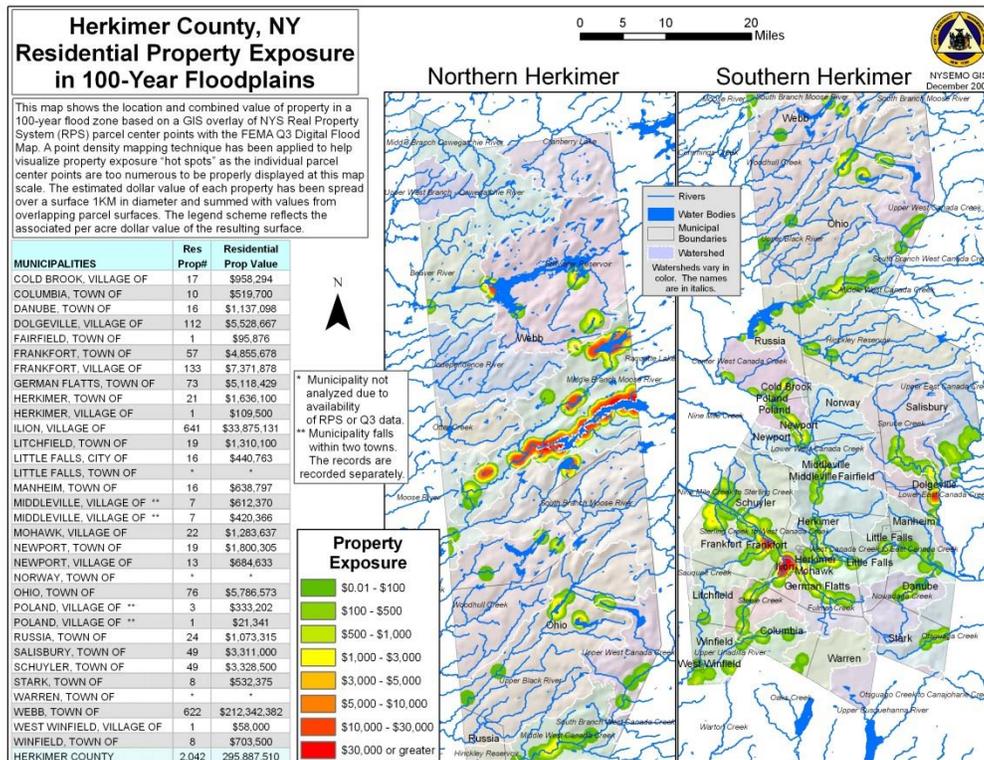


Figure A.3-27: Jefferson County, NY Residential Property Exposure in 100-Yr Floodplains

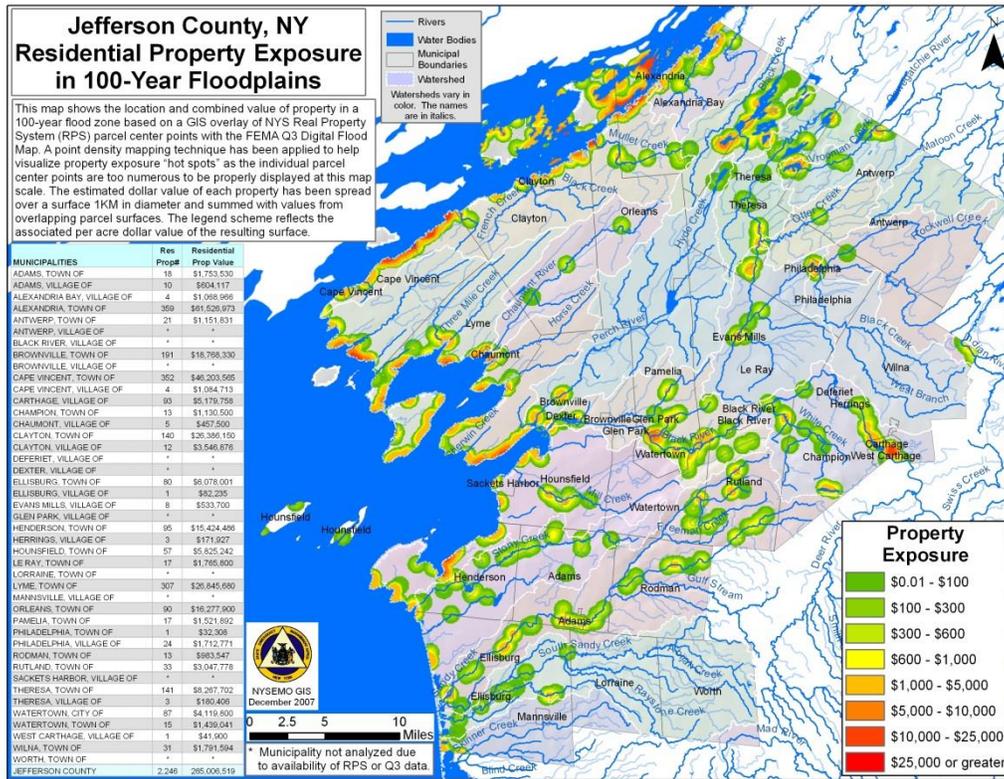


Figure A.3-28: Livingston County, NY Residential Property Exposure in 100-Yr Floodplains

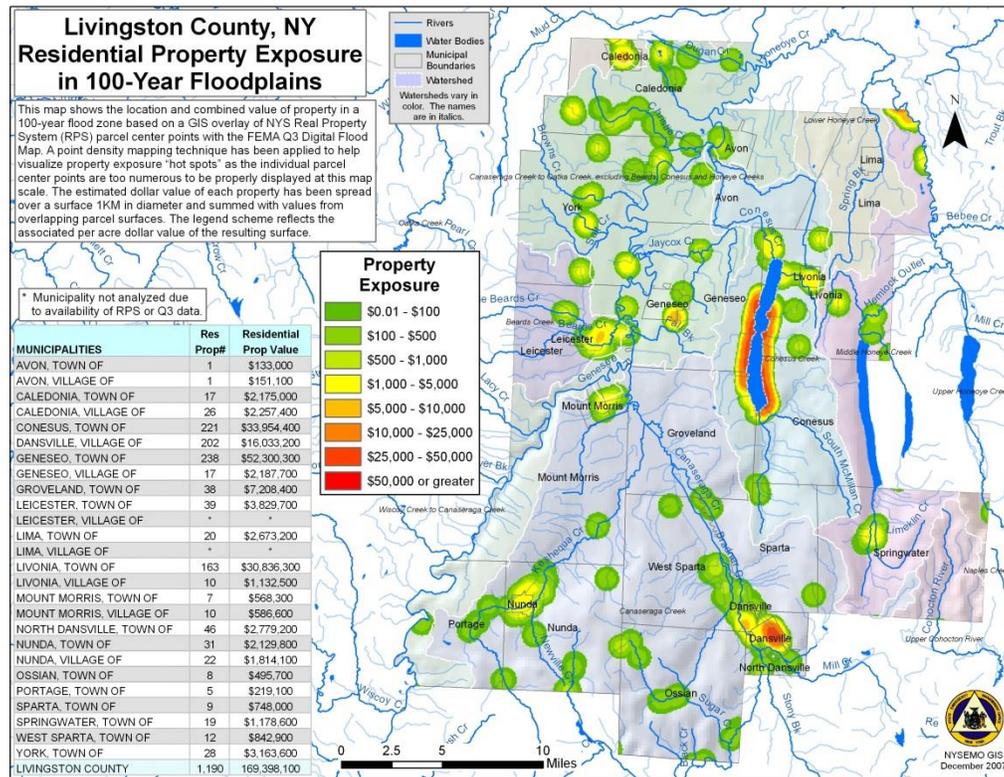


Figure A.3-29: Madison County, NY Residential Property Exposure in 100-Yr Floodplains

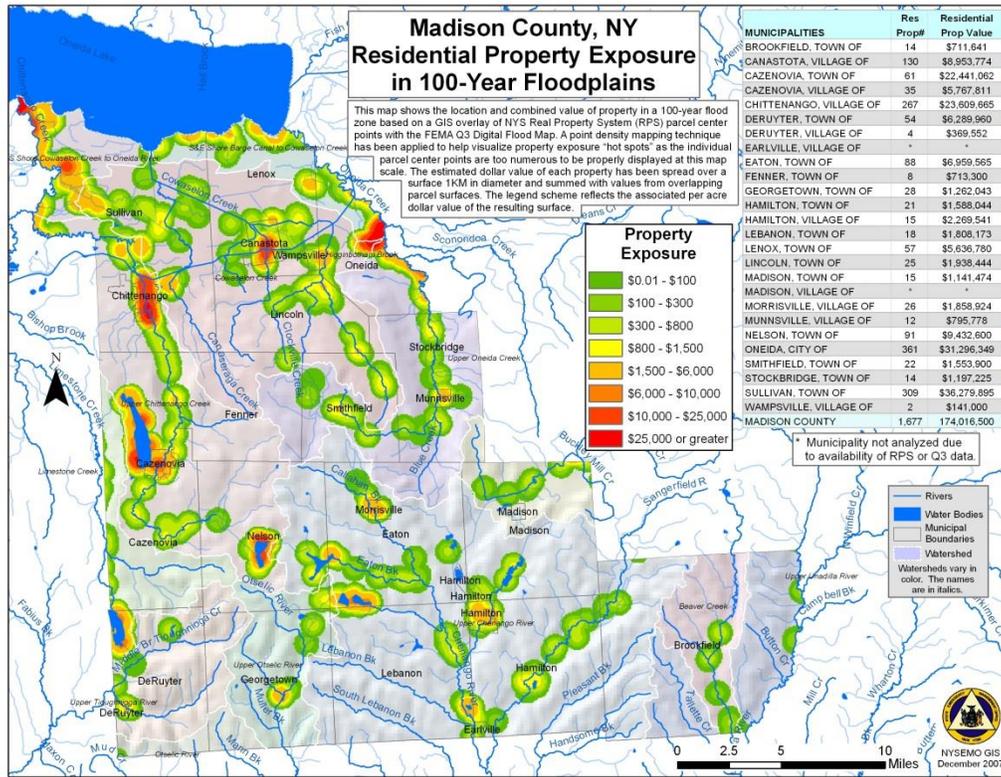


Figure A.3-30: Monroe County, NY Residential Property Exposure in 100-Yr Floodplains

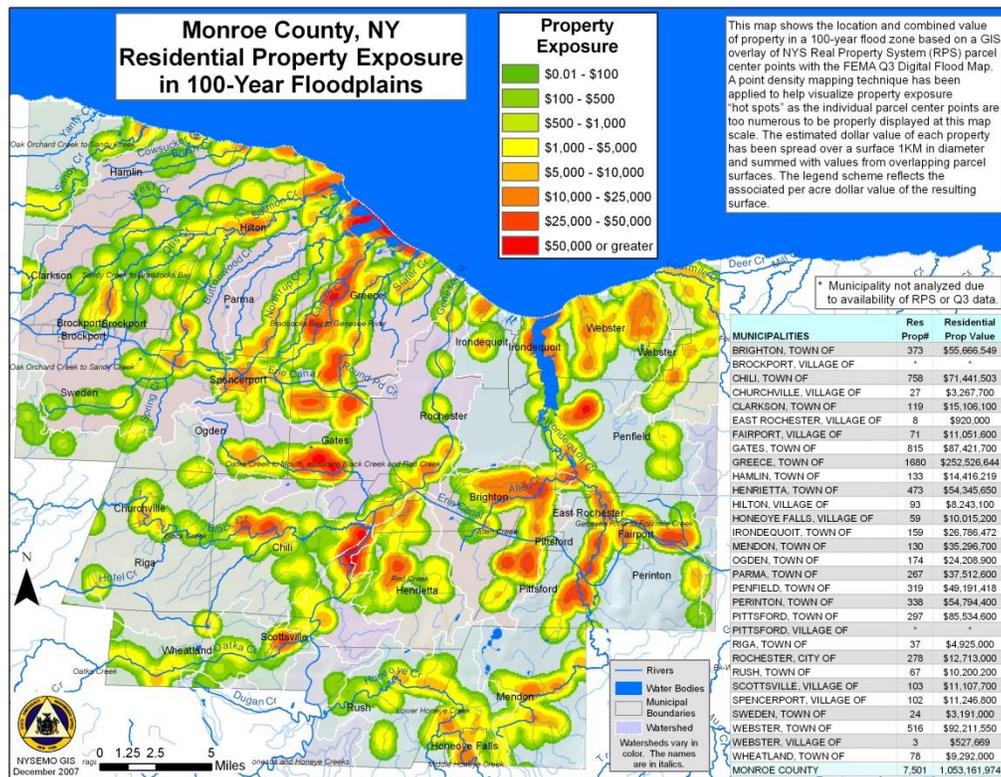


Figure A.3-31: Niagara County, NY Residential Property Exposure in 100-Yr Floodplains

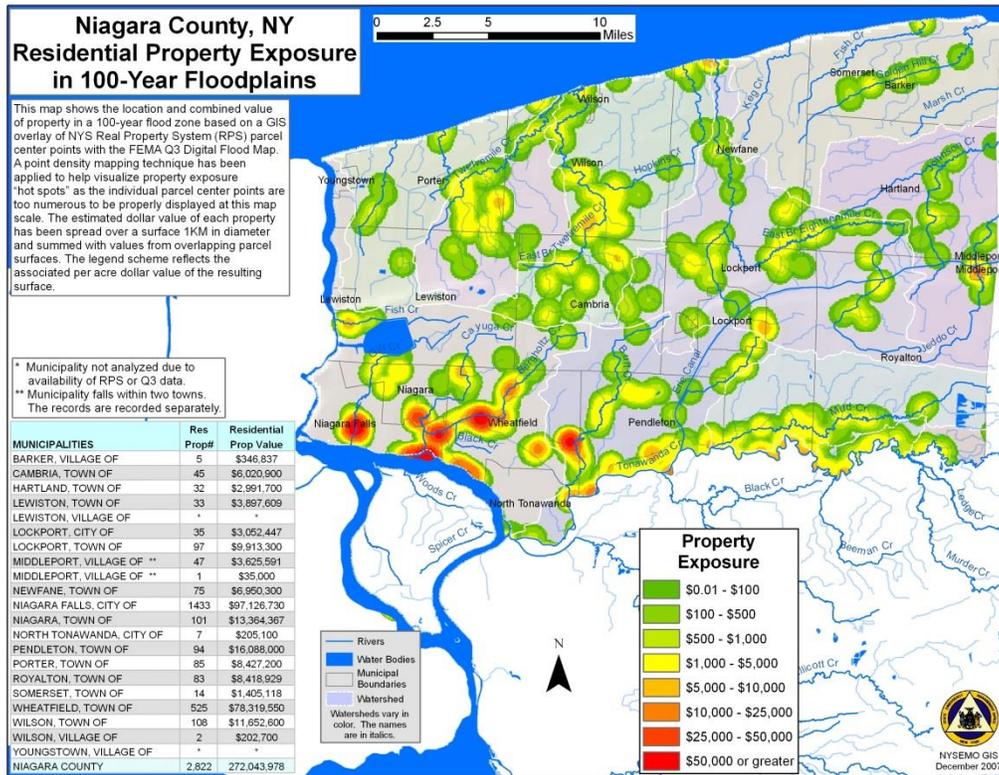


Figure A.3-32: Oneida County, NY Residential Property Exposure in 100-Yr Floodplains

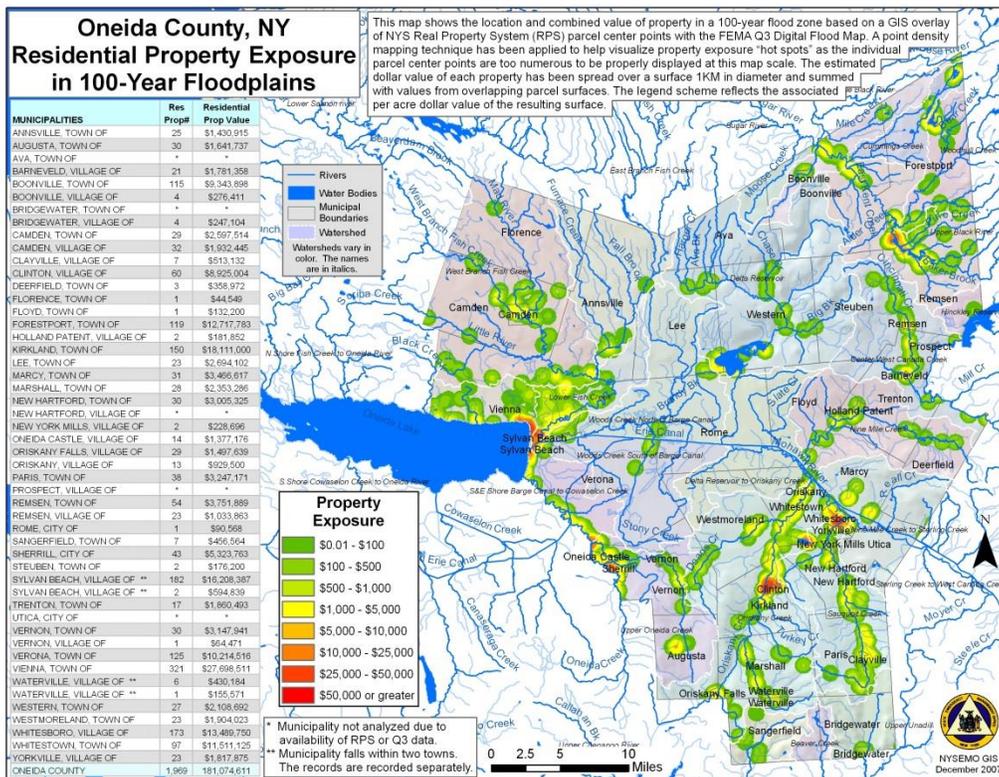


Figure A.3-33: Onondaga County, NY Residential Property Exposure in 100-Yr Floodplains

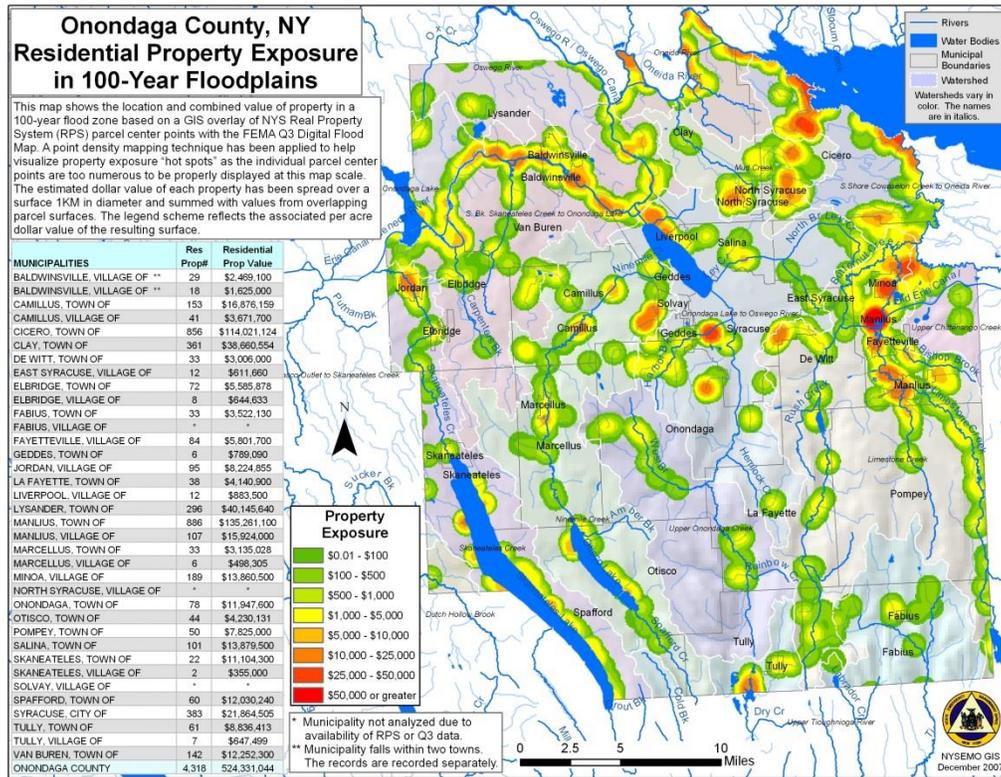


Figure A.3-34: Ontario County, NY Residential Property Exposure in 100-Yr Floodplains

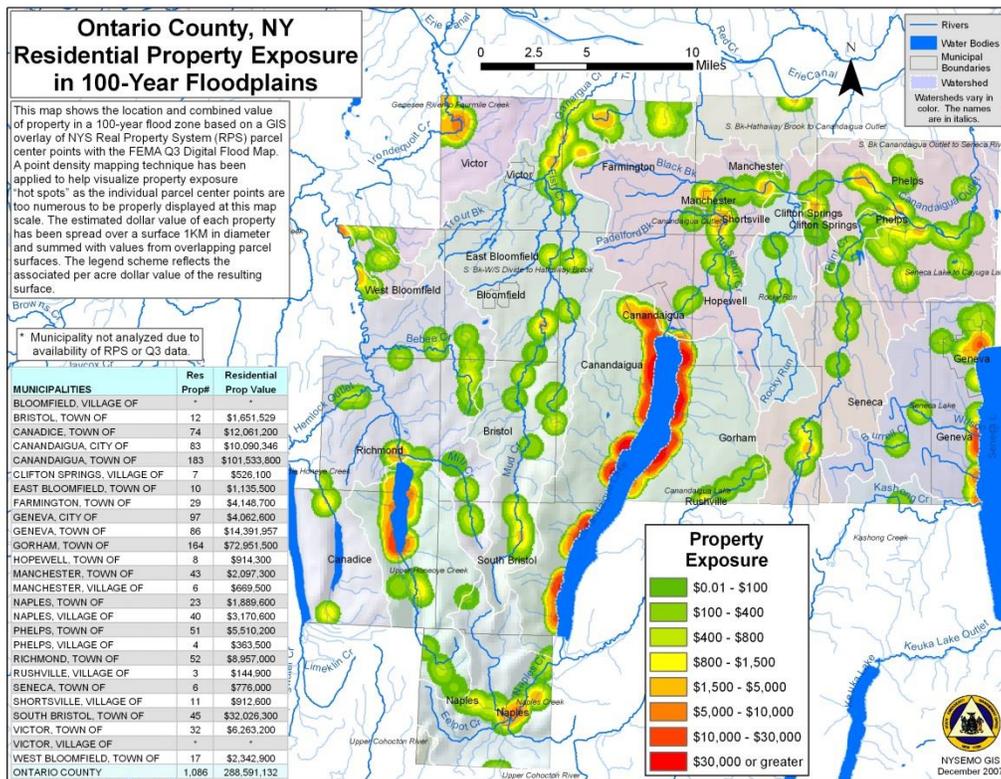


Figure A.3-35: Orange County, NY Residential Property Exposure in 100-Yr Floodplains

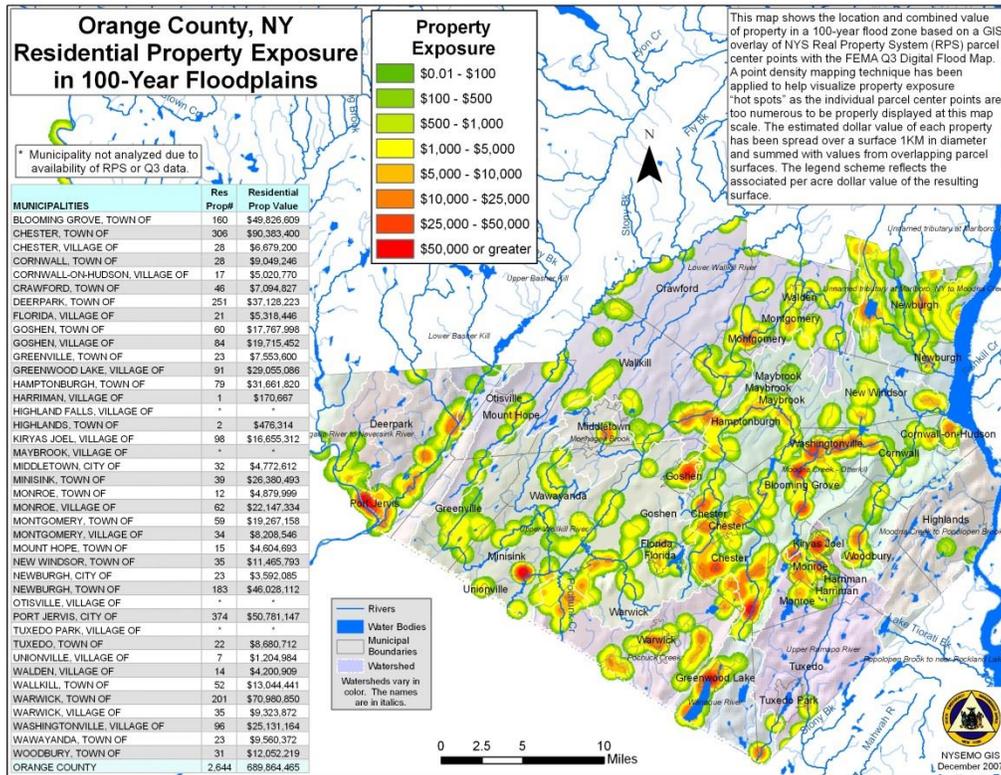


Figure A.3-36: Oswego County, NY Residential Property Exposure in 100-Yr Floodplains

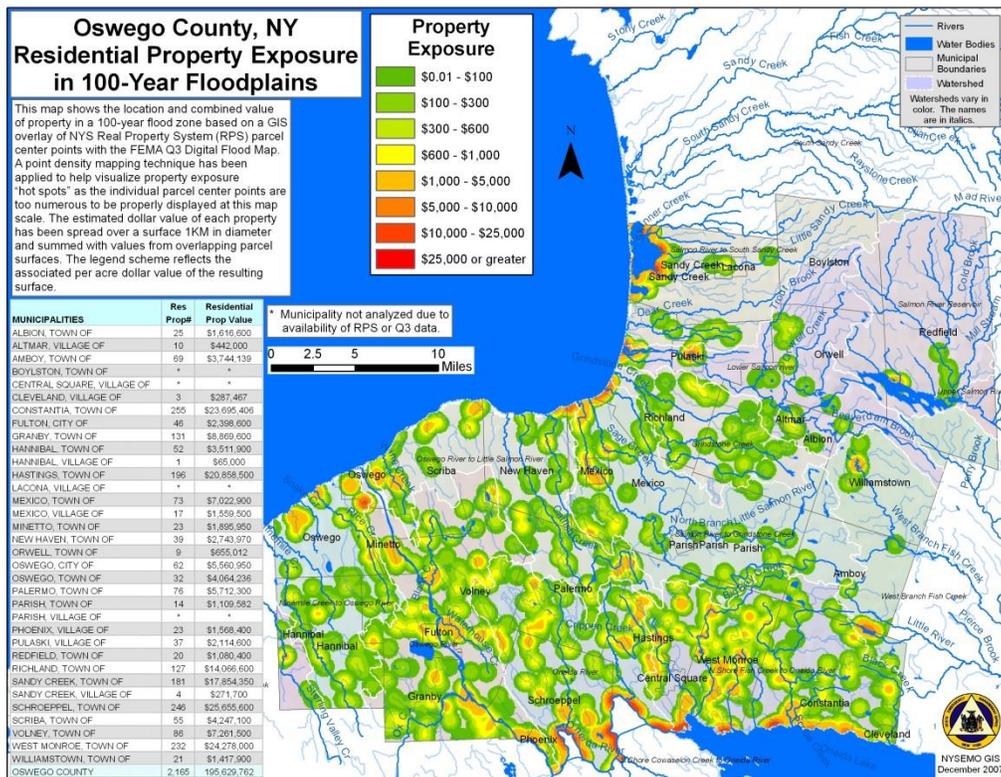


Figure A.3-37: Rensselaer County, NY Residential Property Exposure in 100-Yr Floodplains

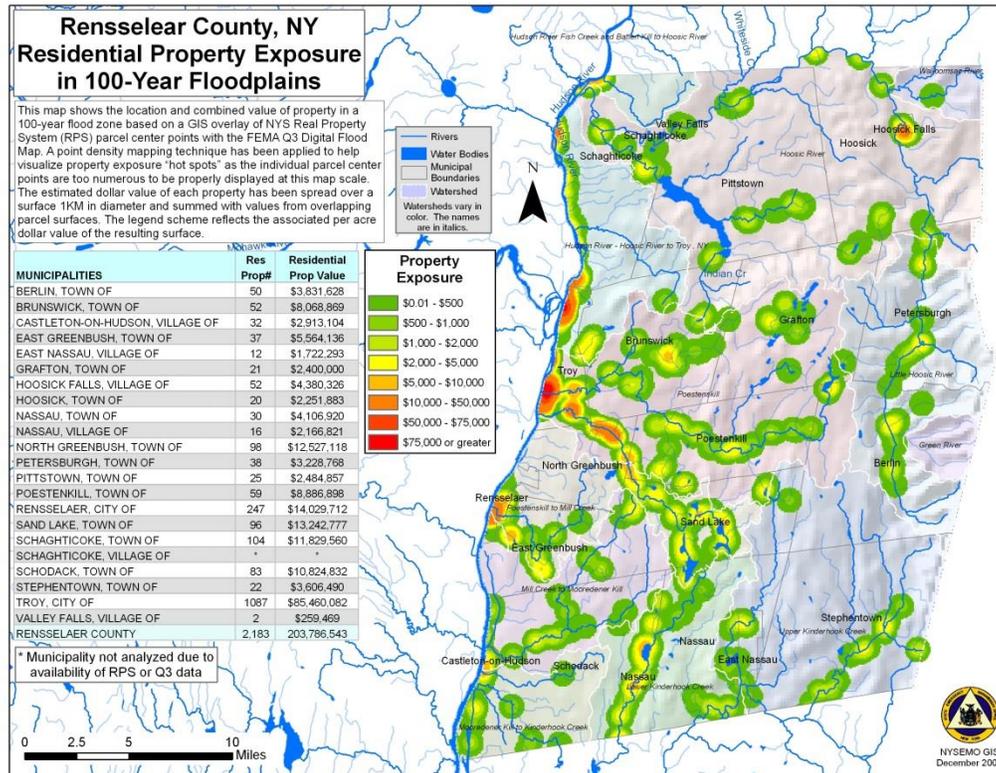


Figure A.3-38: Rockland County, NY Residential Property Exposure in 100-Yr Floodplains

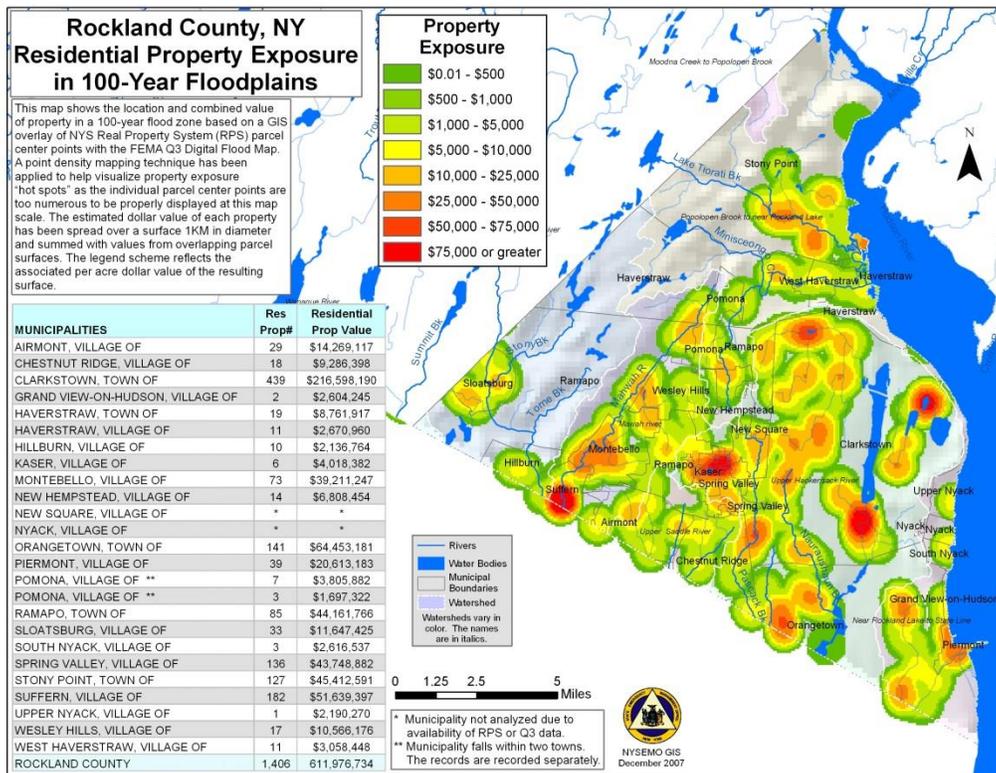


Figure A.3-39: Saratoga County, NY Residential Property Exposure in 100-Yr Floodplains

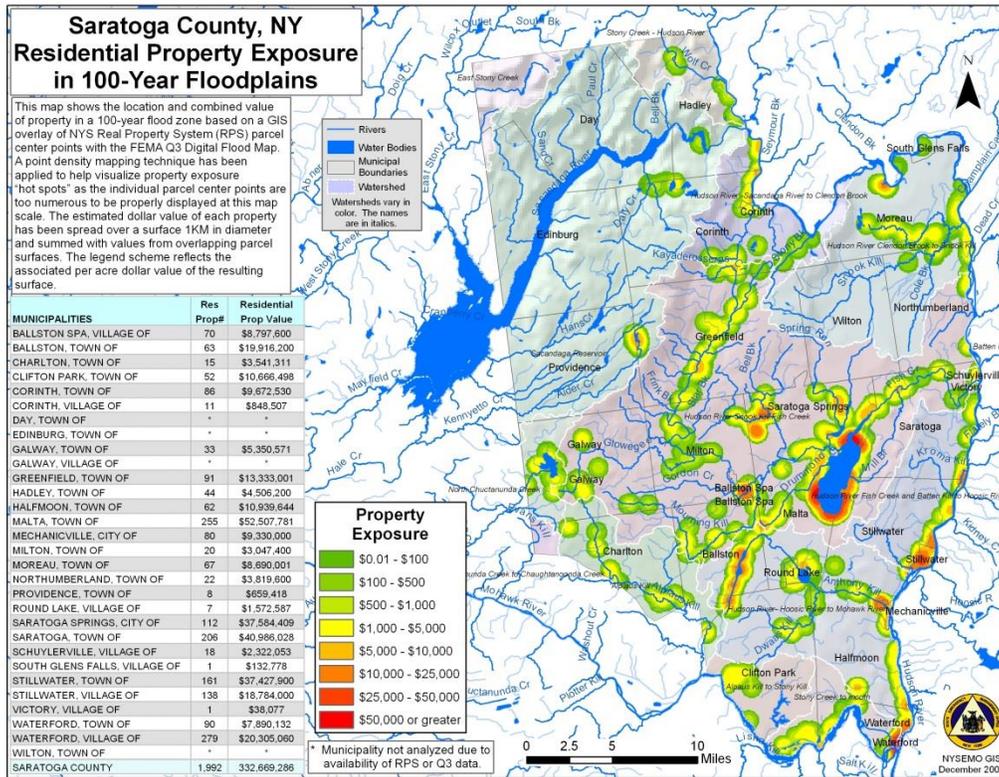


Figure A.3-40: Steuben County, NY Residential Property Exposure in 100-Yr Floodplains

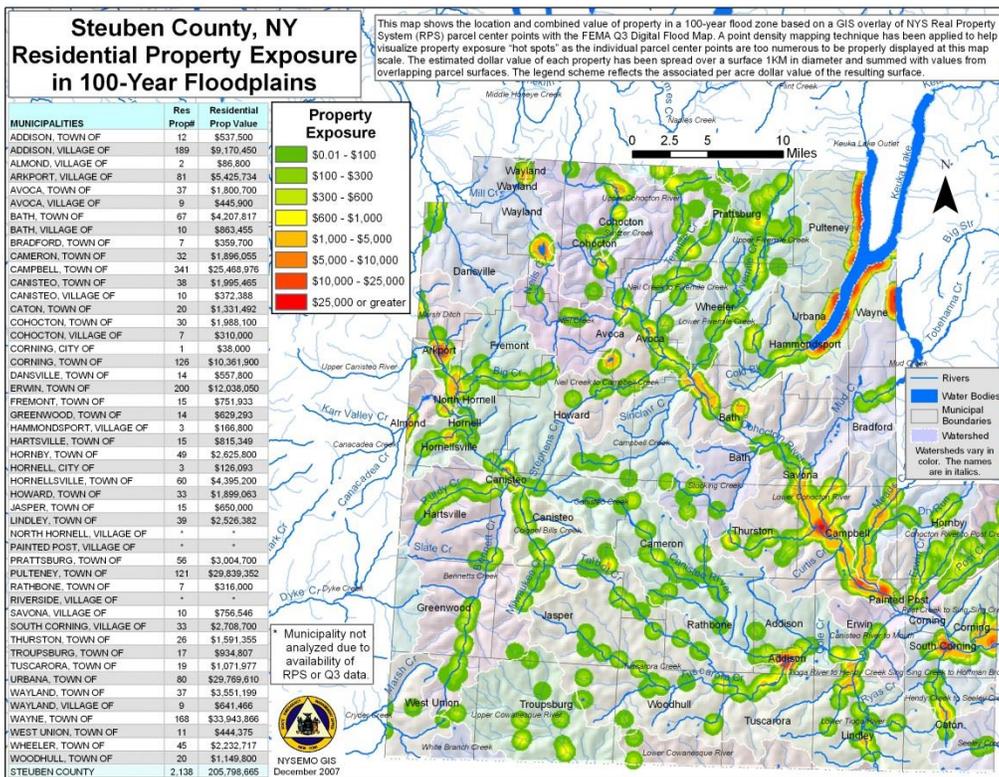


Figure A.3-41: Suffolk County, NY Residential Property Exposure in 100-Yr Floodplains

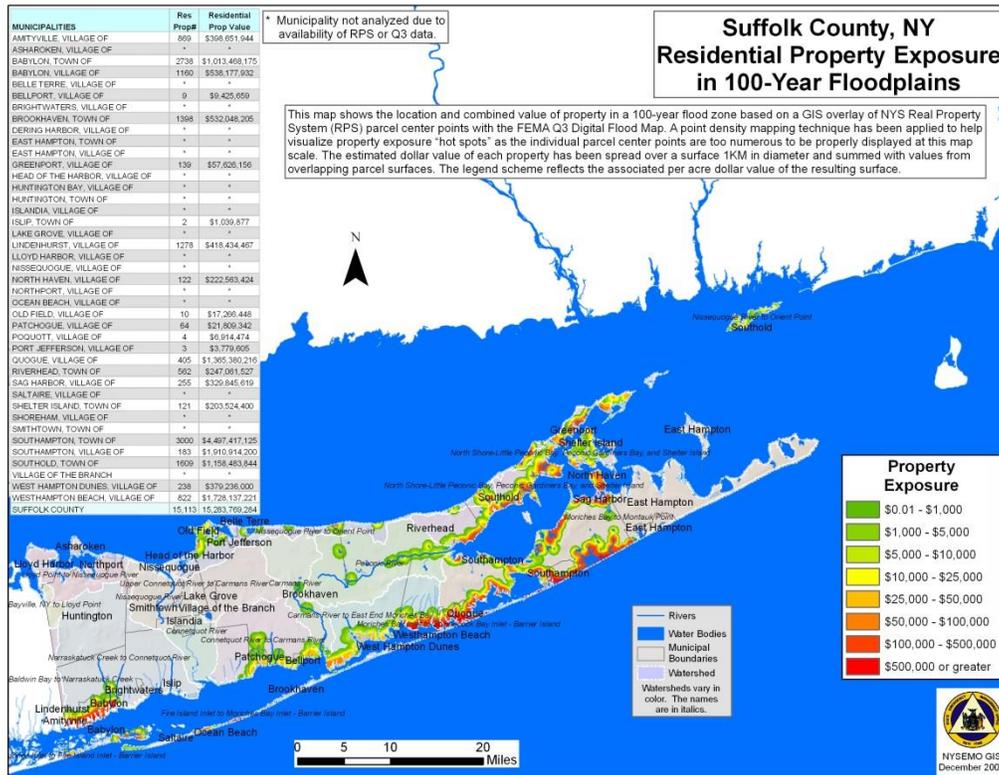


Figure A.3-42: Sullivan County, NY Residential Property Exposure in 100-Yr Floodplains

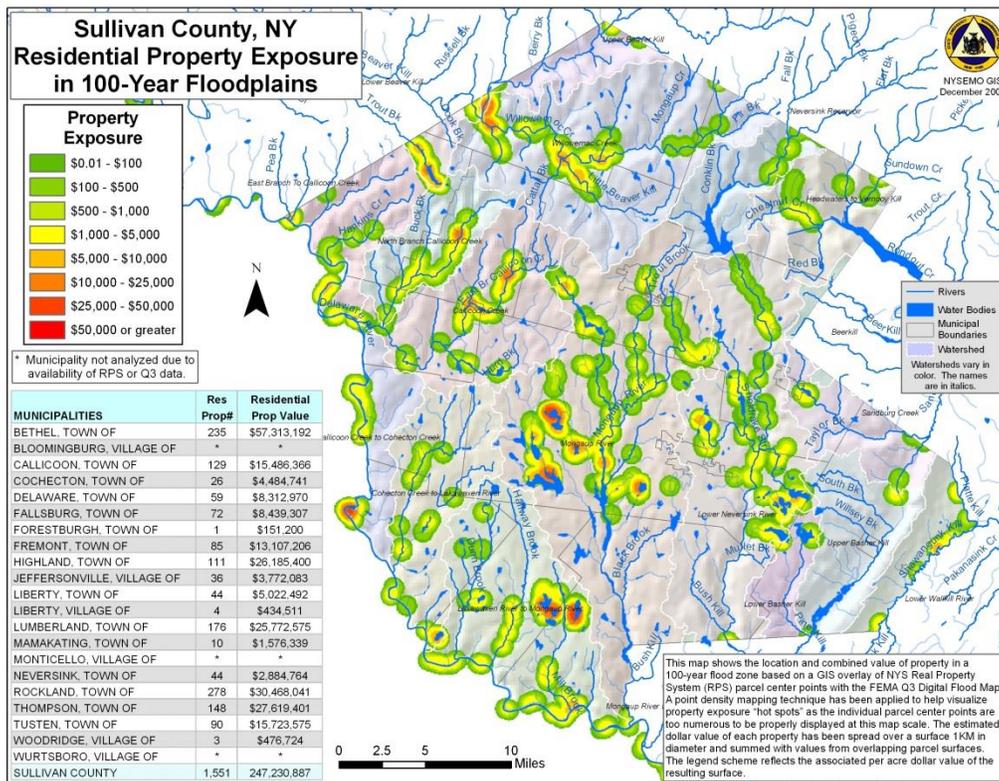


Figure A.3-43: Tioga County, NY Residential Property Exposure in 100-Yr Floodplains

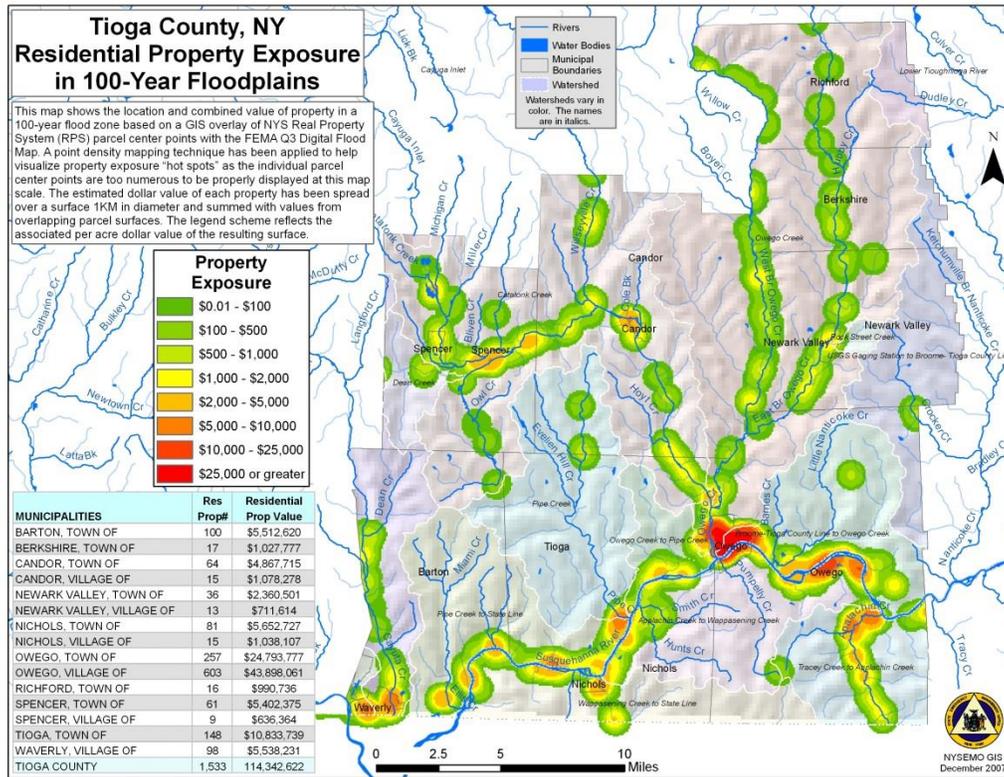


Figure A.3-44: Tompkins County, NY Residential Property Exposure in 100-Yr Floodplains

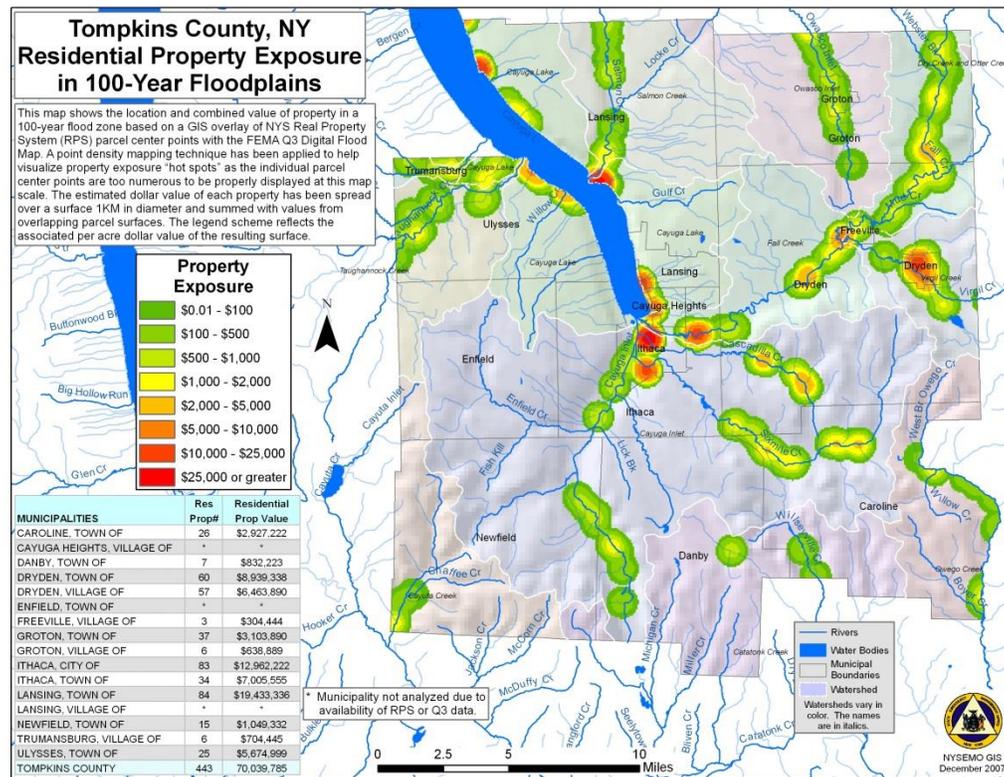


Figure A.3-45: Ulster County, NY Residential Property Exposure

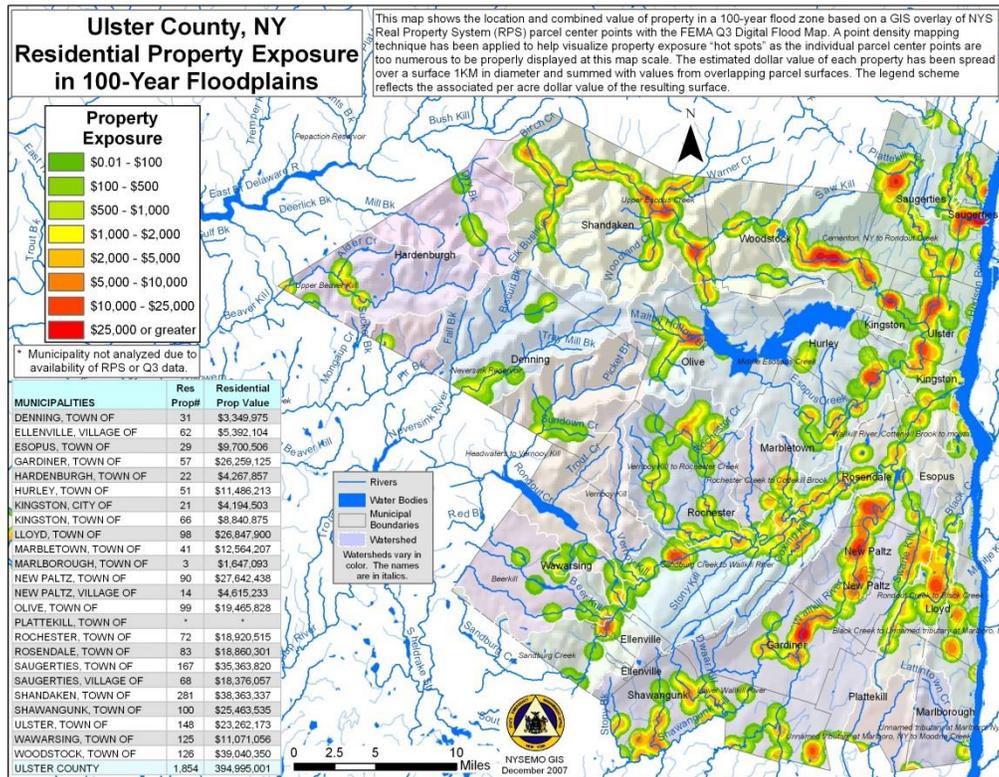
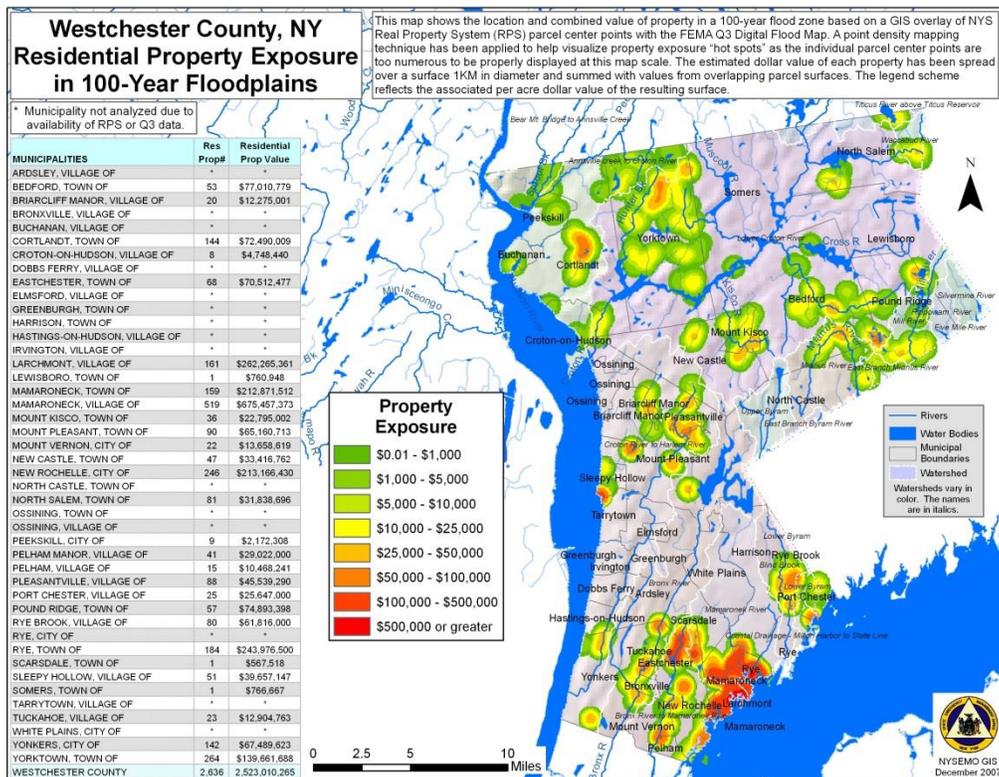


Figure A.3-46: Westchester County, NY Residential Property Exposure in 100-Yr Floodplains



*This section from the 2011 Hazard Mitigation Plan (HMP) demonstrates the method of comparing National Flood Insurance Program (NFIP) and Real Property Services (RPS) data as part of the floodplain analysis. The following series of maps were extracted from the 2011 Hazard Mitigation Plan to demonstrate the level of exposure analysis that can be done at the municipality level geography. The 2014 State Hazard Mitigation Plan does similar analysis but was updated to the county level geography. The inclusion of the data here serves as a resource and to demonstrate the type of analysis that can be done at the local level.*

**Figure A.3-47: Number of Residential Properties in a 100-Yr Flood Zone Compared to the Number of NFIP Policies in Either an A-Zone or V-Zone by Municipality**

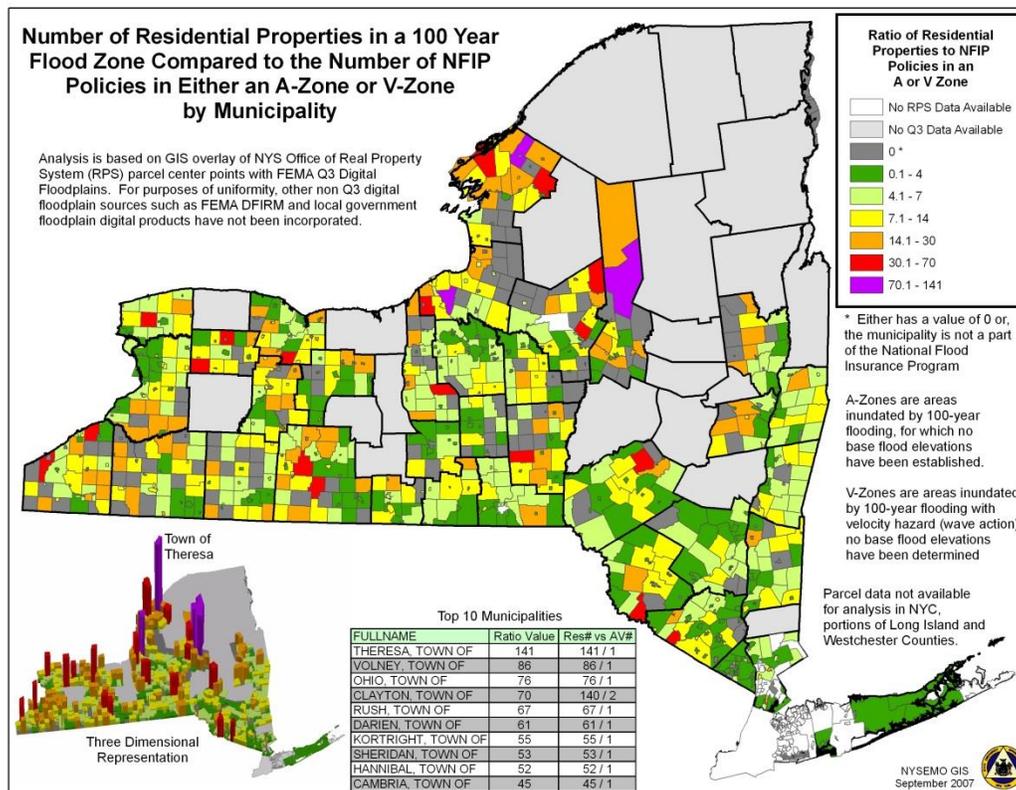


Figure A.3-48: Number of Residential Properties in a 100-Yr Flood Zone Compared to the Number of NFIP Policies by Municipality

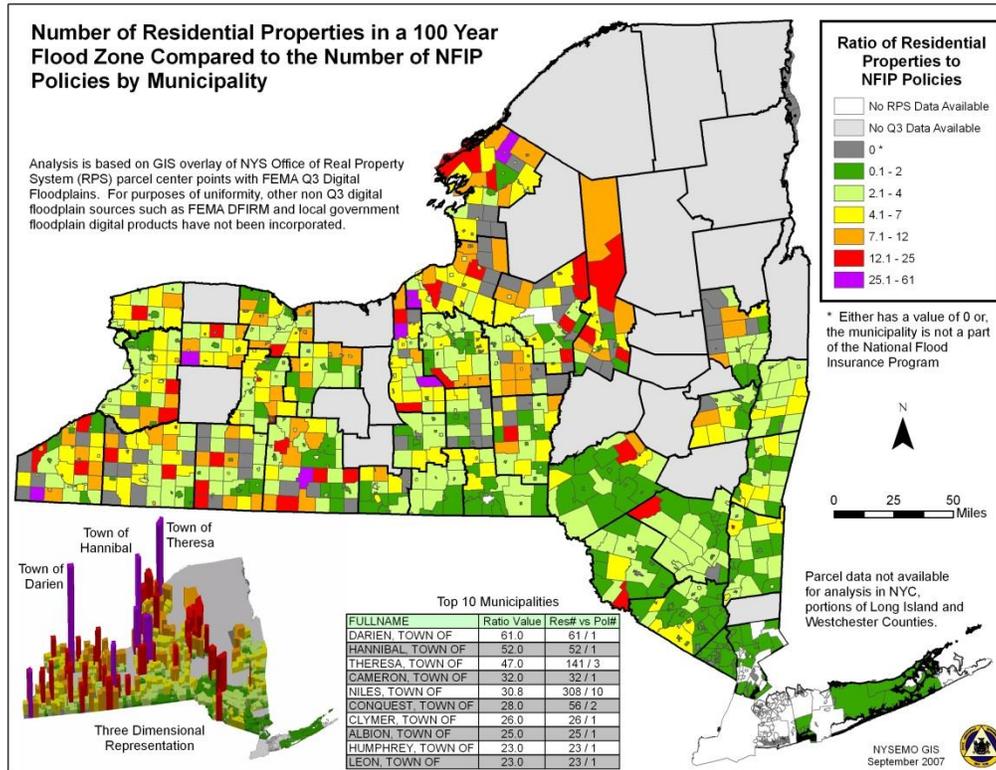


Figure A.3-49: Value of Residential Property in a 100-Yr Flood Zone Compared to the Total Insurance Coverage by Municipality

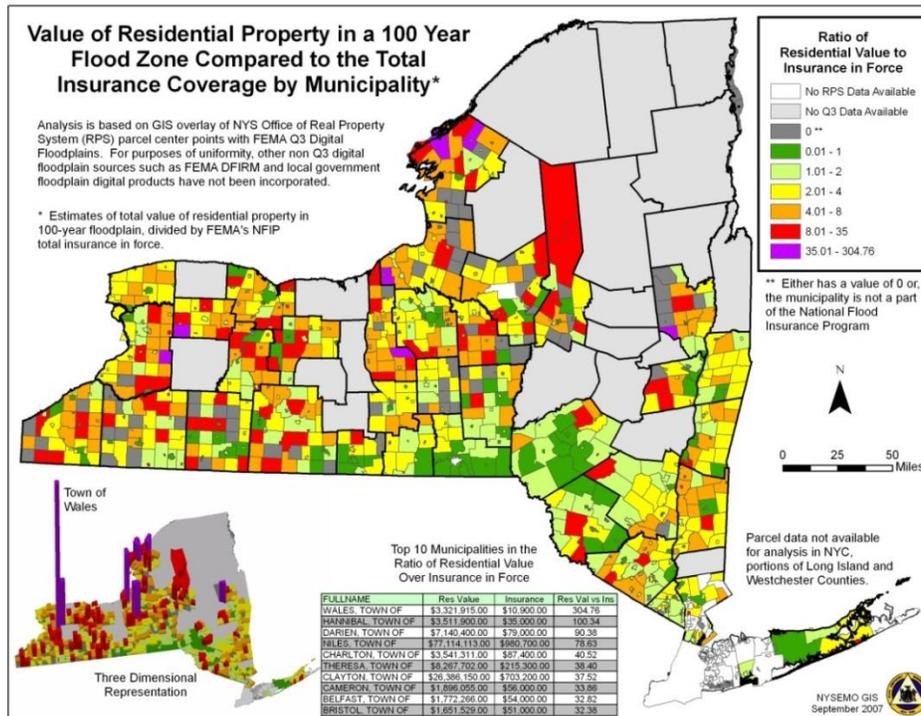


Figure A.3-50: Residential Properties in an A-Zone or V-Zone by Municipality

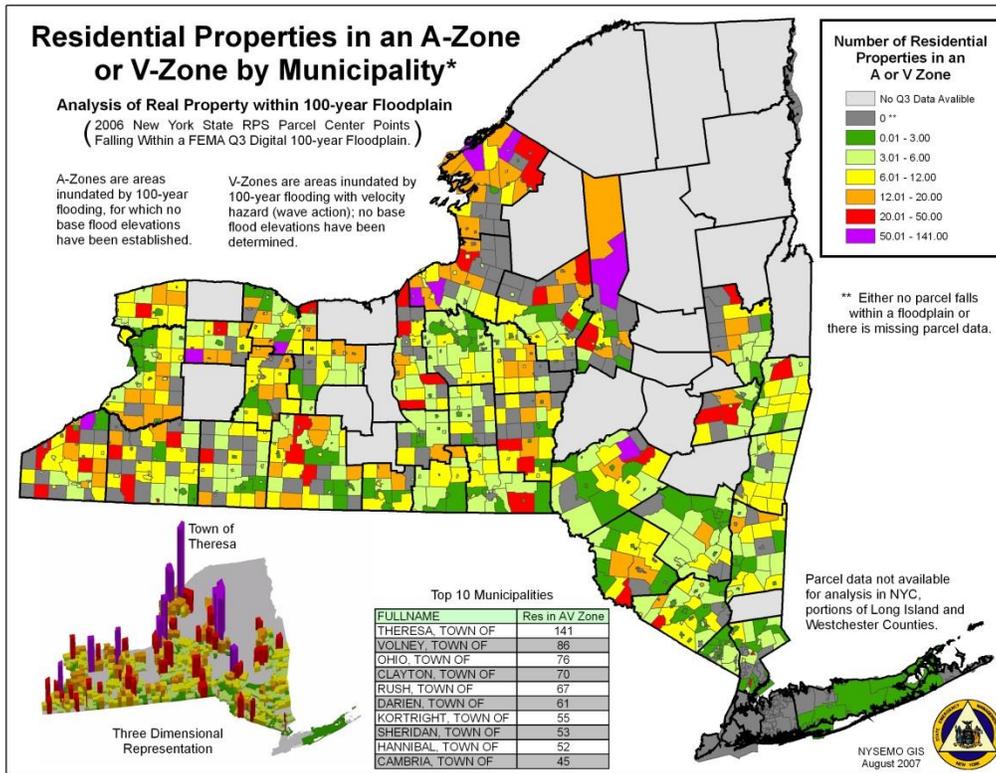
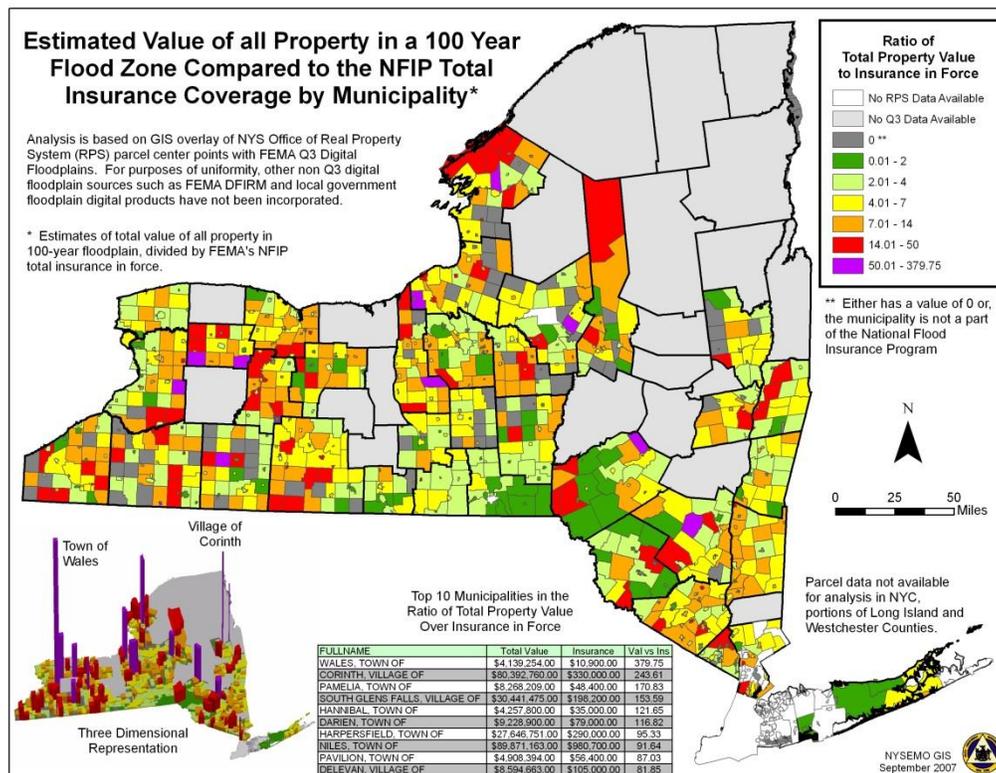


Figure A.3-51: Estimated Value of all Property in a 100-Yr Flood Zone Compared to the NFIP Total Insurance Coverage by Municipality



## Delaware County 2013 Flood Vulnerability Assessment Data using Hazus

*(Please note Delaware County's LHMP was created by Tetra Tech.)*

### VULNERABILITY ASSESSMENT

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the flood hazard, areas identified as hazard areas include the 1% and 0.2% (100- and 500-year) floodplains. The following text evaluates and estimates the potential impact of flooding in Delaware County including:

Overview of vulnerability

Data and methodology used for the evaluation

Impact on: (1) life, safety and health, (2) general building stock, (3) critical facilities and infrastructure, (4) economy and (5) future growth and development

Further data collections that will assist understanding of this hazard over time

Overall vulnerability conclusion

### Overview of Vulnerability

All types of flooding can cause widespread damage throughout rural and urban areas, including but not limited to: water-related damage to the interior and exterior of buildings; destruction of electrical and other expensive and difficult-to-replace equipment; injury and loss of life; proliferation of disease vectors; disruption of utilities, including water, sewer, electricity, communications networks and facilities; loss of agricultural crops and livestock; placement of stress on emergency response and healthcare facilities and personnel; loss of productivity; and displacement of persons from homes and places of employment (Foster, Date Unknown).

The flood hazard is a major concern for Delaware County. To assess vulnerability, potential losses were calculated for the County for riverine flooding for 1% (100-year) and 0.2% (500-year) annual chance flood events. Historic loss data associated with ice jam events and dam failures is limited. Flooding, impacts and losses associated with ice jam and dam failure events are similar to flash flooding events. The flood hazard exposure and loss estimate analysis is presented below.

### Data and Methodology

The 1% and 0.2% (100- and 500-year) annual chance flood events were examined to evaluate Delaware County's risk and vulnerability to the flood hazard. These flood events are generally those considered by planners and evaluated under federal programs such as the NFIP.

Delaware and Broome Counties' Flood Insurance Rate Maps (FIRMs) are currently being updated and the latest versions are considered preliminary. Their preliminary Digital FIRMS (DFIRMS), considered the best available data, were used for analysis. A modified Level 1 HAZUS-MH analysis was performed to analyze the risk and vulnerability to Delaware County. The model uses 2000 U.S. Census data at the block level and default general building stock data (RSMMeans 2006), which has a level of accuracy acceptable for planning purposes. Where possible, the HAZUS-MH default data was enhanced using



Local GIS data from the county, state and federal sources and updated 2010 U.S. Census data was used for the exposure analysis.

The hydrology and hydraulics for the selected river reaches in the County was run in HAZUS and the flood-depth grid and flood boundary for the specified return periods (100- and 500-year mean return period [MRP]) were generated. To estimate exposure, the preliminary DFIRM flood boundaries were used. HAZUS-MH 2.0 calculated the estimated damages to the general building stock and critical facilities based on the depth grid generated and the default HAZUS damage functions in the flood model. Figure 5.4.3-6 illustrates the flood boundaries used for this vulnerability assessment.





### Impact on Life, Health and Safety

The impact of flooding on life, health and safety is dependent upon several factors including the severity of the event and whether or not adequate warning time is provided to residents. Exposure represents the population living in or near floodplain areas that could be impacted should a flood event occur. Additionally, exposure should not be limited to only those who reside in a defined hazard zone, but everyone who may be affected by the effects of a hazard event (e.g., people are at risk while traveling in flooded areas, or their access to emergency services is compromised during an event). The degree of that impact will vary and is not measurable.

To estimate the population exposed to the 1% and 0.2% annual chance (100- and 500-year) flood events, the preliminary FEMA DFIRM floodplain boundaries were overlaid upon the 2010 Census population data in GIS (U.S. Census 2010). Census blocks do not follow the boundaries of the floodplain. The Census blocks with their centroid in the flood boundaries were used to calculate the estimated population exposed to this hazard. Using this approach, it is estimated that 5,863 people are within the 1% (100-year) floodplain or 11.6% of the total County population (population total 50,402 including the entire Village of Deposit), and 6,559 people are within the 0.2% (500-year) floodplain (13.0% of the total County population of 50,402 people). Table 5.4.3-5 lists the estimated population located within these flood zones by municipality.

**Table 5.4.3-1. Estimated Delaware County Population Vulnerable to the 1% and 0.2% (100-Year and 500-Year MRP) Flood Hazard**

Municipality	Population in the 1% annual chance event (100- Year) Flood Boundary	Population in the 0.2% annual chance (500-Year) Flood Boundary
Andes (T)	65	65
Bovina (T)	29	29
Colchester (T)	330	338
Davenport (T)	453	458
Delhi (T)	217	226
Delhi (V)	117	173
Deposit (T)	74	74
Deposit (V)	767	853
Fleischmanns (V)	82	82
Franklin (T)	115	115
Franklin (V)	0	0
Hamden (T)	137	137
Hancock (T)	284	299
Hancock (V)	48	126
Harpersfield (T)	36	36
Hobart (V)	76	76
Kortright (T)	85	85
Margaretville (V)	282	282
Masonville (T)	1	1
Meredith (T)	5	5
Middletown (T)	317	317
Roxbury (T)	70	70
Sidney (T)	120	129



Municipality	Population in the 1% annual chance event (100- Year) Flood Boundary	Population in the 0.2% annual chance (500-Year) Flood Boundary
Sidney (V)	1,176	1512
Stamford (T)	121	121
Stamford (V)	0	0
Tompkins (T)	10	10
Walton (T)	76	76
Walton (V)	770	864
<b>Delaware County</b>	<b>5,863</b>	<b>6,559</b>

Source: Census, 2010; FEMA, 2011

Notes: The exposed population for the Village of Deposit represents the entire Village; area in both Delaware and Broome Counties.

Of the population exposed, the most vulnerable include the economically disadvantaged and the population over the age of 65. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on the net economic impact to their family. The population over the age of 65 is also more vulnerable because they are more likely to seek or need medical attention which may not be available to due isolation during a flood event and they may have more difficulty evacuating.

HAZUS-MH 2.0 estimates the potential sheltering needs as a result of a 1% and 0.2% annual chance (100- and 500-year MRP) flood events. For the 1% (100-year) event, HAZUS-MH 2.0 estimates 6,317 people will be displaced and 3,699 people will seek short-term sheltering, representing 12.9% and 7.5% of the County population, respectively. For the 0.2% (500-year) event, HAZUS-MH 2.0 estimates 6,904 people will be displaced and 4,119 people will seek short-term sheltering, representing 14.1% and 8.4% of the County population, respectively. Refer to Table 5.4.3-6.

The total number of injuries and casualties resulting from flooding is generally limited based on advance weather forecasting, blockades and warnings. Therefore, injuries and deaths generally are not anticipated if proper warning and precautions are in place. Ongoing mitigation efforts should help to avoid the most likely cause of injury, which results from persons trying to cross flooded roadways or channels during a flood.



Table 5.4.3-2. Estimated Delaware County Population Displaced or Seeking Short-Term Shelter from the 1% and 0.2% Annual Chance (100-Year and 500-Year MRP) Flood Events

Municipality	1% Annual Chance (100 Year)				0.2% Annual Chance (500 Year)			
	Displaced Persons	Percent Displaced	Persons Seeking Short-Term Sheltering	Percent Seeking Shelter	Displaced Persons	Percent Displaced	Persons Seeking Short-Term Sheltering	Percent Seeking Shelter
Andes (T)	76	5.6	25	1.8	84	6.2	28	2.1
Bovina (T)	9	1.4	0	0.0	10	1.5	0	0.0
Colchester (T)	235	11.5	115	5.6	272	13.3	135	6.6
Davenport (T)	289	10.4	60	2.2	308	11.1	74	2.7
Delhi (T)	119	5.8	44	2.2	133	6.5	50	2.4
Delhi (V)	97	3.8	49	1.9	111	4.3	58	2.2
Deposit (T)	106	13.2	45	5.6	110	13.7	48	6.0
Deposit (V)	587	30.3	417	21.5	647	33.4	465	24.0
Fleischmanns (V)	75	24.4	19	6.2	84	27.3	29	9.4
Franklin (T)	109	4.9	15	0.7	119	5.4	23	1.0
Franklin (V)	28	7.0	9	2.2	33	8.2	11	2.7
Hamden (T)	68	5.3	15	1.2	78	6.1	22	1.7
Hancock (T)	349	15.7	53	2.4	428	19.3	94	4.2
Hancock (V)	289	23.7	213	17.5	343	28.2	252	20.7
Harpersfield (T)	31	3.0	1	0.1	35	3.3	1	0.1
Hobart (V)	32	11.0	4	1.4	39	13.4	7	2.4
Kortright (T)	98	6.0	4	0.2	108	6.6	6	0.4
Margaretville (V)	174	32.5	136	25.4	186	34.7	155	28.9
Masonville (T)	49	3.5	1	0.1	58	4.1	3	0.2
Meredith (T)	34	2.1	1	0.1	36	2.3	1	0.1
Middletown (T)	212	6.6	86	2.7	228	7.1	95	3.0
Roxbury (T)	263	10.5	149	5.9	278	11.1	166	6.6
Sidney (T)	171	8.2	14	0.7	208	10.0	18	0.9
Sidney (V)	1,717	42.2	1,524	37.5	1,826	44.9	1,635	40.2
Stamford (T)	103	6.2	13	0.8	119	7.2	15	0.9
Stamford (V)	63	11.3	9	1.6	73	13.1	14	2.5



Municipality	1% Annual Chance (100 Year)				0.2% Annual Chance (500 Year)			
	Displaced Persons	Percent Displaced	Persons Seeking Short-Term Sheltering	Percent Seeking Shelter	Displaced Persons	Percent Displaced	Persons Seeking Short-Term Sheltering	Percent Seeking Shelter
Tompkins (T)	13	1.2	0	0.0	22	2.0	0	0.0
Walton (T)	120	4.7	15	0.6	120	4.7	17	0.7
Walton (V)	801	26.1	663	21.6	808	26.3	697	22.7
<b>Delaware County</b>	<b>6,317</b>	<b>12.9</b>	<b>3,699</b>	<b>7.5</b>	<b>6,904</b>	<b>14.1</b>	<b>4,119</b>	<b>8.4</b>

Source: HAZUS-MH 2.0

Note: The percent of the population displaced and seeking shelter was calculated using the 2000 U.S. Census data for Delaware County including the portion of the Village of Deposit in Broome County (population of 49,130).



### Impact on General Building Stock

After considering the population exposed to the flood hazard, developed land, the HAZUS-MH 2.0 default value of general building stock exposed to, and damaged by, the 1% and 0.2% (100- and 500-year MRP) annual chance flood events was evaluated. Exposure in the flood zone includes those buildings located in the flood zone. Potential damage is the modeled loss that could occur to the exposed inventory, including structural and content value.

The HAZUS-MH 2.0 flood model does not estimate general building stock exposure to the flood hazard. To provide a general estimate of number of properties and structural/content replacement value exposure, the preliminary FEMA DFIRM flood boundaries, Delaware County parcel GIS shapefile, July 2011 Real Property assessed values and HAZUS-MH 2.0 general building stock inventory were used. The FEMA preliminary DFIRM 1% and 0.2% (100- and 500-year) flood zones were overlaid upon the County parcel layer and the Real Property layers provided for each municipality. The polygons that cross the 1% and 0.2% flood zones were totaled for each municipality to approximate the number of properties and assessed values (total, building and land) located in the flood zone. Although it is unknown where on each parcel/property a structure may/may not be located, a portion of each property is within the flood zone and is inundated by flood waters.

The HAZUS-MH 2.0 Census blocks with their centroid in the FEMA preliminary DFIRM flood zones were used to estimate the building replacement cost value exposed to this hazard (Table 5.4.3-7).

In summary, there are approximately 54 and 56 square miles of land in Delaware County located in the preliminary DFIRM 1% and 0.2% (100-year and 500-year) floodplains, respectively. Approximately 4.7 miles and 5.3 miles (or 9- to 10-percent) of this land is developed land and located within the 1% and 0.2% preliminary DFIRM floodplains and thus exposed to the flood hazard (FEMA, 2011; USGS, 2011). Refer to Table 5.4.3-8 below.

There are 5,879 parcels and 6,165 parcels exposed to the 1% and 0.2% annual chance (100- and 500-year) events, respectively (refer to Table 5.4.3-9 below). This closely agrees with the Real Property exposure analysis conducted. There are 5,871 properties and greater than \$775K in total assessed value (building and land) exposed to the 1% (100-year) flood. In addition, there are 6,203 properties and nearly \$800K in total assessed value exposed to the 0.2% (500-year) flood. For more detailed information per municipality, please refer to Tables 5.4.3-10 and 5.4.3-11 below.

According to the HAZUS Census block analysis (blocks with the centroid located in the flood zones), there is approximately \$795 million of building/contents exposed to the 1% (100-year) flood in Delaware County. This represents approximately 12-percent of the County's total general building stock replacement value inventory (approximately \$6.5 billion; see Section 4). For the 0.2% (500-year) event, it is estimated there is nearly \$960 million of buildings/contents exposed in Delaware County or nearly 15-percent (Table 5.4.3-12).

HAZUS-MH 2.0 estimates the potential damage to the general building stock inventory associated with the 1% (100-year) flood is approximately \$317 million or 4.8-percent of the County's general building stock inventory. For the 0.2% (500-year) event, the HAZUS-MH 2.0 potential damage estimate is approximately \$377 million (structure and contents) or 5.8-percent of the County's general building stock inventory. HAZUS-MH damage assessments for Delaware County are displayed in Table 5.4.3-13.



Table 5.4.3-3. Land Use (2006) in the 1% and 0.2% (100- and 500-year ) FEMA Preliminary DFIRM Flood Boundaries

Land Use	Total Area (sq. mi.)	1% (100-Year)		0.2% (500-Year)	
		Area (sq. mi.)	Percent of Total	Area (sq. mi.)	Percent of Total
Barren	5.7	4.4	77.2	4.4	77.2
Developed	50.1	4.7	9.4	5.3	10.6
Farmland	233.3	14.3	6.1	15.6	6.7
Forested	1,140.1	7.7	0.7	7.9	0.7
Open Water	17	6.4	37.6	6.4	37.6
Wetlands	22.4	7.5	33.5	7.6	33.9
<b>Total</b>	<b>1,468.6</b>	<b>45.0</b>	<b>3.1</b>	<b>47.2</b>	<b>3.2</b>

Source: FEMA, 2011; USGS, 2011 (2006 National Land Cover Database)

Note: sq. mi. = square miles

Table 5.4.3-4. Area and Estimated Number of Parcels Located in the 1% and 0.2% (100- and 500-year ) FEMA Preliminary DFIRM Flood Boundaries

Municipality	Total Area (sq. mi.)	Area Exposed (sq. miles)		Percent Area Exposed		Total Number of Parcels	Number of Parcels Exposed		Percent of Parcels Exposed	
		1% (100 Year)	02.% (500 Year)	1% (100 Year)	02.% (500 Year)		1% (100 Year)	02.% (500 Year)	1% (100 Year)	02.% (500 Year)
Andes (T)	112.5	4.1	4.1	3.7	3.7	2,382	158	158	6.6	6.6
Bovina (T)	44.5	0.3	0.3	0.6	0.6	966	59	59	6.1	6.1
Colchester (T)	142.2	7.6	7.8	5.3	5.5	2,927	427	476	14.6	16.3
Davenport (T)	52.5	2.3	2.5	4.4	4.7	1,984	249	229	12.6	11.5
Delhi (T)	64.6	2.5	2.6	3.9	4.1	1,409	194	199	13.8	14.1
Delhi (V)	3.2	0.3	0.3	8.5	9.5	750	181	215	24.1	28.7
Deposit (T)	44.6	2.5	2.8	5.7	6.2	1,192	135	148	11.3	12.4
Deposit (V)*	1.3	0.3	0.3	20.6	24.4	364	114	126	31.3	34.6
Fleischmanns (V)	0.7	0.1	0.1	19.4	19.4	330	128	128	38.8	38.8
Franklin (T)	81.6	1.8	1.8	2.2	2.2	1,942	121	121	6.2	6.2
Franklin (V)	0.4	0.1	0.1	31.4	31.4	200	18	18	9.0	9.0
Hamden (T)	59.9	1.6	1.6	2.7	2.7	1,388	97	101	7.0	7.3
Hancock (T)	161.8	7.6	8.2	4.7	5.1	3,569	1,245	1,316	34.9	36.9
Hancock (V)	1.7	0.3	0.4	19.2	22.8	595	103	140	17.3	23.5
Harpersfield (T)	42.4	1.0	1.0	2.4	2.4	1,189	116	116	9.8	9.8
Hobart (V)	0.5	0.1	0.1	10.4	10.4	258	59	59	22.9	22.9



Municipality	Total Area (sq. mi.)	Area Exposed (sq. miles)		Percent Area Exposed		Total Number of Parcels	Number of Parcels Exposed		Percent of Parcels Exposed	
		1% (100 Year)	02.% (500 Year)	1% (100 Year)	02.% (500 Year)		1% (100 Year)	02.% (500 Year)		
Kortright (T)	62.7	2.3	2.3	3.7	3.7	1,599	238	238	14.9	14.9
Margaretville (V)	0.7	0.3	0.3	45.7	48.6	380	117	134	30.8	35.3
Masonville (T)	54.3	0.4	0.4	0.7	0.7	1,261	85	85	6.7	6.7
Meredith (T)	58.3	0.2	0.2	0.3	0.3	1,295	72	72	5.6	5.6
Middletown (T)	97.3	3.9	3.9	4.1	4.1	3,646	489	490	13.4	13.4
Roxbury (T)	87.6	1.7	1.7	1.9	1.9	3,231	247	247	7.6	7.6
Sidney (T)	50.7	2.4	2.6	4.8	5.2	1,466	226	235	15.4	16.0
Sidney (V)	2.4	0.8	0.9	34.6	39.2	1,686	262	278	15.5	16.5
Stamford (T)	48.5	0.9	0.9	1.8	1.8	1,237	88	88	7.1	7.1
Stamford (V)	1.3	0.1	0.1	4.7	4.7	564	70	70	12.4	12.4
Tompkins (T)	104.5	4.6	4.6	4.4	4.4	1,397	49	49	3.5	3.5
Walton (T)	97.6	3.2	3.3	3.2	3.3	2,063	256	258	12.4	12.5
Walton (V)	1.6	0.5	0.5	28.8	31.3	1,405	276	312	19.6	22.2
<b>Delaware County</b>	<b>1,481.5</b>	<b>53.7</b>	<b>55.7</b>	<b>3.6</b>	<b>3.8</b>	<b>42,675</b>	<b>5,879</b>	<b>6,165</b>	<b>13.8</b>	<b>14.4</b>

Source: FEMA, 2011; Delaware County GIS 2010

Notes:

sq.mi. = square miles; T = Town' V = Village

\* Please note that the parcel count only includes the parcels located within Delaware County. Therefore, parcels in the Village of Deposit located in Broome County were not available and are not included in the table above.



Table 5.4.3-5. Estimated Assessed Value (Building and Land) Located in the 1% and 0.2% (100- and 500-year) MRP Flood Boundaries

Municipality	Number of Properties		1% (100 Year)			0.2% Annual Chance (500 Year)		
	1% (100 Year)	0.2% (500 Year)	Land AV	Building AV	Total AV	Land AV	Building AV	Total AV
Andes (T)	161	161	\$58,078,468	\$42,580,441	\$100,658,909	\$58,078,468	\$42,580,441	\$100,658,909
Bovina (T)	61	61	\$1,056,801	\$3,021,310	\$4,078,111	\$1,056,801	\$3,021,310	\$4,078,111
Colchester (T)	420	469	\$406,925	\$18,945,200	\$19,352,125	\$445,287	\$19,067,300	\$19,512,587
Davenport (T)	232	253	\$10,488,433	\$22,381,342	\$32,869,775	\$11,090,557	\$24,046,703	\$35,137,260
Delhi (T)	194	199	\$6,144,448	\$24,862,459	\$31,006,907	\$6,221,848	\$25,071,489	\$31,293,337
Delhi (V)	179	215	\$4,518,937	\$79,177,798	\$83,696,735	\$5,183,537	\$83,119,529	\$88,303,066
Deposit (T)	136	150	\$338,296	\$7,199,396	\$7,537,692	\$349,256	\$7,233,646	\$7,582,902
Deposit (V)	115	127	\$93,165	\$1,364,613	\$1,457,778	\$99,115	\$1,407,863	\$1,506,978
Fleischmanns (V)	128	128	\$2,266,400	\$17,530,000	\$19,796,400	\$2,266,400	\$17,530,000	\$19,796,400
Franklin (T)	123	123	\$5,698,999	\$16,617,001	\$22,316,000	\$5,698,999	\$16,617,001	\$22,316,000
Franklin (V)	18	18	\$383,000	\$8,778,000	\$9,161,000	\$383,000	\$8,778,000	\$9,161,000
Hamden (T)	99	103	\$960,689	\$2,549,537	\$3,510,226	\$972,489	\$2,583,037	\$3,555,526
Hancock (T)	1,245	1,316	\$8,315,061	\$12,751,090	\$21,066,151	\$8,703,845	\$13,494,383	\$22,198,228
Hancock (V)	103	140	\$360,800	\$1,572,873	\$1,933,673	\$471,650	\$2,232,473	\$2,704,123
Harpersfield (T)	116	116	\$2,257,195	\$6,015,499	\$8,272,694	\$2,257,195	\$6,015,499	\$8,272,694
Hobart (V)	60	60	\$80,600	\$990,500	\$1,071,100	\$80,600	\$990,500	\$1,071,100
Kortright (T)	234	234	\$17,774,100	\$36,243,500	\$54,017,600	\$17,774,100	\$36,243,500	\$54,017,600
Margaretville (V)	117	134	\$3,254,800	\$59,830,100	\$63,084,900	\$3,559,900	\$62,568,200	\$66,128,100
Masonville (T)	85	85	\$3,559,560	\$6,646,100	\$10,205,660	\$3,559,560	\$6,646,100	\$10,205,660
Meredith (T)	73	73	\$4,860,700	\$5,391,600	\$10,252,300	\$4,860,700	\$5,391,600	\$10,252,300
Middletown (T)	492	493	\$60,702,100	\$52,689,814	\$113,391,914	\$60,751,100	\$52,876,514	\$113,627,614
Roxbury (T)	247	247	\$4,204,966	\$25,351,409	\$29,556,375	\$4,204,966	\$25,351,409	\$29,556,375
Sidney (T)	229	241	\$6,332,740	\$49,023,667	\$55,356,407	\$6,479,340	\$49,641,327	\$56,120,667
Sidney (V)	262	278	\$4,772,870	\$26,291,040	\$31,063,910	\$5,079,770	\$27,660,110	\$32,739,880
Stamford (T)	90	90	\$955,797	\$2,150,640	\$3,106,437	\$955,797	\$2,150,640	\$3,106,437
Stamford (V)	71	71	\$311,726	\$2,502,400	\$2,814,126	\$311,726	\$2,502,400	\$2,814,126
Tompkins (T)	49	49	\$3,263,647	\$84,900	\$3,348,547	\$3,263,647	\$84,900	\$3,348,547
Walton (T)	256	258	\$3,921,238	\$16,745,578	\$20,666,816	\$3,931,462	\$16,797,270	\$20,728,732
Walton (V)	276	311	\$1,352,300	\$12,844,498	\$14,196,798	\$1,440,476	\$13,731,464	\$15,171,940



Municipality	Number of Properties		1% (100 Year)			02.% Annual Chance (500 Year)		
	1% (100 Year)	02.% (500 Year)	Land AV	Building AV	Total AV	Land AV	Building AV	Total AV
<b>Delaware County</b>	<b>5,871</b>	<b>6,203</b>	<b>\$216,714,761</b>	<b>\$562,132,305</b>	<b>\$778,847,066</b>	<b>\$219,531,591</b>	<b>\$575,434,608</b>	<b>\$794,966,199</b>

Source: Real Property Data (July 2011) provided by Delaware County

Notes:

1. This analysis was conducted using the preliminary DFIRM for Delaware County.
2. Building assessed value (AV) was calculated by subtracting the land AV from the total AV.
3. Please note that the Real Property GIS shapefile for the Village of Deposit only includes the properties located within Delaware County. Therefore, property in the Village of Deposit located in Broome County was not available and are not included in the table above.



**Table 5.4.3-6. Estimated HAZUS General Building Stock Replacement Value (Structure and Contents) Located in the 1% and 0.2% (100- and 500-year ) Flood Boundaries**

Municipality	Total Buildings (All Occupancy Classes)				Residential Buildings		Commercial Buildings		Industrial Buildings	
	1% (100 Year)	% Total	0.2% (500 Year)	% Total	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)
Andes (T)	\$9,585,000	3.8	\$9,585,000	3.8	\$6,781,000	\$6,781,000	\$2,240,000	\$2,240,000	\$224,000	\$224,000
Bovina (T)	\$3,602,000	2.9	\$3,602,000	2.9	\$3,602,000	\$3,602,000	\$0	\$0	\$0	\$0
Colchester (T)	\$27,407,000	8.8	\$28,042,000	9.0	\$25,589,000	\$26,224,000	\$926,000	\$926,000	\$102,000	\$102,000
Davenport (T)	\$26,146,000	10.1	\$26,720,000	10.3	\$9,547,000	\$9,547,000	\$9,993,000	\$10,567,000	\$1,392,000	\$1,392,000
Delhi (T)	\$10,490,000	4.1	\$10,738,000	4.2	\$9,258,000	\$9,506,000	\$1,106,000	\$1,106,000	\$126,000	\$126,000
Delhi (V)	\$67,431,000	16.0	\$67,431,000	16.0	\$19,526,000	\$19,526,000	\$33,164,000	\$33,164,000	\$1,611,000	\$1,611,000
Deposit (T)	\$5,475,000	6.3	\$7,311,000	8.4	\$5,327,000	\$7,163,000	\$148,000	\$148,000	\$0	\$0
Deposit (V)	\$86,005,000	30.4	\$108,248,000	38.3	\$49,163,000	\$54,673,000	\$19,752,000	\$34,845,000	\$1,474,000	\$1,672,000
Fleischmanns (V)	\$16,128,000	24.0	\$16,128,000	24.0	\$9,420,000	\$9,420,000	\$5,972,000	\$5,972,000	\$0	\$0
Franklin (T)	\$7,401,000	3.2	\$7,401,000	3.2	\$6,162,000	\$6,162,000	\$0	\$0	\$563,000	\$563,000
Franklin (V)	\$9,994,000	22.7	\$9,994,000	22.7	\$7,142,000	\$7,142,000	\$618,000	\$618,000	\$0	\$0
Hamden (T)	\$12,449,000	7.4	\$12,449,000	7.4	\$11,547,000	\$11,547,000	\$470,000	\$470,000	\$0	\$0
Hancock (T)	\$29,799,000	10.4	\$30,912,000	10.7	\$21,897,000	\$23,010,000	\$4,764,000	\$4,764,000	\$268,000	\$268,000
Hancock (V)	\$3,382,000	1.9	\$34,419,000	19.6	\$3,382,000	\$11,283,000	\$0	\$16,036,000	\$0	\$6,350,000
Harpersfield (T)	\$2,998,000	3.0	\$2,998,000	3.0	\$2,896,000	\$2,896,000	\$0	\$0	\$102,000	\$102,000
Hobart (V)	\$2,166,000	6.2	\$2,166,000	6.2	\$2,166,000	\$2,166,000	\$0	\$0	\$0	\$0
Kortright (T)	\$9,293,000	4.8	\$9,293,000	4.8	\$7,185,000	\$7,185,000	\$1,686,000	\$1,686,000	\$0	\$0
Margaretville (V)	\$49,535,000	53.8	\$49,535,000	53.8	\$26,078,000	\$26,078,000	\$13,597,000	\$13,597,000	\$696,000	\$696,000
Masonville (T)	\$0	0.0	\$0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
Meredith (T)	\$353,000	0.2	\$353,000	0.2	\$353,000	\$353,000	\$0	\$0	\$0	\$0
Middletown (T)	\$24,128,000	5.1	\$24,128,000	5.1	\$20,282,000	\$20,282,000	\$1,348,000	\$1,348,000	\$2,266,000	\$2,266,000
Roxbury (T)	\$17,870,000	4.2	\$17,870,000	4.2	\$15,090,000	\$15,090,000	\$732,000	\$732,000	\$864,000	\$864,000
Sidney (T)	\$9,493,000	5.2	\$12,589,000	6.7	\$8,367,000	\$11,187,000	\$876,000	\$1,152,000	\$250,000	\$250,000
Sidney (V)	\$228,534,000	39.6	\$289,423,000	50.1	\$92,300,000	\$116,704,000	\$84,584,000	\$114,200,000	\$26,647,000	\$27,440,000
Stamford (T)	\$7,131,000	2.4	\$7,131,000	2.4	\$7,131,000	\$7,131,000	\$0	\$0	\$0	\$0
Stamford (V)	\$7,673,000	8.4	\$7,673,000	8.4	\$3,245,000	\$3,245,000	\$902,000	\$902,000	\$3,526,000	\$3,526,000
Tompkins (T)	\$1,384,000	1.1	\$1,384,000	1.1	\$127,000	\$127,000	\$0	\$0	\$1,257,000	\$1,257,000



Municipality	Total Buildings (All Occupancy Classes)				Residential Buildings		Commercial Buildings		Industrial Buildings	
	1% (100 Year)	% Total	0.2% (500 Year)	% Total	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)
Walton (T)	\$13,258,000	5.7	\$13,258,000	5.7	\$9,392,000	\$9,392,000	\$2,820,000	\$2,820,000	\$436,000	\$436,000
Walton (V)	\$104,315,000	25.0	\$146,670,000	35.2	\$52,268,000	\$72,084,000	\$35,600,000	\$52,114,000	\$5,345,000	\$6,904,000
<b>Delaware County</b>	<b>\$794,551,000</b>	<b>12.1</b>	<b>\$958,577,000</b>	<b>14.6</b>	<b>\$436,349,000</b>	<b>\$500,632,000</b>	<b>\$221,298,000</b>	<b>\$299,407,000</b>	<b>\$47,149,000</b>	<b>\$56,049,000</b>

Source: HAZUS-MH 2.0

Notes:

1. Values represent replacement values (RV) for building structure and contents.
2. The general building stock valuations provided in HAZUS-MH 2.0 are Replacement Cost Value from RSMeans as of 2006.
3. RV represents the entire Village of Deposit; area in both Delaware and Broome Counties.



Table 5.4.3-7. Estimated General Building Stock Replacement Value (Structure and Contents) Located in the 1% and 0.2% (100- and 500-year) Flood Boundaries

Municipality	Agricultural Buildings		Religious Buildings		Government Buildings		Educational Buildings	
	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)
Andes (T)	\$0	\$0	\$0	\$0	\$0	\$0	\$340,000	\$340,000
Bovina (T)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Colchester (T)	\$0	\$0	\$790,000	\$790,000	\$0	\$0	\$0	\$0
Davenport (T)	\$1,792,000	\$1,792,000	\$0	\$0	\$66,000	\$66,000	\$3,356,000	\$3,356,000
Delhi (T)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Delhi (V)	\$0	\$0	\$3,678,000	\$3,678,000	\$9,452,000	\$9,452,000	\$0	\$0
Deposit (T)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Deposit (V)	\$608,000	\$608,000	\$5,314,000	\$6,756,000	\$842,000	\$842,000	\$8,852,000	\$8,852,000
Fleischmanns (V)	\$0	\$0	\$736,000	\$736,000	\$0	\$0	\$0	\$0
Franklin (T)	\$0	\$0	\$0	\$0	\$676,000	\$676,000	\$0	\$0
Franklin (V)	\$0	\$0	\$2,234,000	\$2,234,000	\$0	\$0	\$0	\$0
Hamden (T)	\$432,000	\$432,000	\$0	\$0	\$0	\$0	\$0	\$0
Hancock (T)	\$150,000	\$150,000	\$0	\$0	\$0	\$0	\$2,720,000	\$2,720,000
Hancock (V)	\$0	\$508,000	\$0	\$242,000	\$0	\$0	\$0	\$0
Harpersfield (T)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Hobart (V)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Kortright (T)	\$0	\$0	\$0	\$0	\$422,000	\$422,000	\$0	\$0
Margaretville (V)	\$0	\$0	\$5,130,000	\$5,130,000	\$272,000	\$272,000	\$3,762,000	\$3,762,000
Masonville (T)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Meredith (T)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Middletown (T)	\$0	\$0	\$0	\$0	\$232,000	\$232,000	\$0	\$0
Roxbury (T)	\$448,000	\$448,000	\$736,000	\$736,000	\$0	\$0	\$0	\$0
Sidney (T)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Sidney (V)	\$690,000	\$1,034,000	\$10,544,000	\$16,074,000	\$11,005,000	\$11,207,000	\$2,764,000	\$2,764,000
Stamford (T)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Stamford (V)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Tompkins (T)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Walton (T)	\$610,000	\$610,000	\$0	\$0	\$0	\$0	\$0	\$0
Walton (V)	\$298,000	\$464,000	\$6,422,000	\$7,158,000	\$3,362,000	\$3,616,000	\$1,020,000	\$4,330,000



Municipality	Agricultural Buildings		Religious Buildings		Government Buildings		Educational Buildings	
	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)
<b>Delaware County</b>	<b>\$5,028,000</b>	<b>\$6,046,000</b>	<b>\$35,584,000</b>	<b>\$43,534,000</b>	<b>\$26,329,000</b>	<b>\$26,785,000</b>	<b>\$22,814,000</b>	<b>\$26,124,000</b>

Source: HAZUS-MH 2.0

Notes:

1. Values represent replacement values (RV) for building structure and contents.
2. The general building stock valuations provided in HAZUS-MH 2.0 are Replacement Cost Value from RSMeans as of 2006.
3. RV represents the entire Village of Deposit; area in both Delaware and Broome Counties.



Table 5.4.3-8. Estimated Potential General Building Stock Loss (Structure and Contents) by the 1% and 0.2% (100- and 500-year) Flood Events

Municipality	Total Buildings (All Occupancies)		Percentage of Total Building Value		Residential Buildings		Commercial Buildings		Industrial Buildings	
	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)
Andes (T)	\$3,124,000	\$3,514,000	1.2	1.4	\$1,054,000	\$1,185,000	\$1,348,000	\$1,505,000	\$119,000	\$119,000
Bovina (T)	\$276,000	\$340,000	0.2	0.3	\$273,000	\$335,000	\$1,000	\$2,000	\$0	\$0
Colchester (T)	\$10,947,000	\$13,808,000	3.5	4.4	\$7,895,000	\$10,001,000	\$787,000	\$938,000	\$1,695,000	\$2,172,000
Davenport (T)	\$13,039,000	\$15,187,000	5.0	5.9	\$5,105,000	\$6,043,000	\$5,376,000	\$6,162,000	\$1,700,000	\$1,979,000
Delhi (T)	\$3,723,000	\$4,804,000	1.5	1.9	\$2,902,000	\$3,538,000	\$746,000	\$1,137,000	\$75,000	\$101,000
Delhi (V)	\$11,105,000	\$13,610,000	2.6	3.2	\$3,442,000	\$3,854,000	\$6,076,000	\$6,766,000	\$309,000	\$352,000
Deposit (T)	\$1,577,000	\$1,975,000	1.8	2.3	\$1,611,000	\$1,906,000	\$36,000	\$55,000	\$0	\$0
Deposit (V)	\$13,000,000	\$17,561,000	4.6	6.2	\$8,435,000	\$12,488,000	\$2,894,000	\$4,064,000	\$587,000	\$726,000
Fleischmanns (V)	\$4,507,000	\$5,244,000	6.7	7.8	\$2,118,000	\$2,728,000	\$1,998,000	\$2,096,000	\$0	\$0
Franklin (T)	\$2,483,000	\$2,991,000	1.1	1.3	\$1,980,000	\$1,606,000	\$23,000	\$28,000	\$236,000	\$0
Franklin (V)	\$1,001,000	\$1,177,000	2.3	2.7	\$682,000	\$815,000	\$60,000	\$69,000	\$0	\$263,000
Hamden (T)	\$2,179,000	\$2,755,000	1.3	1.6	\$1,913,000	\$2,462,000	\$115,000	\$134,000	\$14,000	\$17,000
Hancock (T)	\$16,687,000	\$22,274,000	5.8	7.7	\$11,488,000	\$15,399,000	\$3,646,000	\$4,524,000	\$1,127,000	\$1,399,000
Hancock (V)	\$21,048,000	\$23,752,000	12.0	13.5	\$7,670,000	\$8,862,000	\$10,059,000	\$11,274,000	\$2,104,000	\$2,197,000
Harpersfield (T)	\$409,000	\$510,000	0.4	0.5	\$291,000	\$365,000	\$92,000	\$115,000	\$17,000	\$20,000
Hobart (V)	\$782,000	\$990,000	2.2	2.8	\$679,000	\$828,000	\$72,000	\$117,000	\$12,000	\$17,000
Kortright (T)	\$2,372,000	\$2,851,000	1.2	1.5	\$1,440,000	\$1,699,000	\$363,000	\$427,000	\$23,000	\$25,000
Margaretville (V)	\$13,070,000	\$15,156,000	14.2	16.5	\$5,269,000	\$6,276,000	\$5,566,000	\$6,306,000	\$291,000	\$332,000
Masonville (T)	\$1,017,000	\$1,250,000	0.7	0.9	\$436,000	\$582,000	\$1,000	\$1,000	\$54,000	\$70,000
Meredith (T)	\$650,000	\$762,000	0.4	0.4	\$544,000	\$647,000	\$66,000	\$72,000	\$27,000	\$26,000
Middletown (T)	\$7,758,000	\$9,558,000	1.6	2.0	\$5,347,000	\$6,756,000	\$860,000	\$1,023,000	\$1,277,000	\$1,476,000
Roxbury (T)	\$6,128,000	\$7,557,000	1.4	1.8	\$4,229,000	\$5,340,000	\$764,000	\$989,000	\$462,000	\$562,000
Sidney (T)	\$7,626,000	\$9,312,000	3.7	4.6	\$5,160,000	\$6,947,000	\$1,580,000	\$1,812,000	\$796,000	\$1,037,000
Sidney (V)	\$129,241,000	\$154,905,000	22.4	26.8	\$60,459,000	\$70,895,000	\$49,114,000	\$61,877,000	\$6,494,000	\$5,833,000
Stamford (T)	\$2,864,000	\$3,434,000	1.0	1.1	\$1,097,000	\$1,423,000	\$973,000	\$1,090,000	\$277,000	\$274,000
Stamford (V)	\$1,905,000	\$2,396,000	2.1	2.6	\$526,000	\$711,000	\$180,000	\$217,000	\$1,073,000	\$1,316,000



Municipality	Total Buildings (All Occupancies)		Percentage of Total Building Value		Residential Buildings		Commercial Buildings		Industrial Buildings	
	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)
Tompkins (T)	\$261,000	\$395,000	0.2	0.3	\$239,000	\$381,000	\$5,000	\$10,000	\$15,000	\$18,000
Walton (T)	\$5,321,000	\$5,381,000	2.3	2.3	\$3,462,000	\$3,293,000	\$1,342,000	\$1,510,000	\$231,000	\$250,000
Walton (V)	\$33,001,000	\$33,406,000	7.9	8.0	\$8,888,000	\$9,633,000	\$17,017,000	\$16,872,000	\$2,505,000	\$2,375,000
<b>Delaware County</b>	<b>\$317,101,000</b>	<b>\$376,855,000</b>	<b>4.8</b>	<b>5.8</b>	<b>\$154,634,000</b>	<b>\$186,998,000</b>	<b>\$111,160,000</b>	<b>\$131,192,000</b>	<b>\$21,520,000</b>	<b>\$22,956,000</b>

Source: HAZUS-MH 2.0

Notes:

1. Values represent replacement values (RV) for building structure and contents.
2. The general building stock valuations provided in HAZUS-MH 2.0 are Replacement Cost Value from RSMeans as of 2006.
3. RV represents the entire Village of Deposit; portions of the Village are located in Delaware and Broome Counties.



Table 5.4.3-12. Potential Estimated General Building Stock Loss (Structure and Contents) by the 1% and 0.2% (100- and 500-year) Flood Events (Continued)

Municipality	Agriculture Buildings		Religious Buildings		Government Buildings		Education Buildings	
	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)
Andes (T)	\$13,000	\$15,000	\$186,000	\$217,000	\$1,000	\$2,000	\$403,000	\$471,000
Bovina (T)	\$2,000	\$3,000	\$0	\$0	\$0	\$0	\$0	\$0
Colchester (T)	\$4,000	\$6,000	\$419,000	\$465,000	\$146,000	\$177,000	\$0	\$0
Davenport (T)	\$423,000	\$485,000	\$33,000	\$37,000	\$112,000	\$126,000	\$290,000	\$355,000
Delhi (T)	\$13,000	\$14,000	\$13,000	\$31,000	\$0	\$0	\$0	\$0
Delhi (V)	\$0	\$0	\$536,000	\$606,000	\$1,864,000	\$2,032,000	\$0	\$0
Deposit (T)	\$1,000	\$1,000	\$0	\$0	\$0	\$0	\$0	\$0
Deposit (V)	\$40,000	\$65,000	\$831,000	\$1,093,000	\$0	\$21,000	\$213,000	\$215,000
Fleischmanns (V)	\$30,000	\$33,000	\$361,000	\$386,000	\$0	\$1,000	\$0	\$0
Franklin (T)	\$51,000	\$64,000	\$56,000	\$61,000	\$147,000	\$154,000	\$69,000	\$80,000
Franklin (V)	\$0		\$259,000	\$293,000	\$0	\$0	\$0	\$0
Hamden (T)	\$121,000	\$142,000	\$0	\$0	\$0	\$0	\$0	\$0
Hancock (T)	\$34,000	\$45,000	\$24,000	\$28,000	\$833,000	\$0	\$412,000	\$714,000
Hancock (V)	\$67,000	\$75,000	\$161,000	\$203,000	\$0	\$922,000	\$154,000	\$219,000
Harpersfield (T)	\$0	\$0	\$0	\$0	\$9,000	\$10,000	\$0	\$0
Hobart (V)	\$19,000	\$28,000	\$0	\$0	\$0	\$0	\$0	\$0
Kortright (T)	\$25,000	\$32,000	\$25,000	\$27,000	\$188,000	\$220,000	\$386,000	\$423,000
Margaretville (V)	\$4,000	\$4,000	\$1,521,000	\$1,757,000	\$38,000	\$60,000	\$381,000	\$421,000
Masonville (T)	\$0	\$0	\$1,000	\$1,000	\$525,000	\$613,000	\$0	\$0
Meredith (T)	\$10,000	\$12,000	\$0	\$0	\$3,000	\$5,000	\$0	\$0
Middletown (T)	\$61,000	\$67,000	\$78,000	\$78,000	\$141,000	\$158,000	\$0	\$0
Roxbury (T)	\$136,000	\$170,000	\$522,000	\$620,000	\$15,000	\$19,000	\$0	\$0
Sidney (T)	\$59,000	\$79,000	\$13,000	\$13,000	\$10,000	\$12,000	\$8,000	\$10,000
Sidney (V)	\$245,000	\$278,000	\$6,460,000	\$8,775,000	\$5,569,000	\$6,087,000	\$900,000	\$1,160,000
Stamford (T)	\$1,000	\$1,000	\$236,000	\$249,000	\$224,000	\$332,000	\$62,000	\$68,000
Stamford (V)	\$8,000	\$9,000	\$78,000	\$98,000	\$0	\$0	\$40,000	\$45,000
Tompkins (T)	\$15,000	\$0	\$0	\$0	\$0	\$0	\$1,000	\$1,000



Municipality	Agriculture Buildings		Religious Buildings		Government Buildings		Education Buildings	
	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)	1% (100 Year)	0.2% (500 Year)
Walton (T)	\$99,000	\$118,000	\$0	\$0	\$187,000	\$210,000	\$0	\$0
Walton (V)	\$213,000	\$205,000	\$1,640,000	\$1,884,000	\$1,500,000	\$1,149,000	\$1,238,000	\$1,288,000
<b>Delaware County</b>	<b>\$1,694,000</b>	<b>\$1,951,000</b>	<b>\$13,453,000</b>	<b>\$16,922,000</b>	<b>\$11,512,000</b>	<b>\$12,310,000</b>	<b>\$4,557,000</b>	<b>\$5,470,000</b>

Source: HAZUS-MH 2.0

Notes:

1. Values represent replacement values (RV) for building structure and contents.
2. The general building stock valuations provided in HAZUS-MH 2.0 are Replacement Cost Value from RSMeans as of 2006.
3. RV represents the entire Village of Deposit; area in both Delaware and Broome Counties.



In addition to total building stock modeling, individual data available on flood policies, claims, RLP and severe RLP (SRLs) were analyzed. FEMA Region 2 provided a list of residential properties with NFIP policies, past claims and multiple claims (RLPs). According to the metadata provided: “The NFIP Repetitive Loss File contains losses reported from individuals who have flood insurance through the Federal Government. A property is considered a repetitive loss property when there are two or more losses reported which were paid more than \$1,000 for each loss. The two losses must be within 10 years of each other & be as least 10 days apart. Only losses from (*sic* since) 1/1/1978 that are closed are considered.”

Severe RLPs (SRL) were then examined in Delaware County. According to section 1361A of the National Flood Insurance Act, as amended (NFIA), 42 U.S.C. 4102a, an SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

- Has at least four NFIP claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceeds \$20,000; or
  - For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.
- For both of the above, at least two of the referenced claims must have occurred within any 10-year period, and must be greater than 10 days apart.

Table 5.4.3-13 and Figure 5.4.3-7 summarize the NFIP policies, claims and repetitive loss statistics for Delaware County. According to FEMA, using the ‘occ01’ column of their repetitive loss statistics, there 13 2-4 family residential RL properties; eight (8) assumed condominium buildings; 18 non-residential RL properties; two (2) RL property classified as ‘other residential’ and 119 single-family residential RL properties in the County. Of the 11 SRL properties in Delaware County, five (5) are residential (FEMA Region 2, 2012). This information is current as of January 31, 2012.

The location of the properties with policies, claims and repetitive and severe repetitive flooding were geocoded by FEMA with the understanding that there are varying tolerances between how closely the longitude and latitude coordinates correspond to the location of the property address, or that the indication of some locations are more accurate than others. This data is more current than the properties reported in the New York State HMP and may explain any difference in property count between the two sources.



Table 5.4.3-9. NFIP Policies, Claims and Repetitive Loss Statistics

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (1)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% (100-year) Boundary (1,2)	# Policies in 0.2% (500-year) Boundary (1,2)	# Policies Outside the 0.2% (500-year) Flood Hazard (1,2)
Andes (T)	37	25	\$233,416	4	0	6	6	31
Bovina (T)	9	5	\$151,976	0	0	0	0	9
Colchester (T)	103	108	\$1,982,635	12	2	29	38	65
Davenport (T)	21	22	\$122,395	1	0	10	11	10
Delhi (T)	13	9	\$83,551	2	0	1	1	12
Delhi (V)	36	22	\$107,040	2	0	7	11	25
Deposit (T)	27	24	\$347,317	3	1	19	20	7
Deposit (V) (3)	0	0	(3)	0	0	0	0	0
Fleischmanns (V)	19	41	\$678,417	3	0	3	3	16
Franklin (T)	14	5	\$25,719	0	0	0	0	14
Franklin (V)	2	2	\$91,818	0	0	0	0	2
Hamden (T)	12	10	\$76,008	1	0	0	0	12
Hancock (T)	121	121	\$2,001,497	12	2	24	31	90
Hancock (V)	20	6	\$64,081	1	0	4	11	9
Harpersfield (T)	2	1	\$3,700	0	0	0	0	2
Hobart (V)	6	2	\$650	0	0	0	0	6
Kortright (T)	6	1	\$0	0	0	0	0	6
Margaretville (V)	71	126	\$4,801,670	15	6	30	37	34
Masonville (T)	6	3	\$7,816	0	0	0	0	6
Meredith (T)	9	5	\$42,861	0	0	0	0	9
Middletown (T)	65	62	\$1,184,752	5	0	18	18	47
Roxbury (T)	23	15	\$80,666	0	0	9	9	14
Sidney (T)	30	46	\$848,066	11	0	16	16	14
Sidney (V)	216	334	\$14,608,429	79	0	176	202	14



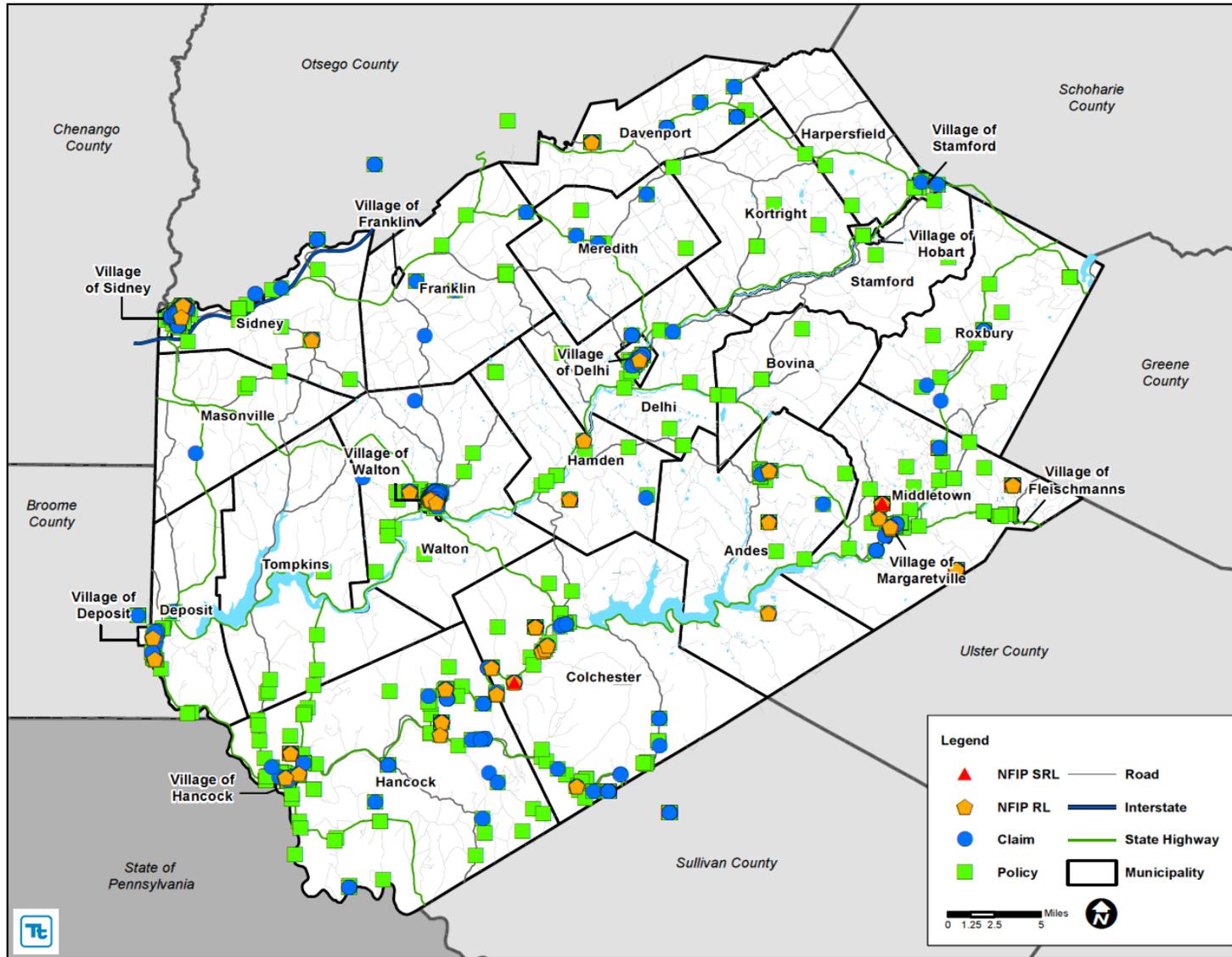
Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (1)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% (100-year) Boundary (1,2)	# Policies in 0.2% (500-year) Boundary (1,2)	# Policies Outside the 0.2% (500-year) Flood Hazard (1,2)
Stamford (T)	5	1	\$12,232	0	0	1	1	4
Stamford (V)	8	1	\$1,213	0	0	2	2	6
Tompkins (T)	7	7	\$38,101	0	0	0	0	7
Walton (T)	24	41	\$981,145	2	0	8	9	15
Walton (V)	160	182	\$7,283,981	7	0	120	132	28
<b>Delaware County</b>	<b>1,073</b>	<b>1,227</b>	<b>\$35,861,149</b>	<b>160</b>	<b>11</b>	<b>483</b>	<b>558</b>	<b>515</b>

Source: FEMA, 2012

- (1) Policies, claims, repetitive loss and severe repetitive loss properties were provided by FEMA Region 2. The total noted is a count using the "Comm\_Name". According to FEMA, some properties may have more than one policy in force. The NFIP stats are current as of January 31, 2012. The repetitive loss property count includes the severe repetitive loss property count for that municipality.
- (2) FEMA preliminary DFIRMs
- (3) There were no policies, claims, repetitive loss or severe repetitive loss properties provided by FEMA Region 2 for the Village of Deposit. This is noted because a portion of the Village is located in Broome County and statistics were only requested/received for Delaware County.



Figure 5.4.3-2. NFIP Policies, Claims, Repetitive Loss and Severe Repetitive Loss Properties in Delaware County



Source: FEMA Region 2, 2012

Note: The NFIP stats are current as of January 31, 2012.



### Impact on Critical Facilities

In addition to considering general building stock at risk, the risk of flood to critical facilities, utilities and user-defined facilities was evaluated. HAZUS-MH was used to estimate the flood loss potential to critical facilities exposed to the flood risk. Using depth/damage function curves, HAZUS estimates the percent of damage to the building and contents of critical facilities. Tables 5.4.4-14 and 5.4.4-15 list the critical facilities and utilities located in the FEMA preliminary DFIRM flood zones and the percent damage HAZUS-MH 2.0 estimates to the facility as a result of the 1% and 0.2% annual chance (100- and 500-year) events.

In cases where short-term functionality is impacted by a hazard, other facilities of neighboring municipalities may need to increase support response functions during a disaster event. Mitigation planning should consider means to reduce impact to critical facilities and ensure sufficient emergency and school services remain when a significant event occurs.

In terms of infrastructure, according to Delaware County DPW, all bridges that have recently been replaced are designed for 50-year storm events with two-feet of freeboard, or designed to pass 100-year storms with gravity flow (no flow against beams) (Fairbairn, 2011).

**Table 5.4.3-10. Critical Facilities Located in the Preliminary DFIRM Flood Boundaries and Estimated Potential Damage from the 1% and 0.2% Annual Chance (100- and 500-year) Events**

Name	Municipality	Type	Exposure		Potential Loss			
			1% (100-Year)	0.2% (500-Year)	1% (100-Year) Structure Damage %	1% (100-Year) Content Damage %	0.2% (500-Year) Structure Damage %	0.2% (500-Year) Content Damage %
Andes Central School	Andes (T)	School			12.2	71.2	12.5	71.5
Andes VFD	Andes (T)	Fire	x	x	2.6	2.9	8.5	14.0
Methodist Church	Andes (T)	Shelter	x	x	-	-	5.1	19.3
Downsville Fire Hall	Andes (T)	Shelter		x	-	-	-	-
Town of Bovina DPW	Bovina (T)	User Defined	x	x	-	-	-	-
Amato Mobile Home Park*	Colchester (T)	User Defined	x	x	-	-	-	-
DEP	Colchester (T)	Police	x	x	-	-	-	-
Cooks Falls Fire Hall	Colchester (T)	Shelter	x	x	-	-	-	-
Downsville VFD and EMS	Colchester (T)	Fire		x	-	-	-	-
Cooks Falls VFD	Colchester (T)	Fire	x	x	-	-	-	-
Alcott Chase Mobile Home Park*	Colchester (T)	User Defined	x	x	83.5	82.0	83.1	81.2



Name	Municipality	Type	Exposure		Potential Loss			
			1% (100-Year)	0.2% (500-Year)	1% (100-Year) Structure Damage %	1% (100-Year) Content Damage %	0.2% (500-Year) Structure Damage %	0.2% (500-Year) Content Damage %
Board of Elections - 1 Page Ave	Delhi (V)	County	x	x	-	-	-	-
Cabinet Shop - 1 Page Ave	Delhi (V)	County	x	x	-	-	22%	35%
Salt Shed - 1 Page Ave	Delhi (V)	County	x	x	47%	59%	50%	66%
Pole Barn - 1 Page Ave	Delhi (V)	County	x	x	-	-	-	-
County Garage Wickham Office - 1 Page Ave	Delhi (V)	County	x	x	-	-	-	-
DPW Garages/DPW/DCPD	Delhi (V)	County	x	x	-	-	-	-
99 Main Street – County Building	Delhi (V)	County		x	-	-	-	-
Deposit Village PD	Deposit (V)	Police		x	-	-	-	-
Bryces Trailer Park*	Deposit (V)	User Defined	x	x	79.8	76.8	81.9	78.9
Deposit VFD and EMS	Deposit (V)	Fire	x	x	10.0	20.6	11.1	40.0
EOC	Deposit (V)	EOC	x	x	10.0	20.6	11.1	40.0
Meadow Park Apartments	Deposit (V)	Senior			9.4	55.6	9.4	55.63
Town of Deposit Town Hall	Deposit (V)	User Defined	x	x	11.9	70.7	13.8	81.2
Deposit Central School	Deposit (V)	School/Shelter	x	x	-	-	-	-
DPW Garage	Deposit (V)	User Defined	x	x	12	-	13	-
Bus Garage	Deposit (V)	User Defined	x	x	19	-	19	-
Fleischmanns VFD	Fleischmanns (V)	Fire	x	x	12.3	56.4	16.5	78.0
School Building	Fleischmanns (V)	School			5.6	30.2	8.6	50.1
Delaware Opportunities Inc.	Hamden (T)	School			0.3	1.7	0.5	2.4
East Branch VFD	Hancock (T)	Fire	x	x	10.1	21.4	14.3	66.2
Patrol Garage	Hancock (T)	User Defined	x	x	16.1	79.1	85.0	98.0
New Highway Garage	Hancock (V)	User Defined	x	x	18.1	83.2	13.1	67.3
Torche's Trailer Park*	Hancock (V)	User Defined	x	x	90.8	83.0	94.6	83.0
Dollar General	Margaretville (V)	User Defined	x	x	13.4	40.0	16.7	60.0
Margaretville Central School	Margaretville (V)	School		x	20.8	84.0	28.3	94.3



Name	Municipality	Type	Exposure		Potential Loss			
			1% (100-Year)	0.2% (500-Year)	1% (100-Year) Structure Damage %	1% (100-Year) Content Damage %	0.2% (500-Year) Structure Damage %	0.2% (500-Year) Content Damage %
Mountainside Residential Care Center	Margaretville (V)	User Defined	x	x	9.8	58.8	11.8	65.8
Post 216 Legion Hall	Margaretville (V)	User Defined		x	0.0	0.0	13.8	72.1
Masonville School	Masonville (T)	School			12.3	71.3	12.2	71.2
Head Start	Middletown (T)	User Defined	x	x	6.7	27.8	8.0	31.6
Delaware Cty American Red Cross	Middletown (T)	Shelter	x	x	-	-	-	-
Mountainside Cream	Roxbury (T)	User Defined	x	x	0.0	0.0	1.8	4.5
Roxbury Central School	Roxbury (T)	School			0.0	0.0	3.8	20.5
Sidney Civic Center	Sidney (V)	User Defined	x	x	-	-	-	-
Sidney PD	Sidney (V)	Police	x	x	-	-	-	-
Sidney Training Center	Sidney (V)	Fire	x	x	6.7	7.6	10.4	27.2
Sidney VFD	Sidney (V)	Fire			43.4	100.0	44.4	100.0
Sidney VFD and EMS	Sidney (V)	Fire	x	x	9.2	16.9	11.2	41.3
Tri-Town Regional Hospital	Sidney (V)	Medical			22.0	14.0	41.9	75.7
Head Start School	Sidney (V)	School	x	x	-	-	-	-
Connelly Development Corp.	Stamford (V)	Medical			23.2	16.4	4.3	2.2
DEP (Beerston)	Walton (T)	Police	x	x	0.0	0.0	16.7	79.2
Patrol Garage	Walton (V)	User Defined	x	x	85.0	98.0	15.1	75.3
Townsend Senior Apt	Walton (V)	User Defined			8.1	46.1	7.2	39.5
Village Clerk Office	Walton (V)	User Defined	x	x	11.0	67.9	10.3	66.0
Walton (Townsend) Central School	Walton (V)	School			11.2	70.2	11.5	70.5
Walton Shop	Walton (V)	User Defined	x	x	-	-	-	-
7 Water Street - Walton Shop County Bldg	Walton (V)	User Defined	x	x	-	-	-	-

Source: FEMA, 2011; HAZUS-MH 2.0

Notes:

(1) 'X' indicates the facility location as provided by Delaware County is located in the preliminary DFIRM flood zone.



- (2) *HAZUS did not calculate potential loss estimates for some facilities located in the preliminary DFIRM flood zone. This is because these facilities are located outside of the flood depth grid generated by HAZUS. The difference between the flood depth grid generated by HAZUS and the preliminary DFIRM flood zones is most likely due to the resolution of the elevation model used (1/3 Arc Second or 10 meters) which differed from the elevation data used to generate the DFIRM itself.*
- (3) *In some cases, HAZUS calculated potential flood loss to structures outside the preliminary FEMA DFIRM. These facilities are located inside the HAZUS flood depth grid.*
- (4) *\* Please note the mobile home park was evaluated as a single structure and the results are reported as such.*



**Table 5.4.3-11. Utilities Located in the Preliminary DFIRM Flood Boundaries and Estimated Potential Damage from the 1% and 0.2% Annual Chance (100- and 500-year) Flood Events**

Name	Municipality	Type	Exposure		Potential Loss	
			1% (100-Year)	0.2% (500-Year)	1% (100-Year) Damage %	0.2% (500-Year) Damage %
Andes Library Well Treatment System	Andes (T)	Potable Water Facility			1.1	1.1
Andes (V) Library Wastewater Treatment System	Andes (T)	WWTF			9.4	9.4
Corbett Water Company	Colchester (T)	Potable Water Facility			3.4	3.4
Cook Falls Pump House	Colchester (T)	Potable Pump Station	x	x	-	0.6
Drinking Water Treatment Plant	Delhi (V)	Potable Water Facility	x	x	-	35.3
NYSEG	Deposit (V)	Electric Substation	x	x	7.5	10
Pump House #1 Borden Street	Deposit (V)	WW Pump	x	x	40	40
Pump House #2 Borden Street	Deposit (V)	WW Pump	x	x	40	40
Waste Water Pump Station	Deposit (V)	WW Pump	x	x	40	40
Pump House #4 Elm Street	Deposit (V)	WW Pump	x	x	0	40
Waste Water Pump Station	Deposit (V)	WWTF	x	x	40	40
Park Wells	Fleischmanns (V)	Potable Water Well	x	x	35.7	3.4
Religious School and Children's Camp	Fleischmanns (V)	WWTF			9.2	9.2
Town of Hamden WWTF	Hamden (T)	WWTF	x	x	-	-
Johnston & Rhodes Stonemill	Hancock (T)	WWTF	x	x	30.0	40.0
Becton Dickinson	Hancock (T)	WWTF	x	x	40.0	40.0
Beaver-Del Campsites	Hancock (T)	WWTF	x	x	40.0	40.0
Pump station	Hancock (V)	Potable Pump Station	x	x	40.0	40.0
Potable wells	Hancock (V)	Potable Water Well	x	x	40.0	1.1
Hancock (V) Sewage Treatment Plant	Hancock (V)	WWTF		x	30.0	37.9
Lift Station - Firemans Park	Hancock (V)	WW Pump	x	x	40.0	40.0
Water Plant	Kortright (T)	Potable Water Facility	x	x	-	23.0
New BV WWTF	Kortright (T)	WWTF	x	x	-	-



Telephone and Cable	Margaretville (V)	Communication	x	x	NA	NA
Well House	Margaretville (V)	Potable Water Well	x	x	40.0	40.0
Well House	Margaretville (V)	Potable Water Well	x	x	40.0	40.0
Hanah Country Resort	Middletown (T)	WWTF	x	x	-	-
Roxbury Water PH#1	Roxbury (T)	Potable Pump Station	x	x	1.7	40.0
NYC DEP Grand Gorge (H) STP	Roxbury (T)	WWTF	x	x	-	4.9
Roxbury Central School	Roxbury (T)	WWTF			1.0	5.1
Water Treatment Plant	Sidney (V)	Potable Water Facility	x	x	20.8	40.0
Meade Substation	Sidney (V)	Electric Substation		x	NA	NA
NYSEG – Oak Ave	Sidney (V)	Electric Substation	x	x	>30	>30
Radio WCDO	Sidney (V)	Communication		x	NA	NA
Sidney Fire Communication	Sidney (V)	Communication	x	x	NA	NA
Well 2-88	Sidney (V)	Potable Water Well	x	x	37.0	40.0
Well 1-46	Sidney (V)	Potable Water Well	x	x	5.8	3.1
Aerospace Operations	Sidney (V)	WWTF	x	x	40.0	40.0
Sidney (V) Water Pollution Control Plant	Sidney (V)	WWTF	x	x	17.1	21.9
Gilbert WW Pump Station	Sidney (V)	WW Pump	x	x	40.0	40.0
Maple Ave Pump Station	Sidney (V)	WW Pump	x	x	-	-
Industrial Park WW Pump Station	Sidney (V)	WW Pump		x	-	-
County Meadow Park	Walton (T)	WWTF	x	x	-	-
Kraft Foods, Inc.	Walton (V)	WWTF	x	x	-	-
Walton (V) Sewage Treatment Plant	Walton (V)	WWTF			-	6.1

Source: FEMA, 2011; HAZUS-MH 2.0

Notes:

- (1) 'X' indicates the facility location as provided by Delaware County is located in the preliminary DFIRM flood zone.
- (2) Loss estimate calculations for electric and communication facilities are not supported in HAZUS-MH 2.0.
- (3) HAZUS did not calculate potential loss estimates for some facilities located in the preliminary DFIRM flood zone. This is because these facilities are located outside of the flood depth grid generated by HAZUS. The difference between the flood depth grid generated by HAZUS and the preliminary DFIRM flood zones is most likely due to the resolution of the elevation model used (1/3 Arc Second or 10 meters) which differed from the elevation data used to generate the DFIRM itself.
- (4) In some cases, HAZUS calculated potential flood loss to structures outside the preliminary FEMA DFIRM. These facilities are located inside the HAZUS flood depth grid.



### Impact on Economy

For impact on economy, estimated losses from a flood event are considered. Losses include but are not limited to general building stock damages, agricultural losses, business interruption, impacts to tourism and tax base to Delaware County. Damages to general building stock can be quantified using HAZUS-MH as discussed above. Other economic components such as loss of facility use, functional downtime and social economic factors are less measurable with a high degree of certainty. For the purposes of this analysis, general building stock damages are discussed further.

Flooding can cause extensive damage to public utilities and disruptions to the delivery of services. Loss of power and communications may occur; and drinking water and wastewater treatment facilities may be temporarily out of operation. Flooded streets and road blocks make it difficult for emergency vehicles to respond to calls for service. Floodwaters can washout sections of roadway and bridges (Foster, Date Unknown).

Direct building losses are the estimated costs to repair or replace the damage caused to the building. The potential damage estimated to the general building stock inventory associated with the 1% (100-year) flood is approximately \$317 million. This estimated building damage represents approximately 4.8-percent of the County's overall total general building stock inventory exposed to this hazard. For the 0.2% (500-year) event, the potential damage estimate is approximately \$377 million (structure and contents), or 5.8-percent of the total exposed building value. These dollar value losses to the County's total building inventory replacement value, in addition to damages to roadways and infrastructure, would greatly impact Delaware's tax base and the local economy.

When a flood occurs, the agricultural industry is at risk in terms of economic impact and damage (i.e., damaged crop, financial loss to the farmer). In 2007, according to the Census of Agriculture, the market value of all agricultural products sold from Delaware County was greater than \$55 million with a majority of the value (86-percent) in livestock, poultry and their products. Although the number of farms and the amount of farmland has decreased in Delaware County from 2002 to 2007, agriculture and agricultural products remains a large portion of the local economy (USDA NASS, 2007). As noted in Table 5.4.3-16, approximately six-percent of the farmland in Delaware County is located in the floodplain.

Specific agricultural loss information (monetary losses per agricultural product) was not available at the time this plan was drafted. However, given professional knowledge and historic loss information available, 40-percent and 60-percent loss estimates for crops as a result of major flood events is considered conservative estimates of potential losses for this hazard.

HAZUS-MH estimates the amount of debris generated from the flood events as a result of 1% and 0.2% Annual Chance (100- and 500-year) events. The model breaks down debris into three categories: 1) finishes (dry wall, insulation, etc.); 2) structural (wood, brick, etc.) and 3) foundations (concrete slab and block, rebar, etc.). The distinction is made because of the different types of equipment needed to handle the debris. Table 5.4.3-16 summarizes the debris HAZUS-MH 2.0 estimates for each participating municipality.



Table 5.4.3-12. Estimated Delaware County Debris Generated from the 1% and 0.2% Annual Chance (100- and 500-year) Flood Events

Municipality	1% Annual Chance Event (100-Year)				0.2% Annual Chance Event (500-Year)			
	Total	Finish	Structure	Foundation	Total	Finish	Structure	Foundation
Andes (T)	367	249	57	61	422	278	70	73
Bovina (T)	61	31	16	14	70	36	19	16
Colchester (T)	5,315	1,285	2,150	1,881	6,653	1,583	2,706	2,365
Davenport (T)	3,006	797	1,168	1,042	3,617	927	1,430	1,260
Delhi (T)	1,732	554	629	548	2,147	665	789	693
Delhi (V)	5,458	832	2,603	2,023	5,841	918	2,763	2,160
Deposit (T)	1,131	349	316	466	1,476	433	427	616
Deposit (V)	3,582	1,764	786	1,032	4,595	2,196	1,042	1,358
Fleischmanns (V)	688	465	114	109	839	559	144	136
Franklin (T)	789	396	204	188	965	461	265	238
Franklin (V)	529	146	208	175	655	175	259	222
Hamden (T)	935	280	355	300	1,197	351	456	389
Hancock (T)	9,331	2,305	3,242	3,784	12,196	2,866	4,407	4,923
Hancock (V)	12,442	2,155	4,862	5,425	14,219	2,471	5,541	6,208
Harpersfield (T)	131	82	21	28	158	97	27	34
Hobart (V)	309	110	104	95	373	133	126	114
Kortright (T)	625	249	190	186	773	295	244	234
Margaretville (V)	4,965	1,422	2,049	1,493	6,875	1,692	2,992	2,190
Masonville (T)	155	87	30	38	207	110	45	52
Meredith (T)	152	91	29	33	186	103	40	43
Middletown (T)	1,698	973	379	346	2,330	1,182	617	531
Roxbury (T)	1,140	800	149	191	1,396	958	198	240
Sidney (T)	3,837	851	1,339	1,646	4,732	1,017	1,696	2,018
Sidney (V)	66,188	12,596	30,035	23,557	81,465	15,163	36,606	29,697
Stamford (T)	398	249	73	77	549	311	120	118
Stamford (V)	123	105	8	9	157	135	11	11
Tompkins (T)	83	55	13	15	158	73	43	42
Walton (T)	2,056	525	805	726	1,951	523	749	680



Municipality	1% Annual Chance Event (100-Year)				0.2% Annual Chance Event (500-Year)			
	Total	Finish	Structure	Foundation	Total	Finish	Structure	Foundation
Walton (V)	3,846	2,563	693	589	4,043	2,696	734	613
<b>Delaware County</b>	<b>131,072</b>	<b>32,367</b>	<b>52,627</b>	<b>46,077</b>	<b>160,246</b>	<b>38,408</b>	<b>64,565</b>	<b>57,273</b>

Source: HAZUS-MH 2.0



### **Effect of Climate Change on Vulnerability**

The potential effects of climate change on Delaware County's vulnerability to flooding shall need to be considered as a greater understanding of regional climate change impacts develop.

### **Future Growth and Development**

As discussed in Section 4, areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by the flood hazard if located within the identified hazard areas. Specific areas of development vulnerable to the flood hazard are also indicated on hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan. Figure 5.4.3-7 illustrates the identified areas of potential new development in relation to the preliminary DFIRM flood boundaries.

### **Additional Data Needs and Next Steps**

A modified Level 1 HAZUS-MH flood analysis was conducted for Delaware County using the default model data, with the exception of the updated critical facility inventory which included user-defined data. For future plan updates, a Level 2 HAZUS analysis can be conducted. A Level 2 analysis provides more accurate exposure and loss estimates by replacing the national default inventories with more accurate local inventories. Updated demographic and general building stock data would be needed to conduct a Level 2 HAZUS-MH analysis. In the future, FEMA's Risk Mapping, Assessment, and Planning (Risk MAP) will be providing the flood depth and analysis grids as part of the DFIRM deliverable. These depth grids can be incorporated into HAZUS and used to calculate the potential losses to the County inventory. The utilization of the RiskMAP depth grids and the updated general building stock inventory on a structural level will provide more accurate flood loss estimates. To estimate exposure and potential loss due to dam breaks, dam break inundation areas can be digitized for future analysis.

### **Overall Vulnerability Assessment**

The flood hazard is evaluated as a significant threat, which was ranked overall as a "high" risk by the Planning Committee with a "frequent" probability of occurrence (see Tables 5.3-3 and 5.3-6 in Section 5.3). This hazard can be managed and planned for through the mitigation strategy and specific activities outlined in Volume II Section 9, which build on efforts already undertaken by these communities.



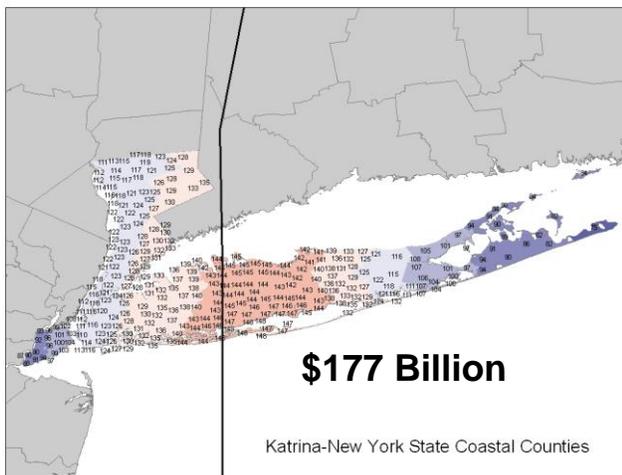
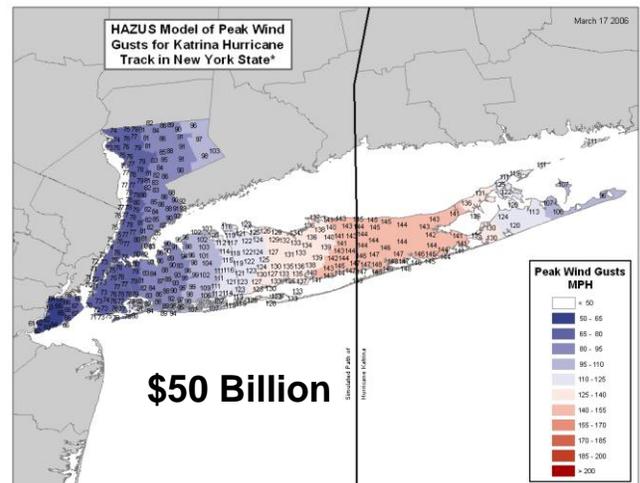
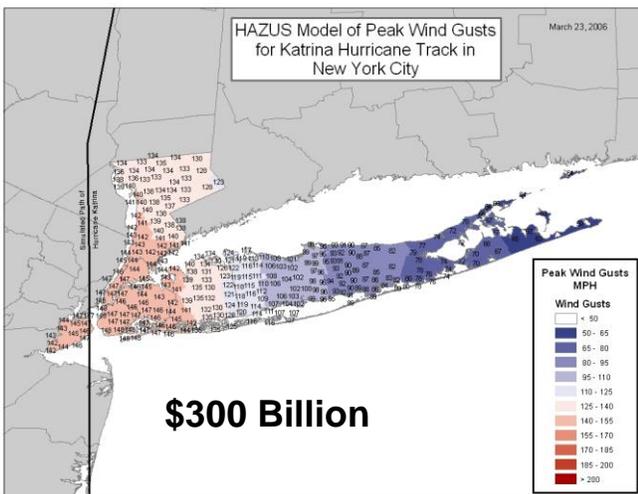
# HURRICANE DATA

**Figure A.3-52** The following Hazus scenario was extracted from the 2011 Hazard Mitigation Plan to demonstrate another modeling method that is capable in Hazus. For the 2014 Hazard Mitigation Plan, this was not repeated because default data is still the same. Rather, another method was demonstrated by selecting annualized loss runs. The inclusion of the data here serves as a resource and to demonstrate the type of analysis that can be done at the local level.

## Hurricane Katrina Scenario Tracking Through NYS

The following three figures represent the total building-related loss based on wind loss estimates generated through HAZUS if Hurricane Katrina tracked through New York State. These maps were created by NYSOEM for use as a case study.

**Figure A.3-52: Hurricane Katrina Scenario Tracking Through NYS**



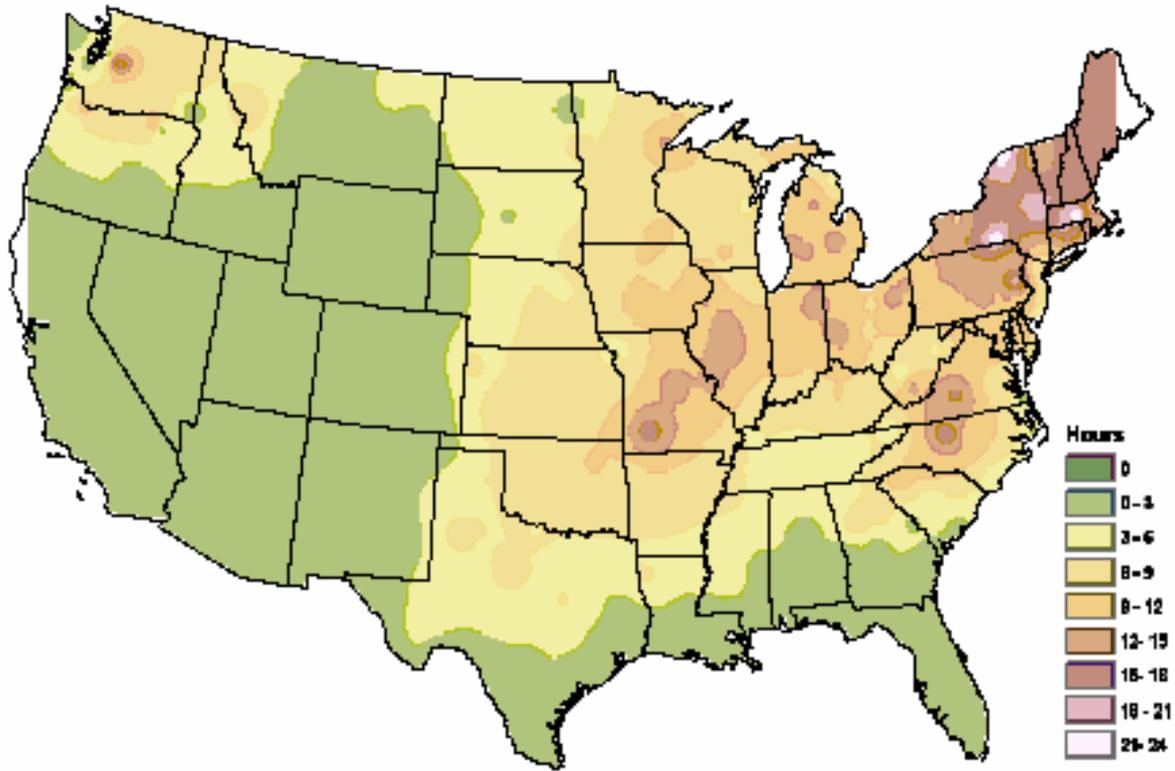
**HAZUS-MH ESTIMATED BUILDING RELATED LOSS (NEW YORK STATE COASTAL COUNTIES ONLY) IF HURRICANE KATRINA TRACKED THROUGH NYS**

**\*Model reflects only losses associated to wind**



# SEVERE WINTER STORM DATA

Figure A.3-53: Average number of hours per year with freezing rain in the United States



**Source:** "FREEZING RAIN EVENTS IN THE UNITED STATES", National Climatic Data Center, Asheville, North Carolina

## EARTHQUAKE DATA

### Case Study 1: New York State Earthquake Probability That Factors the Effect of Local Soil

**Conditions: Adjusted USGS 0.2 Second Spectral Acceleration (SA) with 2% Probability of Exceedance in 50 Years. (Note: Analysis performed in 2007 and based on USGS 2002 Seismic Hazard Map)**

The USGS Seismic Hazard Maps (<http://earthquake.usgs.gov/research/hazmaps/>) provide the USGS's best estimate of the probability of earthquakes expressed in terms of "Peak Ground Acceleration" and "Spectral Acceleration" (spectral acceleration is used as a better indicator of damage to specific buildings types and heights). As these maps cover the entire United States, it has not been possible for the USGS to tailor these maps to reflect the affect of local soil conditions in amplifying seismic waves on a national scale. Consequently, the USGS uses an average (NEHRP B-C) soil condition that is applied throughout.

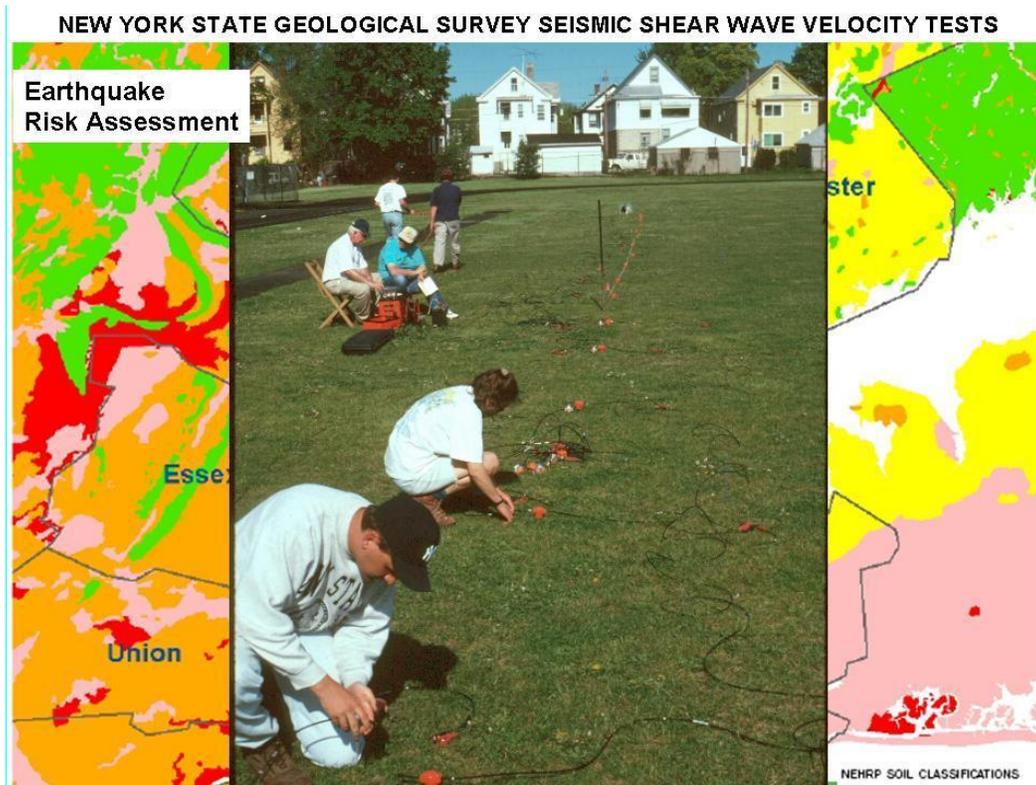
The affect of local soil conditions on seismic waves and the resulting level of damage can be significant. In certain cases, it can more than double accelerations due to wave amplifications than shown on the baseline USGS maps. As a result, a first inspection of the USGS maps used to determine the earthquake hazard in one's locale can be misleading if this is not understood.

Seismic waves propagate out from the earthquake epicenter and travel outward through the bedrock up into the soil layers. As the waves move into the soils, the speed or velocity of the waves is affected by how stiff or soft the soil is. Generally, in a stiff or "hard" soil, the wave will travel at a higher velocity. In the case of "soft" soils, the wave will slow, traveling at lower velocities. When the wave is slowed, the seismic energy is modified, resulting into a wave with greater amplitude. This amplification results in greater earthquake damage.

While the USGS has not conducted seismic micro hazard zonation studies throughout the U.S. enabling it to provide locally specific hazard maps, the New York State Geological Survey has conducted seismic shear-wave tests of the State's surficial geology (glacial deposits). These studies measure the velocity of a wave through representative surficial geologic materials. Tests were run in various parts of the State to provide an understanding of how the various glacial materials varied from one region to another. In each region, a variety of glacial materials were measured, such as till, glacial lake sands and clays, outwash, etc. The velocity measurements are obtained by a recorder connected to sensors placed at set intervals along the ground. A small blast is generated and the arrival times of the wave are recorded at each sensor. From this information, the velocity of the wave through a particular soil type is determined. See **Figure A.3-54**.



Figure A.3-54: New York State Survey Seismic Shear Wave Velocity Tests



Based on the results of these tests it has been possible to classify the surficial geologic materials according to the National Earthquake Hazard Reduction Program’s Soil Site Classifications. See Figure A.3-55.

Figure A.3-55: National Earthquake Hazard Reduction Program (NEHRP) Soil Site Classifications Assigned to New York State Surficial Geologic Units

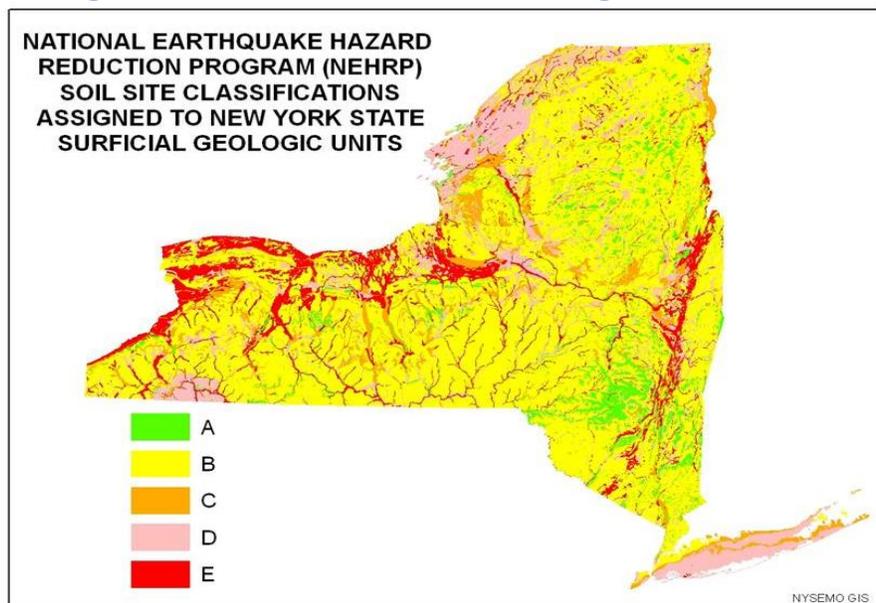


Figure A.3-56: NEHRP Site Class

**NEHRP Site Class**

Site Classifications taken from Table 1615 1.1 Site Class Definitions published in 2000 International Building code, International Code Council, Inc. on page 350.

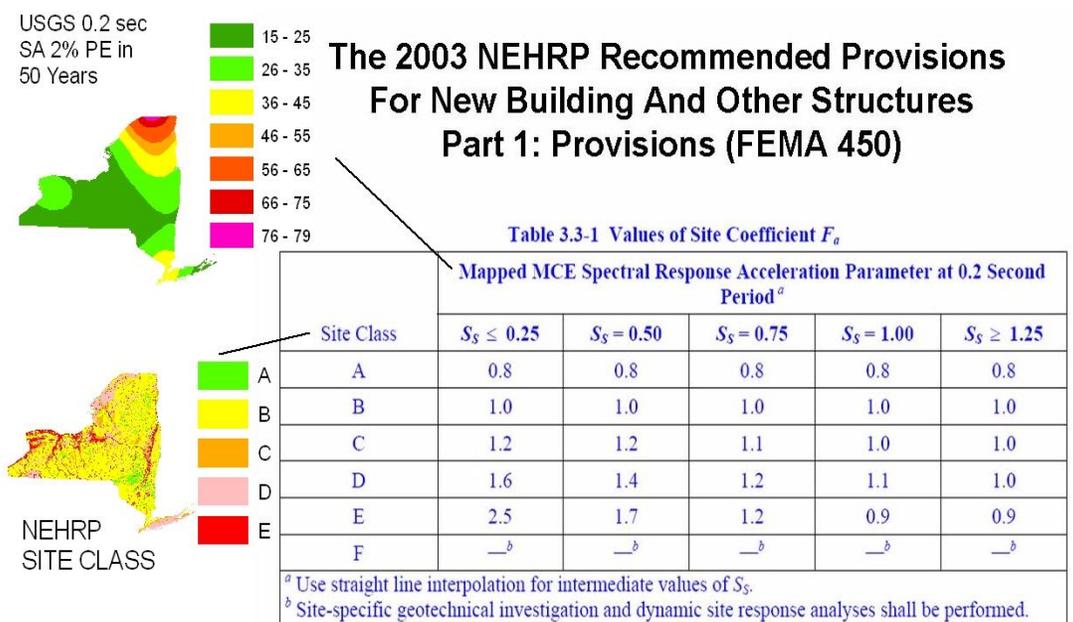
Table 1615 1.1 Site Class Definitions partially reproduced below

Site Class	Soil Profile Name	Average Properties in Top 100 feet (as per 2000 IBC section 1615.1.5) Soil Shear Wave Velocity, $V_s$	
		Feet/second	Meters/second
A	Hard Rock	$V_s > 5000$	$V_s > 1524$
B	Rock	$2500 < V_s \leq 5000$	$762 < V_s \leq 1524$
C	Very dense soil and soft rock	$1200 < V_s \leq 2500$	$366 < V_s \leq 762$
D	Stiff soil profile	$600 < V_s \leq 1200$	$183 < V_s \leq 366$
E	Soft soil profile	$V_s < 600$	$V_s < 183$

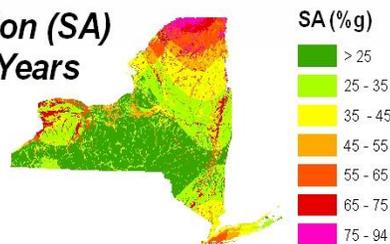
This classification of the State's surficial geologic materials by NEHRP soil site class has enabled the effect of soils to be factored with the USGS seismic hazard maps to give an adjusted, more regionally refined picture, of the State's earthquake hazard based. The level of adjustment to USGS map is based on use of the NEHRP's soil site coefficients for each soil class, which varies according to the USGS mapped accelerations. The reference for the appropriate coefficient is found in "The 2003 NEHRP Recommended Provisions for New Building and Other Structures – Part: Provisions (FEMA 450). These coefficients provide the level of increase or decrease to the USGS's seismic hazard map spectral accelerations. See **Figure A.3-57**.



**Figure A.3-57: The 2003 NEHRP Recommended Provisions For New Building and Other Structures**



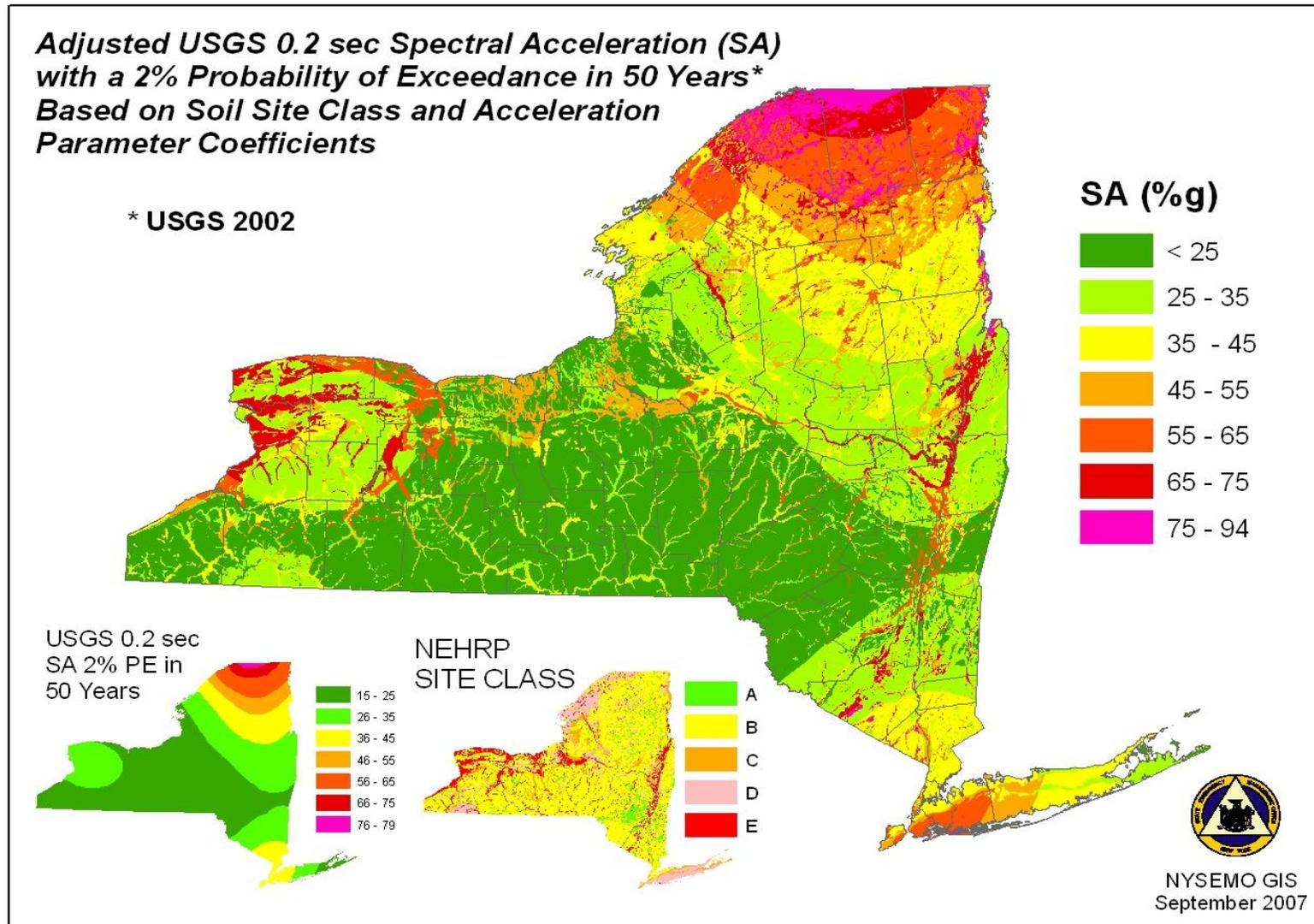
**Adjusted USGS 0.2 sec Spectral Acceleration (SA) with a 2% Probability of Exceedance in 50 Years Based on Soil Site Class and Acceleration Parameter Coefficients**



A review of the adjusted maps that factor soil conditions will show some areas of the state with a significantly higher hazard than is shown on the USGS map. A special note for building officials, this analysis is to be used for hazard modeling not construction design.



Figure A.3-58: Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs



The following series of maps were extracted from the 2011 Hazard Mitigation Plan to show county level earthquake hazard adjusted maps that factor soil conditions. For the 2014 Hazard Mitigation Plan, individual county maps were not completed but were updated and aggregated to the state level. The inclusion of the data here serves as a resource for local planning, and to demonstrate the type of analysis that can be done at the local level.

Figure A.3-59: Albany County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

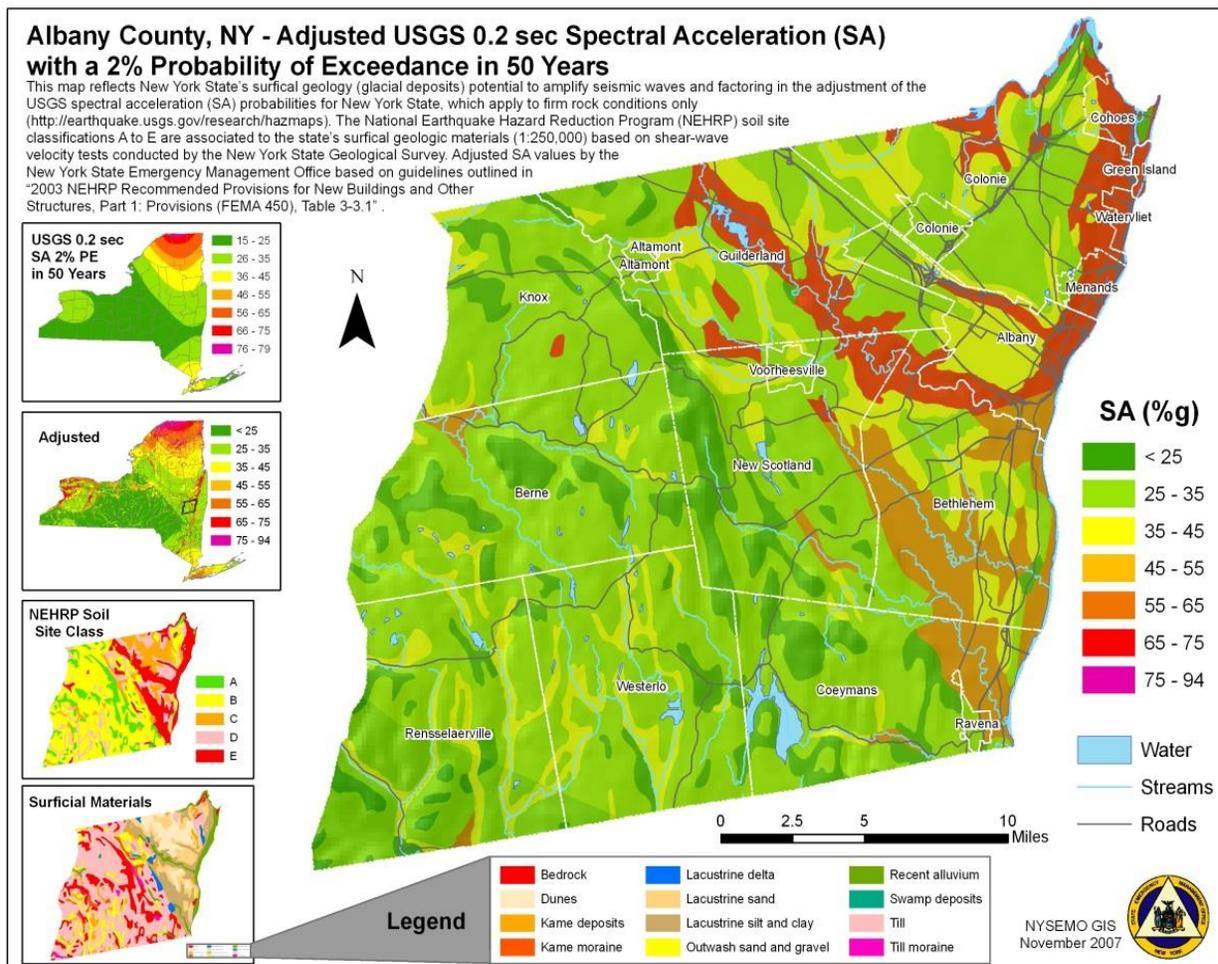


Figure A.3-60: Allegany County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

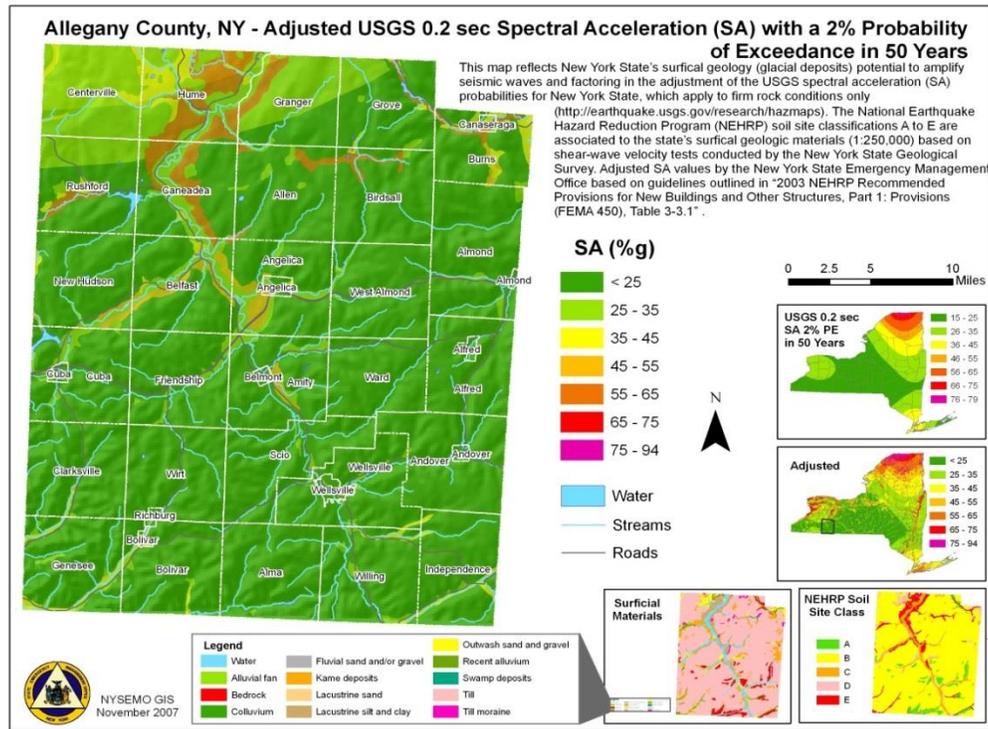


Figure A.3-61: Broome County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

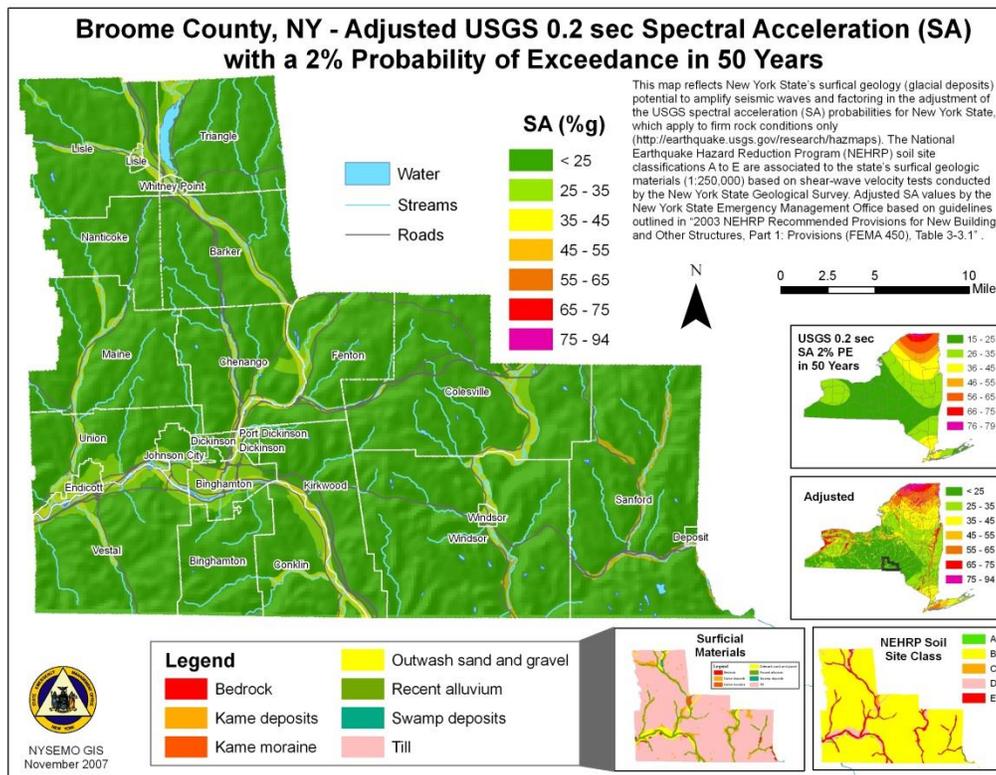


Figure A.3-62: Cattaraugus County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

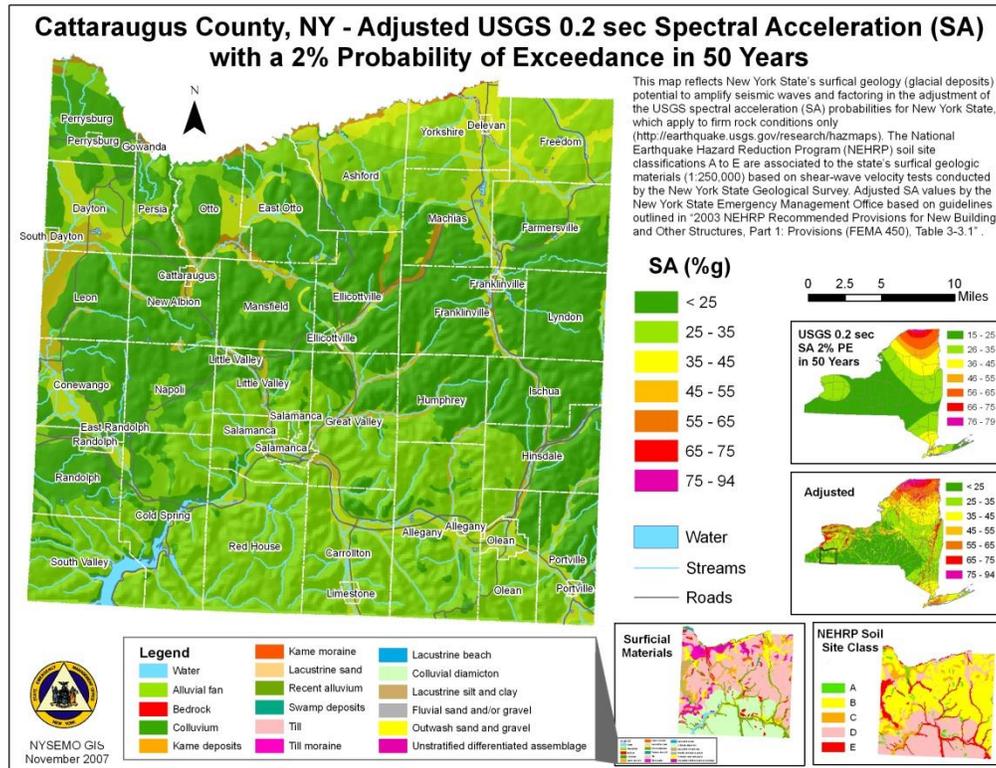


Figure A.3-63: Cayuga County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

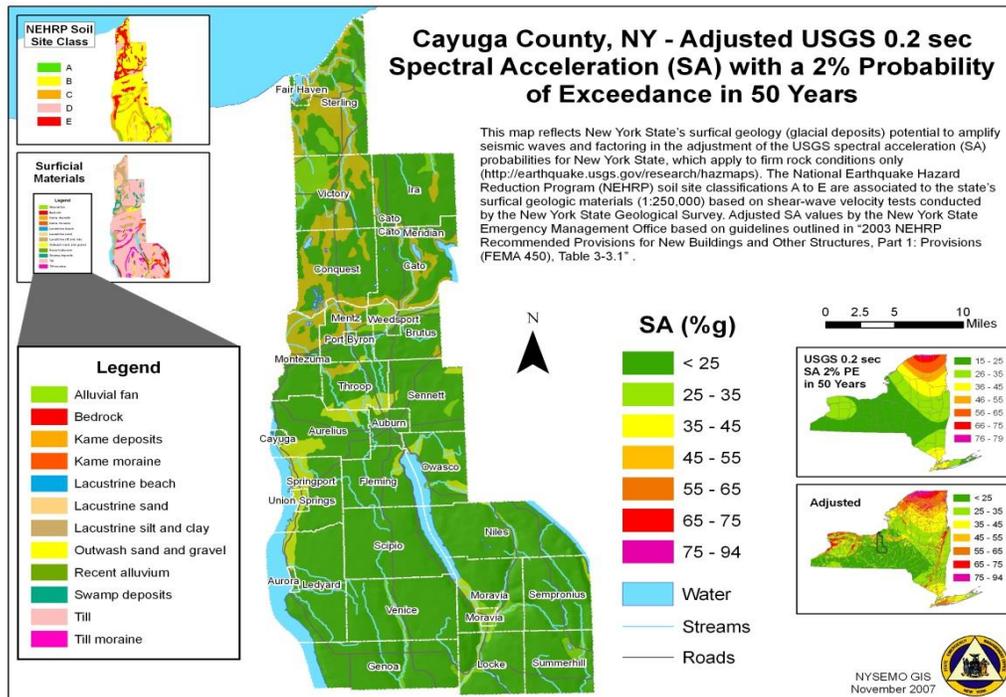


Figure A.3-64: Chautauqua County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

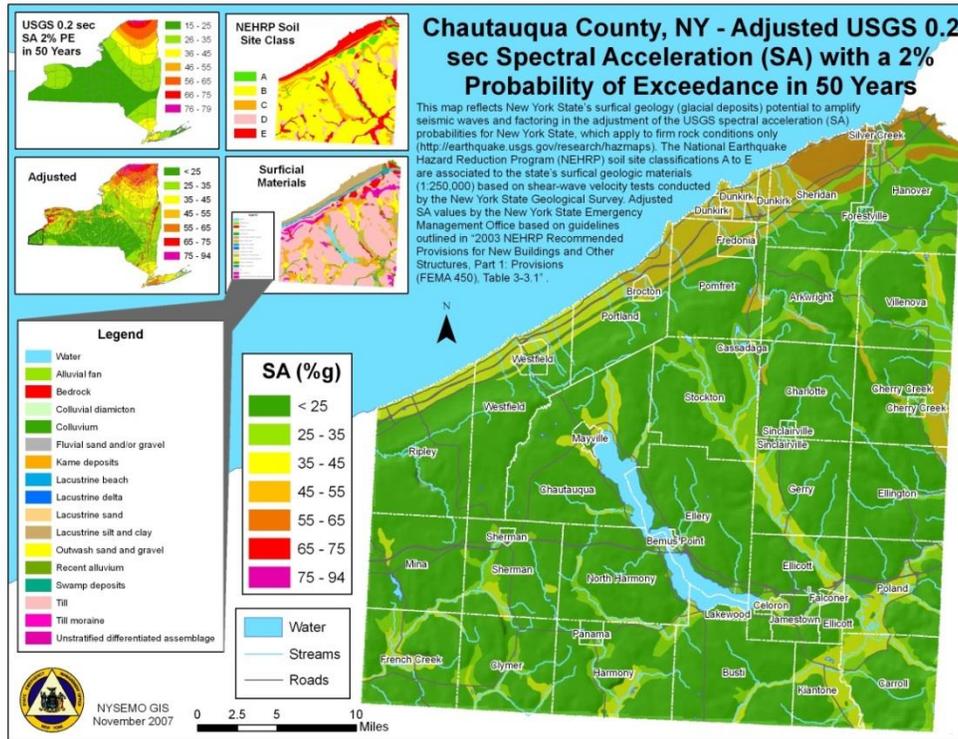


Figure A.3-65: Chemung County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

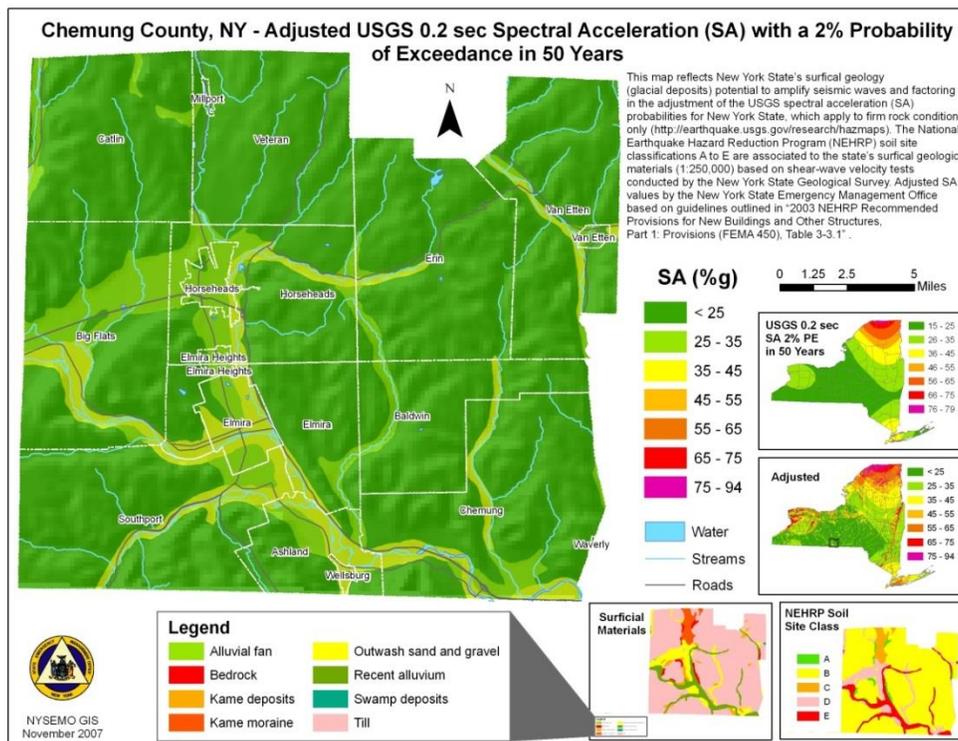


Figure A.3-66: Chenango County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

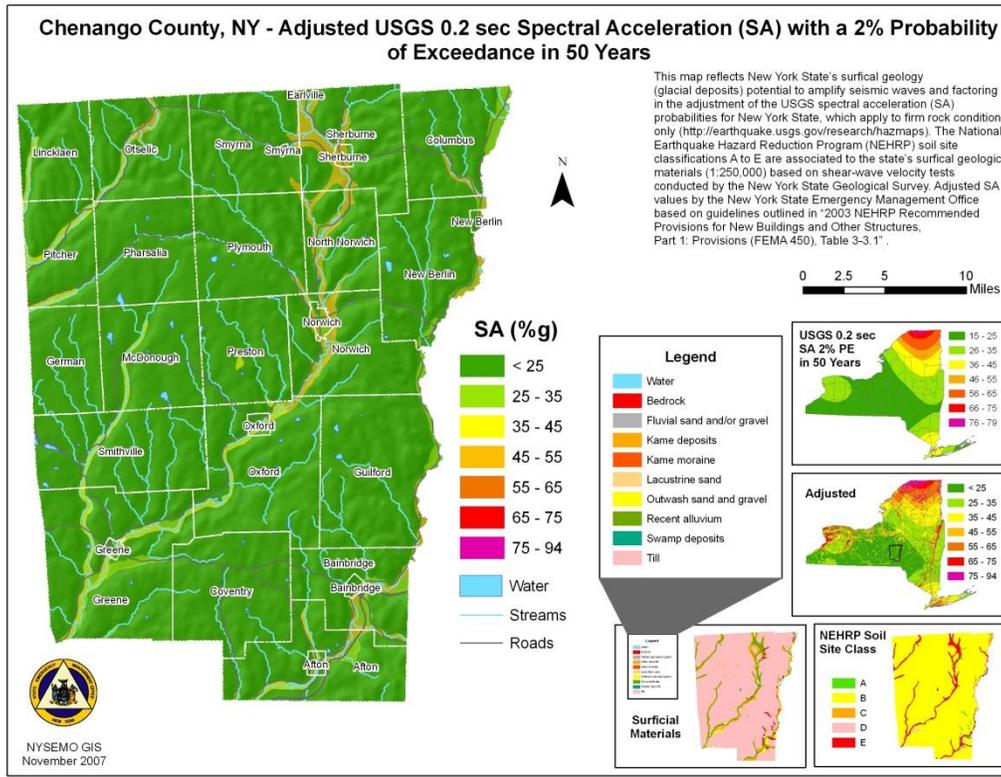


Figure A.3-67: Clinton County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

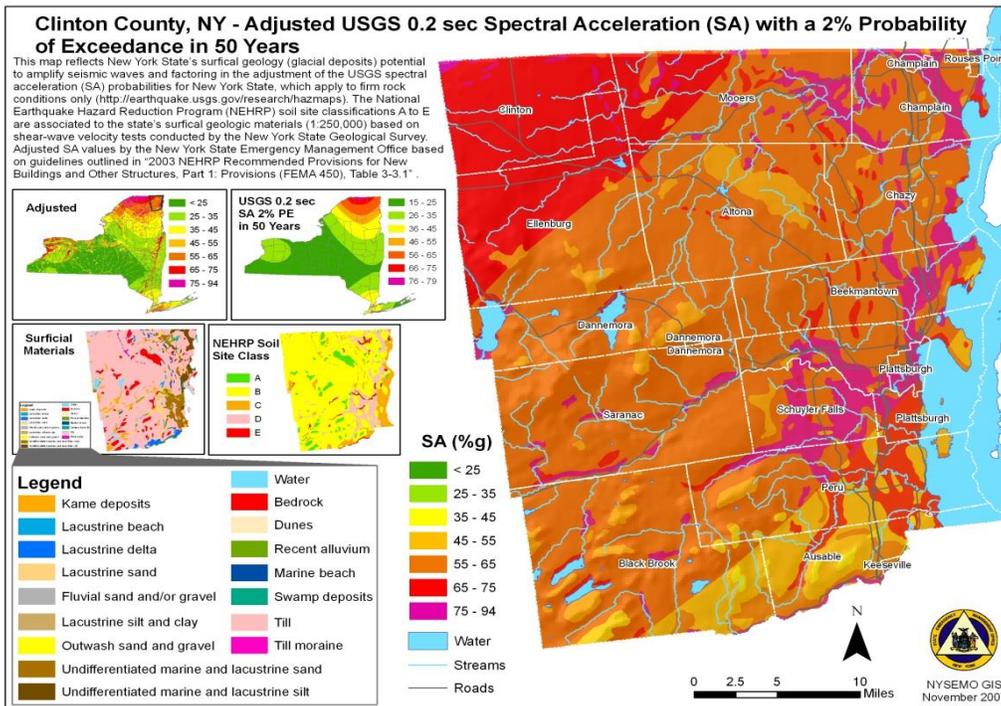


Figure A.3-68: Columbia County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

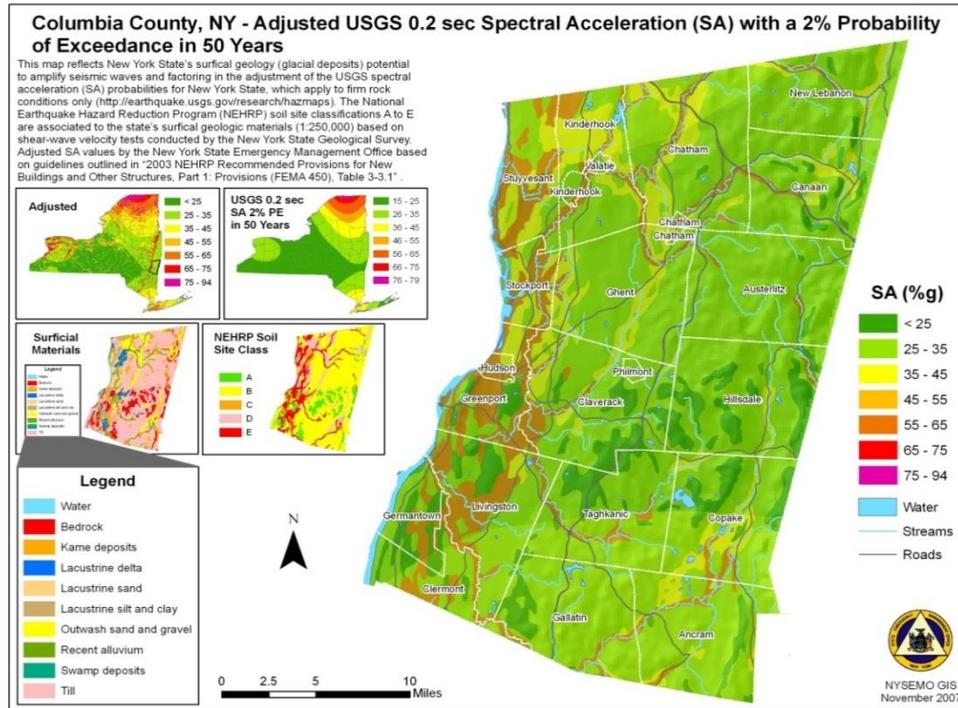


Figure A.3-69: Cortland County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

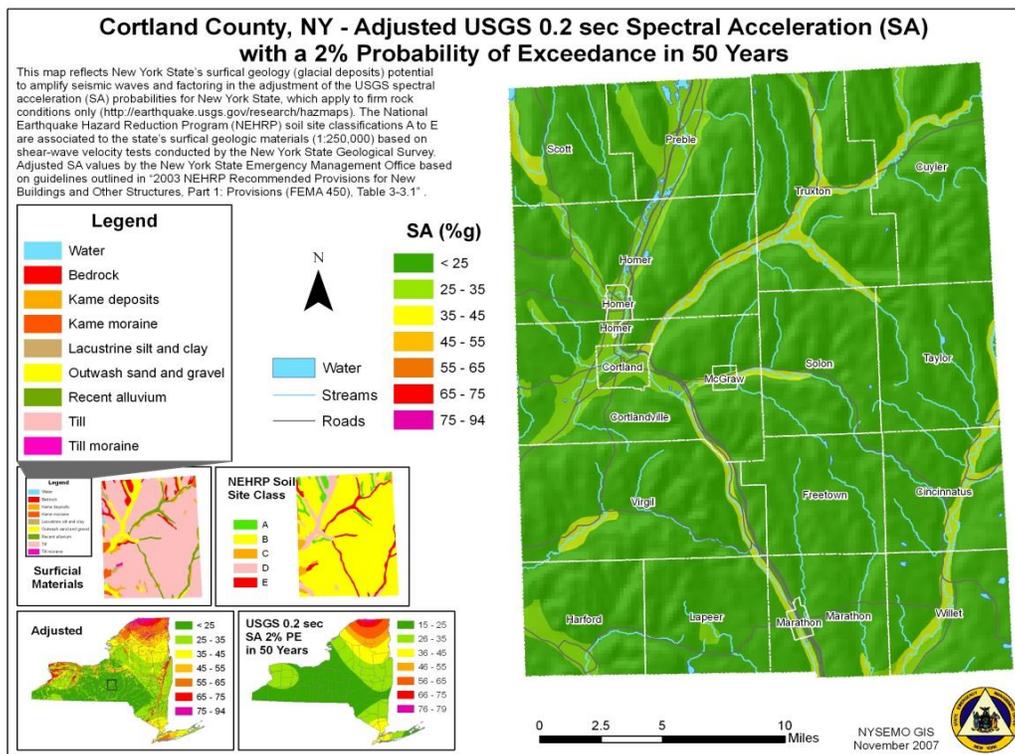


Figure A.3-70: Delaware County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

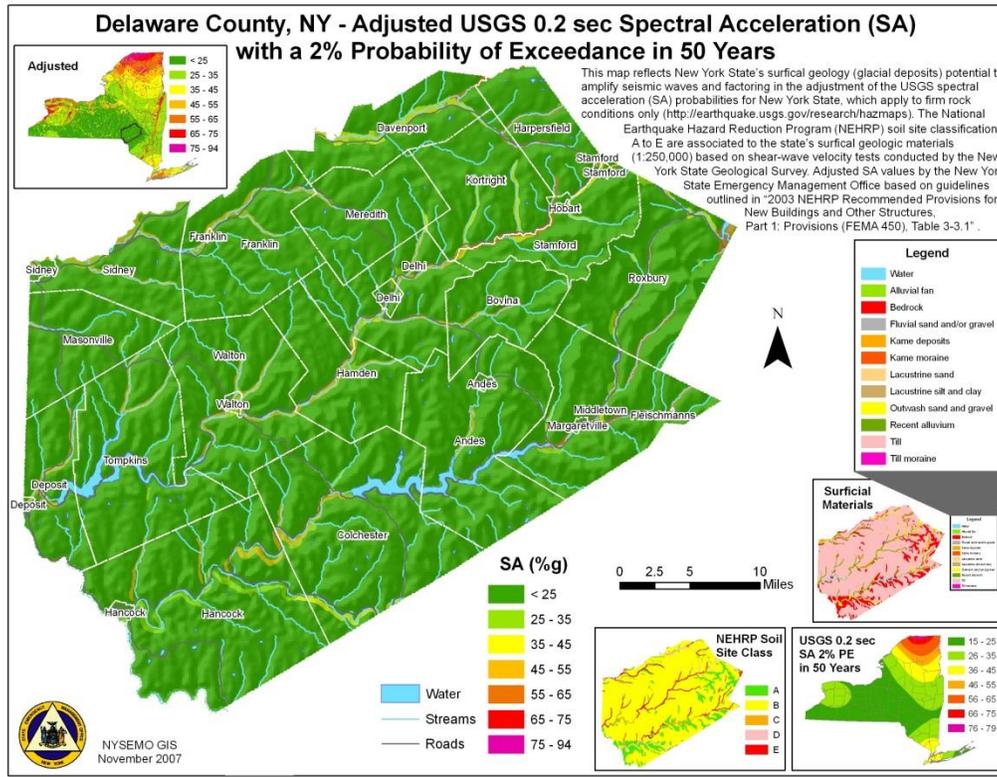


Figure A.3-71: Dutchess County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

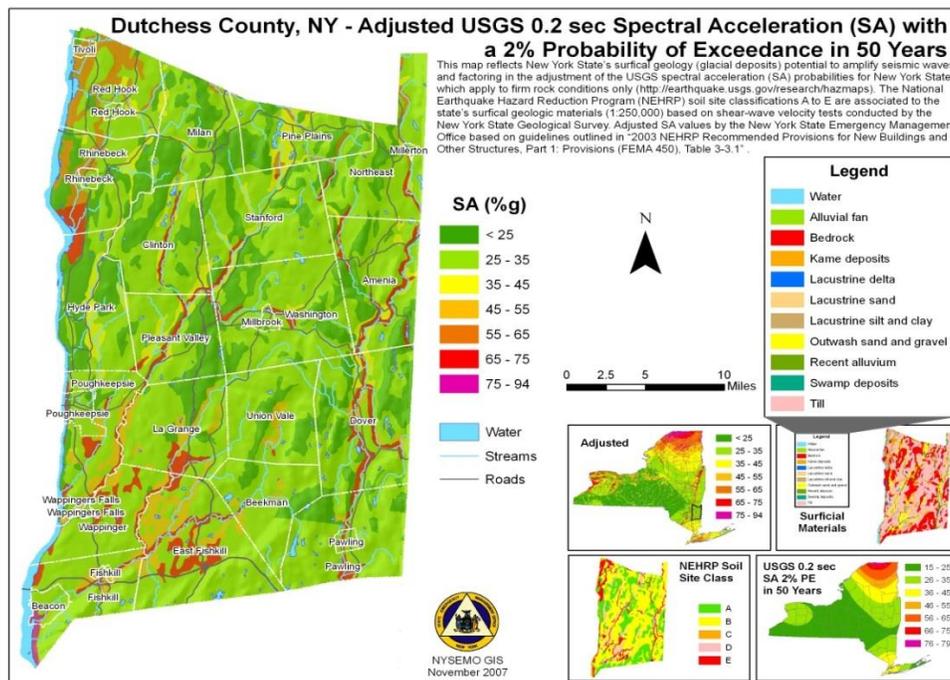


Figure A.3-72: Erie County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

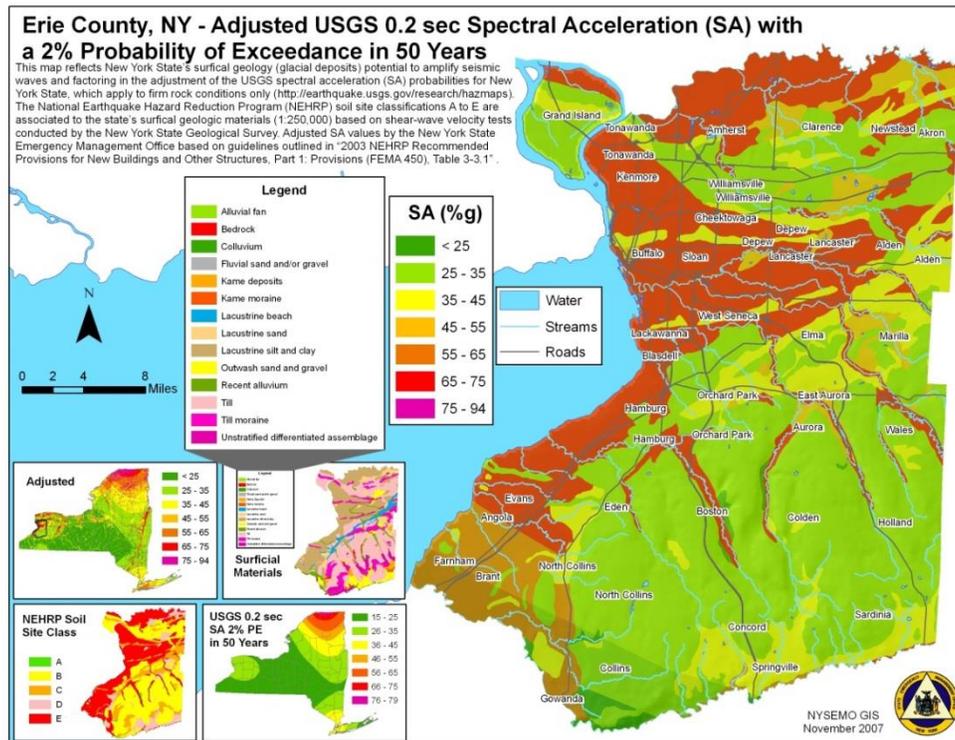


Figure A.3-73: Essex County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

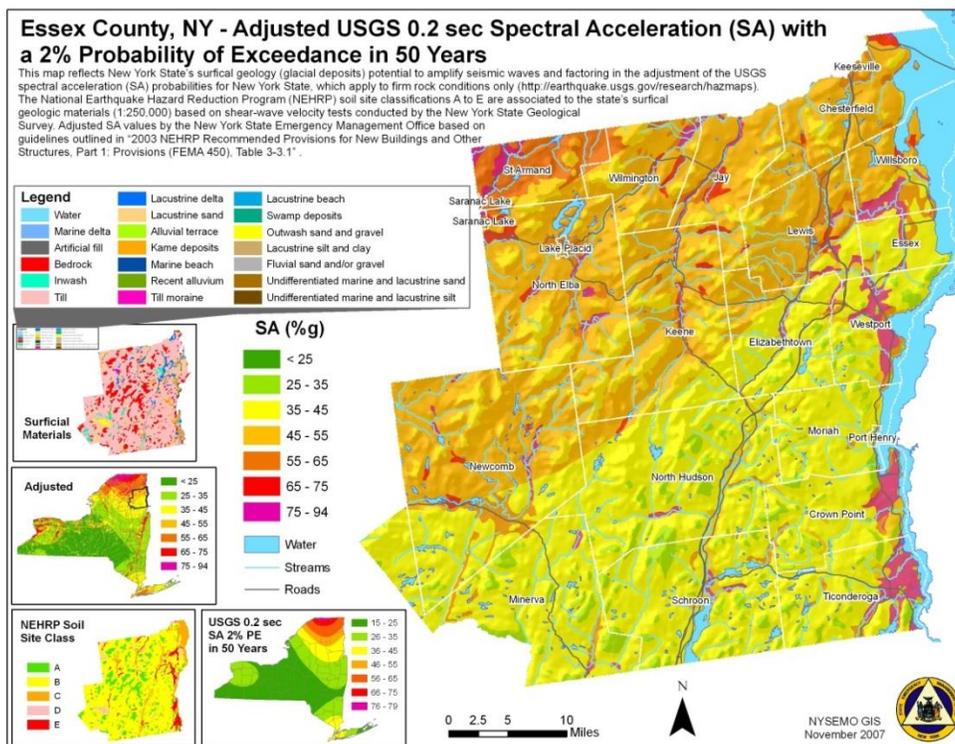


Figure A.3-74: Franklin County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

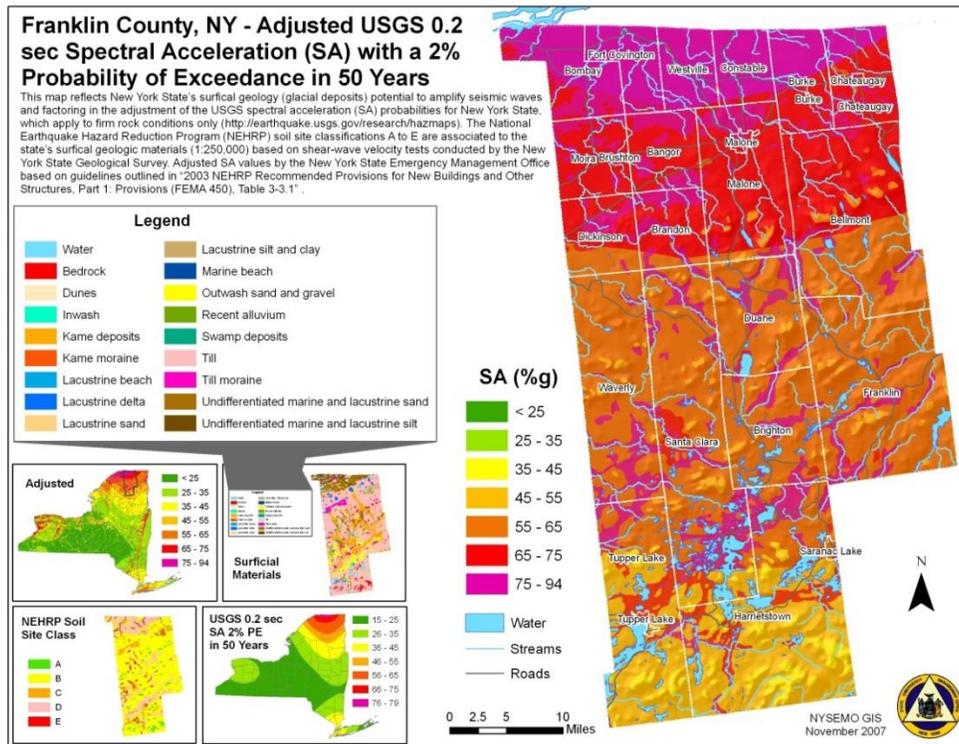


Figure A.3-75: Fulton County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

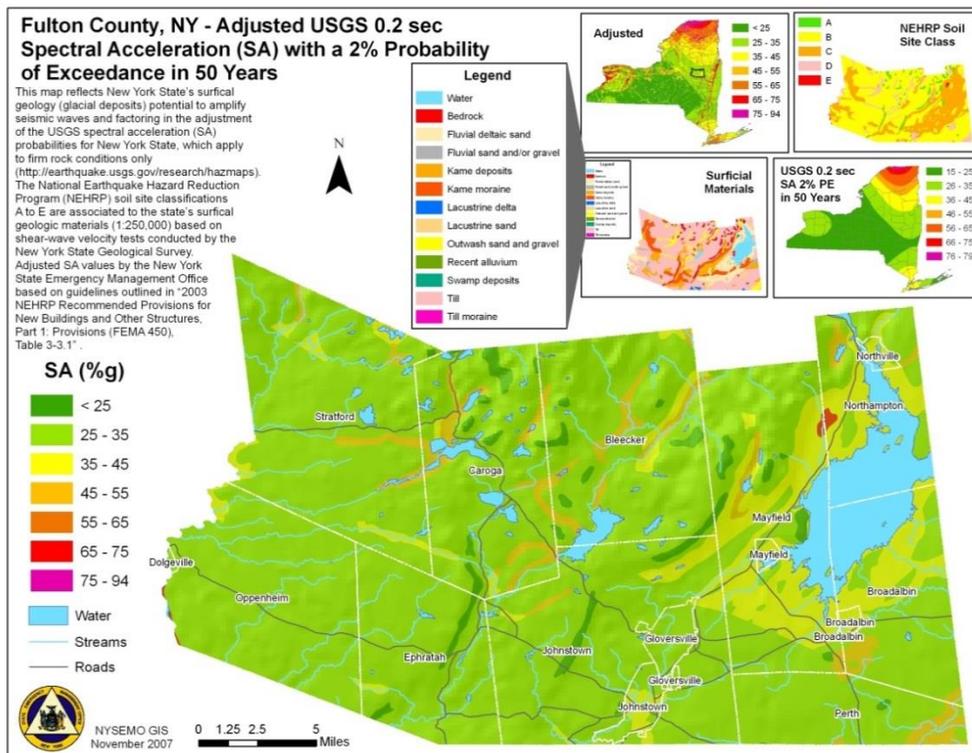


Figure A.3-76: Genesee County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

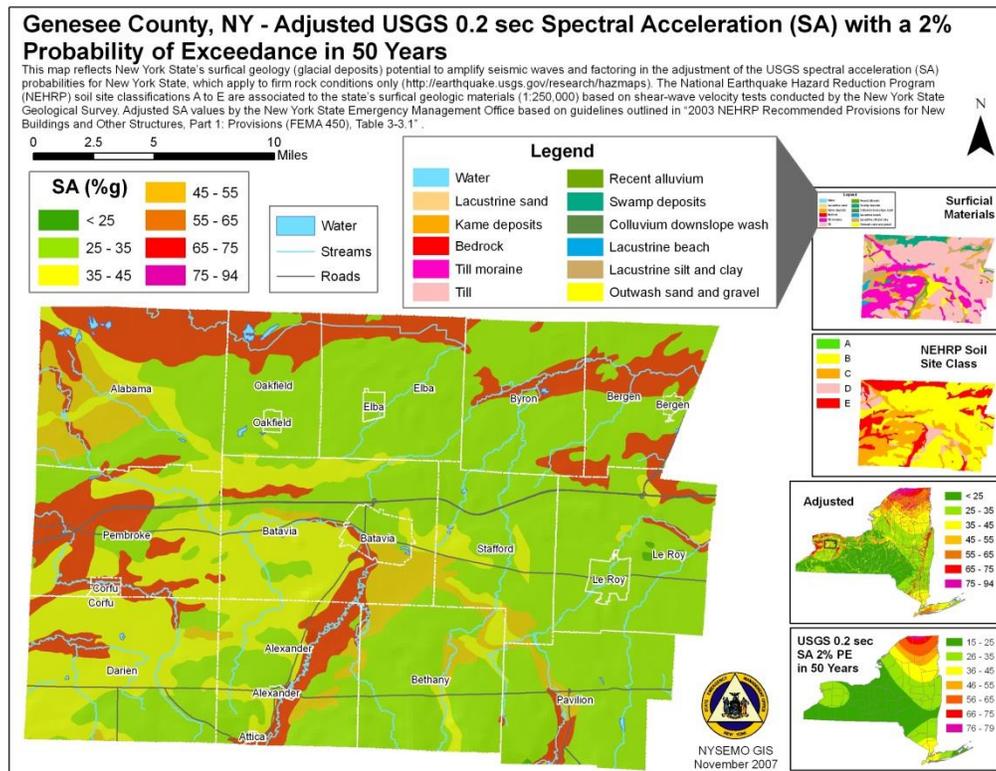


Figure A.3-77: Greene County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

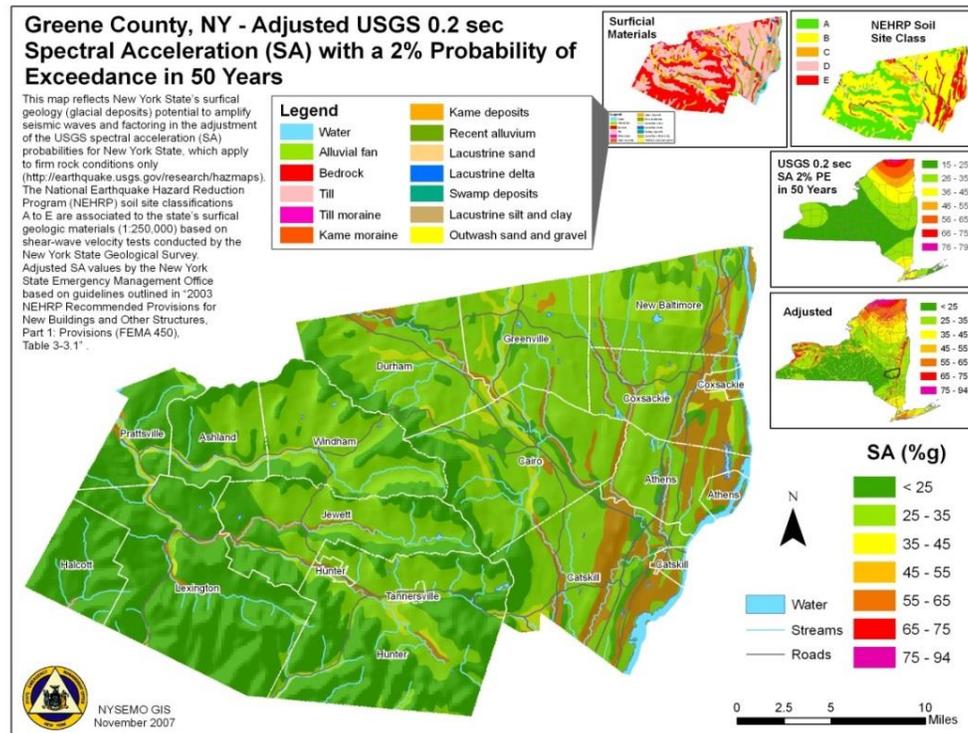


Figure A.3-78: Hamilton County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

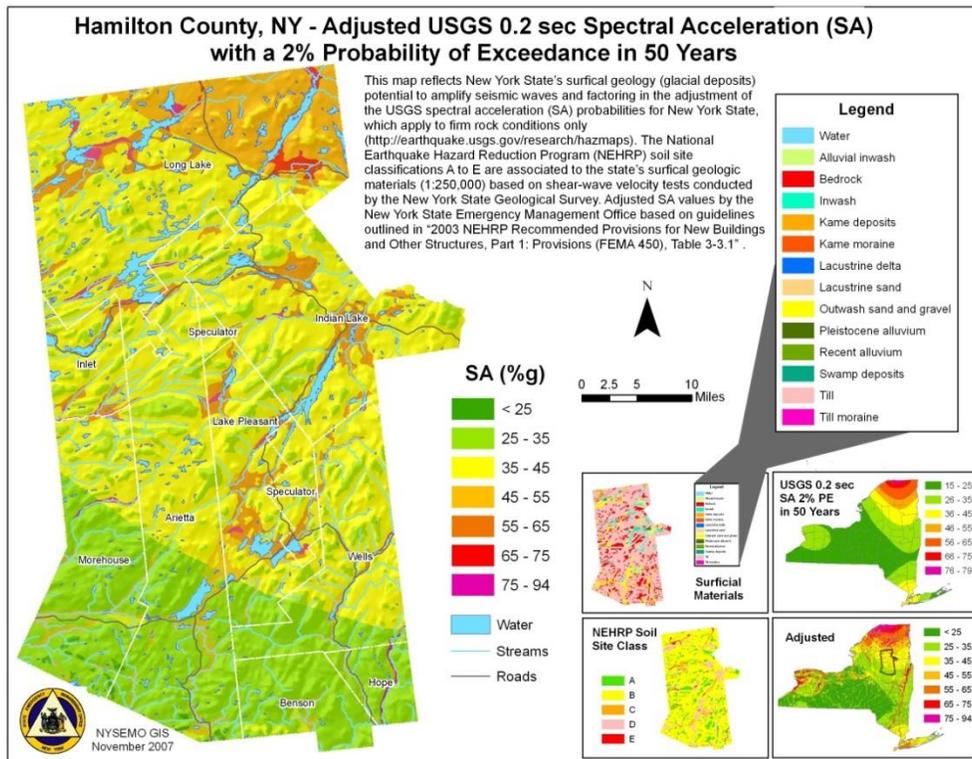


Figure A.3-79: Herkimer County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

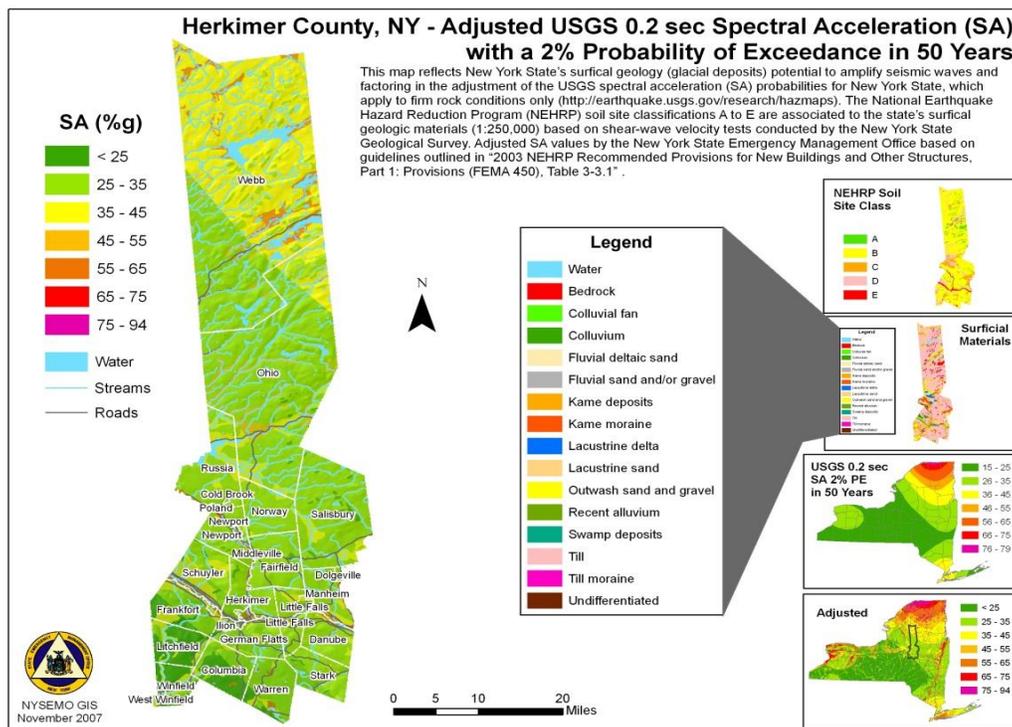


Figure A.3-80: Jefferson County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

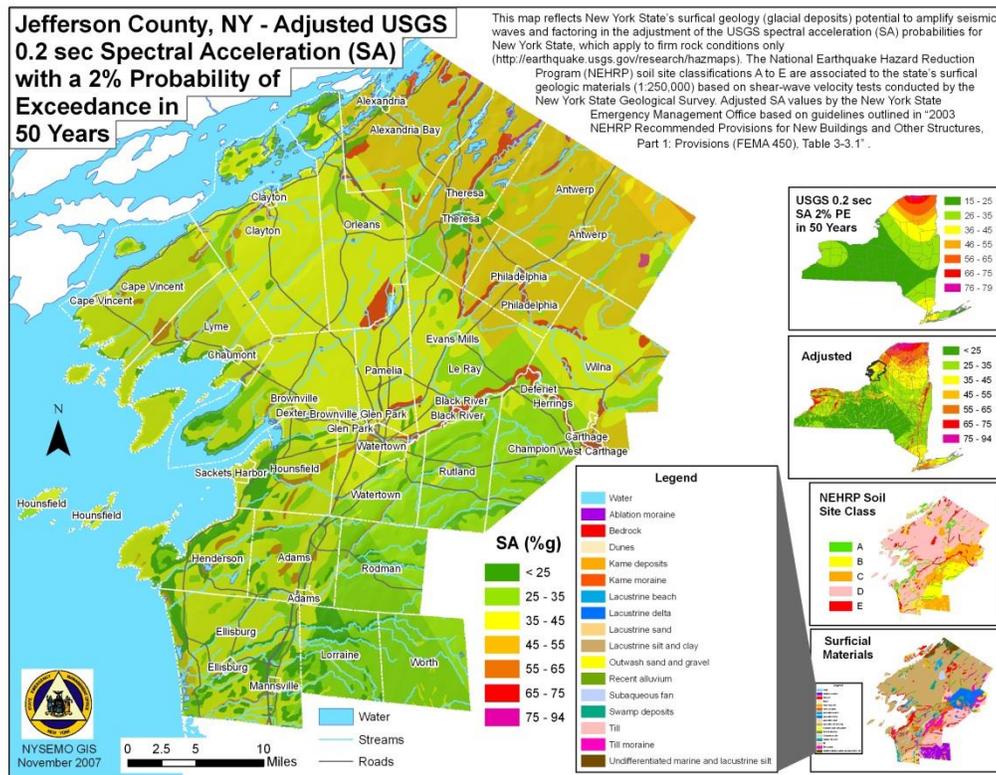


Figure A.3-81: Lewis County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

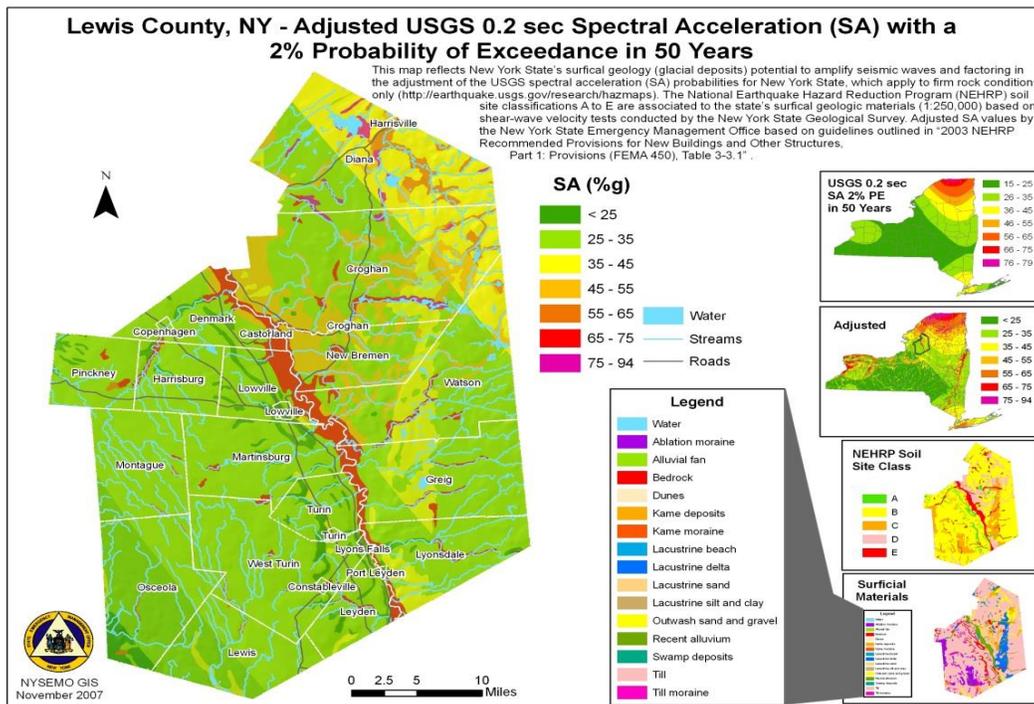


Figure A.3-82: Livingston County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

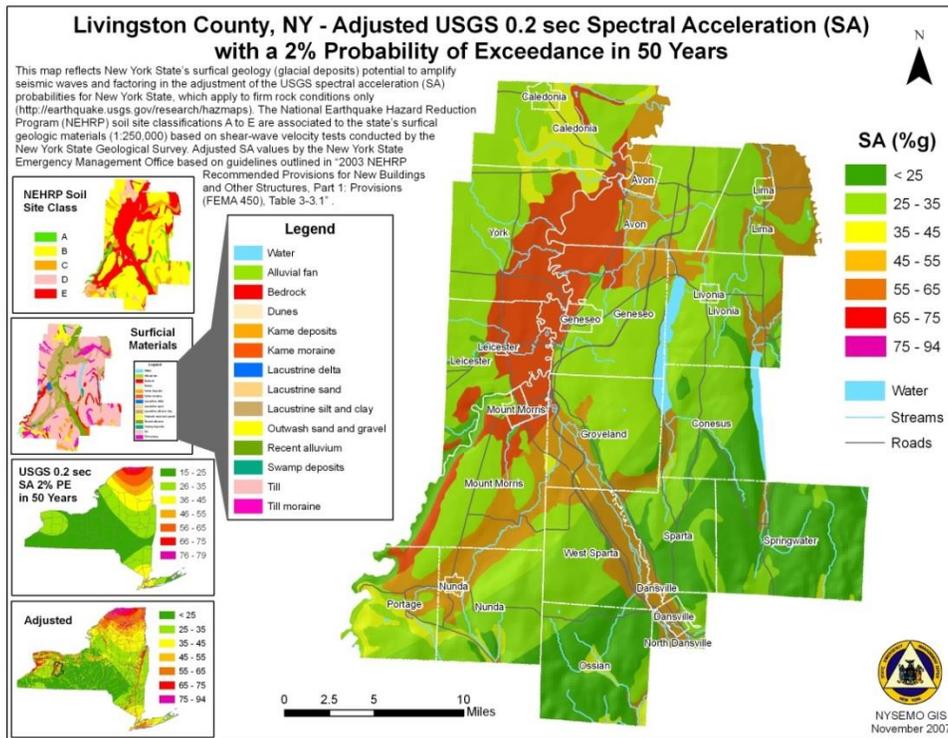


Figure A.3-83: Madison County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

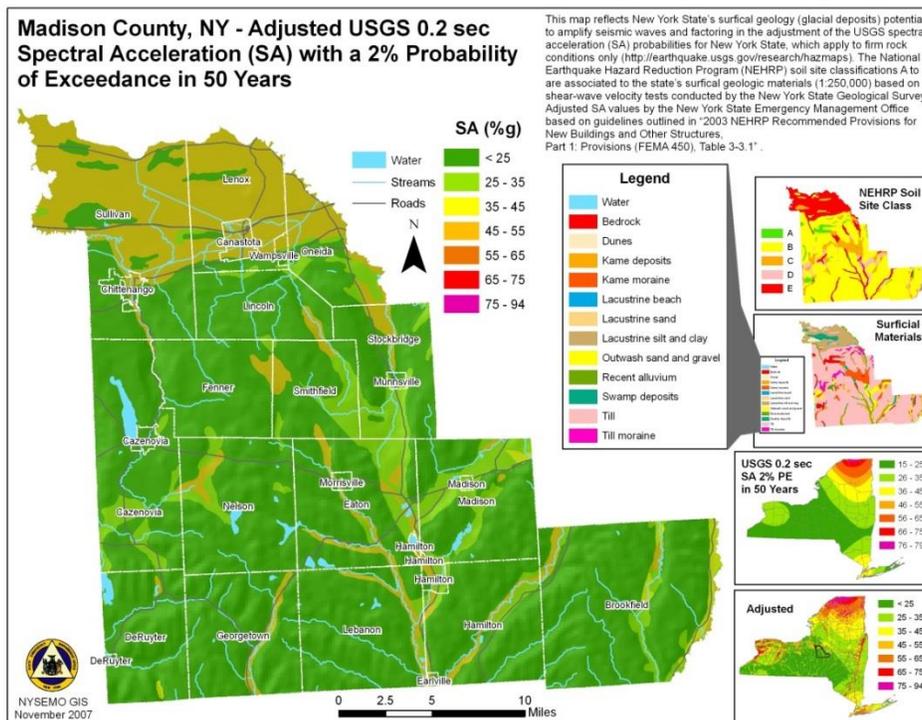


Figure A.3-84: Monroe County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

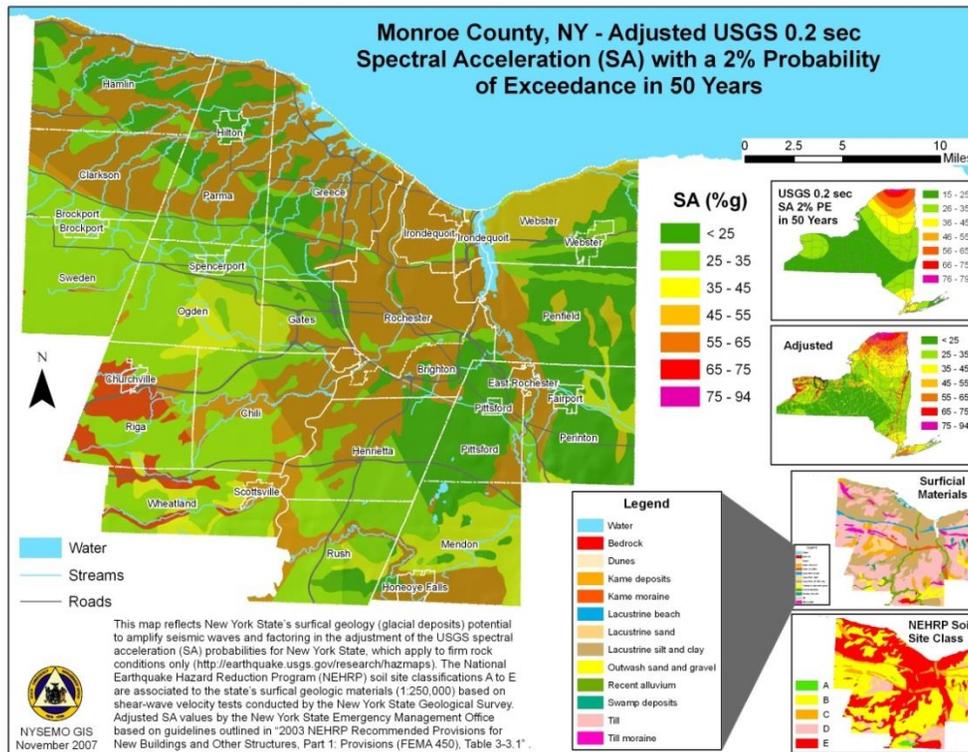


Figure A.3-85: Montgomery County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

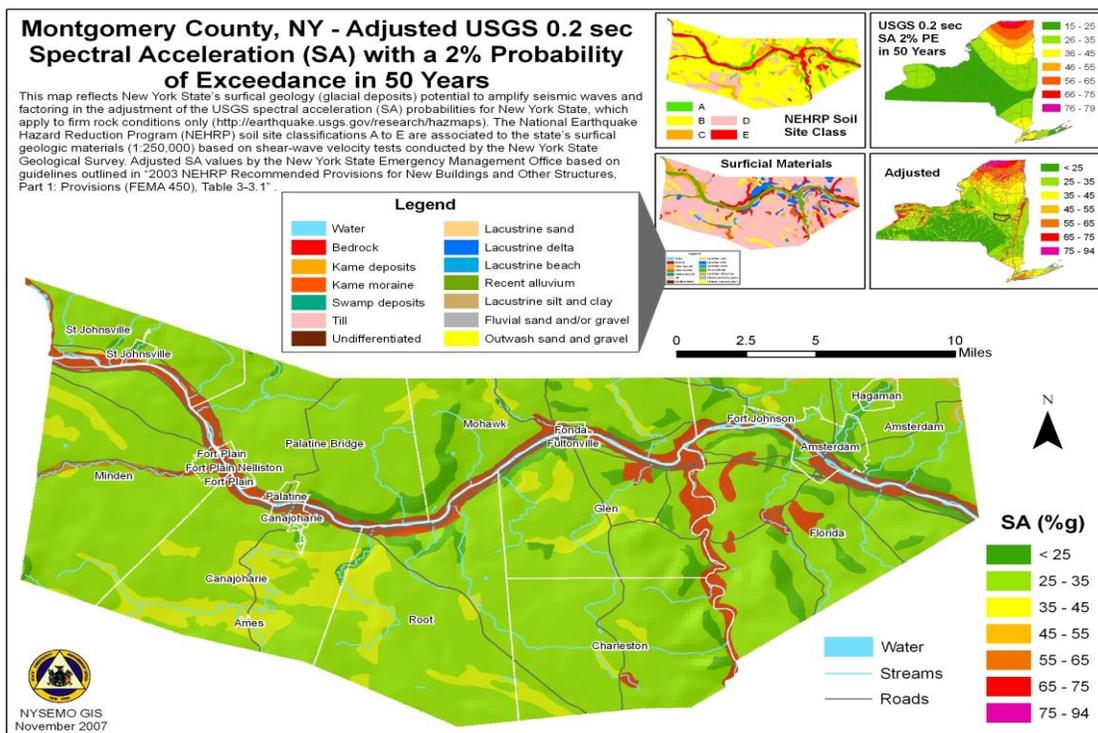


Figure A.3-86: Nassau County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

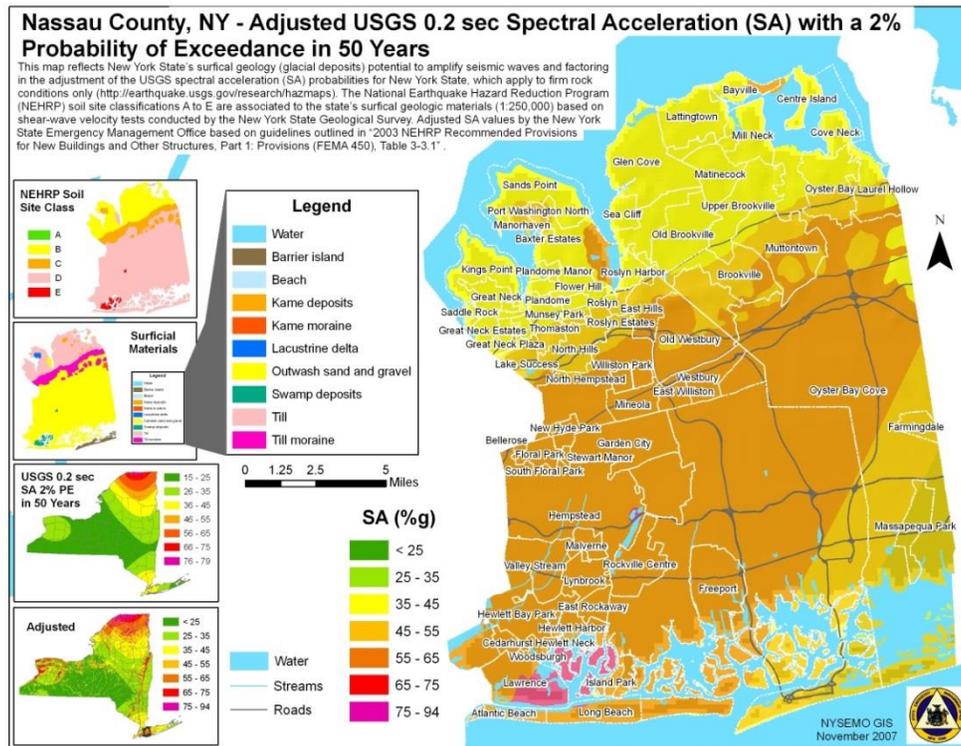


Figure A.3-87: New York City, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

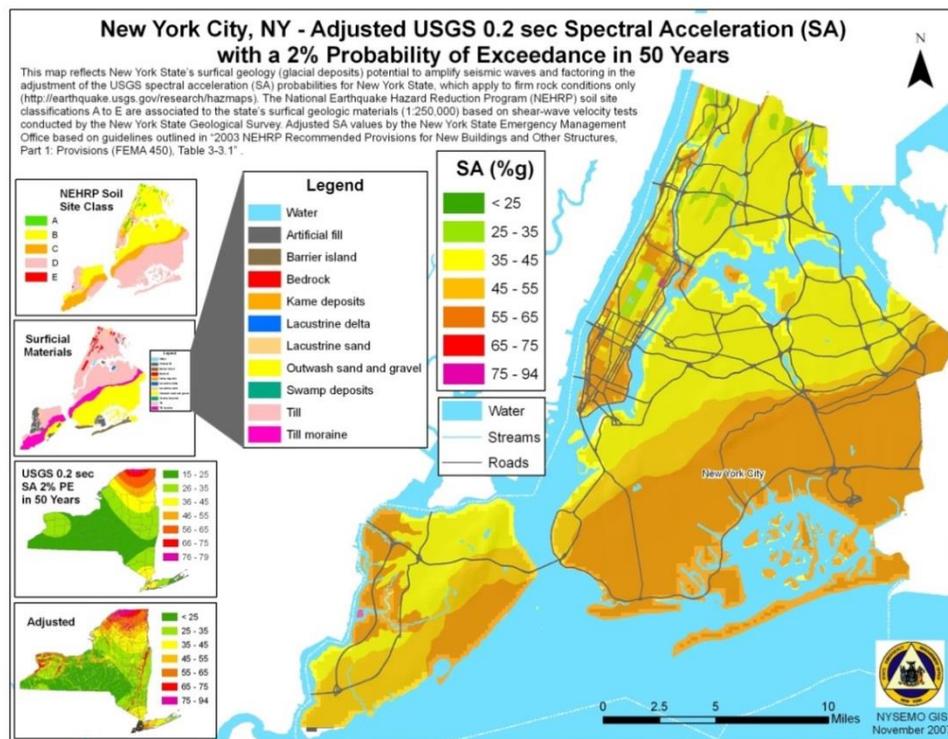


Figure A.3-88: Niagara County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

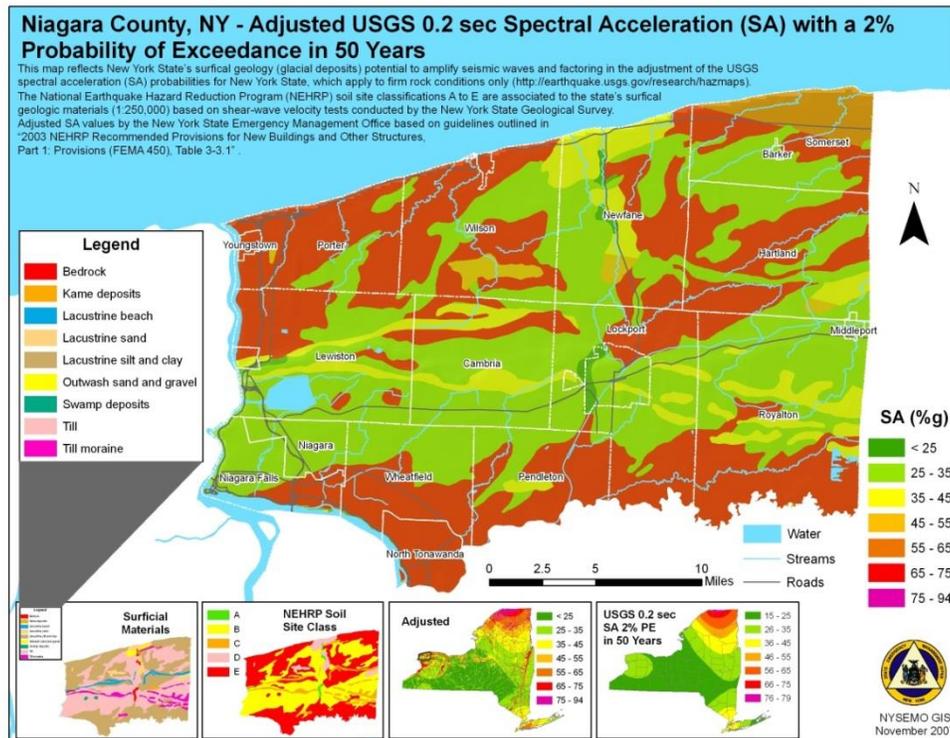


Figure A.3-89: Oneida County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

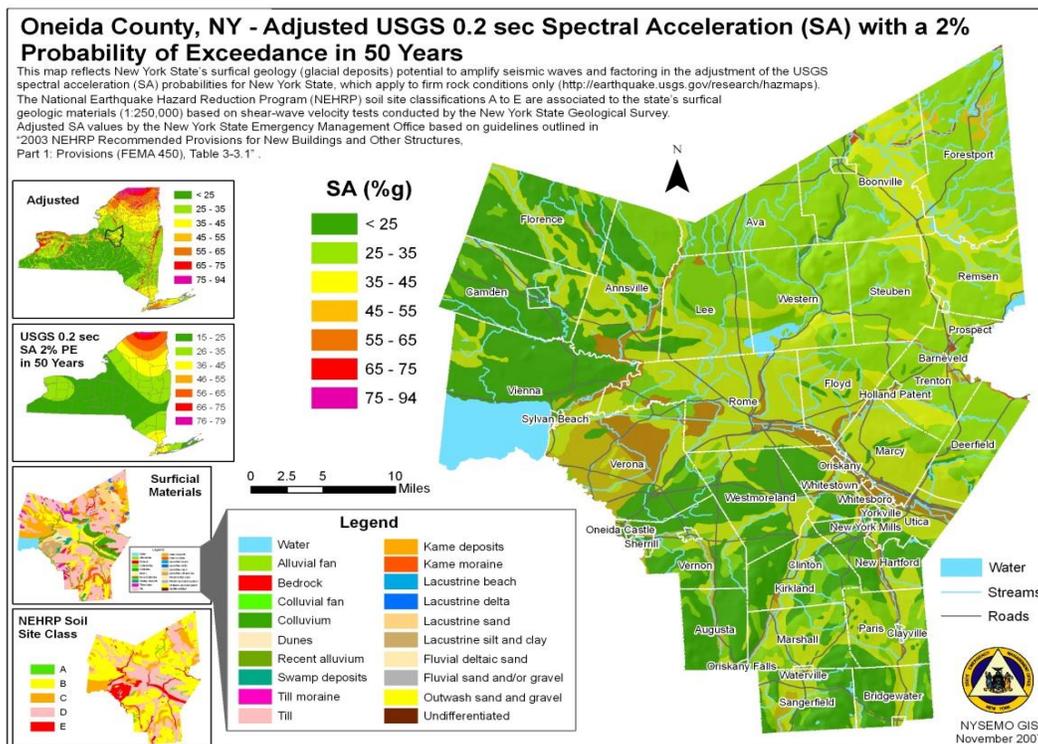


Figure A.3-90: Onondaga County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

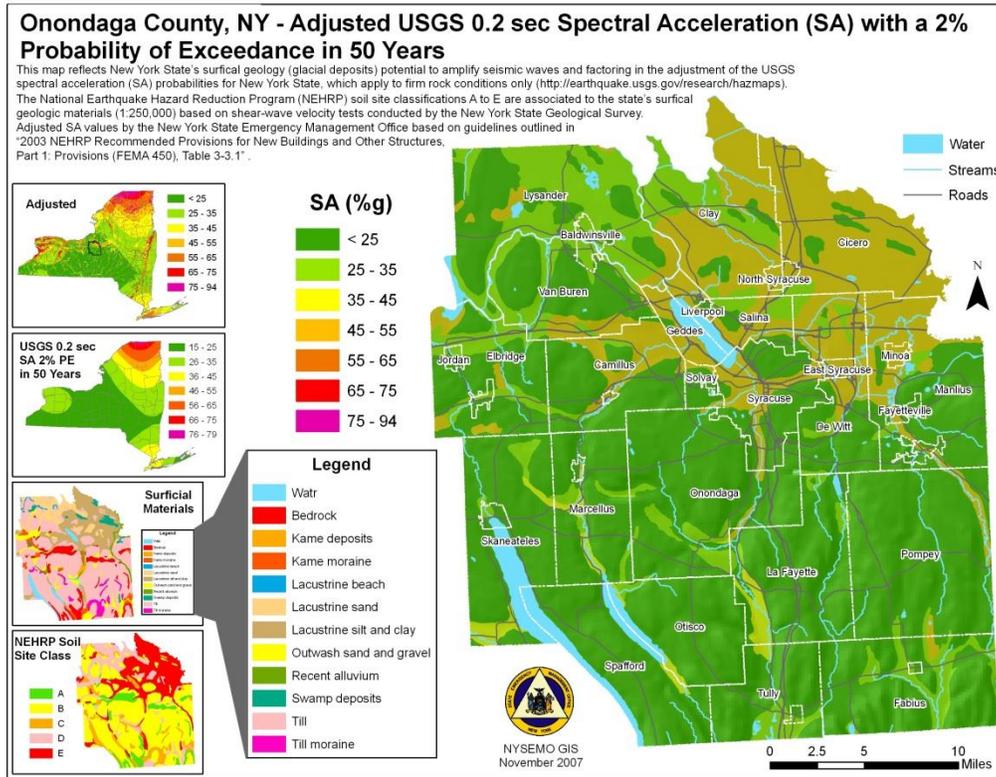


Figure A.3-91: Ontario County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

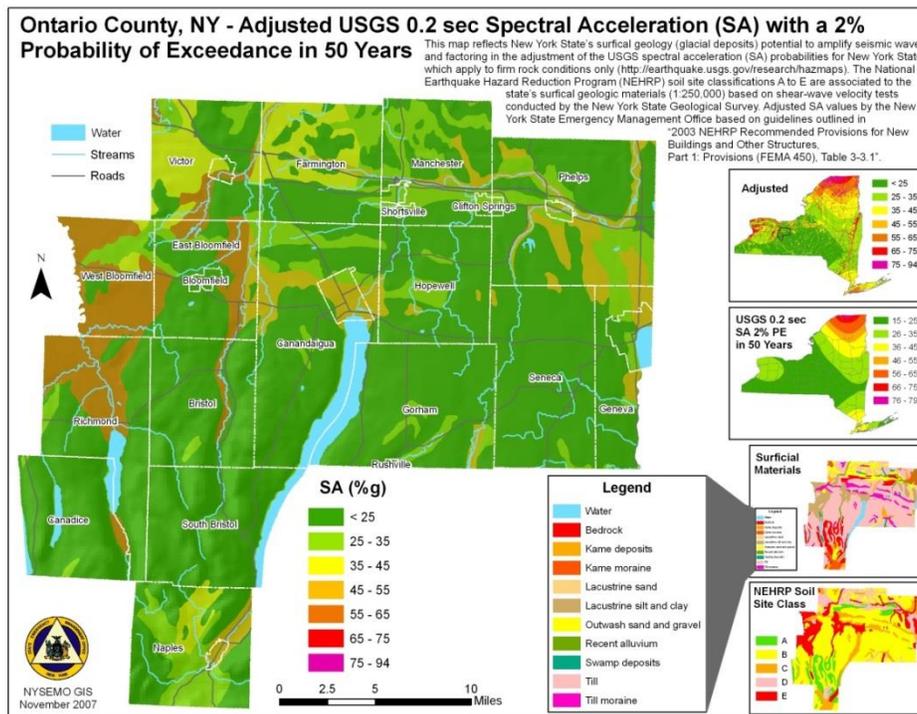


Figure A.3-92: Orange County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

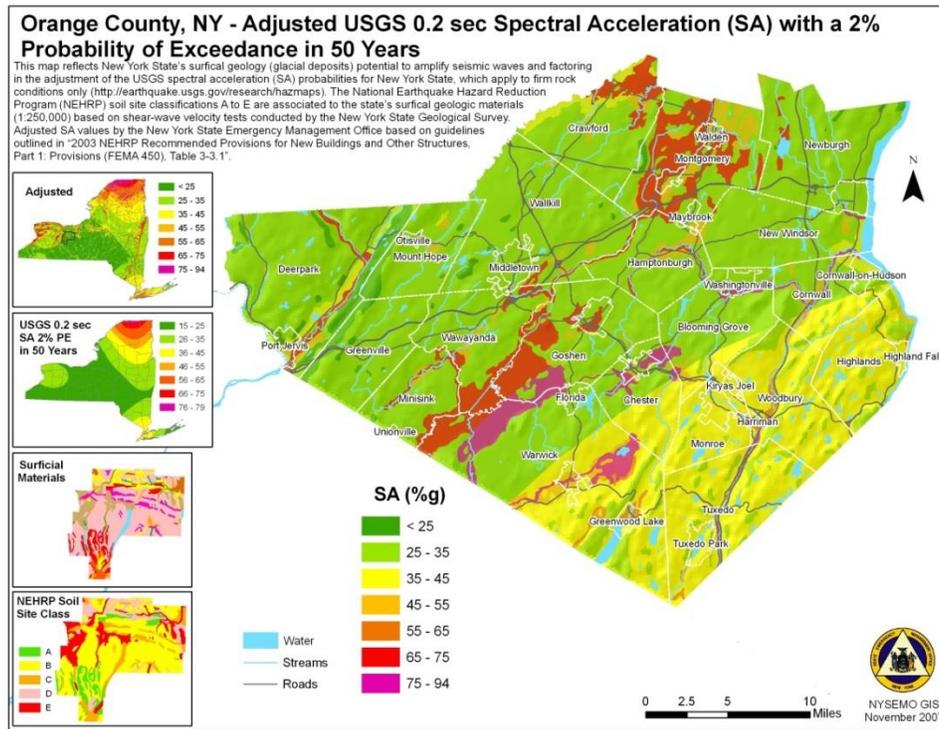


Figure A.3-93: Orleans County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

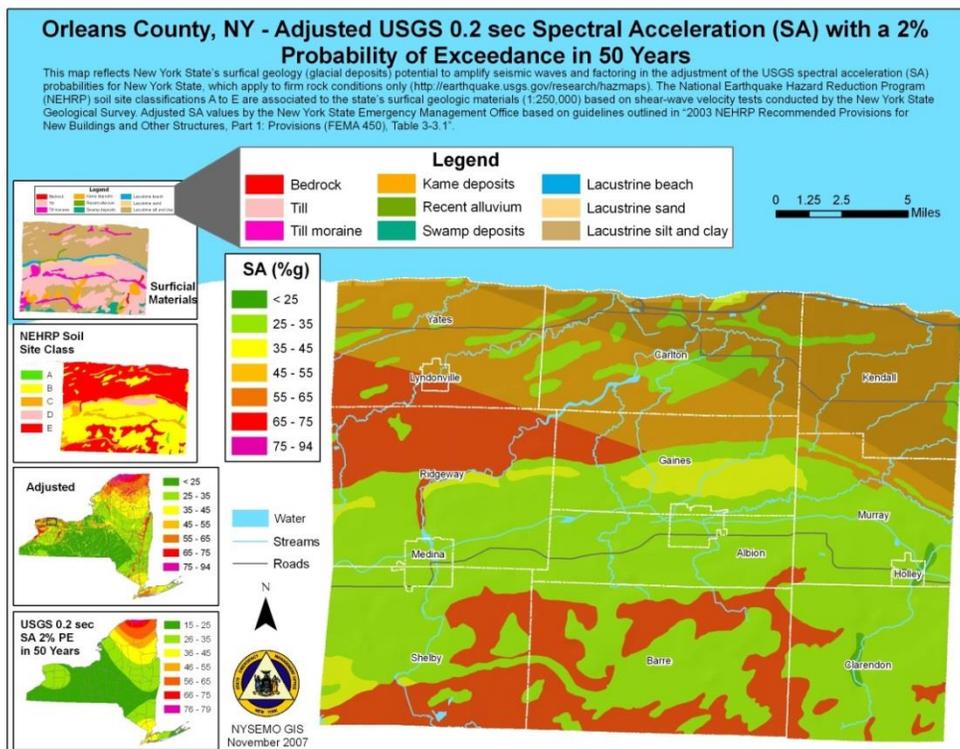


Figure A.3-94: Oswego County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

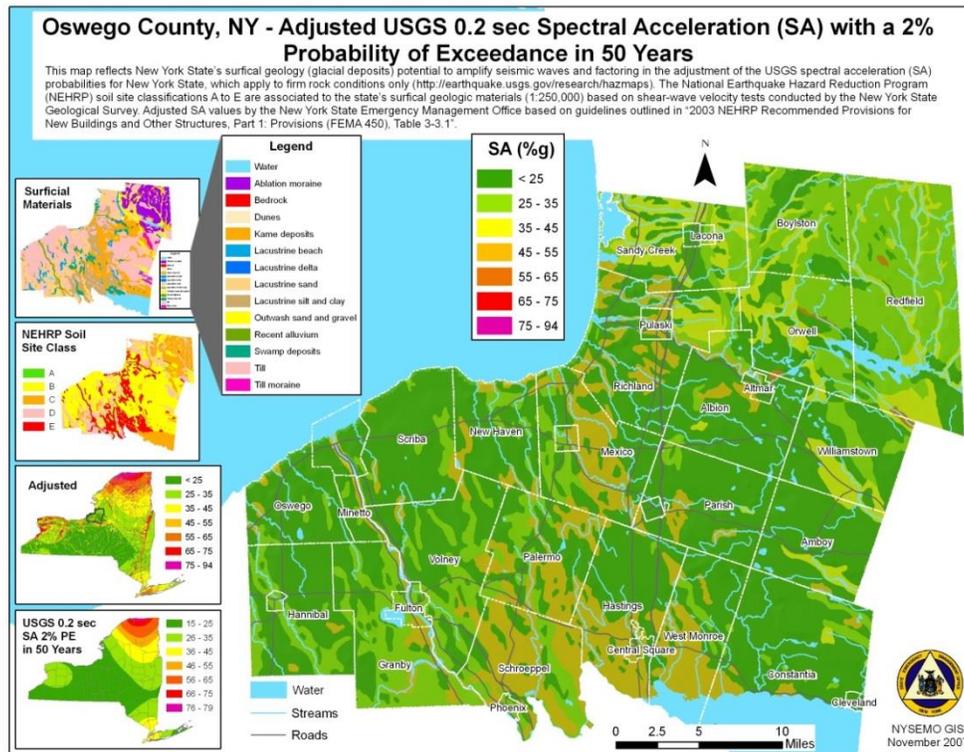


Figure A.3-95: Otsego County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

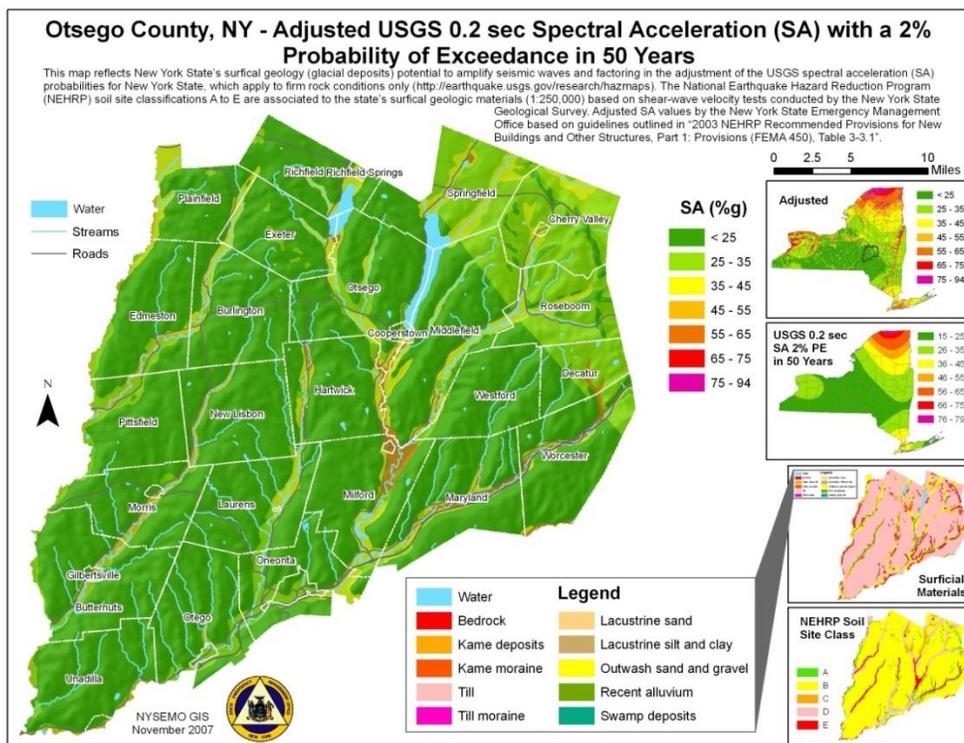


Figure A.3-96: Putnam County, NY Adjusted Spectral Acceleration with a 2% Probability of Figure Exceedance in 50-Yrs

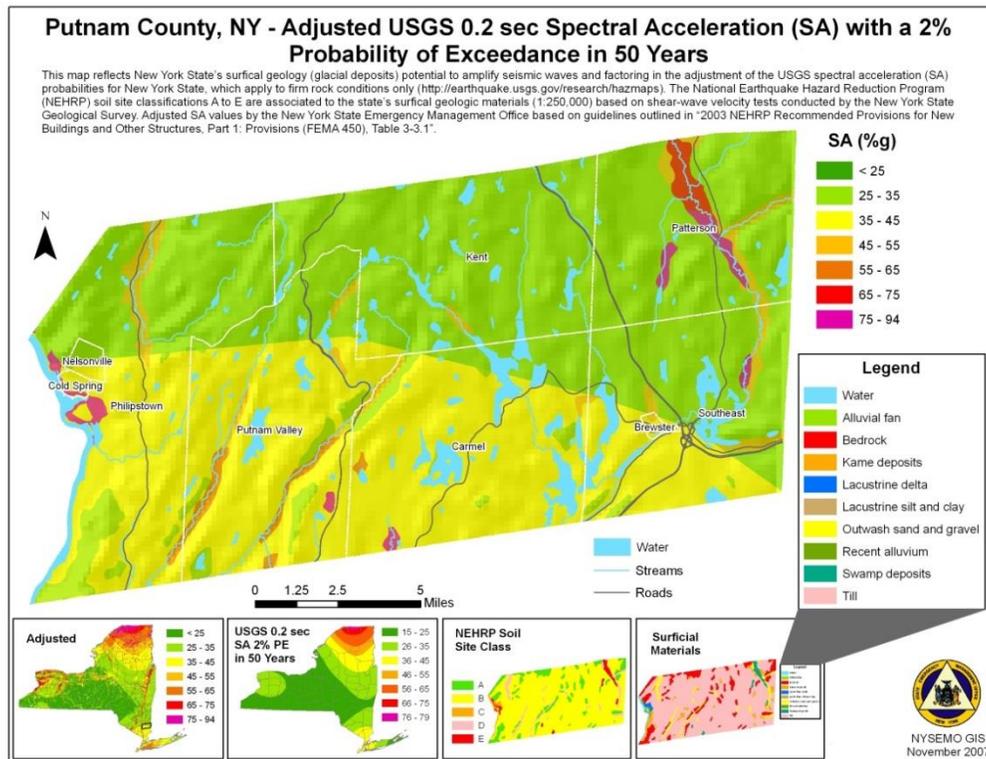


Figure A.3-97: Rensselaer County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

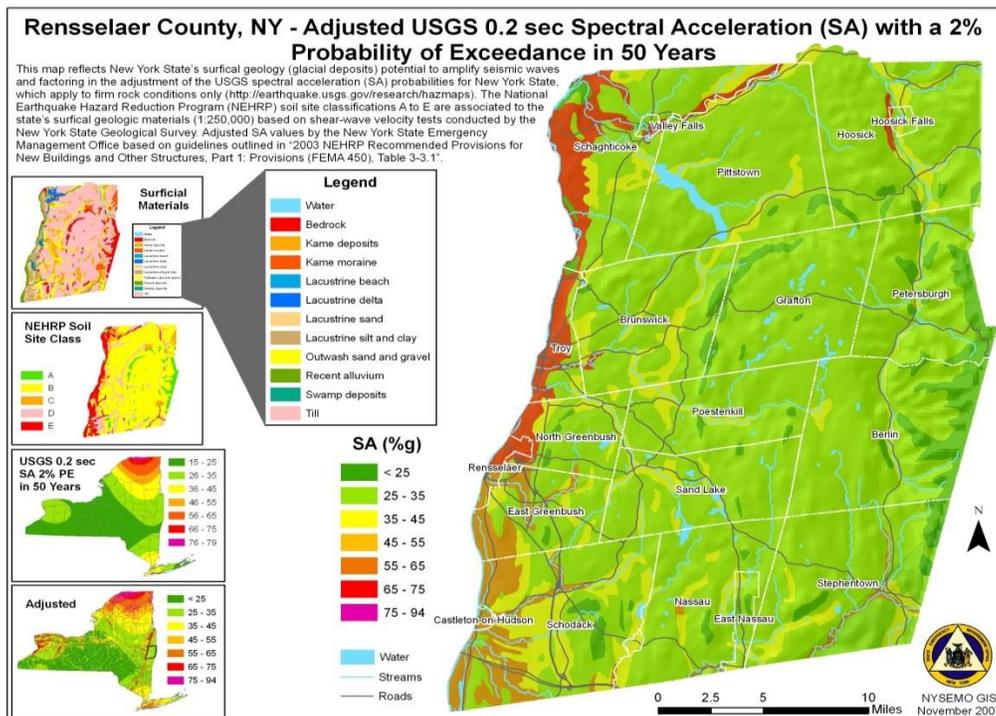


Figure A.3-98: Rockland County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

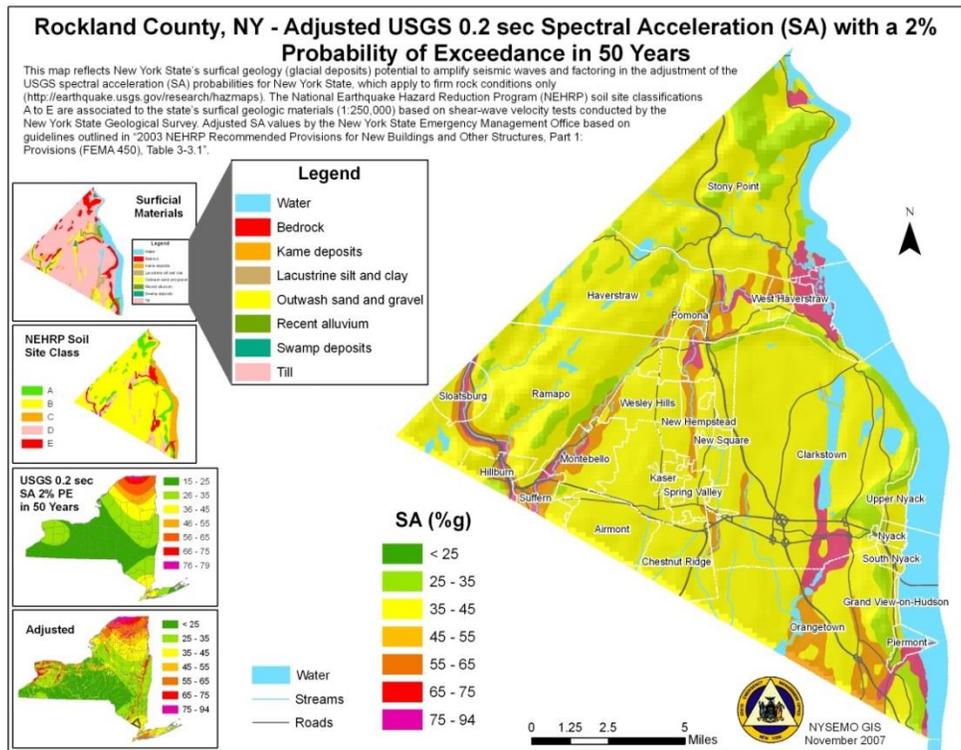


Figure A.3-99: Saratoga County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

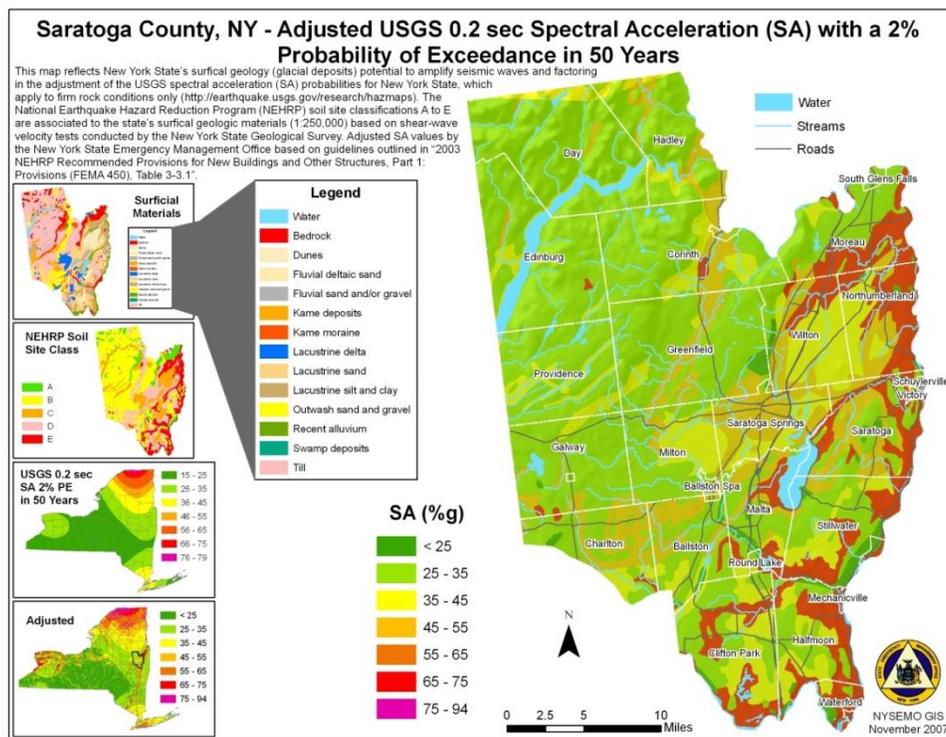


Figure A.3-100: Schenectady County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

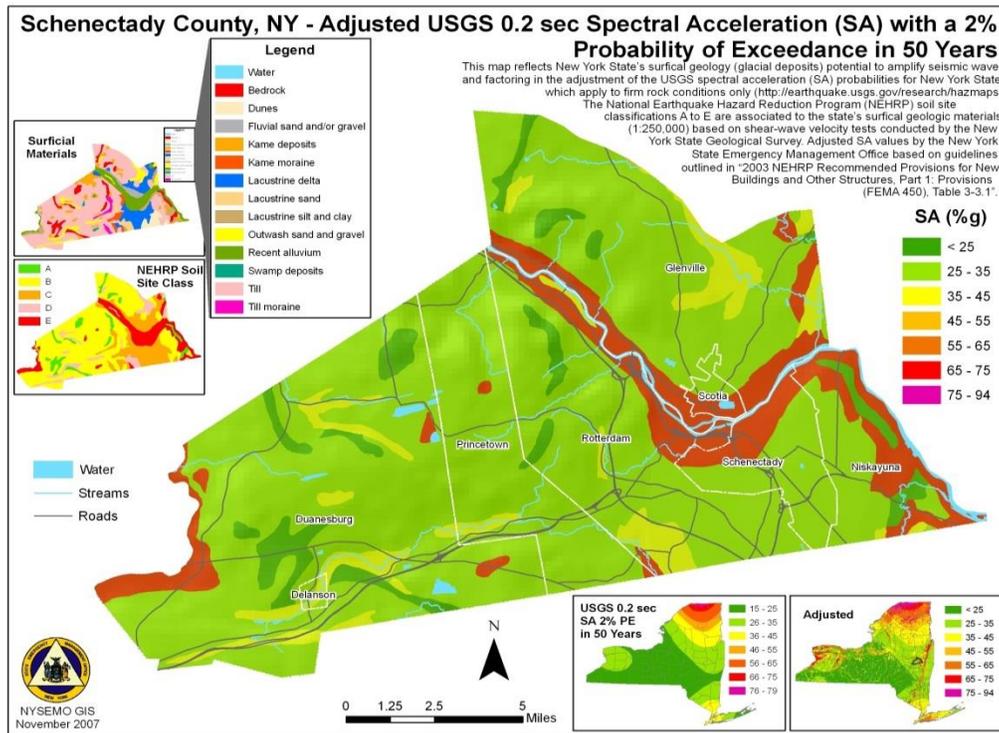


Figure A.3-101: Schoharie County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

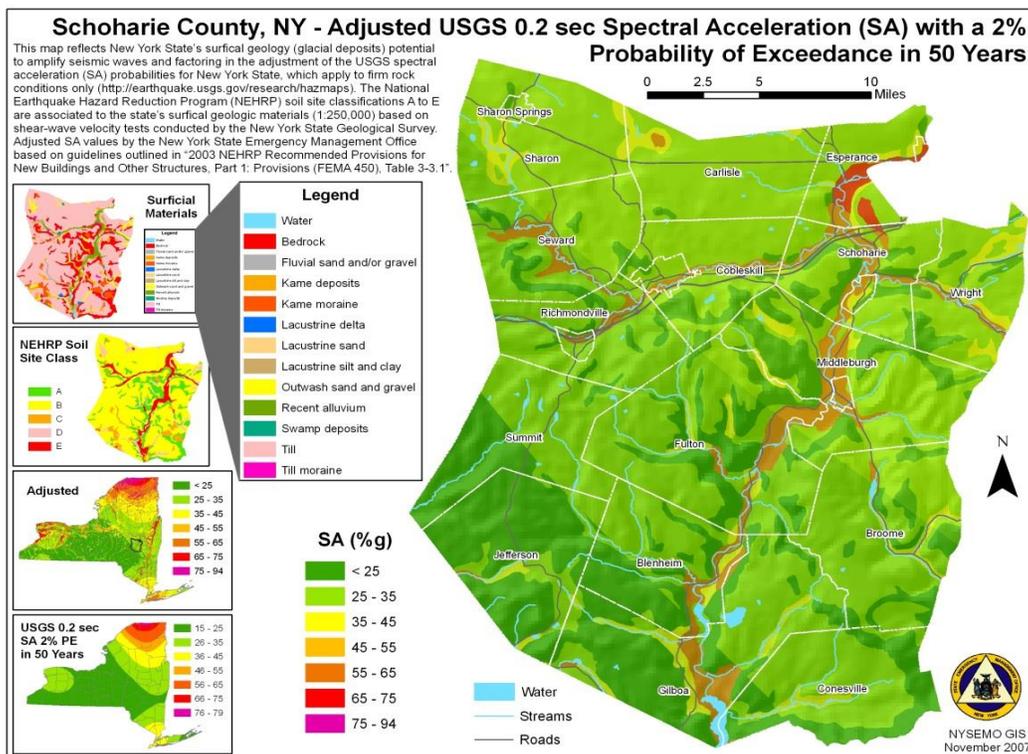


Figure A.3-102: Schuyler County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

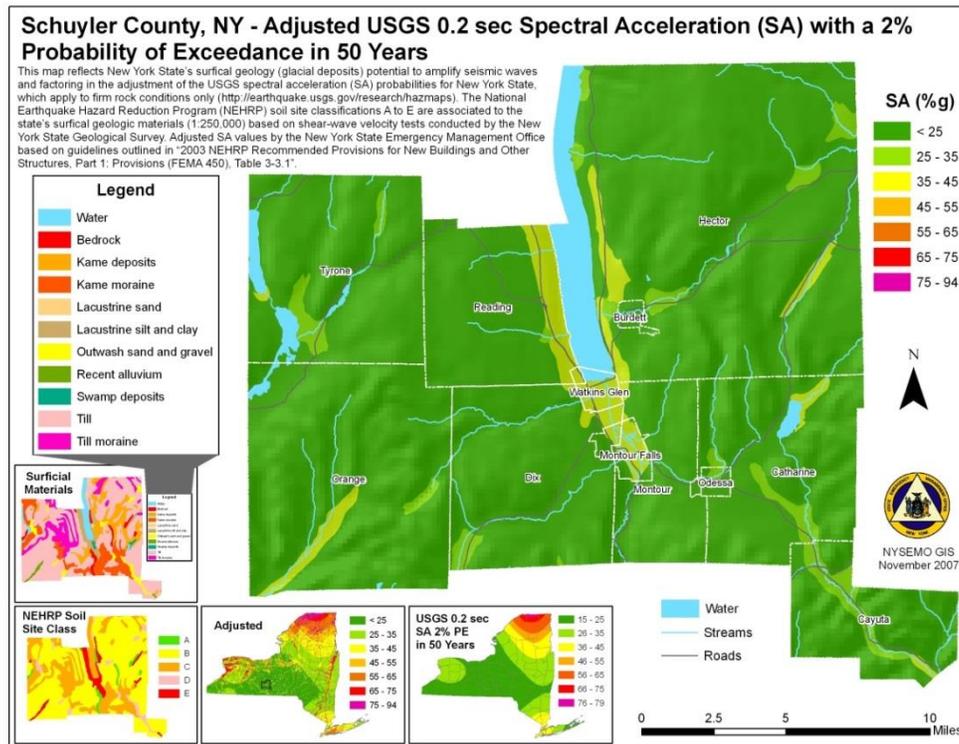


Figure A.3-103: Seneca County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

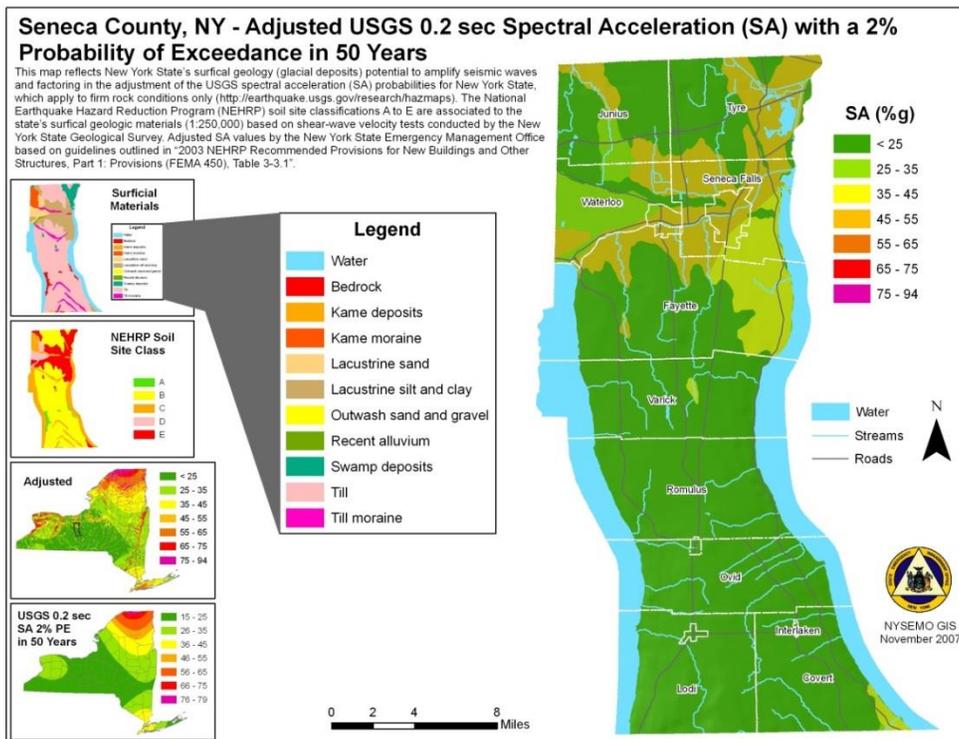


Figure A.3-104: Saint Lawrence County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

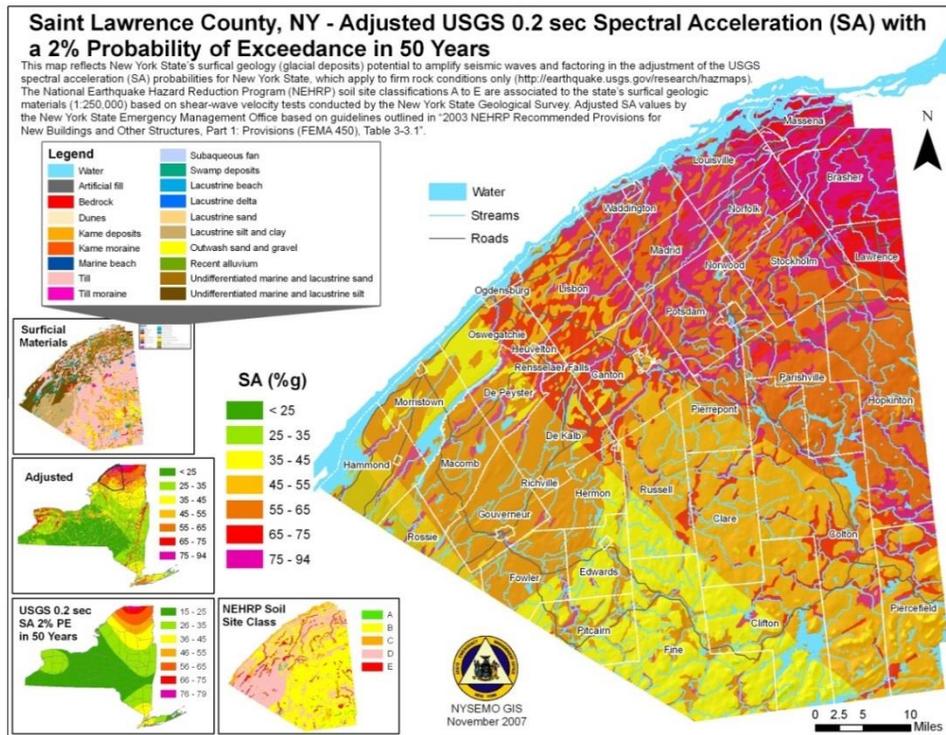


Figure A.3-105: Steuben County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

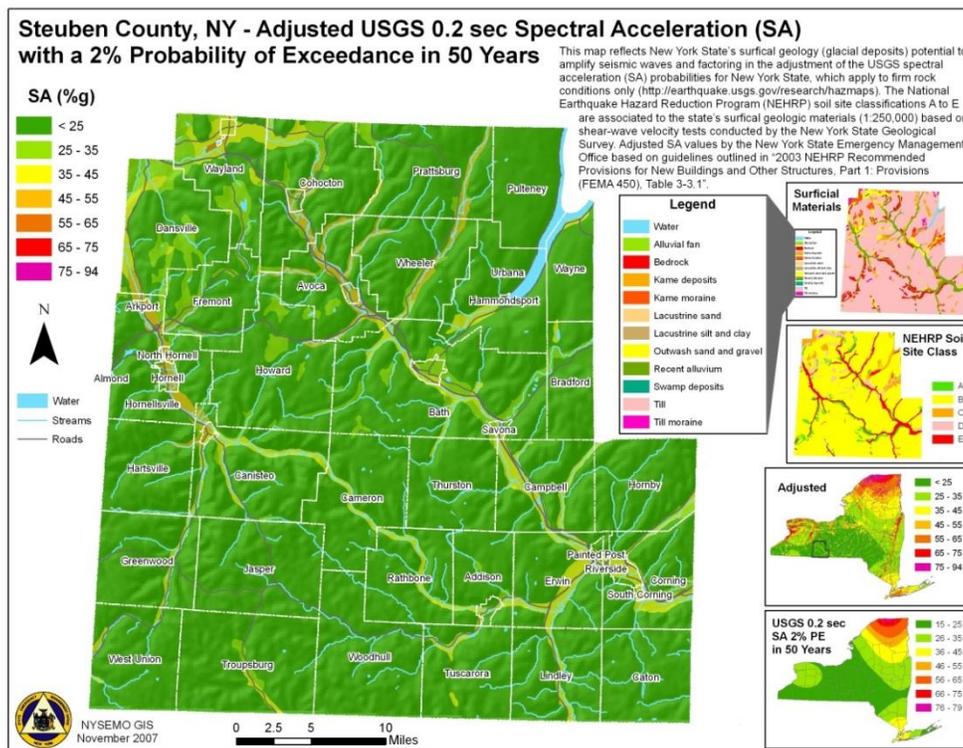


Figure A.3-106: Suffolk County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

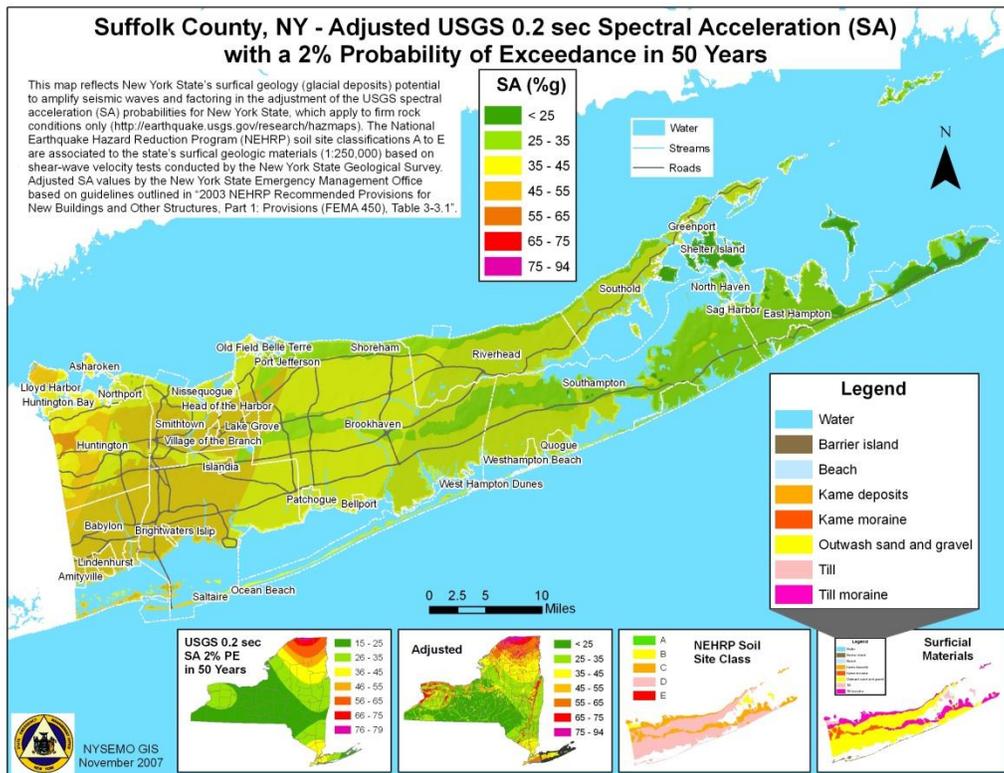


Figure A.3-107: Sullivan County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

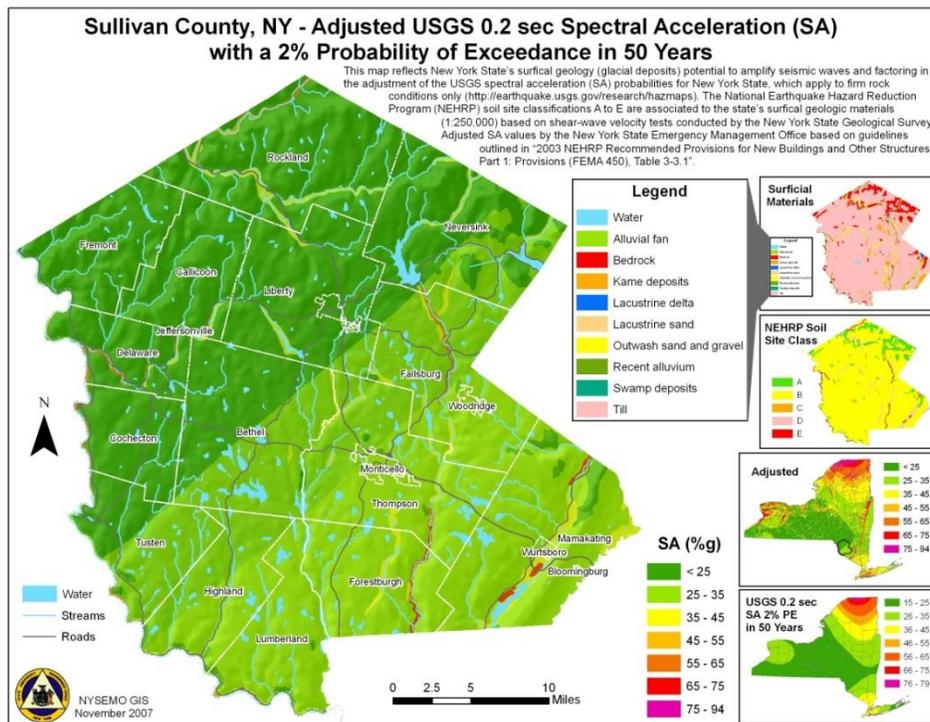




Figure A.3-110: Ulster County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

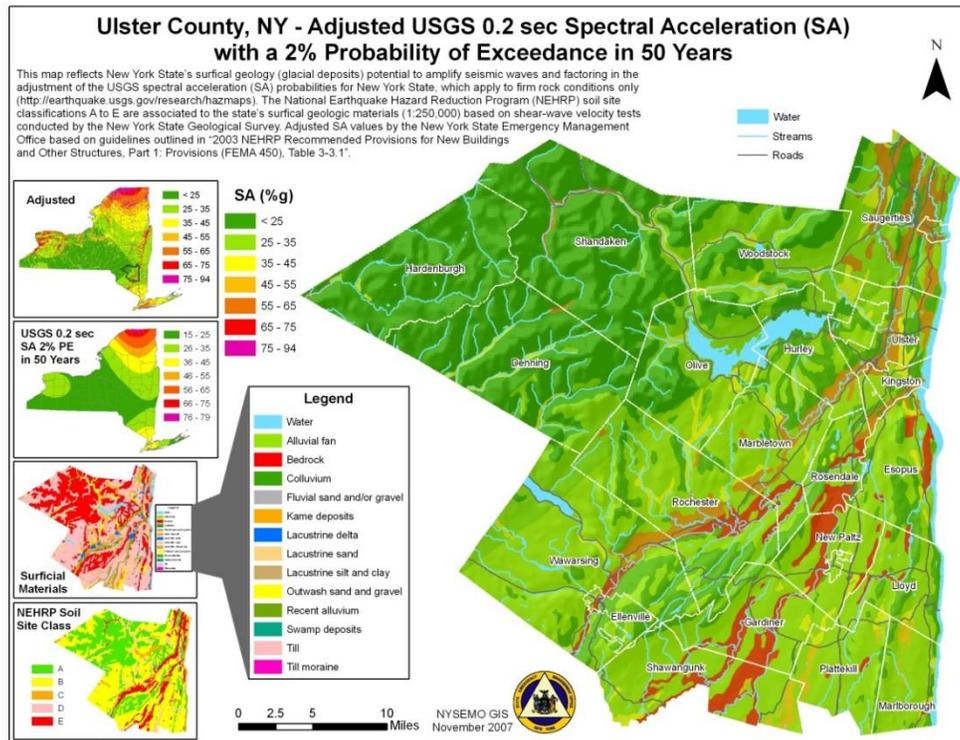


Figure A.3-111: Warren County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

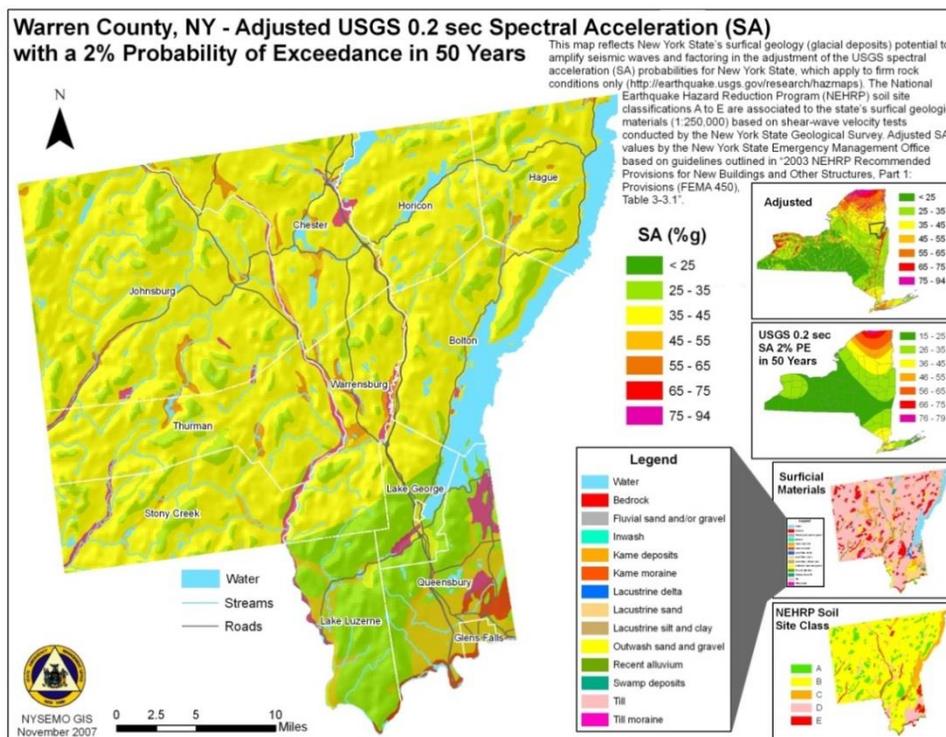


Figure A.3-112: Washington County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

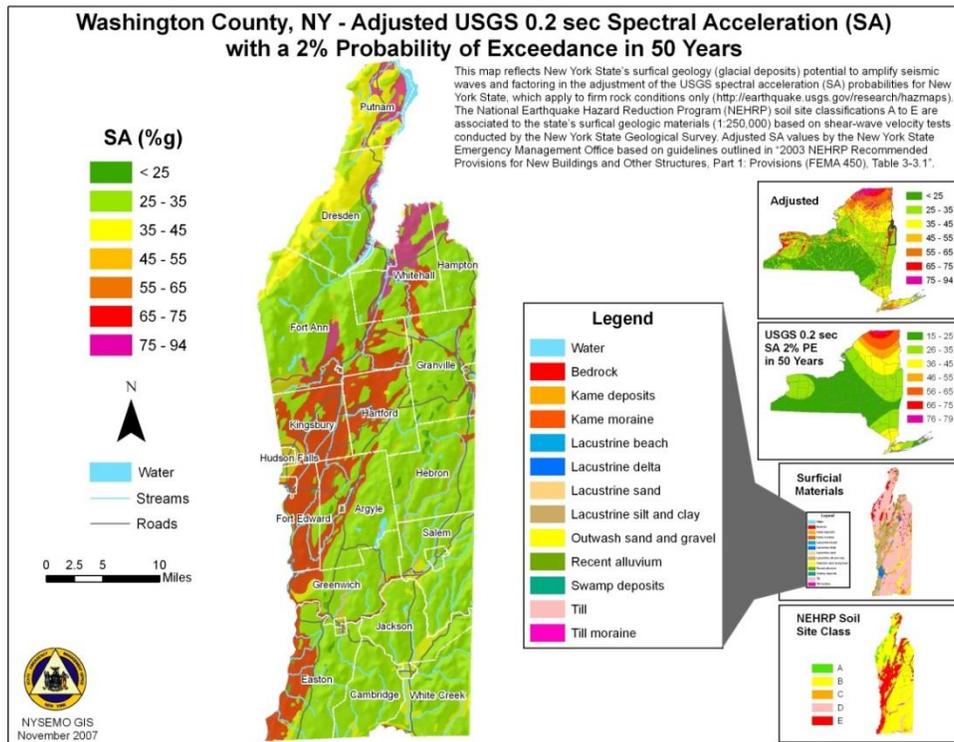


Figure A.3-113: Westchester County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

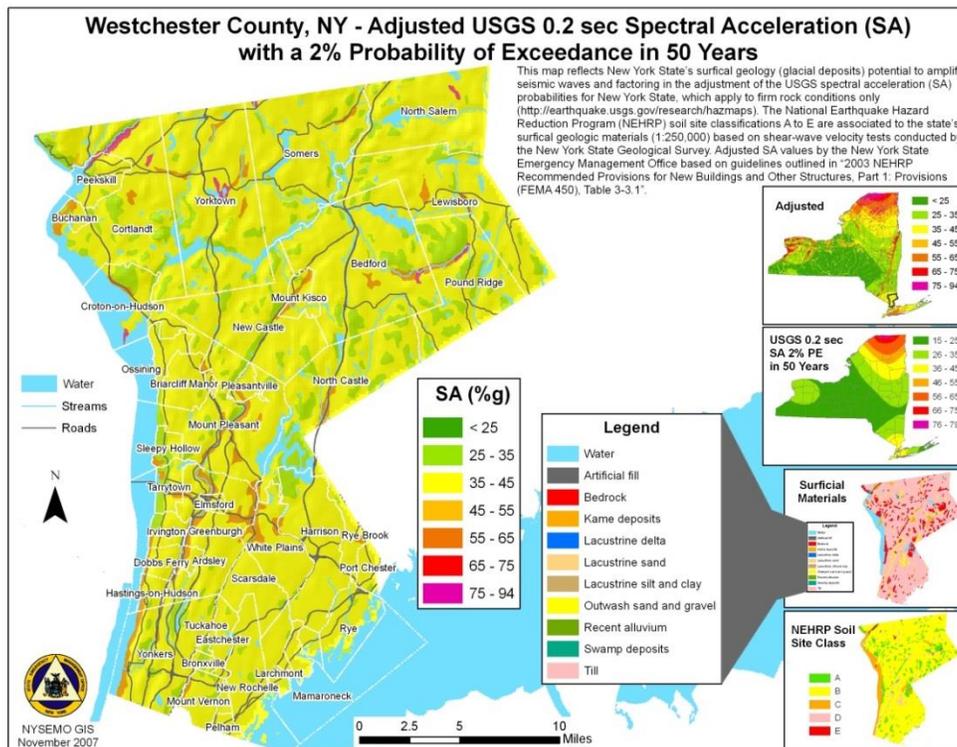


Figure A.3-114: Wyoming County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

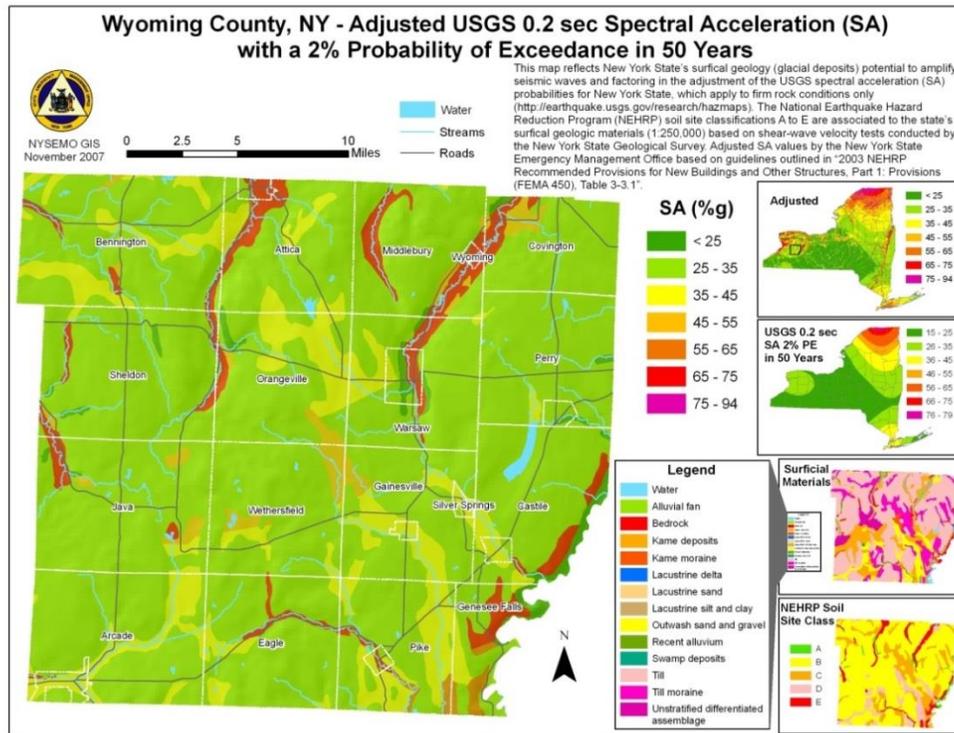


Figure A.3-115: Yates County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50-Yrs

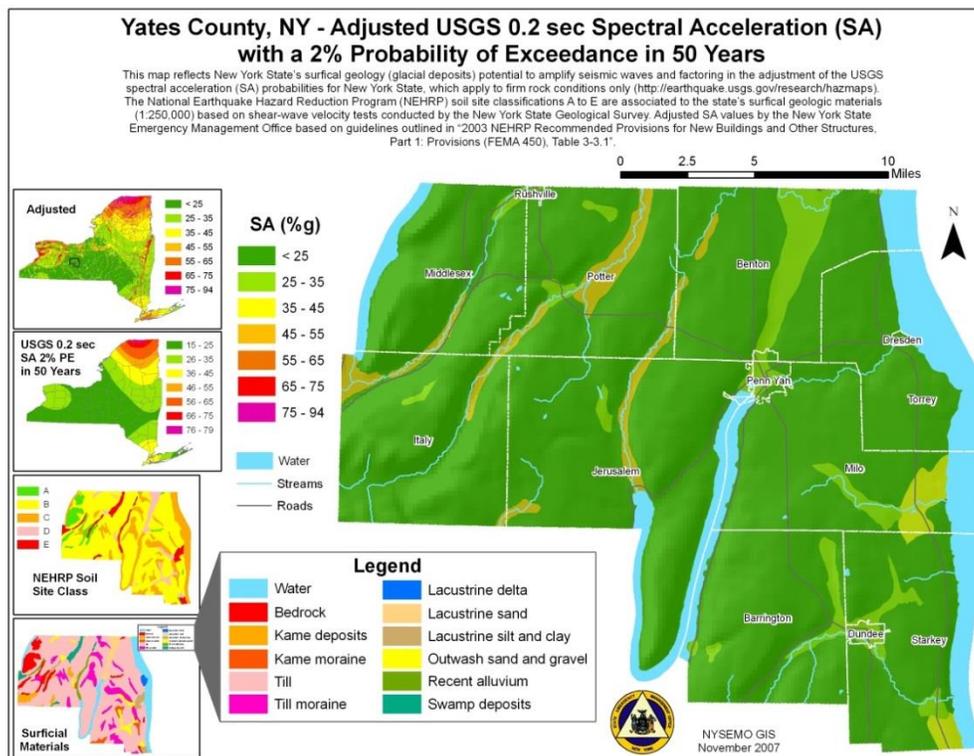


Figure A.3-116: Annualized Earthquake Loss per Capita

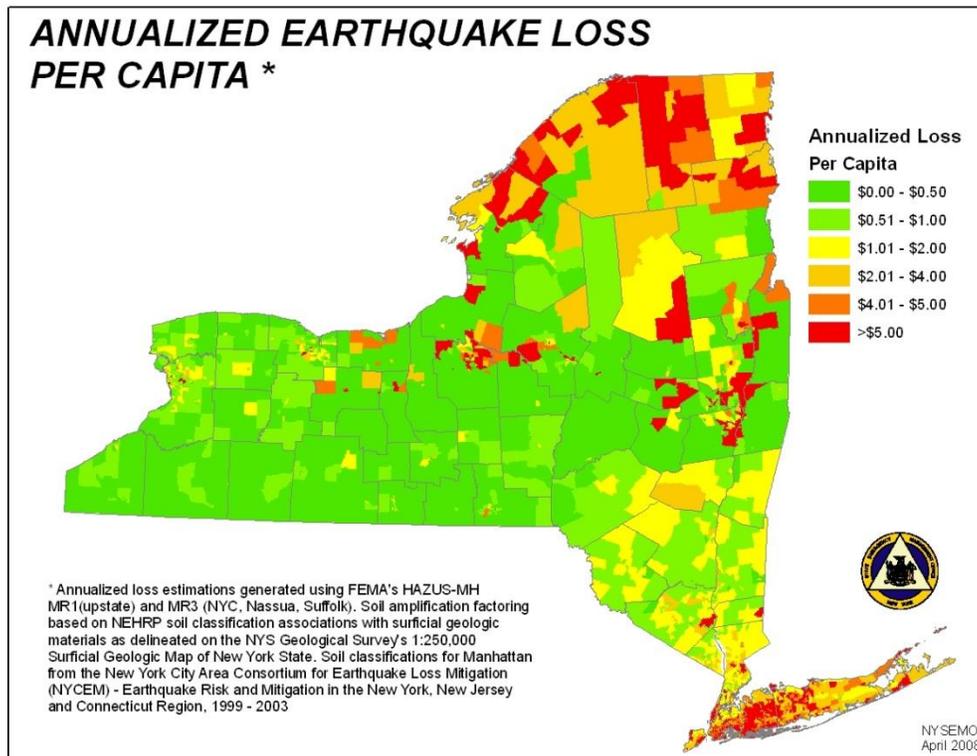
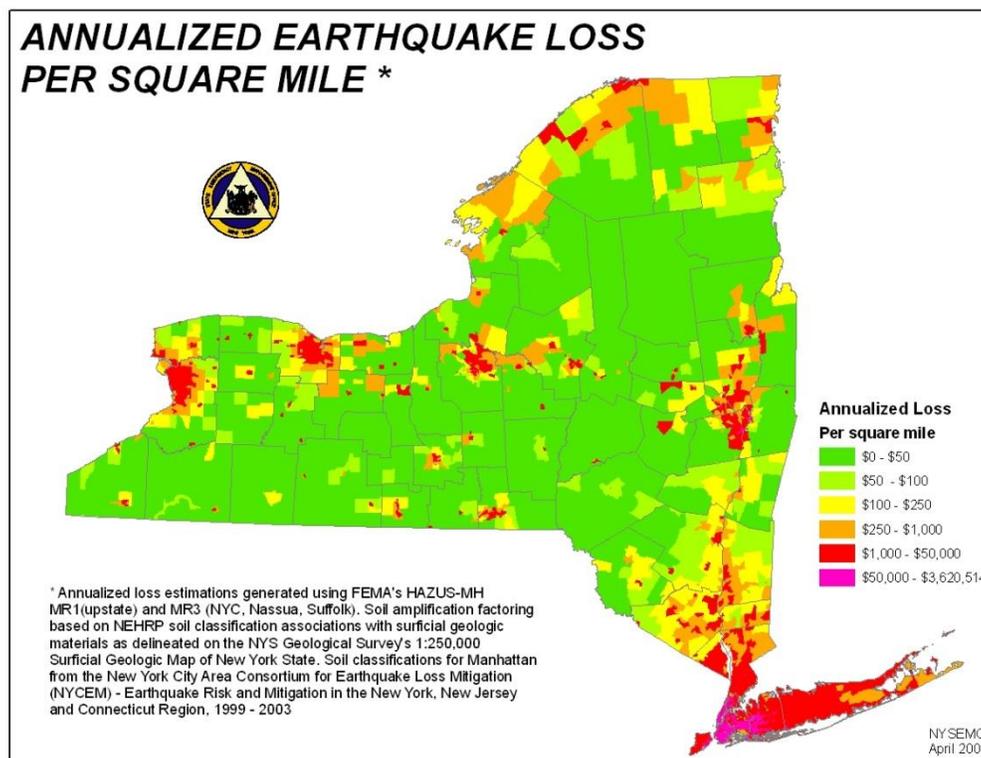


Figure A.3-117: Annualized Earthquake Loss per Square Mile



## New York City Area Consortium for Earthquake Loss Mitigation

In 2005 the New York City Area Consortium for Earthquake Loss Mitigation (NYCEM) published a report known as the NYCEM report. This study began in 1999 and was concluded in 2003. The report combines the New York, New Jersey, and Connecticut metro region. This group was created in 1998 with the intent to create public awareness of seismic risk. The group consists of interested organizations and major public and private stakeholders from Federal and State emergency management, public service, engineering, architecture, financial and insurances companies, and academia.

The following excerpt is from the NYCEM report on why they did this study.

### Why This Study?

Our specific objectives for this study were to:

- Develop and implement a risk and loss estimation for the metropolitan NY-NJ-CT region using HAZUS, which is FEMA's methodology for performing loss estimations;
- Assemble soil information for the entire Tri-State region to quantify details of the seismic hazard;
- Compile a complete building inventory for Manhattan to estimate local impact, and a less detailed building inventory for the surrounding metropolitan areas to realistically quantify regional risk;
- Identify and model a variety of earthquake scenarios and their probable consequences;
- Assess the performance of individual, essential facilities relative to the probable demands placed on them;
- Present results and recommendations for developing and implementing cost-effective risk management plans to reduce potential damage and losses.



Table A.3-3: A Summary of the Findings of the NYCEM Report

Study Results for the Tri-State Region for different Scenarios									
Scenario	Building Damage	Income Losses	Total	Hospitalization	Deaths	Shelter Needs	Fires	Buildings Complete Damage	Debris
M5	\$4.4 b	\$0.4 b	\$4.8 b	24	13	2,800	500	45	1.6 m tons
M6	\$28.5 b	\$10.8 b	\$39.3 b	2,296	1,170	197,705	900	2,600	31.9m tons
M7	\$139.8b	\$57.1b	\$196.8 b	13,171	6,705	766,746	1,200	12,800	132.1m tons
100-yr	\$0.1 b	\$0.1 b	\$0.2 b	0	0	0	0	0	0.2 m tons
500-yr	\$6.1 b	\$2.0 b	\$8.1 b	28	14	575	50	100	3.1 m tons
2500-yr	\$64.3 b	\$20.4b	\$84.8 b	1,430	727	84,626	900	2,200	34.0 m tons
9/11/01	\$13.0 b	\$52-64b	\$98.0 b	6,000		300	10	20	1.6 m tons

Source: NYCEM Report

**NOTE:** For this report the events of September 11<sup>th</sup> 2001 are used as a real life benchmark to be able to make a comparison for the listed earthquake scenarios.

One of the key findings to take from **Table 3-61** is that in the case of an **M6** Earthquake which is considered a moderate event. The total devastation for the area is quite high, in all a total economic loss of almost \$40 billion (**does not include critical infrastructure**) with an estimated loss of life at 1,170. The loss of life is almost on par with that of Hurricane Katrina. Another key issue to point out is that Earthquakes are not seasonal they can happen at any time of the year. For example imagine the varying differences in need and response if an M6 Earthquake were to occur in July compared to January. A winter scenario could dramatically alter the needs of affected people and response to the event.

This following excerpt from the NYCEM report summarizes critical data regarding Population, Buildings and Real estate, and Infrastructure and Essential Facilities.



## Population

In the event of a damaging earthquake in the NY-NJ-CT region, about 18.5 million people in 7 million households would be at risk. The number of human fatalities is the ultimate measure of severity in any disaster.

## Buildings and Real Estate

The large population lives and works in about 3.5 million buildings with a combined 13 billion square feet and a total replacement value of \$1 trillion, excluding contents. About 95% of the buildings are residential. The region occupies nearly 12,000 square miles, has 28 counties, and contains about 5,000 census tracts.

## Infrastructure and Essential Facilities

The region has a very valuable infrastructure that would be severely at risk in the event of a damaging earthquake. Replacing transportation and utility systems alone is estimated to cost \$200 billion. Add to this the damage to essential facilities, and the value at risk increases significantly:

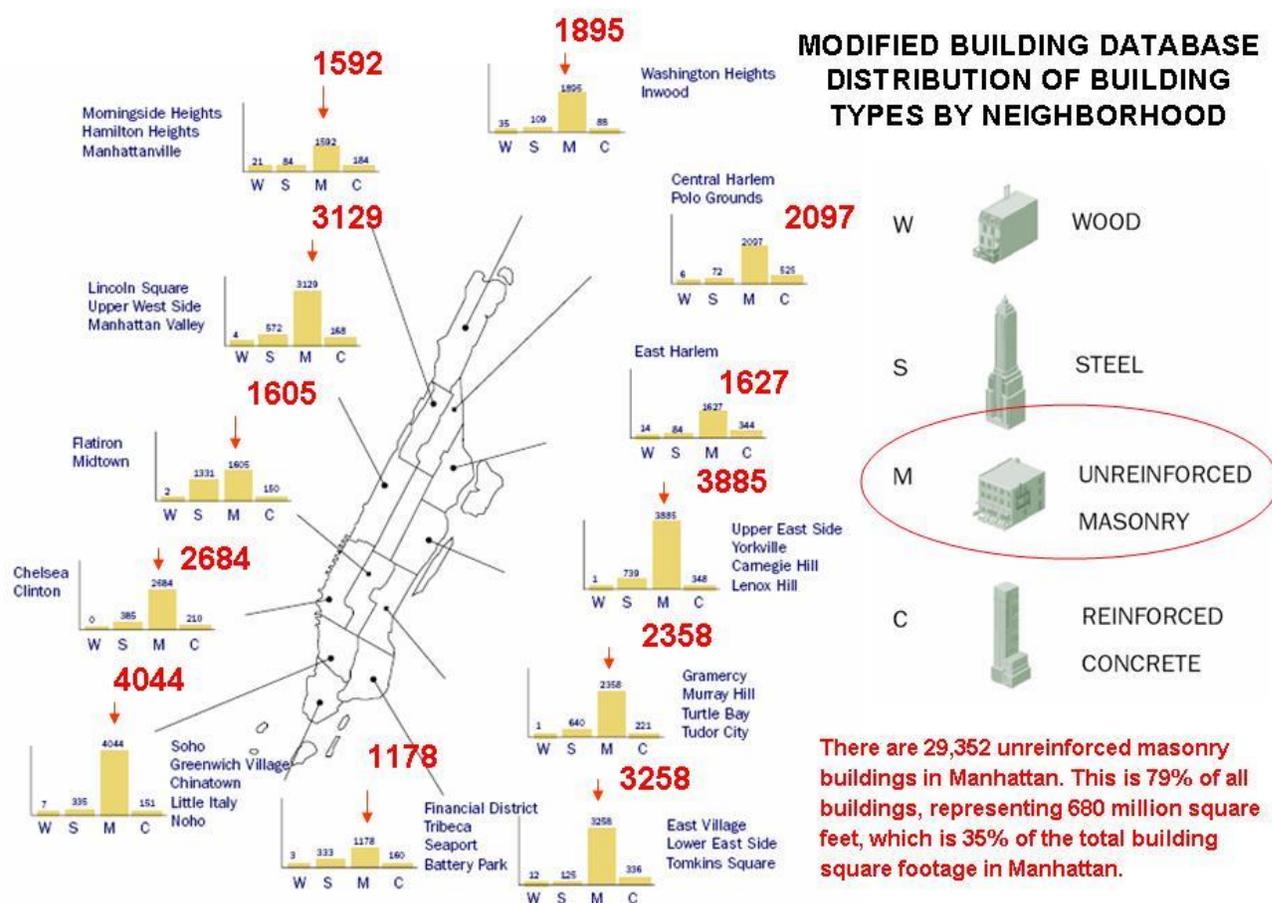
- 246 hospitals
- 123 emergency operation facilities
- 878 fire stations
- 1,348 dams (402 considered “high hazard”)
- 744 police stations
- 53,095 hazardous material sites
- 2 nuclear power plants

### **(Excerpt from the NYCEM Report)**

An extremely alarming and valuable conclusion of this report is that, the greatest damage and concentration of affected population would be in and around the New York City Metro Area.



Figure A.3-118: Building Types in Manhattan Neighborhoods



**“Determining what level of damage buildings experience is the essential component and heart of the loss estimation process.”** (NYCEM Report)

The alarming situation with Unreinforced Masonry is that buildings made of this material are highly susceptible to damage in an Earthquake event and they constitute 79% of all buildings in Manhattan. They are the most vulnerable to damage out of any building type evaluated. The reason is that they are brittle and do not absorb the motion, as well, as the other structure types do (Wood, Steel, and Reinforced Concrete). For more information regarding the NYCEM report please visit their website at [www.nycem.org](http://www.nycem.org).

### Mitigation Actions

One of the crucial factors in prevention and mitigation requires that jurisdictions adhere to the building codes that NYS has adopted. New York State follows the International Building and Residential Codes and each jurisdiction within NYS is required to meet these standards. Local jurisdictions can have their own codes and variances as well, but the



International Building and Residential Codes must be met. These codes have specific requirements for construction (typically new construction) that take into account wind load and seismic activity. For further information regarding New York State's building codes please visit the Department of States website at <http://www.dos.state.ny.us/>, as well please reference any local codes or variances that may apply to your specific area.



# LANDSLIDE DATA

## Landslide Susceptibility – A Pilot Study of Schenectady County, NY

William Kappel, USGS; William Kelly and Andrew Kozlowski, NYSGS; Daniel O'Brien, Jason McWhirter and Ran Zhang, NYSOEM; James Kalohn, and Mark Storti, Schenectady County Economic Development and Planning Department; Tony Minnitti, NYSDOT; Steve Emerick, NYSOCC.

### Background

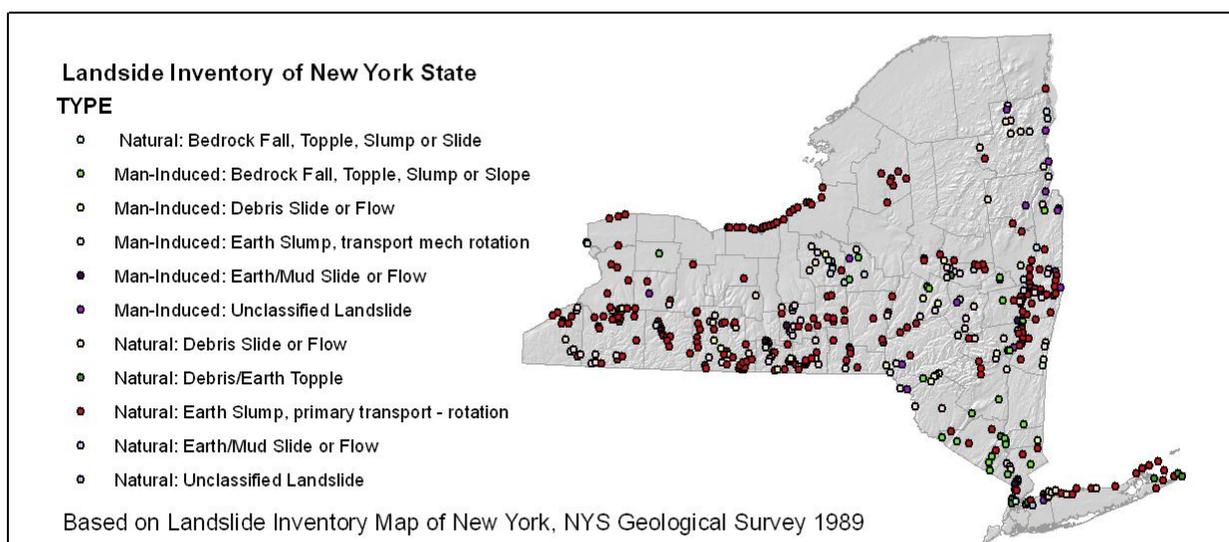
A major impediment in developing an effective mitigation strategy for landslides has been the lack of mapping that delineates, with the necessary degree of geographic specificity, the slopes that are most susceptible to landslide. Consequently, there is a great deal of uncertainty about this hazard in respect to where to target mitigation actions and how to factor this hazard into local land use planning. A contrasting analogy can be made with flood hazard where extensive floodplain mapping has been undertaken through the National Flood Insurance Program (NFIP) and based on those delineations, mitigation measures and policies have been adopted and more informed decisions about the need for insurance can be made. In the case of landslides, no such map products exist.

With only a limited understanding of the areas that are most susceptible to landslides, communities often make land use decisions and approve site plans that do not factor this hazard. Opportunities to take mitigative action such as slope stabilization are missed as hazardous areas go unidentified. Exacerbating conditions such as leaking water lines that drain into vulnerable slopes fail to get the appropriate maintenance priority or drainage discharges that need to be rerouted go unchecked. Best practices, such as avoiding additional loading on vulnerable slopes with debris or other materials or excavating from the bottom of these slopes, are rarely presented in clear and consistent messages to the public. Property owners are often taken by surprise and find themselves uninsured when damaging events occur.

The reasons for limited areas where landslide studies and hazard maps are available has much to do with an analysis that has been manually intensive, time consuming, and cost prohibitive. This situation is further magnified by the number and widespread areas in New York State that have experienced landslides (see **Figure 3-203**). The studies that have been focused primarily on a manual comparison of slope and the presence of soils prone to sliding, such as the 1982 NYS Geological Survey's "Geologic Hazards and Thickness of Overburden of the Albany, New York 15 Minute Quadrangle" by Robert H. Fickies and Peter T. Regan, New York State Museum and Science Service Map and Chart Series 36.



Figure A.3-119: NYS Landslide Inventory



Since this 1982 study there have been key developments in the area of GIS that have provided an opportunity to use the power of the computer to analyze and map what was previously done by hand. In addition, key datasets critical to landslide analysis have been converted into digital formats – particularly slope and soils. These datasets can be overlaid on a GIS with the ability to map locations of areas that have the coinciding soil properties and slope conditions that are most susceptible to sliding.

The recognition that significant progress in the area of landslide hazard mapping may be within reach given both GIS technology and the expanding availability of key digital datasets was previously noted in the 2004 New York State Hazard Mitigation Plan. This was also the agenda topic of a June 2006 meeting of Federal and State scientists and emergency management officials hosted by the USGS New York Water Science Center, Troy, NY. At this meeting a proposal entitled “Evaluation of Landslide Potential in New York State” drafted by the USGS, New York Water Science Center, Ithaca, NY was circulated. The proposal outlined an approach to generating a “Landslide Susceptibility Map for New York State” and the development of a landslide “Fact Sheet” targeted at local government officials. While the USGS proposal was well received, funding for the proposal remained elusive during the following year.

### Pilot Study Purpose

While the June 2006 USGS proposal was supported in concept by the attending officials, there was no example product available that could be used to help convey what was being proposed that could be used to educate and generate additional support from a wider audience. In efforts to move the proposal forward, a “proof of concept” pilot study was discussed in July 2007 between the NYSOEM, USGS and the NYSGS. At this time, the updating of the New York State Multi-Hazard Mitigation Plan was underway. This plan lays out a strategic direction to mitigating the impacts of natural disasters, including identifying specific activities that are needed to advance our understanding of risk – the framework of mitigation. The plan update provided an important opportunity to highlight the potentials to advance the landslide hazard risk assessment.

### Pilot Study Organized

With a consensus between SOEM, USGS, and NYSGS that a pilot study would be useful and timely, the SOEM Planning Section suggested Schenectady County as a candidate for participating in a pilot study. This recommendation was based on the county's landslide history, the landslides focus within their Local Hazard Mitigation Plan, and the County's obvious interest in mitigating landslides as expressed in applications to SOEM's Hazard Mitigation Grant Program (HMGP).

Based on an initial inquiry to Schenectady County and their expressed interest to learn more about what a pilot study would entail, a preliminary meeting was held with the county on August 13, 2007. In addition to representatives from SEMO, NYSGS, USGS and Schenectady County, representatives from the New York State Department of Transportation (NYSDOT) and the Office of Cyber Security (OCC) also attended.

At this August 2007 meeting Schenectady County expressed tentative interest in participating in the pilot study with their final approval requiring further review by the County's legal staff. There was a concern that the study not enhance the County's liability, which is understandable given the uncertainty with a project with no precedence. The liability concern was heightened by the initial pilot scope, including the risk to water, sewer and storm water infrastructure as well as these systems potential contribution to the landslide hazard due to potential leaking or run-off onto vulnerable slopes.

The County's need to conduct a more thorough legal assessment with regard to its participation would require time that was not available given the State Hazard Mitigation Plan's final submission date was December 31, 2007. With a potential delay that threatened the ability to complete the project on time, a decision was made by the core pilot study agencies NYSEMO, NYSGS, and USGS to proceed irrespective of the County's decision to participate. The pilot would focus only on the natural factors contributing to landslide susceptibility, a Phase I of sorts, leaving the integration of infrastructure as a potential "Phase II" effort. This decision was based on an opinion from SOEM management that the proper role of government is to do its best to understand the hazards it faces, even if the knowledge gained exposes previously unseen risks that call for remedies not previously considered or factored in budgets.

This Phase I with an optional Phase II follow-up approach allowed the group to move quickly and promised a future model to allow State and Federal agencies to deliver initial useful products to Local government that in turn could be advanced to a Phase II as more time, data and funding becomes available.

Fortunately, Schenectady County ultimately decided to participate in the study. Given time constraints it was agreed that the project would focus on the geologic factors – a Phase I study, with the County's role focusing primarily on developing a GIS database of past landslide events. This information would be critical for model validation.

While a Phase I study does not necessarily require participation from Local government, it is most advantageous if a collaborative effort can be established. This is most evident by the contributions Schenectady County has made to this pilot study. The knowledge that Local officials have of their geography and history of events, much of which is first hand, is of great value to understanding the landslide hazard. It is also important to recognize that Local government is in the best position to mitigate the landslide hazard through land use regulation, education and other practices.



### Pilot Study Methodology

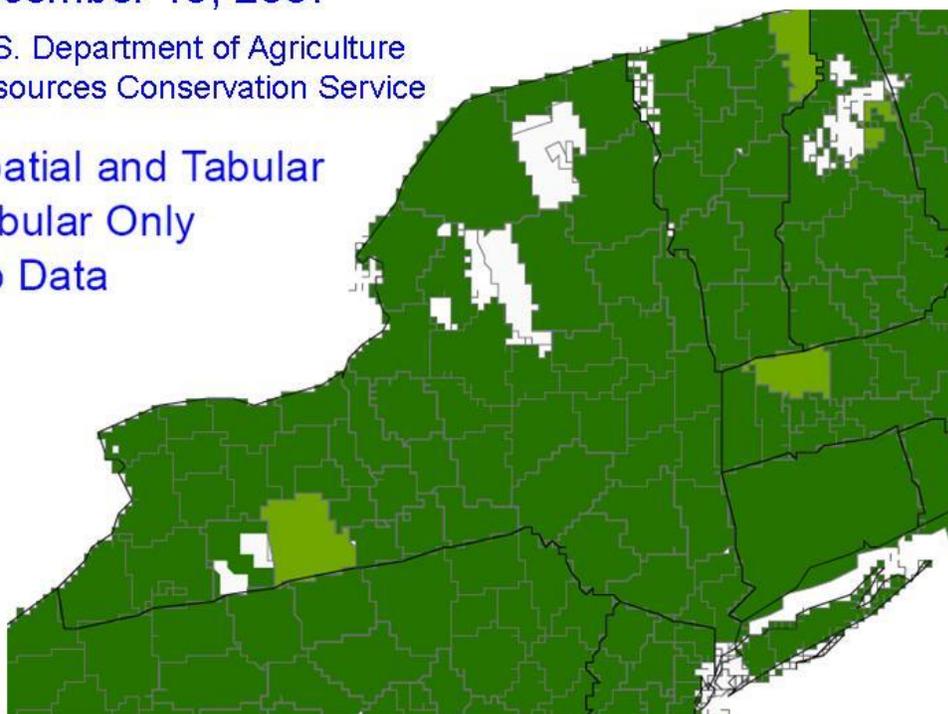
An important aspect of the methodology used in this pilot study is that 5 of the 6 variables used to determine landslide susceptibility are derived from one source - the U.S. Department of Agriculture Natural Resource Conservation Service's SSURGO Digital Soil Survey, accessible for download at: <http://soildatamart.nrcs.usda.gov>.

**Figure A.3-120: NYS Available Soil Data**

### Available Soil Survey Data in New York State As of December 19, 2007

Source: U.S. Department of Agriculture  
Natural Resources Conservation Service

-  Spatial and Tabular
-  Tabular Only
-  No Data



Soil Data Mart at <http://soildatamart.nrcs.usda.gov>

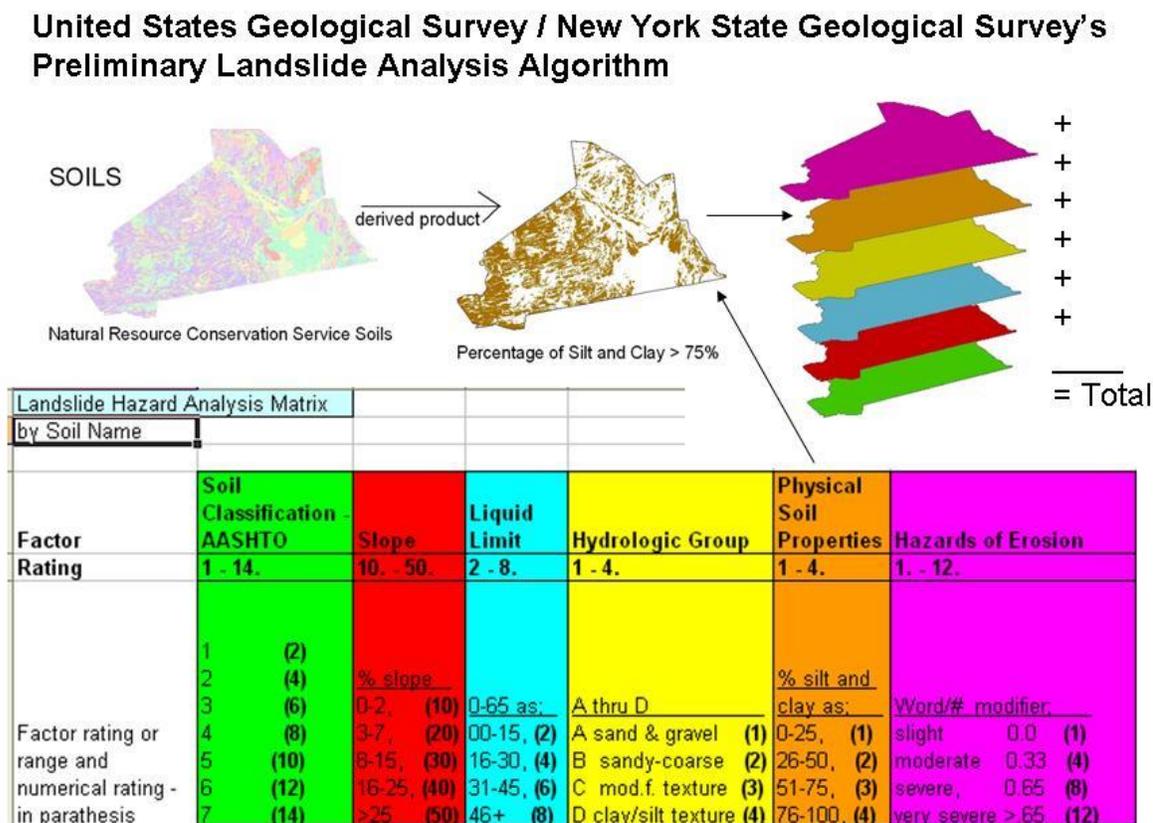
The NRCS web site provides for the ability to select a county of one's choosing and download the SSURGO soil survey database, including information in tabular and spatial (GIS) format. The spatial GIS data includes a GIS shapefile (polygon) of soil units attributed with the soil unit's letter key (field named "MUSYM"), while the tabular data includes a Microsoft Office Access Application with the ability to generate soil reports that provide a great number of data on each soil unit.

Included in the tabular data are soil properties that factor into calculating landslide susceptibility. The soil unit properties contained in the soil survey that were identified by the pilot study geologists Kappel, Kelly, and Kozlowski as landslide susceptibility indicators include: 1) American Association of State Highway and Transportation Officials (ASSHTO) Soil Classification; 2) Liquid Limit; 3) Hydrologic Group; 4) Physical Soil Properties (%silt and %clay); and 5) Hazard of Erosion. In this pilot study methodology, each of these soil unit properties was assigned a weighted



value relative to their contributing factor in predicting landslide susceptibility (see **Figure A.3-121** – relative weights are shown in parentheses).

**Figure A.3-121: USGS/NYS Geological Survey’s Preliminary Landslide Analysis Algorithm**



**Landslide Risk Assessment**

To access the identified soil unit properties, the Microsoft Office Access Application is used to generate soil reports that can be exported to an Excel format. With some database preparation, including deletion of cells containing long sentences, text descriptions and deletion of blank records and cells, this file can be linked to the GIS soil unit shapefile. Using the (MUSYM) field as database link, the pertinent attribute information for landslide susceptibility is established within the GIS layer.

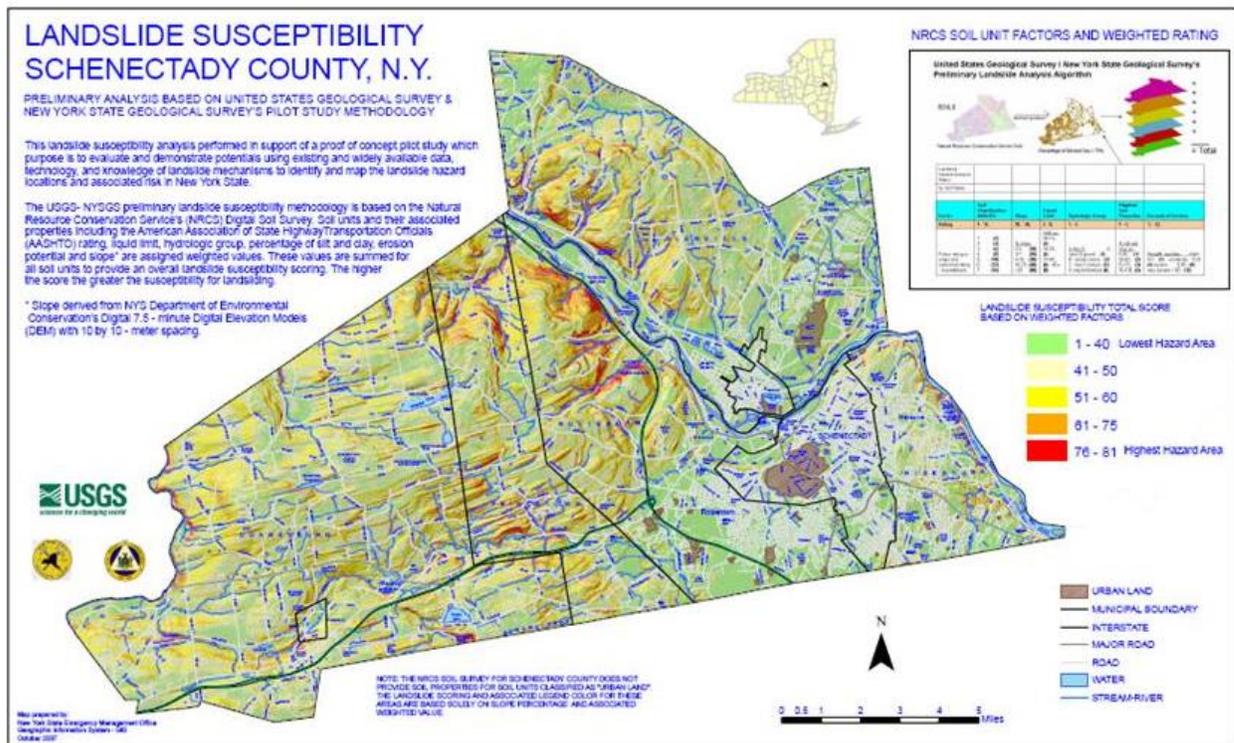
The landslide susceptibility variable that receives the highest weighted value in this methodology is slope. While the SSURGO soil units contain information on slope (indicated by the letters “A”, “B” or “C” that are appended to soil text abbreviation (MUSYM)), the slope values that were used in this study were based on a slope analysis derived from a countywide Digital Elevation Model (DEM) compiled from the NYS Dept. of Environmental Conservation (DEC) 7.5 Minute Quadrangle DEMS. It was believed this would provide a more accurate indicator of slope than the SSURGO source. The slope map generated from the NYS DEC’s 7.5 Minute Quadrangle DEMS was combined (ESRI “Union” command) with the SSURGO Soil Survey GIS layer that was previously attributed with the landslide susceptibility variables. At this point each discrete soil unit had all six variable values and



the corresponding weighted values as individual fields in the attribute table. The six fields containing the weighted values of the six variables were then summed to establish landslide susceptibility "total score". The "total score" ranged from areas with numbers as low as 4 to as high as 81.

**Figure A.3-122: Thumbnail Overview of Landslide Susceptibility in Schenectady County, NY**

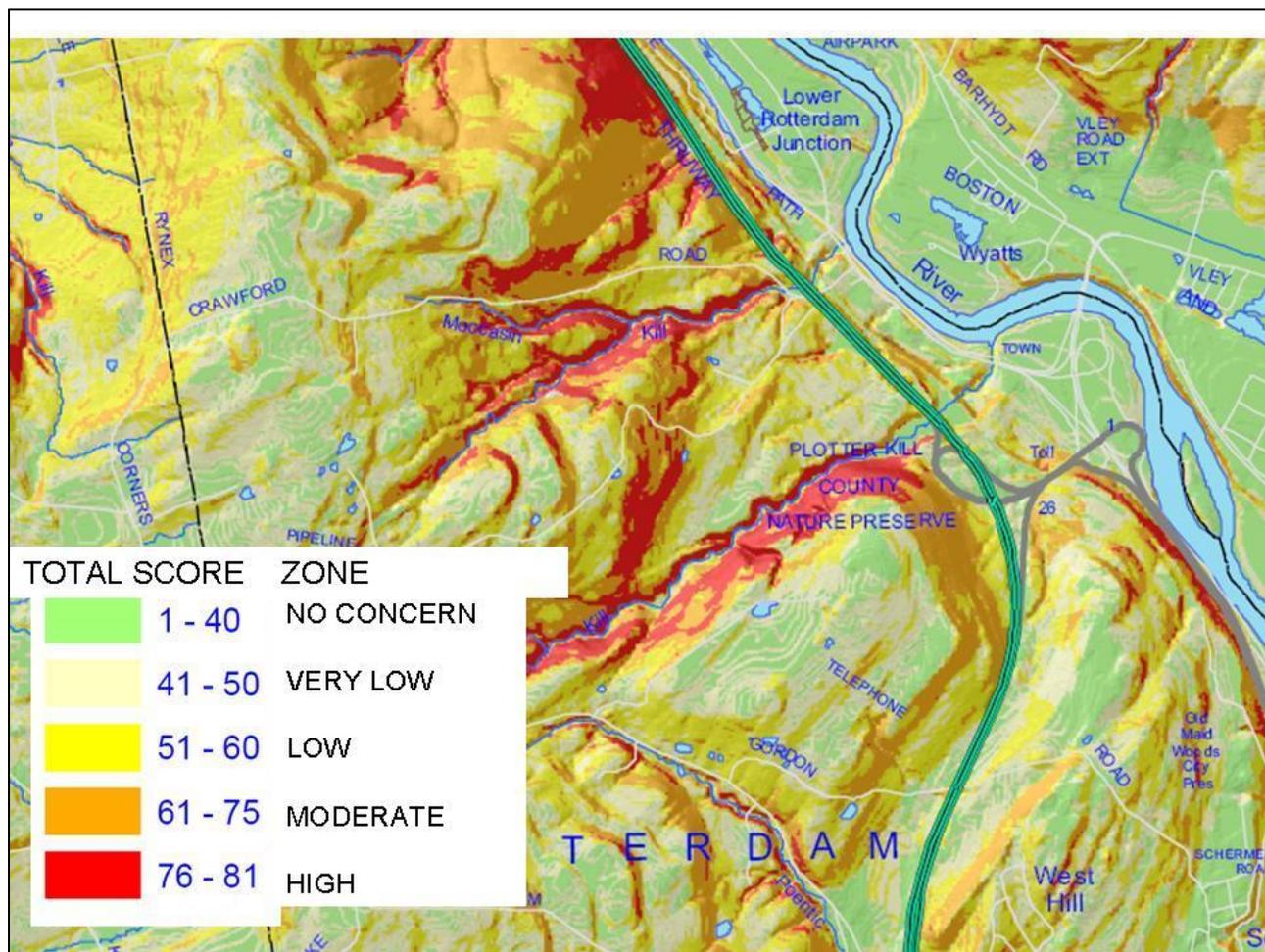
**Thumbnail Overview of 26"x 42" Map Showing Results of Pilot Study: Landslide Susceptibility Schenectady County, N.Y.**



Range groupings were established from total score values to assign landslide susceptibility descriptive zones as HIGH= greater than 75 (Red); MODERATE = 61 to 75 (Orange); LOW = 51 to 60 (Yellow); VERY LOW = 41 to 50 (Beige); NO CONCERN = less than 41 (Green). See **Figure A.3-123**.



Figure A.3-123: Landslide Susceptibility in Schenectady County, NY



#### Model Limitation in NRCS Soil Survey Areas Classified as “Urban”

As the NRCS Soil Surveys were developed primarily for agricultural purposes, portions of the Schenectady County that are highly developed, primarily in the City of Schenectady, have soil units that are classified as “Urban”. The SSURGO database does not include soil properties for the “Urban” soils. Consequently, while slope values for these areas can be calculated from the DEMs, the remaining 5 variables and their associated weighted values were not able to be derived from the Soil Survey. As a result, the total score values in these areas do not reflect the appropriate level of hazard and have been excluded from the study.

#### Pilot Study Validation

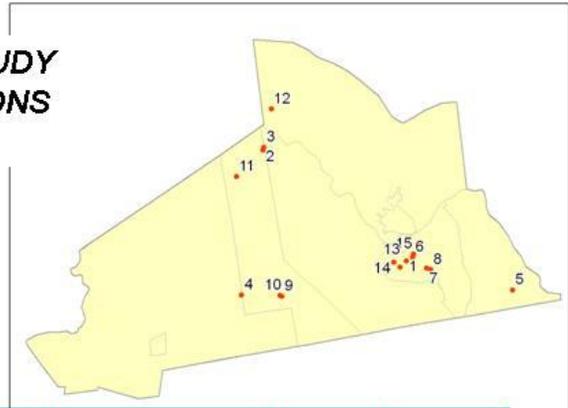
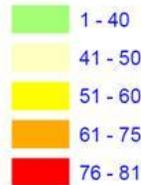
A validation of the model was performed by comparing the locations of past landslide events to the landslide susceptibility map. Schenectady County Economic Development and Planning Department provided a GIS point file of 15 landslide events. These landslides are larger events taken from recent memory and historical records where a general location was easily supplied. There have been many others, usually of lesser magnitude, which have not been geographically located (latitude / longitude) and therefore were not used in this initial assessment.



The GIS file of landslide events was overlaid on the landslide susceptibility map with each landslide event tagged with the “total score” value at the respective point location. The results showing the total score value and associated zone color for each landslide event is shown in **Figure A3-124**.

**Figure A3-124: Schenectady County Landslide Study Risk Score Values at Point Locations**

**SCHENECTADY COUNTY LANDSLIDE STUDY  
RISK SCORE VALUES AT POINT LOCATIONS  
OF LANDSLIDE OCCURRENCES**

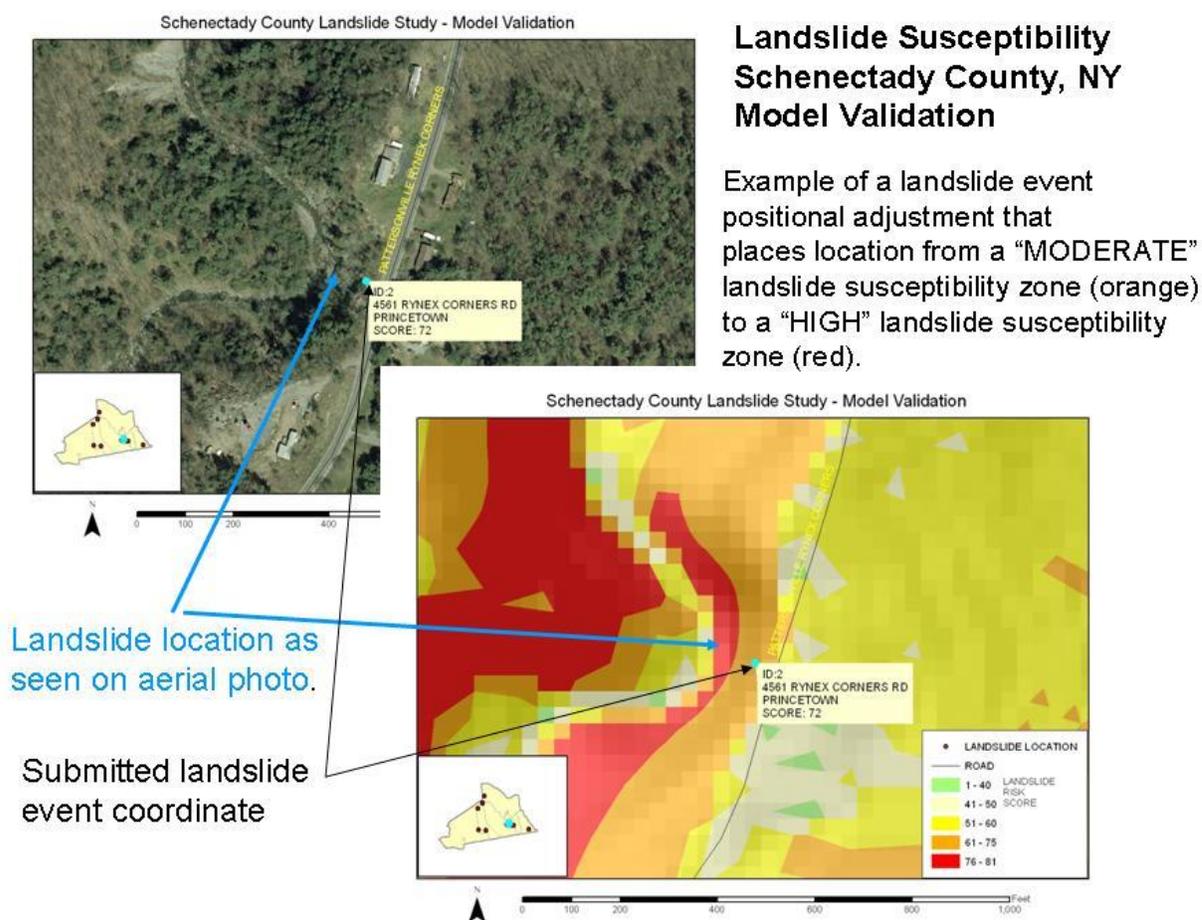


ID	LOCATION	MUNICIPALITY	RISK SCORE	MAP COLOR
1	797 BROADWAY	SCHENECTADY	61	Orange
2	4561 RYNEX CORNERS RD	PRINCETOWN	72	Dark Orange
3	4853 PATTERSONVILLE-RYNEX CORNERS RD	ROTTERDAM	78	Red
4	4169 SCOTCH RIDGE RD	DUANESBURG	68	Dark Orange
5	2654 TROY-SCHENECTADY RD	NISKAYUNA	77	Red
6	585 BROADWAY	SCHENECTADY	76	Red
7	RAMP OFF I-890	SCHENECTADY	61	Dark Orange
8	RAMP OFF I-890	SCHENECTADY	21	Light Green
9	248 KELLEY STATION RD	PRINCETOWN	48	Yellow
10	KELLEY STATION RD	PRINCETOWN	38	Light Green
11	ENNIS RD	PRINCETOWN	76	Red
12	WOLF HOLLOW RD	GLENVILLE	58	Yellow
13	BELLEVUE LITTLE LEAGUE	SCHENECTADY	61	Dark Orange
14	SCHERMERHORN RAVINE	SCHENECTADY	41	Yellow
15	VEEDER/BROADWAY	SCHENECTADY	76	Red

On first inspection, only 5 of the 15 landslide events fall within a HIGH landslide susceptibility zone. On further inspection, however, using an orthoimagery backdrop, it becomes apparent that a slight adjustment in the point location of the landslide to fall more directly on the visible slide area would coincide with 10 of the 15 landslide events in a HIGH landslide susceptibility area. In addition, several of the locations with LOW landslide scores appear to be related to road construction embankments. Since the model is based on natural soils characteristics and slope, these changes are not accounted for in this model. With these landslide events eliminated from the validation, 10 of 13 landslide events fall within a HIGH landslide susceptible zone.



Figure A.3-125: Landslide Susceptibility Schenectady County, NY Model Validation



The HIGH landslide susceptibility zone comprises only 2% of the total area of Schenectady County. Given that only a limited area of the County is classified as HIGH susceptibility and that 10 of 15 landslide events fall within this zone, the model has shown, in this instance, to be an excellent predictor of the landslide hazard.

### Model Refinements

As a pilot study, the methodology used can be considered preliminary and likely to be refined through additional studies. Approaches that address the lack of data for “Urban” soils will need to be devised and other shortcomings, such as the limited information of soil depths, will need to be addressed. A Phase II study that looks at the inclusion of infrastructure would also be of benefit in furthering the identified hazardous areas.

While the NYSDEC DEM provides an acceptable slope resolution, the use of Light Imaging Detection and Ranging (LIDAR) terrain data that is becoming more widely available through the FEMA Flood Map Modernization Program will provide better slope input and may be useful in identifying previous undocumented landslides. An effort should be made to ensure that surrounding slopes



are also included when collecting LIDAR data for a floodplain mapping, and FEMA should consider the multi-hazard utility of LIDAR into its data collection planning.

## Conclusion

The Landslide Susceptibility Pilot Study of Schenectady County provides a “proof of concept” example, reinforcing previous statements by the USGS and New York State Multi-Hazard Mitigation Plan that significant advancements can be made in mapping the landslide hazard in New York State. Given existing widely available data, GIS technology, and knowledge of landslide mechanisms, landslide susceptibility maps can be generated in a cost effective manner. The geographic resolution of these maps is sufficient for land use planning and would provide a foundation for mitigation. Importantly, as a digital product, these landslide susceptibility maps can be easily integrated into systems that make the data widely available to the general public or for internal government review as demonstrated by the integration of the landslide susceptibility GIS map layer into County’s “Schenectady Internet Mapping System (SIMS)” - (see **Figure A.3-126**).

**Figure A.3-126: Schenectady Internet Mapping System**



While this pilot demonstrates that landslide susceptibility maps can be generated in a more cost effective manner than was previously possible, it does not imply that resources will not be needed to expand this work to other Counties and eventually Statewide. Of particular need is staffing. The NYSGS has traditionally been the lead agency on landslide hazard analysis and for many years had staff supporting this responsibility. This staff position remains unfilled following a retirement several years ago. In addition, the agency no longer has its own in-house GIS staff and now relies on limited shared NYS Museum GIS staff.



The enhancement of staffing and resources at the NYSGS would enable this agency to better serve its traditional role and responsibilities with landslides and serve as lead for a multi-agency program focusing on landslide evaluation and susceptibility mapping. This program should include at a minimum NYSDOT, NYSOEM and possibly NYSOCC, which may be in the best position to serve as an interactive clearinghouse for reporting and mapping landslide occurrences.

Irrespective of how the State may organize itself in the future to better map landslide susceptibility and support landslide hazard mitigation, coordination with the USGS and with Local government - an important end user of this information - will be critical to a successful program. The theme of Federal-State-Local partnership that is demonstrated with the Landslide Susceptibility Pilot Study of Schenectady County should be carried forward in future efforts. The partnership theme is also consistent with recommendations made by the National Research Council of the National Academies in its report "Partnerships for Reducing Landslide Risk - Assessment of the National Landslide Hazards Mitigation Strategy", available at: <http://www.nap.edu/catalog/10946.html>.



# APPENDIX 4

## *Mitigation Strategy*

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Mitigation Actions and Activities In Development Matrix .....pg. 2-6



**A.4a: Mitigation Actions and Activities In Development Matrix**

MITIGATION ACTIONS AND ACTIVITIES IN DEVELOPMENT MATRIX									
Date	Project Type	Hazard	Title	Description of Activity	Submitted by (Agency or Organization) /Partner Agencies	Est. Cost (General dollar amount)	Potential Funding Source (grants, budget, etc.)	Estimated Timeframe	Current Status
				and related costs of climate change.					
12/4/2013	Outreach	Climate Change	Development of educational curricula related to climate change adaptation	Education and outreach at all levels are critical to the success of climate change adaptation efforts. Climate science should be incorporated in education curricula to bring the most current, science-based information to tomorrow's leaders. Targeted outreach to affected communities will also be necessary.	NYSERDA/ Education, Colleges and Universities, school districts	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as a potential outreach activity related to climate change
12/4/2013	Research and modeling	Climate Change	Climate change impacts on buildings and structures	Model the impacts of climate change on structures to inform the design, operation, and renovation of buildings.	NYSERDA/ OGS, building construction trades	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as a potential research and modeling topic related to climate change
12/4/2013	Research and risk assessment	Climate Change	Standardized reporting system for climate-related impacts	(1) Develop a state-wide standardized reporting system for climate-related impacts. (2) Scoping for development and implementation of an internet-based reporting system for the state to catalog extreme weather impacts (flooding, heat, drought, storms) at the local and regional level. Use of reporting forms would be triggered in any instance in which a county or local government requested state assistance in response to an extreme weather event. The system could be used to	NYSERDA/DHSES, DEC, DOH, DOT	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as a potential research and risk assessment topic related to climate change



MITIGATION ACTIONS AND ACTIVITIES IN DEVELOPMENT MATRIX									
Date	Project Type	Hazard	Title	Description of Activity	Submitted by (Agency or Organization) /Partner Agencies	Est. Cost (General dollar amount)	Potential Funding Source (grants, budget, etc.)	Estimated Timeframe	Current Status
12/4/2013	Research	Climate Change	Literature search and modeling to identify the likelihood and scale of future coastal events	The existing information regarding the distribution of coastal storm impacts over the landscape is poor. This storm information should be improved through literature searches to help describe the location and scale of impacts from historic events, as well as modeling to help describe the likelihood and scale of future events.	NYSERDA	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as potential research topic related to climate change
12/4/2013	Mapping	Climate Change	Map Update - tidal and freshwater wetlands	Update existing maps to demonstrate the tidal and freshwater wetlands. The existing tidal wetlands maps are 36 years old and need to be updated.	NYSERDA/DEC	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as a potential mapping topic related to climate change
12/4/2013	Mapping	Climate Change	Mapping critical habitats and natural and human-made shoreline protective features	Map the location and status of critical habitats, natural (barrier islands, wetlands, etc.) and human-made shoreline protective features, infrastructure and critical facilities, and vulnerable communities in high-risk coastal areas.	NYSERDA/DEC	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as a potential mapping topic related to climate change
12/4/2013	Research	Climate Change	Economic impact assessment of sea level rise	An assessment to quantify the economic impact of sea level rise and its effects on storm surge would be very valuable in order to prioritize adaptation actions to respond and quantify the cost of various responses.	NYSERDA	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as potential research topic related to climate change

MITIGATION ACTIONS AND ACTIVITIES IN DEVELOPMENT MATRIX									
Date	Project Type	Hazard	Title	Description of Activity	Submitted by (Agency or Organization) /Partner Agencies	Est. Cost (General dollar amount)	Potential Funding Source (grants, budget, etc.)	Estimated Timeframe	Current Status
12/4/2013	Research	Climate Change	Ecosystem buffer widths for various species and other riparian protection	Additional research is needed on minimum buffer widths for various species and for other riparian protection benefits. For example, a minimum of 30 - 50 feet is recommended for typical water quality buffers, but this would be insufficient for most species of wildlife to use as a dispersal corridor. Recommendations on planting and promotion of riparian buffers should be condensed into specific conservation practices detailing species to be planted, arrangement, and managing requirements. Information is also needed on how to better market the value of buffers to local communities and landowners for voluntary measures.	NYSERDA	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as potential research topic related to climate change
12/4/2013	Research	Climate Change	Enhance alternative communication technologies to address adaptation to consequences related to climate change	Develop and expand alternative communication technologies to increase redundancy and/or reliability, including free-space optics (which transmits data with light rather than physical connections), power line communications (which transmits data over electric power lines), and satellite phones.	NYSERDA	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as potential research topic related to climate change



MITIGATION ACTIONS AND ACTIVITIES IN DEVELOPMENT MATRIX									
Date	Project Type	Hazard	Title	Description of Activity	Submitted by (Agency or Organization) /Partner Agencies	Est. Cost (General dollar amount)	Potential Funding Source (grants, budget, etc.)	Estimated Timeframe	Current Status
12/4/2013	Research	Climate Change	Increase resilience of energy infrastructure to hazards and consequences related to climate change	Develop effective protocols and procedures or a software tool for considering climate change-related risks in decisions to locate, design, and build energy infrastructure, both to maintain the reliability of existing systems and to meet the future energy needs.	NYSERDA/Energy providers	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as potential research topic related to climate change
12/4/2013	Research	Climate Change	Approaches to address public health needs resulting from power outages	Assess approaches for addressing urgent public health needs of all New Yorker's resulting from power outages associated with severe weather events.	NYSERDA/DOH	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as potential research topic related to climate change
12/4/2013	Research	Climate Change	Climate change impacts on transportation routes	Develop a methodology for identifying specific climate change impacts on transportation routes.	NYSERDA/DOT	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as potential research topic related to climate change
12/4/2013	Research	Climate Change	River flooding projections related to climate change	Develop river flooding projections for regionalized changes in rainfall and storm intensities and stream flows.	NYSERDA/DEC/NOAA	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as potential research topic related to climate change
12/4/2013	Research	Climate Change	Data collection standards related to climate change	Develop data collection standards for informed risk analysis, asset management, and decision making.	NYSERDA/DEC / DHSES	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as potential research topic related to climate change
12/4/2013	Research	Climate Change	Project future water availability, use and ecosystem requirements	Conduct research to better characterize and project future water availability, human use, and ecosystem requirements in a changing climate.	NYSERDA/DEC	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as potential research topic related to climate change
12/4/2013	Mapping	Climate Change	Mapping of riparian corridors	Additional mapping of riparian corridors may be needed, depending on the	NYSERDA/DEC	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as a potential

MITIGATION ACTIONS AND ACTIVITIES IN DEVELOPMENT MATRIX									
Date	Project Type	Hazard	Title	Description of Activity	Submitted by (Agency or Organization) /Partner Agencies	Est. Cost (General dollar amount)	Potential Funding Source (grants, budget, etc.)	Estimated Timeframe	Current Status
				approach taken to regulate and protect these resources. Mapping may include a corridor zoning approach with distinct uses or regulated activities within delineated riparian corridor zones.					mapping topic related to climate change
12/4/2013	Research	Climate Change	Guidelines for riparian corridors, buffers and floodplains	Develop guidelines or best practices for the riparian corridors, buffers, and floodplains.	NYSERDA/DEC	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as potential research topic related to climate change
12/4/2013	Outreach	Climate Change	Comprehensive outreach program related to climate change and its impact on policy development and implementation	Expand climate change education and outreach initiatives for students, landowners, and local governments. Include sound scientific information on the potential impacts of climate change on natural areas and ecosystem services. Statewide assessments regarding the extent of climate education initiatives, and landowner and community technical assistance programs across NYS must be conducted prior to policy implementation in order to maximize potential success.	NYSERDA/ local governments, universities and colleges, school districts, general public	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as a potential outreach activity related to climate change
12/4/2013	Outreach	Climate Change	Comprehensive outreach program related to Public Health impacts from climate change	Raise the awareness of policy makers, State and local government officials, community leaders, businesses, institutions, health-care providers, and the general public about the public health significance	NYSERDA/ DOH	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as a potential outreach activity related to climate change



MITIGATION ACTIONS AND ACTIVITIES IN DEVELOPMENT MATRIX									
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				and related costs of climate change.					
12/4/2013	Outreach	Climate Change	Development of educational curricula related to climate change adaptation	Education and outreach at all levels are critical to the success of climate change adaptation efforts. Climate science should be incorporated in education curricula to bring the most current, science-based information to tomorrow's leaders. Targeted outreach to affected communities will also be necessary.	NYSERDA/ Education, Colleges and Universities, school districts	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as a potential outreach activity related to climate change
12/4/2013	Research and modeling	Climate Change	Climate change impacts on buildings and structures	Model the impacts of climate change on structures to inform the design, operation, and renovation of buildings.	NYSERDA/ OGS, building construction trades	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as a potential research and modeling topic related to climate change
12/4/2013	Research and risk assessment	Climate Change	Standardized reporting system for climate-related impacts	(1) Develop a state-wide standardized reporting system for climate-related impacts. (2) Scoping for development and implementation of an internet-based reporting system for the state to catalog extreme weather impacts (flooding, heat, drought, storms) at the local and regional level. Use of reporting forms would be triggered in any instance in which a county or local government requested state assistance in response to an extreme weather event. The system could be used to	NYSERDA/DHSES, DEC, DOH, DOT	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as a potential research and risk assessment topic related to climate change

MITIGATION ACTIONS AND ACTIVITIES IN DEVELOPMENT MATRIX									
Date	Project Type	Hazard	Title	Description of Activity	Submitted by (Agency or Organization) /Partner Agencies	Est. Cost (General dollar amount)	Potential Funding Source (grants, budget, etc.)	Estimated Timeframe	Current Status
				assess the magnitude and frequency of impacts across the state so that resources can be directed to reduce long term vulnerability in areas of greatest need. DOS has a draft version set up for coastal storm damage that could be revised for all extreme weather impacts. The system should not affect provision of emergency services following a natural disaster. (3) Develop tools and methods for analyzing vulnerability and evaluating adaptation options.					
12/4/2013	Research	Climate Change	Standards for critical infrastructure	Design guidelines, specifications, and standards for new and updated critical infrastructure. Investigate the design standards used in other areas of the country to withstand exposure to extreme weather and elevated water levels and temperatures to understand options for how design standards could be improved for infrastructure in NYS in response to a changing climate.	NYSERDA/ OGS, building construction trades	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as potential research topic related to climate change
12/4/2013	Research	Climate Change	Progress assessment tool(s) for adaptation to climate change	Develop a framework for describing, monitoring, assessing, and reporting progress on adaptation efforts within the state. An assessment of adaptation efforts by local governments, State agencies, and federal	NYSERDA/ DHSES, DEC	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as potential research topic related to climate change



MITIGATION ACTIONS AND ACTIVITIES IN DEVELOPMENT MATRIX									
Date	Project Type	Hazard	Title	Description of Activity	Submitted by (Agency or Organization) /Partner Agencies	Est. Cost (General dollar amount)	Potential Funding Source (grants, budget, etc.)	Estimated Timeframe	Current Status
				programs should be started to collect baseline information. This will help identify gaps in information, research, or tools needed for decision making and will help better prioritize next steps. Adaptation information should be shared and efforts coordinated among all levels of government.					
12/4/2013	Research and Vulnerability assessment	Climate Change	Assessment of vulnerable populations, areas and industries in relation to climate change impacts and adaptation policies	Certain groups will be disproportionately affected by climate change; it is necessary to identify these groups and ensure their participation throughout the adaptation planning processes. Climate change risks, vulnerabilities, and capacities to adapt are uneven across regions, sectors, households, individuals, and social groups. Equity concerns emerge because climate change impacts and adaptation policies can worsen existing inequalities and can also create new patterns of inequities. The impacts of climate change adaptation policies on different populations, areas and industries must be considered and addressed.	NYSDERDA/ DHSES, DEC, DOH, regional planning organizations, Empire State Development Authority	unknown	unknown	unknown	Presented to Interagency Adaptation Work Group on 8/14/13 as a potential research and vulnerability assessment activity related to climate change



# APPENDIX 5

## *Coordination of Local Mitigation Planning*

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<b>New York State Mitigation Planning Standards .....</b>	<b>pg. 2-10</b>
<b>Sample Letter of Intent (LOI) Announcement .....</b>	<b>pg. 11-13</b>
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## A.5a: New York State Mitigation Planning Standards



### NYS Office of Emergency Management Hazard Mitigation Planning Standards

Dear Hazard Mitigation Partner:

Congratulations on taking the first steps to create or update a multi-hazard mitigation plan for your community! Based on New York State's disaster history, the State Office of Emergency Management (State OEM) recommends your mitigation plan consider incorporating the standards below from the earliest planning phases.

**PLEASE NOTE:** These will be "required actions" for any hazard mitigation plan developed with funds administered by State OEM and will be part of all contracts executed with grant recipients after October 15, 2012. All grantees are encouraged to include this information in their "Request for Proposals" and to provide it to their consultants before planning begins in earnest.

1. Counties and communities should invite (at a minimum) the following stakeholders when initiating the planning process and identifying strategies and specific projects:
  - County Hazard Mitigation Coordinators and Floodplain Professionals
  - County Emergency Managers
  - County Planners & GIS staff
  - County Soil & Water Conservation Districts
  - Regional & Metropolitan (Transportation) Planning Organizations
  - Delaware and Susquehanna River Basin Commissions (if applicable)
  - Local Hazard Mitigation Coordinators and Floodplain Managers
  - Local Code Enforcement Officials
  - Local Emergency Management (Emergency Manager, Fire & Police Chiefs)
  - Local Planners and planning consultants (if applicable)
  - Local Engineers and engineering consultants (if applicable)
  - Local Public Works or Highway Superintendents

Inviting and encouraging participation of the local officials noted above is the best way to ensure success in the planning phases that develop a community's mitigation strategies and identify its specific projects. Plans developed without the participation of land use or community planners, and DPW officials, engineers, or others personally familiar with past damages to local infrastructure are less likely to contain viable, innovative or useful projects.

The goal is to include the widest range of organizations and stakeholders to develop a hazard mitigation plan that best suits your community's unique needs. **Plans developed with State OEM-administered funds must document that the stakeholders above were invited to participate at each phase, and whether they did or not.**



2. As part of the analysis of critical facilities, counties and communities should identify mitigation strategies and projects for any such facility that has ever sustained flooding, even if it is not located in a 100-year floodplain on a current (adopted) or draft FEMA Flood Insurance Rate Map (FIRM). Per FEMA's Part 9 regulations, critical facilities as defined by FEMA should be protected to a 500-year flood event. Identified projects should include the information described in 5a below. If mitigation projects have already been performed to address or reduce previous flooding, with or without FEMA assistance, the plan should also analyze these and document:

- the original problem and the estimated annual damages;
- the project, its cost, and the damages avoided since implementation;
- other option(s) considered, their estimated costs, why they were deemed not feasible;
- how well the project performed in subsequent events, if your basic assumptions were accurate, and what you'd change if you were doing it again;
- social, economic or environmental considerations that support/challenge the project.

Critical public facilities include those for police, fire protection/emergency services, medical care, education, libraries, utilities and other essential community services, the administrative and support facilities essential to their operation (as defined by FEMA), as well as major communication centers and facilities designed for bulk storage of chemicals, petrochemicals, hazardous or toxic substances or floatable materials (as defined by NYS DEC).

Critical private non-profit (PNP) facilities include those for fire protection/emergency services, medical care, education, utilities, child care facilities, alcohol and drug rehabilitation facilities, custodial care, homeless shelters, libraries and other facilities that provide health and safety services of a governmental nature. Communities may also want to analyze risks to major employers and assess the economic impact of prolonged down-time due to disasters.

The goal is to ensure that critical facilities remain accessible and functional before, during and after disasters to meet the community's continuity of government (COG) and continuity of operations (COOP) needs, and to support important emergency, response, government and sheltering functions. Plans developed with State OEM-administered funds must document that proposed (or already implemented) projects will protect critical facilities to a 500-year flood event or the actual worst-damage scenario, whichever is greater.

3. Counties and communities containing a 100-year floodplain on either a current (adopted) or draft FEMA Flood Insurance Rate Map (FIRM) should identify:
- a. Sites for the placement of temporary housing units to house residents displaced by disaster. This can be an existing mobile home park, public or private land or parkland, or a site easily convertible to accept the temporary housing units, which, per the New York State Uniform Fire Prevention and Building Code, must have floor assemblies placed no less than 2' above the Base Flood Elevation (i.e., of the 100-year flood level). If sites are in a neighboring community, they should be discussed with that community and consistent with its mitigation and emergency plans, evacuation routes, etc.
  - b. Potential sites within the community suitable for relocating houses out of the floodplain, or building new houses once properties in the floodplain are razed. The exploration should identify all suitable sites currently owned by the jurisdiction, and potential sites under private ownership that meet applicable local zoning requirements and floodplain laws.



The goal is to provide more immediate short-term and long-term housing options to residents in flood-prone homes, to continue their active involvement in their neighborhoods, schools or places of worship, and to avoid or reduce personal hardship and impacts to the local economy and tax base. Plans developed with State OEM-administered funds must identify potential sites and any pre-disaster actions required to make them viable, and include a letter from the local floodplain administrator listing any actions required to ensure conformance with the NYS Uniform Fire Prevention and Building Code, the applicable local floodplain law, etc.

4. Communities with residential neighborhoods or critical facilities [see 2 above] that have been flooded, inundated, or isolated by water, even if they are not located in a 100-year floodplain on a current (adopted) or draft FEMA Flood Insurance Rate Map (FIRM), should develop evacuation routes and procedures (or analyze/update current evacuation routes and shelter procedures based on recent flooding) and identify shelters, including provisions for a range of medical needs, accommodation for pets, and compliance with the Americans with Disabilities Act (see [www.adh.gov](http://www.adh.gov)).

The goal is to protect residents and minimize stress and personal hardship during disasters. Plans developed with State OEM-administered funds must identify evacuation routes and shelters (or refer back to such components in an existing valid plan), any pre-disaster actions required to make them viable, evidence of coordination with adjoining communities, and a project lead/point of contact and timetable for implementing new items or revisions.

5. Counties and communities should incorporate the following items and features in the strategies and projects sections of their plans:
  - a. The Plan should include all mitigation projects on the community's wish list, even those that may not meet FEMA eligibility or Benefit-Cost Analysis requirements, since funding should be sought from multiple sources to achieve a community's mitigation goals most quickly. Each project identified should include a brief description of:
    - the problem and the estimated annual damages;
    - the preferred option, its estimate cost, and the estimated annual damages that will be avoided if it is implemented;
    - how the proposal might be eligible under grant criteria other than mitigation (e.g., coastal, sustainability or climate change initiatives, brownfield funds);
    - other option(s) considered, their estimated costs, and their challenges or why they were deemed not feasible;
    - the social, economic or environmental considerations that support/challenge it;
    - any steps that need to be taken (e.g., engineering studies) before the project can be implemented, the person(s) or organization(s) with lead and supporting roles in completing those steps, and an estimated timetable for completion.

The goal is to have all the community's projects in one place to easily and quickly identify viable candidates when grants are available from FEMA and other private, local, State or Federal agencies. Plans developed with State OEM-administered funds must use the attached template prepared by FEMA Region II as a starting point for developing a format to describe the projects identified in individual communities.



- b. The Plan should include a list of potential local, State and Federal funding sources that apply to the projects identified as well as public-private partnerships worth pursuing. This should include a brief description of the programs and links to webpages for those opportunities. (N.B.: lack of an identified funding source or program should not prevent a project's inclusion in a community's list of possible mitigation actions.)

The goal is to link identified projects with viable funding sources, and not to rely solely on the availability of FEMA funding, making implementation that much more likely. **Plans developed with State OEM-administered funds must include this list, which must incorporate active web links to the appropriate agency page.**

- c. The Plan should include a section that documents previous mitigation projects completed by the county or the jurisdiction within community's borders, whether funded locally or by private, state or federal agencies and organizations. Each project should include a brief description of:
- the original problem and the estimated annual damages;
  - the project, its cost, and the damages avoided since implementation;
  - the other option(s) considered, their estimated costs, and their challenges or why they were deemed not feasible;
  - how well the project performed in subsequent events, if your basic assumptions were accurate, and what you'd change if you were doing it again;
  - the social, political or environmental considerations that supported/challenged the proposal, and the stakeholders, approaches and other factors that contributed to its successful implementation.

The goal is to provide a context for the community's projects, to act as a source of ideas for mitigation projects and evaluate the accuracy of assumptions and engineering solutions to inform future, similar projects, and to support future mitigation planning and its coordination with other planning, zoning and environmental procedures within the community. **Plans developed with State OEM-administered funds must use the attached template prepared by FEMA Region II as a starting point for developing a format to describe its communities' already-completed projects.**

6. Jurisdictions should also take into account how climate change may affect their vulnerability to the following hazards, specifically the increased frequency of occurrence and/or severity for: Flooding, Wildfire, Drought and Extreme Temperatures.

If it is determined that climate change is likely to increase the frequency or severity of a specific hazard, jurisdictions should identify how they will adapt to or mitigate for these issues. Counties and communities with coastal property should also analyze their vulnerability to sea level rise.

The goal is to plan for and accommodate climate change and sea level rise to protect residents, avoid or reduce damage to property and public infrastructure, and reduce personal hardship. **Plans developed with State OEM-administered funds must include this information within their discussion of these hazards and must contain strategies and projects to address them.**



7. Draft plans should be placed on an existing county/community website, or one created for the purpose of soliciting comments, for 30 days or the time prescribed by local law, whichever is greater. The webpage should identify the name, mailing address, day phone and/or e-mail address for the person responsible for receiving and reviewing comments on the draft hazard mitigation plan. The final plan should also be placed on an existing county/community website, or one created for the purpose of educating the public about the community's mitigation initiatives, and should contain the contact information specified above for the person responsible for maintaining the plan and answering questions about it once it has been adopted.

The goal is to educate the public about how mitigation can both save lives and avoid repetitive property damage in times of diminishing local infrastructure budgets. Plans developed with State OEM-administered funds must be posted (draft plan during the public comment period, and final adopted versions after adoption) and must include the specified contact information.

8. For plans developed with State OEM-administered funds: final payment will occur only after 50% of the participating jurisdictions have adopted the FEMA-approved plan and provided adoption resolutions to State OEM. For county-led hazard mitigation planning efforts, the county must be one of the adopting jurisdictions.

Some of the standards listed above may be considered Response activities that do not meet the formal definition of Mitigation actions. They also may not be eligible for grant assistance under FEMA's hazard mitigation programs, and they will not "count" toward the strategy development or project identification that's required of participants in the mitigation planning process: communities must still identify projects that meet the traditional definition of mitigation for each natural hazard analyzed in their local plans.

However, these will be "required actions" for any mitigation plan developed with funds administered by State OEM, and part of all contracts executed with our grant recipients after October 15, 2012.

Questions? Contact the Hazard Mitigation Section at 518-292-2304 or [NYSOEMHazMit@dhses.ny.gov](mailto:NYSOEMHazMit@dhses.ny.gov).

#### Other Resources

The following online resources may also be helpful as you begin the mitigation planning process:

- [Mitigation Planning](#)
- [2008 Local Multi-Hazard Mitigation Planning Guidance](#)
- ["New" 2011 Local Mitigation Plan Review Guide](#) - Use this review guide & tool as FEMA will use it to review plans exclusively, beginning October 1, 2012 - see "fact sheet" below for details.
- [Fact Sheet - "New" 2011 Local Mitigation Plan Review Process](#)
- NYS Sea Level Rise Task Force materials and findings: [www.dec.ny.gov/energy/25794.html](http://www.dec.ny.gov/energy/25794.html).
- ["Hazard Mitigation: Integrating Best Practices into Planning"](#) by the American Planning Association (Planning Advisory Service Report Number 560).
- ["Disaster Resilience: A National Imperative"](#) by the Committee on Increasing National Resilience to Hazards and Disasters, the Committee on Science, Engineering, and Public Policy, and The National Academies: [www.nap.edu/catalog.php?record\\_id=13457](http://www.nap.edu/catalog.php?record_id=13457).

10/15/12



<b>Action Title:</b>	
Your Plan Name	
Your Community Name	
Community Action Number	
<b>Risk</b>	
Hazard(s) Addressed	
Risk Finding	
<b>Action - description</b>	
Action Category	
Action Type	
Action Description	
Existing, Future &/or N/A	
<b>Action - evaluation</b>	
Risk Reduction (losses avoided)	
Technical	
Political	
Legal	
Environmental	
Social	
Administrative Capability	
Local Champion	
Other Community Objectives	
<b>Implementation</b>	
Priority	
Local Planning Mechanism	
Responsible Party & Partners	
Cost Estimate	
Potential Funding Sources	
Time Line	
<b>Progress</b>	
Action Progress Status	



<b>Floodproof Structures</b>	
Your Plan Name	County A Hazard Mitigation Plan
Your Community Name	Village E
Community Action Number	Village E#1
<b>Risk</b>	
Hazard(s) Addressed	Flood
Risk Finding	Property damage of about \$100,000 per year. Business interruptions an average of 5 days per year.
<b>Action - description</b>	
Action Category	Structure/Infrastructure projects
Action Type	Floodproofing
Action Description	Floodproof 10 businesses in the downtown area
Existing, Future &/or N/A	Addresses existing structures
<b>Action - evaluation</b>	
Risk Reduction (losses avoided)	City's cost to repair flooded properties reduced by 90%; approximate saving of \$10,000 per year.
Technical	Technically feasible. Flooding problem in downtown area solved for the long-term; community's problem of business interruption solved.
Political	- More than half the members of the City Council are opposed to buy-outs; it might be easier to get their support for an alternative to buy-outs. - Will help improve CRS rating in the long term (so entire community's flood insurance premium will be reduced).
Legal	ok
Environmental	No adverse environmental effects
Social	ok
Administrative Capability	Need at least 3 people to administer (after technical assistance from the State)
Local Champion	Possibly from business community
Other Community Objectives	ok
<b>Implementation</b>	
Priority	High
Local Planning Mechanism	
Responsible Party & Partners	Village E (Public Works)
Cost Estimate	Floodproofing cost = \$10,000 X 10 = \$100,000
Potential Funding Sources	HMGP, RFC, SRL and FMA. For 25% local match, in-kind services.
Time Line	1 year
<b>Progress</b>	
Action Progress Status	New action proposed in 2012



<b>Acquire Repetitive Loss Properties</b>	
Your Plan Name	County A Hazard Mitigation Plan
Your Community Name	Village B
Community Action Number	Village B#1
<b>Risk</b>	
Hazard(s) Addressed	Flood
Risk Finding	12 Repetitive Loss Properties located in a neighborhood with combined losses of \$4.3 million over past 30 years.
<b>Action - description</b>	
Action Category	Structure/infrastructure projects and planning mechanisms
Action Type	Acquisition
Action Description	Acquire 12 of the Repetitive Loss Properties in neighborhood A
Existing, Future &/or N/A	Existing structures and future development
<b>Action - evaluation</b>	
Risk Reduction (losses avoided)	Removes flooding problem. May not pass benefit-cost analysis (BCA)
Technical	ok
Political	Potential effect on tax base. Support from residents for this voluntary program.
Legal	ok
Environmental	Adjacent to park so open space created can be used to extend park.
Social	ok
Administrative Capability	ok
Local Champion	no
Other Community Objectives	Supports open-space preservation
<b>Implementation</b>	
Priority	High
Local Planning Mechanism	Modify comprehensive plan and zoning to identify land as open space during next scheduled updates.
Responsible Party	Village B (Planning Department)
Cost Estimate	\$ 4.2 million
Potential Funding Sources	HMGP, RFC, SRL and FMA. For 25% local match, in-kind services, village open-space fund, Community Development Block Grant (CDBG) and NFIP Increased Cost of Compliance (ICC).
Time Line	3 years
<b>Progress</b>	
Action Progress Status	Ongoing. Obtained HMGP grant and acquired 5 of 12 flood-prone properties to date. See Progress Report for more information.



<b>Acquire Repetitive Loss Properties - Short BCR</b>	
Your Plan Name	County A Hazard Mitigation Plan
Your Community Name	Village B
Community Action Number	Village B#1
<b>Risk</b>	
Hazard(s) Addressed	Flood
Risk Finding	12 Repetitive Loss Properties located in a neighborhood with combined losses of \$4.3 million over past 30 years.
<b>Action - description</b>	
Action Category	Structure/infrastructure projects and planning mechanisms
Action Type	Acquisition
Action Description	Acquire 12 of the Repetitive Loss Properties in neighborhood A
Existing, Future &/or N/A	Existing structures and future development
<b>Action - evaluation</b>	
Benefits	Removes flooding problem. Support from residents for this voluntary program. Adjacent to park so open space created can be used to extend park.
Costs	Monetary cost, potential effect on tax base, may not pass benefit-cost analysis (BCA)
<b>Implementation</b>	
Priority	High
Local Planning Mechanism	Modify comprehensive plan and zoning to identify land as open space during next scheduled updates.
Responsible Party	Village B (Planning Department)
Cost Estimate	\$ 4.2 million
Potential Funding Sources	HMGP, RFC, SRL and FMA. For 25% local match, in-kind services, village open-space fund, Community Development Block Grant (CDBG) and NFIP Increased Cost of Compliance (ICC).
Time Line	3 years
<b>Progress</b>	
Action Progress Status	Ongoing. Obtained HMGP grant and acquired 5 of 12 flood-prone properties to date. See Progress Worksheet for more information.



**A.5b: NYS FY 2013 Unified HMA Program Announcement****FY 2013 UNIFIED HAZARD MITIGATION ASSISTANCE (HMA) PROGRAM**

**DATE ANNOUNCED:** August 29, 2013

**FUNDS AVAILABLE FOR:** Implementing Hazard Mitigation Projects

The New York State Division of Homeland Security and Emergency Services (DHSES) is pleased to announce the availability of Federal Emergency Management Agency (FEMA) FY 2013 Unified Hazard Mitigation Assistance (HMA) Program grants to qualified sub-applicants in New York State. This program is available only to qualified local and state government agencies and authorities. Individuals, businesses, or private non-profits (PNPs) are not eligible applicants and cannot apply.

**What is the Unified HMA Program?**

The Unified HMA Program consolidated the deadlines and many of the procedures for four earlier FEMA mitigation grant programs run annually and not tied to Presidential declarations. The Biggert-Waters Flood Insurance Reform Act of 2012 further revised the Unified HMA, leaving 2 non-disaster programs:

- Pre-Disaster Mitigation Program (PDM) to support planning and address all-hazards;
- Flood Mitigation Assistance Program (FMA) to address flooding.

These funds *are not* part of New York's response to Superstorm Sandy, including the Hazard Mitigation Grant Program (HMGP) announced on June 10, 2013 with Letters of Intent (LOIs) due August 1, 2013.

Information is available from our Regional Offices, on our website [www.dhSES.ny.gov](http://www.dhSES.ny.gov) and on FEMA's website at <http://www.fema.gov/hazard-mitigation-assistance>. Please note the Guidance is effective for all Hazard Mitigation Grant Program (HMGP) activities for disasters declared on or after the July 12, 2013, and for the Programs opened with this announcement.<sup>1</sup>

**State Priorities**

The State will accept applications for projects mitigating Severe Repetitive Loss (SRL) properties, as determined by FEMA and the National Flood Insurance Program (NFIP). Please note communities or counties without a valid all-hazards mitigation plan cannot apply for this grant cycle. These priorities

<sup>1</sup> Page numbers used in this notice refer to FEMA's "Hazard Mitigation Assistance Unified Guidance" document, which remains valid for this year's grant cycle and can be found on DHSES's website, with this mailing, and on FEMA's website at <http://www.fema.gov/library/viewRecord.do?id=7851>.



were established to maximize funding, and because the State has recently offered several opportunities for communities to create or update all-hazards plans and access grants for flood-damaged properties:

- DHSES processed \$3.5 million in grants supporting planning efforts covering 13.4 million people in its Irene and Lee HMGP cycle, and offered planning grants again in its Sandy HMGP;
- Since 2012, New York State offered acquisition and elevation grants in its combined Irene and Lee HMGP cycle (closed), the still-open NY Rising Program ([www.NYSANDYHELP.ny.gov](http://www.NYSANDYHELP.ny.gov) and 1-855-NYS-SANDY), and the \$16 million Mohawk Valley, Niagara County and 2013 Upstate Flood Recovery Program (<https://flood2013.aidrc.com/> and 888-769-7243), also still open.

More importantly, FEMA has cut the application development period from 180 to 90 days, and advised its priorities will focus on SRL program activities, which offer Federal reimbursement up to 90% (compared to the normal 75%) because the appropriated funding is smaller than in years past.

The State will also prioritize the acquisition of properties substantially-damaged by flooding after the LOI window closed on its last HMGP cycle August 1, 2013. (Substantial damage determinations must be made by the local administrator with jurisdiction under a local floodplain law.)

#### Important Requirements

Subapplicants should carefully review the following sections of FEMA's "Hazard Mitigation Assistance Unified Guidance" document

- "Additional Program Information" (Guidance pg. 3), which explains the document's format;
- Funding limits for the Programs (Guidance pp. 39 -41);
- Program requirements (Guidance pp. 87 and 89);
- Eligible activities (Guidance pp. 22-29), including activities that are eligible only when included as a functional component of eligible mitigation activities (Guidance pg. 12);
- Ineligible activities (Guidance pg. 28 and 30). Please read this carefully.

#### Eligible Activities

Per FEMA's guidance, the following are examples of eligible activities at SRL properties:<sup>2</sup>

- Acquisition and demolition or relocation of structures, with the conversion of underlying property to deed-restricted open space;
- Elevation of existing structures to at least the Base Flood Elevation (BFE) or an Advance Base Flood Elevation (ABFE) or higher. (New York State requires BFE plus two feet.)
- Dry floodproofing (historic structures only);
- Minor and localized flood reduction projects.

#### How to Apply

<sup>2</sup> Please note: All properties must be National Flood Insurance Program-insured at the time of application. The State will not accept applications for mitigation reconstruction projects.



**Please note: The State is handling its registration process differently for this grant cycle.**

Only SRL communities designated by FEMA are eligible to apply, and proposed activities must mitigate SRL properties within those communities with current National Flood Insurance Program (NFIP) policies. A list of SRL communities is included with this announcement and on the DHSES website [www.dhSES.ny.gov/oem/mitigation/](http://www.dhSES.ny.gov/oem/mitigation/), as is the LOI that must be used for eligible sub-applicants with SRL properties to register.

Eligible sub-applicants will be notified of the application process. Applications must be filed using FEMA's electronic grants (*e-Grants*) system located at <http://www.grants.gov/>. After completing the pre-registration process, sub-applicants must notify DHSES to have their access validated. Sub-applicants will have to provide DHSES with an original and two paper copies of any supporting documentation that cannot be electronically attached to the e-Grant application.

#### **Important 2013 Deadlines**

**September 6 @ 5:00 pm: Applicants must submit LOIs**

**October 4 @ 11:59 pm: Complete applications must be submitted via FEMA's eGrants system.**

**October 18: DHSES must submit its applications to FEMA via eGrants.**

#### **Information Dissemination**

To disseminate program information to the widest possible eligible audience, DHSES has placed program information on its website and disseminated it to County Emergency Managers, Mitigation Coordinators and Planners, as well as regional and metropolitan planning organizations, soil and water conservation districts, and other mitigation stakeholders and partners.

If you have questions or need further information, please visit [www.dhSES.ny.gov/oem/mitigation](http://www.dhSES.ny.gov/oem/mitigation) or telephone DHSES's Mitigation Section at (518) 292-2304.



**A.5c: HMA Planning Activity Application, Evaluation, and Ranking System****NEW YORK STATE DIVISION OF HOMELAND SECURITY AND EMERGENCY SERVICES  
STATE HAZARD MITIGATION OFFICE****PLANNING ACTIVITY APPLICATION EVALUATION AND RANKING SYSTEM FOR PRE-  
DISASTER MITIGATION (PDM), FLOOD MITIGATION ASSISTANCE (FMA), AND  
HAZARD MITIGATION GRANT PROGRAM (HMGP)****I. Requirement for Planning Activity Application Evaluation and Ranking**

The Robert T. Stafford Act, as amended by Public Law 106390, October 30, 2000, Section 203 Pre-disaster Hazard Mitigation Sub-Section (d) State Recommendations- (C) Criteria, references use of criteria established in sub-section (g) in determining awards for assistance (Allocation of Funds). In summary, the criteria includes; extent & nature of hazards to be mitigated, degree of commitment, contribution to mitigation goal/priorities of State & similarly, consistent with own plan, consistent with other assistance provided by this Act, extent of eligible activities produce meaningful /definable outcomes are clearly define, maximize net benefits to society, extent to which assistance funds activity in small impoverished communities, and such other criteria the President establishes.

**II. Planning Activity Application Evaluation and Ranking Methodology**

Given the potential number of planning applications likely to be submitted by eligible applicants for the Pre-Disaster Mitigation (PDM), Flood Mitigation Assistance (FMA), and Hazard Mitigation Grant Program (HMGP) funding, it is imperative that the applications be evaluated and ranked using an objective methodology. The methodology to be used entails the selection of activity and application evaluation and ranking criteria as identified above from the Stafford Act. It also establishes assignment of weights - based on importance - to each criterion and the scoring of each criterion as presented in the planning activity application. The product of the criteria weights and the criteria scores for the plan application being evaluated will provide weighted scores. The sum of the weighted scores will be used towards the planning application final score. The final score that is used for ranking purposes will be the total sum of a review board members scores.

Prior to submission to the Project Review Board (PRB), project applications are first reviewed by NYSDHSES Mitigation Section staff for completeness. All planning activity applications reviewed by the PRB are also checked to insure that the proposed activity conforms with Federally established eligibility criteria. Eligibility criteria as described in the Stafford Act, and supporting documents such as 44 CFR, Chapter 1 Part 201 Mitigation Planning, Subpart N, Hazard Mitigation Grant Program, Section 206, and the implementing regulation for the Flood Mitigation Assistance program. In particular the applications



should be clear that mitigation plan development will follow Disaster Mitigation Act (DMA) 2000 criteria.

### **III. How to Use the Planning Activity Ranking Form**

1. Assign a score to the evaluation and rating criteria for each planning activity application using a scale of 0 to 10, with 0 being assigned to criterion that is not applicable to the activity or not addressed at all, even though required, and 10 being assigned to a criterion that is addressed in an excellent manner.
2. Multiply the criterion weight by the criterion score to obtain a weighted score for each evaluation and rating criterion.
3. Add all weighted scores to obtain a Total Weighted Score for each applicant. This will comprise the activity application score for use in establishing a prioritized list that will be submitted to FEMA for review and approval.



## A.5d: FEMA Mitigation Policy – FP-108-024-01

 <b>FEMA</b> MITIGATION POLICY – FP-108-024-01
<b>I. TITLE:</b> Consideration of Environmental Benefits in the Evaluation of Acquisition Projects under the Hazard Mitigation Assistance (HMA) Programs
<b>II. DATE OF ISSUANCE:</b> JUN 1 8 2013
<b>III. POLICY STATEMENT:</b> FEMA will allow the inclusion of environmental benefits in benefit-cost analyses (BCA) to determine cost effectiveness of acquisition projects.
<b>IV. PURPOSE:</b> The purpose of this policy is to identify and quantify the types of environmental benefits that FEMA will consider in the BCA for acquisition projects.
<b>V. SCOPE AND APPLICABILITY:</b> This policy applies to the Pre-Disaster Mitigation (PDM) and the Flood Mitigation Assistance (FMA) Programs for which the application period is open on or after the date of this policy and to the Hazard Mitigation Grant Program (HMGP) for major disasters declared on or after the date of issuance of this policy. Further, the policy only applies to property acquisitions for the purpose of open space and subsequent relocations or demolitions.
<b>VI. AUTHORITY:</b> Sections 203 and 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) (42 U.S. Code [U.S.C.] §§ 5133; 5170c) authorize the PDM Program and HMGP, respectively. Section 1366 of the National Flood Insurance Act of 1968 (NFIA), as amended by the Biggert-Waters Flood Insurance Reform Act of 2012, (42 U.S.C. § 4104c) authorizes the FMA Programs. Regulations that implement the HMGP can be found at Title 44 Code of Federal Regulations (CFR) §§ 206.430–206.440. The FMA Program regulations can be found at Title 44 CFR Part 79. Regulations for property acquisition and relocation for open space can be found at Title 44 CFR Part 80. General requirements for BCA can be found in the Office of Management and Budget's (OMB) Circular A-94, <i>Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs</i> .





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**VII. OBJECTIVE:**

The objective of this policy is to incorporate environmental benefits into the BCA used to demonstrate cost effectiveness for acquisition projects funded by FEMA's HMA Programs.

**VIII. DEFINITIONS, ABBREVIATIONS, AND FORMATTING:**

**Benefit-Cost Analysis:** A quantitative procedure that assesses the cost effectiveness of a hazard mitigation measure by taking a long-term view of avoided future damages as compared to the cost of a project.

**Benefit-Cost Ratio (BCR):** A numerical expression of the cost effectiveness of a project calculated as the net present value of total project benefits divided by the net present value of total project costs.

**Environmental Benefits:** Environmental benefits are direct or indirect contributions that ecosystems make to the environment and human populations. For FEMA BCA, certain types of environmental benefits may be realized when homes are removed and land is returned to open space uses. Benefits may include flood hazard reduction; an increase in recreation and tourism; enhanced aesthetic value; and improved erosion control, air quality, and water filtration.

**Greatest Savings to the Fund (GSTF) Methodology:** The GSTF methodology measures the expected savings of a mitigation project over a specific time period, such as 30 years. This methodology is based on actual National Flood Insurance Fund (NFIF) losses for severe repetitive loss properties.

**Green Open Space:** Green open space is land that does not directly touch a natural body of water such as a river, lake, stream, creek, or coastal body of water.

**HMGP 5-percent Initiative:** Some mitigation activities are difficult to evaluate using FEMA BCA methodologies. Up to 5 percent of the total HMGP funds may be set aside by the Grantee to pay for such activities.

**Property Acquisition and Structure Demolition:** The voluntary acquisition of an existing at-risk structure and, typically, the underlying land, and conversion of the land to open space after the demolition of the structure. The property must be deed-restricted in perpetuity to open space uses to restore and/or conserve the natural floodplain functions.

**Property Acquisition and Structure Relocation:** The voluntary physical relocation of an existing structure to an area outside of a hazard-prone area, such as the Special Flood Hazard Area (SFHA) or a regulatory erosion zone and, typically, the acquisition of the underlying land. Relocations must conform to all applicable state and local regulations. The property must be deed-restricted in perpetuity to open space uses to restore and/or conserve the natural floodplain functions.





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**Riparian Area:** The land that directly abuts a natural body of water such as a river, lake, stream, creek, or coastal body of water.

**Special Flood Hazard Areas (SFHAs):** The land in the floodplain within a community subject to a 1-percent or greater chance of flooding in a given year. An area having special flood, mudflow, or flood-related erosion hazards, and shown on a Flood Hazard Boundary Map or a Flood Insurance Rate Map (FIRM) (e.g., Zones A and V).

**Substantial Damage Waiver Policy:** For acquisition and structure demolition or relocation projects only, structures identified in a riverine SFHA on the current effective FIRM and declared by a local authority having such jurisdiction to be substantially damaged by flooding, property acquisition and structure demolition or relocation is considered cost effective and a BCA is not required to be submitted for the structure.

#### IX. POLICY DETAILS:

##### A. Background

Statutes that authorize mitigation programs (FMA at 42 U.S.C. 4104e, PDM at 42 U.S.C. 5133, and HMGP at 42 U.S.C. 5170c) require that FEMA provide funding for mitigation measures that are cost effective or are in the interest of the NFIF. FEMA has specified minimum project criteria via regulation (44 CFR 79 and 44 CFR 206.434), including that Applicants must demonstrate mitigation projects are cost effective. The determination of cost effectiveness is typically demonstrated by the calculation of the BCR, or the division of the net present value of the benefits by the net present value of the costs. Projects where benefits equal or exceed costs are considered cost effective.

To assist States and local communities, FEMA has developed a toolkit that standardizes the evaluation of cost effectiveness and quantifies the financial and social benefits of a proposed mitigation activity. Typical mitigation project benefits are derived from avoided damage to structures and contents, avoided deaths and injuries, and avoidance of other quantifiable losses that a mitigation project can significantly reduce or eliminate.

To integrate environmental benefits into the BCA Toolkit, it was important to determine which mitigation activity would best achieve these benefits. One prime example is property acquisition. Acquisition projects are funded by the FEMA's FMA, HMGP, and PDM Programs to mitigate flood hazards. To date, 38 percent of all HMA funds have been allocated for acquisition-related activities.

The inclusion of environmental benefits in the evaluation of acquisition projects supports the use of ecosystem-based management, which is encouraged by the Federal Insurance and Mitigation Administration (FIMA) and the U.S. Army of Corps of Engineers as part of the Federal Interagency Floodplain Management Task Force. In this context, incorporating environmental





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benefits into the overall quantification of project benefits for acquisition projects supports FEMA's mission of risk reduction, environmental compliance, and the preservation of the natural and beneficial functions of the floodplain.

FEMA collaborated with private, public, and academic sectors to develop an Environmental Benefits Analysis Report (EBAR), which identifies benefits produced by deed-restricted open space. The EBAR contains peer-reviewed academic journal articles, agency analysis, and private studies examining the economic value provided by lands both inside and outside the SFHAs. These studies provide a sound basis for generating economic values useful to FEMA. The results of the EBAR were used to develop FEMA's quantification of environmental benefits for open green space and riparian areas in the BCA Toolkit.

Regional variations in dollar values as well as differences in rural and urban areas were considered, but it was concluded that normalizing the environmental benefits through the value transfer method used in the BCA Toolkit was appropriate. While there will be a need in the future to re-study both green open space and riparian environmental benefits, FEMA believes the economic valuation used in the EBAR and in this policy are reasonable to be included in a BCA.

#### B. Environmental Benefits

Since FEMA has a primary mission to reduce or eliminate future damage from natural hazards where possible, project benefits from acquisitions must be derived primarily from avoided future damage, displacement, and other direct damage. Acquisition-related mitigation activities have proven to be the most effective example of hazard mitigation; therefore, FEMA has incorporated an environmental benefits methodology into its BCA Toolkit for acquisition-related mitigation activities. Acquisition-related activities permanently remove at-risk structures from the most vulnerable areas of the floodplain, thereby eliminating the cycle of damage, reconstruction, and repeat damage. Additionally, the inclusion of environmental benefits into the BCA Toolkit for acquisition-related activities supports floodplain management recommendations to restore and maintain the natural and beneficial functions of the floodplain.

The BCA Toolkit will automatically include environmental benefits for projects calculated to have BCRs of 0.75 or greater using traditional benefits. The environmental benefits for green open space or riparian areas are based on the size (in square feet) of the land (lot) being acquired. The inclusion of environmental benefits into the BCA does not apply to acquisition projects that are approved under the following methodologies:

- The Substantial Damage Waiver policy
- The Savings to the NFIF Methodology (GSTF)
- The HMGP 5-percent Initiative





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Table I shows the types and values of environmental benefits included in the BCA for acquisition-demolition or acquisition-relocation projects:

**Table I: Annual Estimated Monetary Benefits per Acre per Year**

Environmental Benefit	Green Open Space	Riparian
Aesthetic Value	\$1,623	\$582
Air Quality	\$204	\$215
Biological Control	--	\$164
Climate Regulation	\$13	\$204
Erosion Control	\$65	\$11,447
Flood Hazard Reduction	--	\$4,007
Food Provisioning	--	\$609
Habitat	--	\$835
Pollination	\$290	--
Recreation/Tourism	\$5,365	\$15,178
Storm Water Retention	\$293	--
Water Filtration	--	\$4,252
<b>Total Estimated Benefits</b>	<b>\$7,853</b>	<b>\$37,493</b>

Table II shows total estimated benefits per acre per year and the total estimated benefits per-square-foot for green open space and riparian land use; the benefits can accrue for any lot size. The green open space and riparian values used in this policy are calculated per square foot per year using the OMB-approved 7 percent discount rate applied over the project useful life. The environmental benefits accrue over a projected 100-year lifespan of the acquisition-related activity. For green open space, the accumulated benefit is estimated as \$2.57 per square foot per year. For riparian areas, the accumulated environmental benefit is estimated as \$12.29 per square foot per year.





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Table II: Green Open Space and Riparian Benefits Allowed in the BCA Toolkit

Land Use	Total Estimated Benefits	Total Estimated Benefits (projected for 100 years with 7 percent discount rate)
Green Open Space	\$7,853 per acre per year	\$2.57 per square foot
Riparian	\$37,493 per acre per year	\$12.29 per square foot

### C. Limitation

Because the fundamental purpose of the HMA Programs is to reduce future damage to property, environmental benefits are not included in the BCA unless the project BCR is 0.75 or greater. Additionally, the inclusion of environmental benefits in the BCA is limited to acquisition-related activities until further study of other mitigation activities (e.g., detention basins) can be completed.

### X. ROLES & RESPONSIBILITIES:

Roles and responsibilities herein for all Federal, Grantee/Applicant, and subgrantee/subapplicant participants are consistent with those outlined in 44 CFR Parts 13, 79, 80 and 206 subpart N (for HMGP Projects), and the HMA Unified Guidance.

### XI. MONITORING AND EVALUATION:

The performance of an awarded grant will be monitored in accordance with the financial and performance reporting requirements outlined in 44 CFR Parts 13, 79, 80, and 206 subpart N (for HMGP Projects), as well as the HMA Unified Guidance. In addition, all awarded grants must comply with the administrative and audit requirements of 44 CFR Parts 13 and 206 subpart N (for HMGP Projects), as well as the terms and conditions of the grant award agreement.

### XII. RESPONSIBLE OFFICE:

FIMA, Risk Reduction Division, Grants Data Analysis and Tools Branch

### XIII. SUPERSESSION:

This policy does not supersede any other policy on this subject.



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**XIV. ORIGINATING OFFICE:**  
FIMA, Risk Reduction Division

**XV. REVIEW DATE:**  
This policy will not automatically expire, but will be substantively reviewed on or before 3 years from the date of issuance.

  
David L. Miller  
Associate Administrator  
Federal Insurance and Mitigation Administration

This policy represents FEMA's interpretation of a statute or regulation. The policy itself does not impose legally enforceable rights or obligations but sets forth a standard operating procedure or agency practice that FEMA employees follow to be consistent, fair, and equitable in the implementation of the agency's authorities.



# APPENDIX 6

## *Plan Maintenance*

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**NYS Hazard Mitigation Plan – Roadmap Activities.....pg. 2-8**



## NYS Hazard Mitigation Plan – Roadmap Activities (Final) as of 12/12/13

ELEMENT	Plan Section	Activity	Start Date	Timeline
<b>6. Profiling Hazards</b>				
<i>Element B</i>				
The SHMP needs to document the impacts to State facilities and critical infrastructure from the most recent major disasters; specifically, Hurricane Sandy.	<b>Section 3</b>	Conduct an in-depth survey and analysis of State agencies and organizations to obtain detailed facility and critical infrastructure information related to impacts, damages, losses and mitigation opportunities from Hurricane Sandy.	1/2014	Ongoing in concert with FEMA
<i>Element C</i>				
Re-evaluate methodology used to calculate probabilities for future occurrences.	<b>Section 3</b>	<p><b>(Short-term priority)</b> Re-evaluate methodology for calculating probabilities of future occurrences (frequency and severity) for all hazards; i.e.; translate numerical probability percentage figures into categories that more clearly and realistically identify probabilities by county.</p> <ul style="list-style-type: none"> <li>• Review California and North Dakota Plans for examples.</li> </ul>	3/2014	1-2 month
<b>7. Assessing Vulnerability by Jurisdiction</b>				
<i>Element C</i>				
Enhance review of local plans to assess and integrate types of risks and assets	<b>Section 3</b>	During the local plan review process, conduct and summarize the content of local plans related to types of risks faced and types of assets found vulnerable.	1/2014	On-going– integrate into local plan review process



<i>Element D</i>				
ELEMENT	Plan Section	Activity	Start Date	Timeline
[Bullet 1] Continue to roll up information from local plans to track trends in development that impact vulnerability and provide a means of reducing risk to future development.	<b>Section 3</b>	During the plan maintenance process, extract information related to local development from local plan capability assessments; focus on physical development, construction activity, building codes, changes in development, anticipated development trends tracked by State, regional or metropolitan agencies and organizations.	1/2014	On-going-integrate into local plan review process
[Bullet 2] Develop additional detail related to development in most densely populated areas.	<b>Section 3</b>	Develop high-level discussion related to most densely populated areas and how development may be changing; coordinate with DEC (NFIP) and Dept. of State (Codes) to provide guidance on how municipalities may address this and offer targeted assistance in coordinating NYS Building Code and local floodplain law, where needed.	4/2014	1 month
<b>8. Assessing Vulnerability of State Facilities</b>				
<i>Element A</i>				
[Bullets 1-3] Provide a separate detailed description of the State fixed assets inventory project	<b>Section 3.1</b>	Provide a separate detailed summary of the State's plan for addressing how and what type of data will be obtained during the project (i.e., type of facilities and infrastructure, uses, construction and values of buildings and critical facilities), the project timeline, and the State's plan for addressing this requirement within the next 18 months. <sup>1</sup>	2/2014	1 month

<sup>1</sup> See Note following this table for text to be inserted in Section 3.0, p. 3.0-42



ELEMENT	Plan Section	Activity	Start Date	Timeline
<b>9. Estimating Potential Losses by Jurisdiction</b>				
<i>Element A</i>				
[Bullets 1 and 2] Review local plans to incorporate estimates provided in local risk assessments into the State's plan	<b>Section 3</b>	Capture estimated losses by jurisdiction from local risk assessments; or, alternately, consider estimating a percentage of past events associated with each hazard using a method similar to predicting probability, by extrapolating potential annual damages based on historic data. <ul style="list-style-type: none"> <li>• Review examples of State plans – Alabama provided a summary table of risk projections/loss estimates by county extracted from LHMPs for specific hazards, such as flood, hurricane, tornado and winds</li> <li>• [Bullet 2] Review and incorporate data that becomes available through Risk MAP to use new data such as FEMA-generated Annualized Loss Estimates for flooding.</li> </ul>	6/2014	6 months
<i>Element B (See also Element 9.A)</i>				
[Bullet 1] – extract loss information from local plans	<b>Section 3</b>	Except for hazards where Hazus data is used (flood, earthquakes, wind) estimate losses by jurisdiction using local plans as well as an independent analysis (structures and critical facility locations in hazard prone areas) to identify vulnerable structures and then determine a loss percentage to calculate loss.	6/2014	6 months



ELEMENT	Plan Section	Activity	Start Date	Timeline
[Bullet 2] Incorporate risk assessment information from the FEMA Average Annualized Loss Study	Section 3	Research Average Annualized Loss Study for all counties in the State and incorporate data in hazard sections for potential estimated losses by jurisdictions. Expand the review of local risk assessments and incorporate estimated future loss data by jurisdiction from local plans, by: <ul style="list-style-type: none"> <li>Extracting Hazus findings for flood, high wind and earthquake from local plans.</li> <li>Incorporating Average Annualized Loss (AAL) study data into the State plan</li> </ul>	6/2014	6 months
<i>Element C</i>				
Develop loss estimate analysis based on changes in development	Section 3	Once loss estimates are completed, and changes in development are better summarized, account for development changes within the loss estimates which are projected as a certain percentage.	1/2015	3 months
<b>10. Estimating Potential Losses of State Facilities</b>				
<i>Element A</i>				
[Bullets 1& 2] Survey State agencies for damage data from recent events to inform potential loss estimates. Calculate percentage of losses based on fixed asset inventory data [See also 6.B]	Section 3	<b>In current FEMA Planning Grant:</b> Collect information through survey of State and critical infrastructure agencies; develop estimation of losses (as a percentage of value lost in an event) for all hazards through data analysis, survey and/or scenario ( <b>TOP PRIORITY - must be addressed in current FEMA Planning Grant</b> )	6/2014	9 months
<b>13. Local Capability Assessment</b>				
<i>Element A</i>				



ELEMENT	Plan Section	Activity	Start Date	Timeline
Information can be extracted from local plans as reviewed to identify increases or decreases in local capabilities. <b>[See also Element 9.]</b>	<b>Section 4</b>	[Actions added to monitoring and evaluation tables, p. 6-6,7, 8 & 9] Analyze local capabilities from all available local plans to identify regulatory, technical or financial capabilities that could be used to implement mitigation policies and programs.	6/2014	6 months
<b>14. Mitigation Actions</b>				
<i>Element D</i>				
Develop narrative describing the link between mitigation strategies with the risk assessment needs to be made	<b>Section 4</b>	Develop a narrative explaining the rationale of identifying each type of mitigation activity and how it addresses an identified risk (e.g., generators are appropriate for critical facilities despite the short-term respite it provides), especially since there are a lot of “new projects” identified in this update.	2/2014	1 month
<b>16. Local Funding and Technical Assistance</b>				
<i>Element A</i>				
Develop narrative description of training/ technical assistance provided by State to local jurisdictions	<b>Section 5</b>	Prepare a narrative statement that details how the State contributes to mitigation planning training; and the improvement of mitigation planning overall	3/2014	1 month
<b>17. Local Plan Integration</b>				
<i>Element B</i>				
As part of the ongoing State review of local hazard mitigation plans, continue to incorporate content of local risk assessments into the SHMP.	<b>Section 5</b>	[Actions added to monitoring & evaluation tables, p. 6-6, 7, 8, & 9] Document local risk assessment information during on-going local plan review process and add information to the SHMP in the monitoring, evaluation and update cycle	1/2014	On-going-integrate into local plan review process
<b>19. Monitoring, Evaluating, and Updating the Plan</b>				



ELEMENT	Plan Section	Activity	Start Date	Timeline
Element C – [See 17. B above]		[Actions added to monitoring & evaluation tables, p. 6-6, 7, 8, & 9] As new plans are submitted and approved, review the content of local risk assessments and incorporate into the State’s plan during the monitoring, evaluation and update cycle.	1/2014	On-going–integrate into local plan review process

**Text inserted in Section 3.0 for Element 8.A (also references Element 6.B):**

The State of New York is taking steps to inventory its facilities and built assets to evaluate its risk from natural hazards. Initial efforts to inventory facilities under a FEMA Earthquake grant, employing State Fire Inspectors utilizing FEMA-developed software, were unsuccessful for a couple of reasons: after modifying the earthquake software to capture wind and flood, the number of questions to answer and data sets to provide became too time-consuming for State Fire Inspectors to complete during the course of their normal building inspections. Also, some inspectors felt that the “Integrated Rapid Visual Screening of Buildings” (IRVS) approach was best executed by architects or engineers. Finally, Fire Inspectors survey universities and all state office buildings on a rotating basis, which would leave a large part of the universe of state facilities without survey. After regrouping, and evaluating what we know about our risk from discussions with state agencies during Irene, Lee and Sandy response (and during the update of the State Hazard Mitigation Plan), DHSES coordinated with FEMA and decided on a two-prong approach:

- We would begin our survey at facilities that house children and adults with mental and/or physical challenges because:
  - A March 2009 fire in Wells, Herkimer County killed four residents of a group home who could not evacuate themselves, and injured a fifth resident and two staffers (see [www.nytimes.com/2009/03/22/nyregion/22fire.html? r=0](http://www.nytimes.com/2009/03/22/nyregion/22fire.html? r=0));
  - Such facilities are overseen by a small universe of state agencies, easing coordination on our first survey effort;
  - These facilities occur both as stand-alone buildings (residences) or campuses with several buildings; the latter will help inform subsequent survey efforts at various other campuses and complexes across the State.



- Having experienced Irene, Lee and Sandy, and traditionally citing water in its various forms as our most prevalent natural disaster, DHSES will poll State agencies in February 2014 to see if lives were lost, injuries occurred, or structures were damaged or destroyed in any of these three events;
  - From that we will ascertain whether there are inordinately high positive responses:
    - In specific counties or regions of the State;
    - Correlating to certain facility types or uses;
    - From certain agencies who may not have capacity to address mitigation deficits.
  - This will allow us to target assistance like site visits (with other agencies if needed), webinars, etc., to provide technical assistance and develop short- and long-term strategies and flesh out activities in anticipation of future funding opportunities.

The State will analyze risk from wind, flood and earthquake at all buildings surveyed, using hand-held software applications and FEMA's "Integrated Rapid Visual Screening of Buildings" (IRVS) to guide the process. This approach better achieves the State's goals because we will employ teams of contractors with training in architecture or engineering who can respond to each of the IRVS questions, and who can focus on priorities we establish rather than another agency's prescribed inspection schedule. Before teams conduct site visits, they will research available DFIRMs, State agency records (Office of General Services, the responsible agency's Main office and Regional Office capital facilities archives, etc.) and various online resources to gather relevant information regarding floodplain locations and relationships, construction type, etc., then fill the gaps with onsite visits and interviews. Data will be collated and analyzed in an initial screening, which will then determine which structures and facilities get a more in-depth analysis and possible assistance in developing mitigation strategies.

These two activities will run on parallel but independent tracks, and in close coordination with FEMA. (In fact, the survey effort was initiated with FEMA-sponsored training of the first architects and engineers occurring in Albany the week of December 9, 2013.) Once the initial group home survey has been complete we will analyze the results with FEMA to determine our ongoing survey strategy (e.g., by agency, region, facility type, year of construction, recent damage in declared disasters), and decide what tweaking, if any, is necessary moving forward to streamline the process and capture and collate all needed data.

DHSES will also decide with FEMA whether the results of the initial group home survey warrant revisions to the State Plan's description of hazards, analysis of risk, or the strategies and activities for key agencies. As noted above, subsequent survey strategies will be developed with FEMA's concurrence, and after each survey round we will revisit the Plan as noted above to see if changes are warranted, or if State agencies need targeted assistance.



# APPENDIX 7

## *Severe Repetitive Loss Strategy*

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**Reserved for future development**



## Acronyms

<b>AEL/AELR</b>	Annualized Earthquake Loss/Ratio
<b>AG &amp; MKTS</b>	New York State Department of Agriculture and Markets
<b>APA</b>	Approved Pending Adoption <b>or</b> Adirondack Park Agency
<b>BCA</b>	Benefit-Cost Analysis
<b>BCR</b>	Benefit-Cost Ratio
<b>CBRA</b>	Coastal Barrier Resources Act
<b>CBRS</b>	Coastal Barrier Resources System
<b>CDBG</b>	Community Development Block Grant
<b>CDC</b>	Centers for Disease Control and Prevention
<b>CEHA</b>	Coastal Erosion Hazard Area
<b>CEMP</b>	Comprehensive Emergency Management Plan
<b>CFR</b>	Code of Federal Regulations
<b>ClimAID</b>	Report - "Responding to Climate Change in New York State"
<b>CMP</b>	Coastal Management Program
<b>COURTS</b>	New York State Unified Court System
<b>CRS</b>	Community Rating System
<b>CRZ</b>	Community Reconstruction Zone
<b>CSCIC</b>	New York State Department of Cyber Security and Critical Infrastructure Coordination
<b>CWPP</b>	Community Wildfire Protection Plan
<b>DASAS</b>	New York State Dormitories Authority
<b>DEC</b>	New York State Department of Environmental Conservation New York State Division of Homeland Security and Emergency Services
<b>DHSES</b>	
<b>DI</b>	Damage Indicator ( <a href="#">high wind</a> )
<b>DMA</b>	Disaster Mitigation Act of 2000 ( <a href="#">Federal</a> )
<b>DMNA</b>	New York State Department of Military and Naval Affairs
<b>DMTF</b>	Drought Management Task Force
<b>DOCCS</b>	New York State Department of Corrections and Community Services
<b>DOD</b>	Degree of Damage ( <a href="#">high wind</a> )
<b>DOH</b>	New York State Department of Health
<b>DOL</b>	New York State Department of Labor
<b>DOS</b>	New York State Department of State
<b>DOT</b>	New York State Department of Transportation
<b>DPC</b>	Disaster Preparedness Commission New York State Department of Parks, Recreation and Historic Preservation
<b>DPRHP</b>	
<b>DPW</b>	Department of Public Works ( <a href="#">local</a> )
<b>DSP</b>	New York State Division of State Police



## Acronyms

<b>ECL</b>	Environmental Conservation Law
<b>EF</b>	Enhanced Fujita Scale ( <a href="#">tornado</a> )
<b>EMAP</b>	Emergency Management Accreditation Program
<b>EOC</b>	Emergency Operations Center
<b>FDRA</b>	Fire Danger Rating Area
<b>FEMA</b>	Federal Emergency Management Agency
<b>FMA</b>	Flood Mitigation Assistance Program
<b>GAR</b>	Governor's Authorized Representative
<b>GIS</b>	Geographical Information System
<b>HAZNY</b>	Hazards New York
<b>Hazus-MH</b>	Hazards U.S. - Multi-Hazard
<b>HI</b>	Heat Index
<b>HIRA</b>	Hazard Identification and Risk Assessment
<b>HMA</b>	Unified Hazard Mitigation Assistance Program
<b>HMGP</b>	Hazard Mitigation Grant Program
<b>IA</b>	Individual Assistance ( <a href="#">Federal disaster recovery assistance program</a> )
<b>IFR</b>	Interim Final Rule
<b>IN</b>	Inland community
<b>IPCC</b>	International Panel on Climate Change
<b>LHMP</b>	Local Hazard Mitigation Program
<b>LiDAR</b>	Light Detection and Ranging
<b>LIRPB</b>	Long Island Regional Planning Board
<b>LOI</b>	Letter of Intent
<b>LWRP</b>	Local Waterfront Revitalization Plan
<b>MEHRP</b>	National Earthquake Hazard Reduction Program
<b>MMI</b>	Modified Mercalli Intensity Scale ( <a href="#">earthquake</a> )
<b>NCDC</b>	National Climatic Data Center
<b>NDMC</b>	National Drought Monitoring Center
<b>NESIS</b>	Northeast Snowfall Impact Scale
<b>NFIP</b>	National Flood Insurance Program
<b>NHC</b>	National Hurricane Center
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>NSSL</b>	National Severe Storms Laboratory
<b>NTHMP</b>	National Tsunami Hazard Mitigation Program
<b>NWS</b>	National Weather Service
<b>NYC</b>	New York City
<b>NYS</b>	New York State
<b>NYSED</b>	New York State Education Department



## Acronyms

<b>NYSERDA</b>	New York State Energy Research and Development Authority
<b>NYSGS</b>	New York State Geological Survey
<b>OCFS</b>	New York State Office of Children and Family Services
<b>OCRM</b>	New York State Office of Coastal Resource Management
<b>OCS</b>	New York State Office of Cyber Security
<b>OEM</b>	New York State Office of Emergency Management
<b>OFFP&amp;C</b>	New York State Office of Fire Prevention and Control
<b>OGS</b>	New York State Office of General Services
<b>OMH</b>	New York State Office of Mental Health
<b>OPA</b>	Other Protected Areas ( <a href="#">Coastal Barrier Resources Act</a> )
<b>OPDD</b>	New York State Office of People with Developmental Disabilities
<b>PA</b>	Public Assistance ( <a href="#">Federal disaster assistance program</a> )
<b>PDD</b>	Presidentially Declared Disaster
<b>PDI</b>	Palmer Drought Index ( <a href="#">drought</a> )
<b>PDM</b>	Pre-Disaster Mitigation Program
<b>PGA</b>	Peak Ground Acceleration ( <a href="#">earthquake</a> )
<b>PRB</b>	Project Review Board ( <a href="#">mitigation grants</a> )
<b>SA</b>	Spectral Acceleration ( <a href="#">earthquake</a> )
<b>SBA</b>	Small Business Administration
<b>SDI</b>	State Drought Index ( <a href="#">drought</a> )
<b>SHA</b>	Structural Hazard Area ( <a href="#">coastal erosion</a> )
<b>SHELDUS</b>	Spatial Hazard Events and Losses Database United States
<b>SHMO</b>	State Hazard Mitigation Officer
<b>SHMP</b>	State Hazard Mitigation Program
<b>SLAMM</b>	Sea level Rise Affecting Marshes Model ( <a href="#">flood, climate change</a> )
<b>SLOSH</b>	Sea, Lake and Overland Surge Heights ( <a href="#">hurricane</a> )
<b>SOS</b>	New York State Secretary of State
<b>SUNY</b>	State University of New York
<b>THIRA</b>	Threat/Hazard Identification and Risk Assessment
<b>UBC</b>	Uniform Building Code
<b>USACE</b>	U.S. Army Corps of Engineers
<b>USDA</b>	U.S. Department of Agriculture
<b>USGS</b>	U.S. Geological Survey
<b>WUI</b>	Wildland/Urban Interface ( <a href="#">wildfire</a> )



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**2014 New York State Hazard Mitigation Plan****Emergency Management Accreditation Program (EMAP) –  
Contractor Review of Consistency with Relevant Standard Areas**

**Review performed by:** Nancy Freeman, State Hazard Mitigation Planning Team  
**Contractor:** Adjusters International  
**Date:** December 23, 2013

**Note:** In August, 2013, an independent contractor team was tasked by the New York State Division of Homeland Security and Emergency Services (DHSES) to revise and update the State’s 2011 Hazard Mitigation Plan (SHMP) and achieve FEMA approval prior to the plan expiration deadline on January 3, 2014. Due to the short timeline, the SHMP planning team was charged with developing a plan that focused on meeting all criteria of a Standard State Hazard Mitigation Plan as defined in 44 CFR 201.4. The team was directed to address only natural hazards in the 2014 SHMP; and compliance with applicable EMAP standards (January 2014 release) was not included in the scope of work for the updated plan.

In recognition of New York State’s EMAP accreditation status, this review is provided as a courtesy from the contractor team to the State to assist in identifying areas where the 2014 SHMP **potentially** supports compliance with EMAP standards. In addition, the review attempts to highlight areas for improvement that may be considered for future SHMP updates to continue to bring the plan in alignment with EMAP standards. This review captures only the information contained in the State’s 2014 hazard mitigation plan update as it intersects with two EMAP standard areas, and did not include review of additional documents that potentially support compliance with these or other standards. **This review has not been endorsed by or prepared in coordination with EMAP and any statement indicating that information that supports compliance is documented in the plan does not guarantee compliance with the relevant standards.**

The format of this review consists of two parts:

- Narrative summary that describes the information in the 2014 SHMP that supports compliance with EMAP Standards 4.3 - Hazard Identification and Risk Assessment and 4.4 - Hazard Mitigation
- Consistency matrix for Standard 4.3 – Hazard Identification and Risk Assessment

**PART I – Narrative Summary****STANDARD 4.3: Hazard Identification and Risk Assessment**

**4.3.1:** *The Emergency Management Program shall identify the natural and human-caused hazards that potentially impact the jurisdiction using a broad range of sources. The*



*Emergency Management Program shall assess the risk and vulnerability of people, property, the environment, and its own operations from these hazards.*

The 2014 New York State Hazard Mitigation Plan identifies fifteen (15) **natural** hazards: avalanche, climate change, coastal erosion, drought, earthquake, extreme temperatures, flood, hailstorm, high winds, hurricane, land subsidence/expansive soils, landslide, severe winter storm, tsunami and wildfire. Of the 15 hazards, nine (9) were considered to be of low probability and impact, and a full consequence analysis was not justified. (This is consistent with the hazard ranking summary in the 2014 SHMP, [Section 3.2](#), p. 62-66.) A hazard ranking scale was used to determine the highest hazards, on the basis of scope, cascading effects, frequency, impacts (people, private property, and community infrastructure), onset, duration and mitigation potential. The following six (6) hazards (in ranked order) were identified as high hazards and a full risk assessment and consequence analysis was conducted:

- Hurricane
- Climate Change
- Flood
- High Winds
- Earthquake
- Coastal Erosion

The risk and vulnerability of these six hazards was assessed in the State's plan using various methodologies and multiple sources, including data extracted from local hazard mitigation plans, Hazus-MH, and GIS data sets. Historical data related to previous occurrences, and information from hazard-specific sources, such as the National Weather Service, National Climatic Data Center and United States Geological Survey, provide the foundation to determine vulnerability of people, property, the environment and the Program's ability to operate under hazard conditions.

[Section 3.1](#) of the SHMP describes the general vulnerability to all natural hazards within the jurisdiction. In addition, specific vulnerabilities are noted in the various hazard sections. The information provided within [Section 3.1](#) and the hazard-specific sections covers all elements required in this standard. Each hazard section also presents detailed impact information that provides a more comprehensive understanding of the level of risk and vulnerability of people, property, the economy, and program operations.

Vulnerability of people is addressed in [Section 3.1](#), as well as in the six sections that address high hazards. As an example, the Climate Change section discusses vulnerability of population, property, critical infrastructure, environment, economy, continuity of services/program operations and public confidence in the state's governance (p. 3.4-15 to 21).

Impacts to property, agriculture, and critical infrastructure are addressed throughout the multiple hazard sections. For example, the High Winds section clearly identifies the dollar



amount of property and crop damage resulting from previous storms (p. 3.11-11 to 13) and highlights the counties with the highest losses. In addition, each section features the average annualized losses by county, demonstrating the most vulnerable local jurisdictions within the state. The Hazus-MH software was used as a primary means of determining potential physical damage caused by wind (hurricane), flood and earthquake, to residential and commercial buildings, schools, critical facilities, and infrastructure. Hazus-MH also produced information related to potential economic loss, including lost jobs, business interruptions, repair, and reconstruction costs.

As an example of economic vulnerability, Section 3.1.4, (p. 3.0-38) states that “natural hazards have both direct and indirect impacts on the jurisdiction’s economy”, explaining that events such as hurricanes and floods can cause immediate significant loss due to damaged and destroyed structures and infrastructure. In addition, the section notes that the magnitude of the event can also result in long-term indirect impacts on state and local economies due to failure of businesses, redevelopment costs, and supply chain impacts. This section of the plan also provides additional information such as the potential number of New York businesses affected by Hurricane Sandy in 2012, based on applications requested by businesses for assistance through the Small Business Administration (SBA) loan program. The six high hazard sections of the plan provide the amount of economic loss as well as average annualized losses (by dollars) based on projections from previous disasters.

Vulnerability of the environment is also addressed in the six high hazard sections, referencing a wide variety of impacts to coastal areas, wetlands, forests, and agriculture. Information was provided from a broad range of sources, including a number of State agencies such as the Department of Environmental Affairs, which has a broad regulatory and management authority over programs that cover multiple aspects of the environment, including water (coastal and inland), air quality, and recreational lands and forests.

Based on the contractor review of the updated 2014 SHMP, information documented in the plan supports all elements of Standard 4.3.1.

**4.3.2:** *The Emergency Management Program shall conduct a consequence analysis for the hazards identified in 4.3.1 to consider the impact on the public; responders; continuity of operations including continued delivery of services; property, facilities, and, infrastructure; the environment; the economic condition of the jurisdiction and public confidence in the jurisdiction’s governance.*

The 2014 New York State Hazard Mitigation Plan identifies fifteen (15) **natural** hazards: avalanche, climate change, coastal erosion, drought, earthquake, extreme temperatures, flood, hailstorm, high winds, hurricane, land subsidence/expansive soils, landslide, severe winter storm, tsunami and wildfire. Of the 15 hazards, nine (9) were considered to be of low probability and impact, and a risk/consequence analysis was not justified. (This is consistent with the hazard ranking summary in the 2014 SHMP, Section 3.2, p. 62-66.) A



hazard ranking scale was used to determine the highest hazards, on the basis of scope, consequences/cascading effects, frequency, impacts (people, private property, and community infrastructure), onset, duration and mitigation potential. The following six (6) hazards (in ranked order) were identified as high hazards and a full risk assessment and consequence analysis was conducted:

- Hurricane
- Climate Change
- Flood
- High Winds
- Earthquake
- Coastal Erosion

Section 3.1.5 of the 2014 SHMP identifies and describes general categories used for vulnerability assessment and consequence analysis: population, property, environment, and economy. In addition, the methodology for assessing vulnerability of and consequences to state facilities and critical infrastructure is described in Sections 3.1.8 and 3.1.9. Table 3.1g provides a matrix of the consequences and potential cascading effects related to all natural hazards considered by the state. Categories represented in this table that are relevant to this standard are:

- Structural damage (property)
- Utility outage (infrastructure)
- Commodity shortage (facilities; continuity of operations/continued delivery of services)
- Emergency communication failure (infrastructure)
- Erosion (environment)
- Environmental impact (environment)
- Disease/Public Health (continuity of operations/continued delivery of services)
- Impact to responders and/or Program operations (responders; continuity of operations)

Additional analysis of potential consequences is evidenced in each hazard section. The EMAP Standards Review Matrix provides the page number where each element of this standard is covered within the six high hazard sections of the plan. As examples:

- Vulnerability of people is addressed in Section 3.1.5, as well as in the six sections that address high hazards.
- The Climate Change section discusses vulnerability of population, property, critical infrastructure, environment, economy, continuity of services/program operations and public confidence in the state's governance (p. 3.4-15 to 21).

Public confidence in the jurisdiction's governance is the only element in this standard covered within only one hazard section, which is climate change. The section notes that public confidence tends to be higher when the jurisdiction has taken a visible lead in



addressing the threats, vulnerabilities, and potential adaptive [mitigation] strategies and actions that can lessen their impacts, and that New York has taken significant initiatives at local and state levels to identify and act upon adaptive measures. Public education related to these efforts has been a priority and various programs are promoted in public services messages and through other measures. *Other hazard sections within the 2014 SHMP do not address public confidence in the jurisdiction's governance.*

#### **STANDARD 4.4: Hazard Mitigation**

**4.4.1:** *The Emergency Management Program shall develop and implement its mitigation program to eliminate hazards or mitigate the effects of hazards that cannot be reasonably prevented. The mitigation program identifies ongoing opportunities and tracks repetitive loss. The Emergency Management Program implements mitigation projects according to a plan that sets priorities based upon loss reduction.*

The 2014 New York State Hazard Mitigation Plan (SHMP) provides the framework for the jurisdiction's comprehensive hazard mitigation program. The SHMP identifies 15 natural hazards and uses ranking criteria that considers multiple factors including frequency, severity of impacts, duration, and mitigation potential to identify the highest hazards that provide the greatest opportunity for loss reduction. Ranking criteria is defined in Section 3.2 of the plan.

The SHMP risk assessment process identifies the effects of hazards, which serves as the foundation to identify potential mitigation projects. In addition to the process used to rank hazards, the SHMP also describes two additional processes that assist in addressing hazard impacts and consequences that could be reduced or eliminated. The ranking process (described in Section 4) for actions and activities uses a comprehensive scale to identify and quantify benefits of the activity. This process results in a list of prioritized activities that can be monitored and linked to funding opportunities for implementation. In addition, a prioritization process (described in Section 5) based on criteria that include repetitive loss and benefit cost review is implemented to determine funding priorities for mitigation projects. Repetitive loss and severe repetitive loss have been a priority for mitigation funding in the past few years (see Section 7), as evidenced by more than 1,200 buyout projects proposed in currently funding cycles.

**4.4.2:** *The mitigation program includes participation in applicable jurisdictional, inter-jurisdictional and multi-jurisdictional mitigation efforts.*

The 2014 SHMP documents multiple levels of participation in mitigation programs. Participation includes membership in jurisdictional and inter-jurisdictional programs and projects, such as the federally-led Silver Jackets program and the State Drought Management Task Force, and funding programs such as the Hazard Mitigation Grant Program, and Community Development Block Grant Program. Participation is also demonstrated through implementation of the National Flood Insurance Program (NFIP)



and Community Rating System initiatives (CRS). Multiple State-level agencies and entities participate in various programs and projects, such as Local Waterfront Revitalization Program, coordinated by entities such as the Department of Environmental Conservation, Department of State, Department of Transportation, and the Canal Corporation.

Participation with local jurisdictions is documented through technical assistance, training, plan reviews, mitigation planning, and project implementation.

Recent disasters such as Hurricanes Irene and Sandy, Tropical Storm Lee and flood events have enhanced opportunities to focus on mitigation initiatives presented as “resiliency” initiatives. Policy programs such as the New York 2100 Commission, and New York Rising have brought mitigation to the forefront with inter- and multi-jurisdictional recovery programs implemented at State, regional and local levels, and with the public.

Documentation of the Program’s participation in mitigation programs is provided primarily in the following sections of the SHMP:

- Section 2 (Coordination with Stakeholders)
- Section 4 (State Capabilities)
- Section 3 (Section 3.0 and multiple hazard sections)
- Section 5 (local mitigation programs)
- Section 7 (Severe Repetitive Loss programs and projects).

**4.4.3:** *The Emergency Management Program provides technical assistance consistent with the scope of the mitigation program such as implementing building codes, fire codes, and land-use ordinances.*

The 2014 SHMP documents multiple programs that include technical assistance consistent with the scope of the mitigation program. Section 4.2 (State Capability Assessment) describes a number of programs that include technical assistance components related to land-use and construction methods such as public education related to building codes to resist natural hazards; the FIREWISE wildfire mitigation program, and the programs and projects related to Coastal Erosion Hazard Areas (CEHAs). In the latter program, the Division of Coastal Resources provides technical assistance to municipalities considering adoption of local laws implementing CEHAs.

Technical assistance is provided through various methods including presentations at conferences and meetings; training; local agency web pages; and distribution of fliers and informational materials. An example of this is described in the Department of State’s website <http://www.dos.ny.gov/communitieswaterfronts/> providing technical assistance or “guidance” to local communities to revitalize, protect and improve the environment, strengthen local economies and improve the efficiency and effectiveness of municipal service delivery. Another program that includes technical assistance is the Local Waterfront Revitalization Program (LWRP) which is provided to local governments concerning proposed storm damage reduction projects, as well as local ordinances that address coastal hazard risks. Another program that provides technical assistance is the



Department of Environmental Conservation's Stream Maintenance Program, which provides technical assistance and training for local governments on the benefits of stream maintenance to reduce flooding and erosion.

**4.4.4:** *The Emergency Management Program shall implement a process to monitor overall progress of the mitigation strategies, document completed initiatives, and resulting reduction or limitation of hazard impact in the jurisdiction.*

The Program's progress in achieving mitigation strategies is monitored and evaluated through the processes described in Section 6 of the 2014 SHMP. Monitoring processes are implemented annually to assess progress in initiatives and activities listed in the current plan and identify new opportunities for mitigation based on the mitigation strategy goals and objectives. This process also captures information related to any initiatives or activities completed since the last plan update cycle, and documents progress in a table format in Section 4.

The evaluation process is conducted at a minimum annually to review existing and new policies, regulations, initiatives and/or studies; assess changes in state agencies and/or their procedures, new grant programs or new areas of focus; research new or updated data and information that contributes to the risk assessments, loss estimates or vulnerabilities in State assets; assess progress in previously implemented actions that reduce vulnerability and losses; and maintain and complete documentation of the SHMP plan review process. The evaluation process results in a summary report that documents progress in achieving the mitigation strategy. The annual summary reports assist in updating the plan, as needed and/or required.

The responsibility for monitoring and evaluation is assigned to the DHSES Mitigation Section, and involves coordinating with stakeholders and documenting outcomes of the plan maintenance process and progress achieved in completion of mitigation activities.

**4.4.5:** *The mitigation plan shall be based on the natural and human-caused hazards identified by the Emergency Management Program and the risk and consequences of those hazards. The mitigation plan for the jurisdiction is developed through formal planning processes involving Emergency Management Program stakeholders and shall establish interim and long-term strategies, goals, objectives, and actions to reduce risk to the hazards identified. The Emergency Management Program implements a process and documents project ranking based upon the greatest opportunity for loss reduction and documents how specific mitigation actions contribute to overall risk reduction.*

The 2014 SHMP includes only natural hazards identified by the Program and does not identify or assess risks or consequences of human-caused hazards.



The SHMP identifies six high hazards that are comprehensively assessed for their risk and consequences in Section 3 (See Standard 4.3). The formal planning process followed for development of the jurisdiction's mitigation plan is documented in Section 2 of the plan. The processes followed to maintain the plan are described in Section 6. The planning process involves multiple stakeholder groups, representing federal, state, local agencies and private-sector entities. Section 4 describes the strategies, goals and objectives developed to reduce risk to the hazards identified in Section 3. The actions and activities table in Section 4 presents initiatives that support both interim and long-term actions. The ranking process to prioritize mitigation actions is based on a number of factors, including benefit-cost, technical feasibility, environmental benefit, funding availability, acceptability, and timeframe for implementation. The methodology used to rank mitigation activities as projects when they are submitted for funding provides the basis for identifying the greatest opportunity for loss reduction.

Section 7 documents flood buy-out projects implemented in the past several years to address one of the jurisdiction's highest hazards, illustrating how specific mitigation actions contribute to overall risk reduction.



**PART II – Consistency Matrix for Standard 4.3 Hazard Identification and Risk Assessment**

HAZARD (2014 NY SHMP)	RISK and VULNERABILITY (4.3.1)				CONSEQUENCES (4.3.2)							NOTES
	People	Property	Environment	Program Operations	The Public	Responders	Continuity of Operations/ delivery of services	Property, facilities & infrastructure	Environment	Economic condition of the Jurisdiction	Public Confidence in governance	
<b>Natural</b>												
<b>Hurricane</b>	3.0-32, 36-39; 3.12-10, 3.12-39, 3.12-53	3.12-16, 3.12-40-51, 3.12-52-57	3.0-32; 3.12-35	3.0-32	3.0-32, 36-39; 3.12-36-39	3.0-32	3.0-32	3.0-32; 3.12-40-51, 52-57	3.12-35	3.12-34		Recommendation for plan update: Address issues related to hurricanes that could positively or negatively influence public confidence in governance.
<b>Climate Change</b>	3.0-32, 36-39; 3.4-15-19, 20	3.4-15, 3.4-18	3.0-32; 3.4-20	3.0-32	3.0-32, 36-39; 3.4-15-18	3.0-32	3.0-32, 3.4-21	3.0-32; 3.4-19,20	3.4-20	3.4-19, 20	3.4-21	
<b>Flood</b>	3.0-32, 36-39; 3.9-57	3.9-32-33, 68-70, 74-75	3.0-32; 3.9-4	3.0-32	3.0-32, 36-39; 3.9-57	3.0-32	3.0-32	3.0-32; 3.9-32-33, 68-70, 72-73, 74-83	3.0-32; 3.9-4	3.9-76-78		Recommendation for plan update: Address issues related to flood that could positively or negatively influence public confidence in governance.
<b>High Wind</b>	3.0-32, 36-39; 3.11-19	3.11-11 to 13, 20, 22-23	3.0-32; 3.11-11 to 13	3.0-32	3.0-32, 36-39; 3.11-19	3.0-32	3.0-32	3.0-32; 3.11-11 to 13, 20, 36-38	3.0-32	3.11-11-13, 22-23		Recommendation for plan update: Address issues related to high wind that could positively or negatively influence public confidence in governance.
<b>Earthquake</b>	3.0-32, 36-39; 3.7-19-21	3.7-19-29	3.0-32; 3.7-8-11	3.0-32	3.0-32, 36-39; 3.7-19-21	3.0-32	3.0-32	3.0-32; 3.7-19-29	3.7-8-11	3.7-19-20, 30-36		Recommendation for plan update: Address issues related to earthquake that could positively or negatively influence public confidence in governance.
<b>Coastal Erosion</b>	3.0-32, 36-39; 3.5-1, 3, 3.5-1, 3, 9-11, 23	3.5-1, 3, 9-11, 23	3.0-32; 3.5-11-27	3.0-32	3.0-32, 36-39; 3.5-1, 3, 23	3.0-32	3.0-32	3.0-32; 3.5-9, 23, 40-42, 50-51	3.5-3, 26-27	3.5-21, 44-49		Recommendation for plan update: Address issues related to coastal erosion that could positively or negatively influence public confidence in governance.
<b>Human-Caused or Technological**</b>												
<b>Cyber Threats *(referenced)</b>												
<b>Terrorism - IND (*scenario)</b>												
*Specific Threats/Hazards addressed in the THIRA												
<b>Key</b>												
Information not identified = <span style="background-color: red; color: black;">          </span>												



**Matrix Summary Information**

<b>THIRA (June 2013) - addresses 1 hazard scenario - IND</b>												
<b>4 Human-caused (IND addressed through scenarion, others referenced olny):</b>												
Terrorism - Improvised Nuclear Devise (IND) Scenario												
Cyber Threats												
Active Shooter Attacks												
Nuclear Power Plant accidents												
<b>7 Natural and Technological hazards referenced (referenced only):</b>												
Hurricanes/Tropical Storms												
Flooding												
Severe Winter Storms/Ice storms												
Tornadoes												
Earthquakes												
Dam Failures												
Hazardous Materials												
<p><b>THIRA SUMMARY:</b> The NYS THIRA amended the FEMA process and conducted a "POETE" (Planning, Organization, Equipment, Training, and Exercises) assessment of 28 "Critical Capabilities". The THIRA was conducted through statewide survey with State and Local stakeholder agencies, and non-governmental organizations, and used one human-caused threat scenario (IND) to evaluate capabilities. The THIRA report did not include the ranking scale criteria. used for assessment.</p>												
<b>INSTRUCTIONS</b>												
<b>Column A :</b> List hazard/threat name												
<b>Columns C-F:</b> Reference section or page numbers that support standard 4.3.1												
<b>Columns H-N:</b> Reference section or page numbers that support standard 4.3.2.												
<b>Notes:</b> Provide clarification, explanation or additional information												
<b>THIRA:</b> Provide date and specific hazards addressed in area noted below the table. Reference "THIRA" in appropriate cells of table if information supports specific standard elements												

