



MULTIJURISDICTIONAL HAZARD MITIGATION PLAN—DRAFT

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Executive Summary

Across the United States and around the world, natural disasters occur every day. As the world's population and development have increased, so have the effects of these natural disasters. Climate change also increases the frequency and severity of some types of hazards. The time and money required to recover from these events often strain or exhaust local resources. Hazard mitigation is any sustained action to reduce or eliminate the long-term risk to human life and property from hazards. The purpose of developing a hazard mitigation plan is to identify policies, actions, and tools for implementation that will, over time, work to reduce risk and the potential for future losses.

Hazard mitigation is best realized when community leaders, businesses, citizens, and other stakeholders come together to identify and evaluate the hazards that can affect their area and use this knowledge to prioritize needs and develop a risk-based strategy for reducing damages. Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), enacted by Section 104 of the Disaster Mitigation Act of 2000 (DMA 2000), and the guidance outlined in the Federal Emergency Management Agency (FEMA) Local Mitigation Planning Policy Guide provide the framework for the mitigation planning process. While Rensselaer County has always sought ways to reduce their vulnerability to hazards, the passage of DMA 2000 helped county officials recognize the benefits of pursuing a long-term, coordinated approach to hazard mitigation through hazard mitigation planning. This plan is funded through a FEMA grant for hazard mitigation planning.

In order to apply for federal hazard mitigation funding, local jurisdictions must comply with DMA 2000 and its implementing regulations (44 Code of Federal Regulations Part 201.6). By adopting this hazard mitigation plan, the plan participants will meet this requirement. Rensselaer County's first hazard mitigation plan was approved by FEMA in November 2011. Thereafter, it was adopted by resolutions passed by the county and each participating jurisdiction. FEMA requires hazard mitigation plans to be monitored and evaluated regularly and updated at least once every five years. This document is the second update to the Rensselaer County Multi-Jurisdictional Hazard Mitigation Plan. In this update, the plan was revised to meet the guidelines of the new FEMA Local Mitigation Planning Policy that became effective April 19, 2023, the 2022 NYS Mitigation Planning Standards, and the New York Emergency Management Accreditation Program.

This update was led by the Rensselaer County Emergency Preparedness Coordinator and outside consultants with active participation from a wide range of plan participants, stakeholders, and the public. The plan participants include Rensselaer County and as many of its 22 municipalities as chose to participate. This Rensselaer County Multi-Jurisdictional Hazard Mitigation Plan represents the collective efforts of the county and 22 fully participating jurisdictions, the general public, and other stakeholders.

The county, participating jurisdictions, and key stakeholders met regularly throughout the plan update timeline to share information and ideas about natural hazards, areas in need of mitigation, and potential

mitigation measures to reduce risks. Over the course of the plan update, four meetings were held including the following:

- Kickoff Meeting
- Risk Assessment Meeting
- Capability Assessment Meeting
- Mitigation Strategy Meeting

In addition, multiple jurisdiction meetings, phone calls, and email outreach was conducted throughout the plan update process. Community support is vital to the success of any hazard mitigation plan. The county and each participating community were responsible for conducting outreach within their respective jurisdictions. A survey in English and Spanish was shared digitally via social media as well as in-person in locations across the county, including areas where socially vulnerable populations were known to visit. Additionally, multiple community partners helped share the survey specifically with vulnerable populations such as the unhoused population. These efforts provided the general public and other stakeholders with opportunities to take part in the decisions that will affect their future. Each jurisdiction's outreach activities are summarized in detail in their respective jurisdictional annexes.

The initial hazard mitigation planning process consisted of the following key steps:

- Organize the planning effort.
- Identify hazards and draft the risk assessment.
- Complete a vulnerability assessment.
- Conduct a capability assessment.
- Evaluate the mitigation strategy, actions, and plan integration opportunities.
- Develop an implementation and plan maintenance strategy.
- Compile the draft plan.
- Adopt the draft plan.

One priority of this hazard mitigation plan update was to expand the hazards included. The plan participants evaluated the hazards included in the last plan and decided to profile the following hazards in this plan:

- Drought
- Earthquake
- Extreme Temperatures
- Flooding
- Hazardous Materials
- High Winds

- Hurricane/Tropical Storm
- Landslide
- Lightning
- Terrorism
- Tornado
- Utility and Infrastructure Failure
- Wildfire
- Winter Storm

After evaluating these hazards and assets within the county to which they are vulnerable and considering their unique capabilities, each participating jurisdiction developed an updated hazard mitigation strategy to increase the disaster resilience of the county. The mitigation strategy includes the following goals:

1. **Increase public awareness.** Promote and sustain disaster resilient communities by increasing the awareness of hazard risks within the whole community (general public, elderly and low income, county government, local governments, and key stakeholders), and how this risk can be mitigated.
2. **Improve capabilities.** Enhance and support the capacity and capability of the county and its communities to prepare for, respond to, and recover from disasters and ensure continuity of operations.
3. **Protect existing assets.** Reduce the potential dangers and losses caused by hazards that pose a significant risk to Rensselaer County through implementation of hazard mitigation initiatives that will protect people and property in harm's way (structures, infrastructure, and critical facilities) during future hazard events.
4. **Promote resilient new development.** Promote mitigation actions and construction and design techniques that will minimize or eliminate potential impacts of natural hazards at sites where new development is taking place or where existing development is being expanded.

Finally, the plan participants evaluated a comprehensive range of mitigation actions and determined a method for keeping the plan current over the next five-year planning cycle.



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Section Introduction and Planning Process

The Planning Process

Hazard mitigation involves using long- and short-term policies, programs, projects, and other activities to alleviate the death, injury, and property damage that can result from a disaster. Rensselaer County has partnered with local governments—the incorporated jurisdictions within its geographical boundaries—to develop a multijurisdictional hazard mitigation plan (HMP) to reduce risks from natural disasters. The plan reaffirms the planning partners' commitment to implementing cost-effective, environmentally sound, and technically feasible mitigation actions. It also complies with federal and state hazard mitigation planning requirements to establish eligibility for funding under Federal Emergency Management Agency (FEMA) grant programs.

The entire community within Rensselaer County—including individuals and families, businesses, community and non-profit organizations, schools, academia, and all levels of government—ultimately benefits from this HMP. Implementing the plan will reduce risks for those who live and work in and visit the county. The plan provides a viable planning framework for natural hazards of concern for the area. Key stakeholders' participation in the plan's development helped ensure that the outcomes would be mutually beneficial. The resources and background information in the plan are applicable across the county, and the plan's goals and recommendations can lay the groundwork for developing and implementing local mitigation activities and partnerships for years to come.

Federally approved state and local mitigation plans are prerequisites for many mitigation grants. The development and FEMA approval of the Rensselaer County Hazard Mitigation Plan (HMP) will ensure the county's future eligibility for federal mitigation funds, including:

- Building Resilient Infrastructure and Communities (BRIC) grants
- Hazard Mitigation Grant Program (HMGP)
- Flood Mitigation Assistance (FMA) grants
- Pre-Disaster Mitigation (PDM) grants
- High Hazard Potential Dam Grants (HHPD)

The plan is maintained and updated following FEMA's required five-year planning cycle. This update strives to expand upon the revised methodology of Rensselaer County's previous HMP. It complies with the updated FEMA mitigation planning guidelines outlined in the FEMA Local Mitigation Planning Policy Guide, which became effective April 19, 2023, including the optional HHPD element. The county intends to strengthen its mitigation program by enhancing local plan integration and technical assistance programs. This plan's improved risk and vulnerability assessment drives a more effective and

implementable mitigation strategy. After submitting the plan to FEMA for review, it will be formally adopted by Rensselaer County and its jurisdictions.

Approach to the Plan Update

The 2025 Rensselaer HMP update was developed with the support of many agencies, organizations, and individuals. Rensselaer County led the planning process, which involved identifying stakeholders, conducting meetings, coordinating with plan participants, providing input on completing the plan update, and reviewing the draft plan. By working together, this delegation of duties helped bridge the gap between HMP development and implementation. Input was additionally collected from stakeholders through meetings, direct communication, and surveys. The planning process was designed to engage all relevant stakeholders and integrate with other state planning efforts.

The participating jurisdictions are:

- Rensselaer County
- Cities of:
 - > Rensselaer
 - > Troy
- Towns of:
 - > Berlin
 - > Brunswick
 - > East Greenbush
 - > Grafton
 - > Hoosick
 - > North Greenbush
 - > Petersburg
 - > Pittstown
 - > Poestenkill
 - > Sand Lake
 - > Schaghticoke
 - > Schodack
 - > Stephentown
- Villages of:
 - > Castleton-on-Hudson

- > East Nassau
- > Hoosick Falls
- > Nassau
- > Schaghticoke
- > Valley Falls

Rensselaer County hired IEM International, Inc. (IEM) to update and augment the 2025 plan update. IEM provided technical and administrative assistance throughout the planning process, including drafting the base plan, facilitating meetings, and developing and incorporating forms to gather stakeholder input. The IEM Lead Planner worked closely with the county and its jurisdictions to ensure all steps reflected its goals for this plan update. The 2025 update focused on enhancing previous hazard mitigation planning efforts.

Planning Process Methodology

Hazard mitigation planning in the United States is guided by the statutory regulations described in the Disaster Mitigation Act (DMA) 2000 and implemented through 44 Code of Federal Regulations (CFR) Parts 201 and 206. FEMA’s guidelines outline a four-step planning process for developing and approving HMPs.

A planning process was created to develop the HMP based on the various federal guidance documents and regulations. Figure 1 shows the four major components of the HMP planning process: organizing resources, assessing risk, developing the mitigation action strategy, and adopting and implementing the plan.



Figure 1: Multi-Jurisdiction Hazard Mitigation Planning Process

FUNDING THE PLAN

The 2025 Rensselaer County HMP has been successfully funded through the HMGP and local match contributions from the county. This funding will enable the implementation of essential hazard mitigation strategies to reduce the community’s vulnerability to natural disasters and other emergencies. The collaboration between HMGP and Rensselaer County underscores the commitment to proactive disaster risk reduction and resilience building. With this support, Rensselaer County is better equipped to safeguard the county and its residents from potential hazards.

PLAN PARTICIPANT ENGAGEMENT

Key IEM members created the HMP in collaboration with the Hazard Mitigation Planning Team (HMPT). This team was responsible for completing capability assessments, providing input on identifying hazards, setting mitigation goals, and devising mitigation strategies. A core planning team, consisting of personnel from Rensselaer County and each participating jurisdiction, oversaw planning efforts, sought input, and participated throughout the planning process. Representatives from various organizations and departments from the participating jurisdictions and Rensselaer County also provided input throughout the planning process. In particular, the plan update process benefited from the input of nonprofits, county public health, and other representatives of socially vulnerable populations who helped identify vulnerable populations with the planning area and how best to conduct them. The planning team members, their agencies, and the sector they represented are listed in Table 1. Meeting topics and dates are provided in Table 2 provides a comprehensive overview of the scheduled meetings pertinent to developing and implementing the Hazard Mitigation Plan. This table outlines the specific dates for each meeting and the types of meetings conducted. These gatherings are essential for facilitating collaboration among stakeholders and ensuring that all aspects of the plan are thoroughly discussed and addressed. By documenting this information, we aim to promote transparency and foster active participation in the hazard mitigation process, ultimately enhancing the community’s resilience to potential hazards.

Table 2, and stakeholder representatives in Table 3.

Table 1: Planning Team Members

Member	Agency	Sector
Hagan Hill	Emergency Preparedness Coordinator	Rensselaer County Bureau of Public Safety
Andrew Flumano	Director of Law Enforcement	Mohawk Hudson Humane Society
Derek Pyle	Captain	Rensselaer County Sheriff’s Office
Don Richards	Assistant Director of Public Safety	University Heights Association Troy Campus, Russell Sage College
Doug La Rocque	Deputy Supervisor	Town of Grafton
Edward Heffern	Deputy Director	Rensselaer County Bureau of Public Safety
Fred Aliberti	Director of Public Safety	Hudson Valley Community College

Member	Agency	Sector
Jason Vandenburg	Sergeant	Hudson Valley Community College Public Safety
Joseph Bott	Town Supervisor	North Greenbush
Rebecca Lawston	Unknown	Red Cross Mass Care
Len Claus	Deputy Director of Public Health	Rensselaer County
Mark Lacivita	Bureau of Public Safety Deputy Emergency Manager	Rensselaer County
Peter McKee	Interim Disaster Program Manager	American Red Cross Territory 5
Melinda Reed	Chief Operating Officer	Unity House of Troy
Nicole Pollay	Preparedness Coordinator	Rensselaer County Department of Public Health
Elizabeth (Beth) O'Reilly	Planning Manager for Rensselaer County	New York State Division of Homeland Security and Emergency Services (NYS DHSES)
Robert Sears	Director of Public Safety	University Heights Association, Russell Sage College
Terry O'Brien	Rensselaer County Public Safety Grant Coordinator	Rensselaer County
Tim Salisbury	Supervisor	Town of Schaghticoke
Tom Russell	Town Supervisor	Poestenkill
Peter Swieton	Director of Environmental Health and Safety	Hudson Valley Community College
Richard Elder	Environmental Health Director	Rensselaer County
Heinz Noeding	Town Supervisor Engineer	Town of Petersburg
Wayne Bonesteel	Town Engineer	Towns of Poestenkill and Nassau
Thomas Burrall	Building Inspector	Village of Castleton
Tom King	Building Dept.	Town of Schodack
Beth O'Reilly	Planning Manager	NYS DHSES
Matt Curley	Supervisor	Town Of Pittstown
Jerad Smith	Code Enforcement	Town of Hoosick
Josh Giller	Director of Planning,	Town of East Greenbush
Michael Tarasoff -	Planning Manager	NYS DHSES
Michael Slik	Mayor	Village of Castleton-on-Hudson
Nicole Pollay	PHEP Coordinator	Rensselaer County Department of H ealth
Maryfran Wachunas	Public Health Director	Rensselaer County Department of Health

Member	Agency	Sector
John Pritt	Trustee	Village of Schaghticoke
Russ Reeves	City Engineer	City of Troy
Betsy Parmerter	Hazard Mitigation Planning Contractor	NYS DHSES
Kevin Clapp	Supervisor	Hazard Mitigation Planning - NYS Division of Homeland Security & Emergency Services
Dawne Kelley	Town Supervisor Admin Assistant	Town of Schodack
Michael Stammel	Mayor	City of Rensselaer
Jay Wilson	Director of Public Safety	Rensselaer County
Meaghan Hart	Deputy Commissioner	Town of East Greenbush
Dan Fiacco	Commissioner	Town of East Greenbush
John Hudson	Police Department	Hoosick Falls
Mark Surdam	Town Supervisor	Hoosick
Joe Bott	Town Supervisor	North Greenbush
Paul Hoag	HWY Superintendent	Town Of Hoosick
Charles Peter	Town Supervisor	Town of Schodack
Michael McDonald	Building Department	Brunswick
Megan Meyers	District Manager	RC Soil and Water
Mark Lacivita	Bureau of Public Safety Deputy Emergency Manager	Rensselaer County
Alex Portugal	Intern	Rensselaer County Bureau of Public Safety
Ingrid Gundrum	Supervisor	Grafton
Eric Westfall	Town engineer & Stormwater Management Officer	North Greenbush
Elisa Martin	Mayor	Village of East Nassau
Kevin Rifenburgh	Comm. Of Public Works	Sand Lake
Mark Acevedo	Public Safety	Rensselaer County
	MS-4 Officer/ Building Inspector/Code Enforcement	Schaghticoke
Thomas Hulihan	Director of Planning and Development	City of Rensselaer

Member	Agency	Sector
Scott Frisino	MS-4 Officer/ Building Inspector/Code Enforcement	Town of Schaghticoke

Table 2 provides a comprehensive overview of the scheduled meetings pertinent to developing and implementing the Hazard Mitigation Plan. This table outlines the specific dates for each meeting and the types of meetings conducted. These gatherings are essential for facilitating collaboration among stakeholders and ensuring that all aspects of the plan are thoroughly discussed and addressed. By documenting this information, we aim to promote transparency and foster active participation in the hazard mitigation process, ultimately enhancing the community's resilience to potential hazards.

Table 2: Core Planning Team Meetings

Meeting	Date
Kickoff Meeting	February 7, 2024
Risk Assessment Meeting	May 02, 2024
Capability Assessment Meeting	June 03, 2024
Mitigation Strategy Meeting	August 08, 2024

Table 3 indicates how each plan participant was actively involved in the planning process. Such involvement refers to being engaged as participants and given the chance to provide input to affect the plan's content. This input was vital to developing a plan reflective of Rensselaer County and its planning partner's risks, capabilities, and needs.

Table 3: Plan Participant Summary

Participant	Attended Meeting?				Developed Annex?	Reviewed Draft	Individual Meeting
	Kickoff	Risk Assessment	Capability Assessment	Mitigation Strategy			
Rensselaer County	X	X	X	X	X	X	X
City of Rensselaer				X			
City of Troy				X			X
Town of Berlin							X
Town of Brunswick		X					X
Town of East Greenbush				X			
Town of Grafton	X		X				X
Town of Hoosick		X		X			X
Town of Nassau		X		X			X
Town of North Greenbush	X		X	X			X
Town of Petersburg		X		X			X

Participant	Attended Meeting?				Developed Annex?	Reviewed Draft	Individual Meeting
	Kickoff	Risk Assessment	Capability Assessment	Mitigation Strategy			
Town of Pittstown		X		X			X
Town of Poestenkill	X			X			X
Town of Sand Lake			X				X
Town of Schaghticoke	X		X				X
Town of Schodack				X			X
Town of Stephentown		X					X
Village of Castleton-on-Hudson				X			X
Village of East Nassau			X				X
Village of Hoosick Falls			X	X			X
Village of Nassau							X
Village of Schaghticoke		X		X			X
Village of Valley Falls		X					X

COORDINATING WITH OTHER AGENCIES AND STAKEHOLDERS

Stakeholders are individuals or groups that have a vested interest in the outcomes of a project, initiative, or organization. They play a crucial role in shaping decisions and policies, as their perspectives and insights can significantly influence the direction and effectiveness of various activities. Stakeholders received email invitations to the planning meetings and were encouraged to participate in a stakeholder survey. Additionally, all stakeholders had the opportunity to review and provide feedback on the draft plan.

Table 4 provides a detailed overview of key stakeholders within the local governmental framework, highlighting their roles. This table encompasses representatives from various agencies and their titles, showcasing the diverse individuals involved in community governance and public service. By identifying and acknowledging these stakeholders, we can better appreciate the dynamics of local administration and the importance of cooperation in addressing community needs and challenges.

Table 4: Stakeholder Representatives That Participated in the Plan Update

Agency/Organization	Representative	Position
Mohawk Hudson Humane Society	Andrew Fiumano	Director of Law Enforcement
Rensselaer County Sheriff's Office	Derek Pyle	Captain
University Heights Association Troy Campus, Russell Sage College	Don Richards	Assistant Director of Public Safety
Rensselaer County Bureau of Public Safety	Edward Heffern	Deputy Director
Hudson Valley Community College	Fred Aliberti	Director of Public Safety
Hudson Valley Community College Public Safety	Jason Vandenburg	Sergeant/Assistant Director of Public Safety
Red Cross Mass Care	Rebecca Lawston	Unknown
American Red Cross Territory 5	Peter McKee	Interim Disaster Program Manager
Unity House of Troy	Milinda Reed	Chief Operating Officer
Rensselaer County Department of Public Health	Nicole Pollay	Preparedness Coordinator
New York State Division of Homeland Security and Emergency Services (NYS DHSES)	Elizabeth (Beth) O'Reilly	Planning Manager for Rensselaer County

Agency/Organization	Representative	Position
Rensselaer County Department of Health	Richard Elder	Environmental Health Director
University Heights Association, Russell Sage College	Robert Sears	Director of Public Safety
New York Department of Health	Kwang-Seok Kang	Safety, Emergency Management and Preparedness Program Director
Rensselaer County Department of Public Health	Nicole Pollay	Rensselaer County Department of Public Health
Rensselaer County Bureau of Public Safety	Jack Thomas	Rensselaer County Bureau of Public Safety
Rensselaer County Department of Social Services	Misty LaBrake	Rensselaer County Department of Social Services
Rensselaer County Bureau of Public Safety	John Mainello	Rensselaer County Bureau of Public Safety
NYS DHSES	Michael Tarasoff	Planning Manager
Rensselaer Health Department	Maryfran Wachunas	Public Health Director
NYS DHSES	Betsy Parmerter	Hazard Mitigation Planning Contractor
Hazard Mitigation Planning - NYS Division of Homeland Security & Emergency Services	Kevin Clapp	Supervisor
New York State Division of Homeland Security and Emergency Services (NYS DHSES)	Scott Feverstein	Planning Manager
Hudson Valley Community College	Peter Swieton	Director of Environmental Health and Safety
Rensselaer Polytech Institute	Manuel F. Villaderey	EM and Cleary Compliance Officer

While a wide range of participants were invited to the meetings, not all could participate. Further, the survey was anonymous, meaning additional participants could have responded via survey. Identifying the stakeholders invited, even if they were unable to attend, documents the outreach process and potential partners for mitigation measures in the future. The agencies and stakeholders invited to participate in the planning process are listed in Table 4.

Table 5: Stakeholders Given the Opportunity to Participate

Stakeholder	Type of Stakeholder
Samaritan Hospital	Health and Social Services
Rensselaer Polytechnic Institute	Academia
Brunswick Historical Society	Private Interest
Wagner Farms Poestenkill NY	Business
Dzembo Farms Corn	Business
Hudson Valley Community College	Academia
Samaritan Hospital School of Nursing	Academia
Capital District YMCA – Troy Branch	Business
Brunswick Community Library	Non-profit
Oakwood Veterinary Clinic	Business
Collar City Animal Hospital	Business
Lansingburgh Public Library (Troy Public Library- Lansingburgh Branch)	Non-profit
Lansingburgh Historical Society	Special Interest
American Diabetes Association - Living with Type 2 Program	Health and social services
Cornell Cooperative Extension	Neighboring community
Rensselaer County Department of Health	Health and social services
St. Peter's Health Partners (Diabetes and Endocrine Care)	Health and social services
Stratton Veterans Administration Medical Center	Health and social services
TOPS Grocery Stores- Hoosick Falls	Business
Silver Sneakers-Rensselaer	Business
Regional Food Bank of Northeastern New York	Social services
Capital District Childcare Coordinating Council	Social services
Commission on Economic Opportunity	Local and regional agency
The Food Pantries for the Capital District	Social services
Legal Aid Society of NY	Social services
Trinity Alliance of the Capital Region	Social services
Addiction Care Center (ACCA) -Prevention and Community Education Services	Social services
Albany Medical Center	Health and social services
Brattleboro Retreat	Non-profit
Capital Counseling	Business

Stakeholder	Type of Stakeholder
Capital District Psychiatric Center	Health and social services
Catholic Charities	Non-profit
Center for Disability Services	Health and social services
The Community Hospice	Business/ health and social services
Conifer Park Inc.	Health and social services
Hudson Mohawk Recovery Center/Hope House Inc.	Health and social services
In Our Own Voices	Social services
Joseph House Shelter Inc.	Non-profit
Karner Psychological Associates	Business
Mental Health Empowerment Exchange	Non-profit
National Alliance on Mental Illness in NYS - Capital Region	Local or regional agency
Northeast Career Planning	Academia
Northern Rivers Mobile Crisis Team	Social services
Northern Rivers On-Track New York	Social services
Pearl Counseling Center, Inc.	Social services
The Pride Center of the Capital Region	Non-profit
Rehabilitation Support Services (RSS)	Social Services
Rensselaer County Mental Health	Health and social services
St. Catherine's Center for Children	Non-profit
American Red Cross of Northeastern New York	Non-profit
American Red Cross – Statewide	Non-profit
American Red Cross	Non-profit
Business for Good	Business
National Grid	Business
Capital Region Chamber	Local and Regional Agency
Capital Region Chamber	Local and Regional Agency
United Way of the Greater Capital Region	Non-profit
United Way of the Greater Capital Region	Non-profit
Capital Region Organizations Active in Disasters	Local and Regional Agency
Capital Region Organizations Active in Disasters	Local and Regional Agency
Grafton Town Board	An agency that has the authority to regulate development
Petersburgh, NY	Neighboring community

Stakeholder	Type of Stakeholder
Averill Park FD 1	Local and regional agency
Berlin FD 1	Local and regional agency
Best Luther FD 1	Local and regional agency
Brunswick 1 FD	Local and regional agency
Buskirk FD	Local and regional agency
Castleton FD 1	Local and regional agency
Center Brunswick	Local and regional agency
Clinton Heights	Neighboring community
Defreestville FD	Neighboring community
Eagle Mills C1	Neighboring community
East Greenbush 1	Local and regional agency
East Schodack	Local and regional agency
Grafton	Local and regional agency
Hemstreet Park	Local and regional agency
Hoags Corners	Local and regional agency
Hoosick	Local and regional agency
Hoosick Falls	Local and regional agency
Hoosick Valley	Local and regional agency
Johnsonville	Local and regional agency
Melrose	Local and regional agency
Mountain View FD 1	Local and regional agency
Nassau FD 1	Local and regional agency
North Hoosick 1	Local and regional agency
Petersburgh Fire 1	Local and regional agency
Pittstown FD 1	Local and regional agency
Pleasantdale 1	Local and regional agency
Poestenkill 1	Local and regional agency
Raymertown 1	Neighboring community
Schaghticoke	Local and regional agency
Schodack Landing	Local and regional agency
Schodack Valley 1	Local and regional agency
South Schodack	Local and regional agency
Speigletown 1	Local and regional agency
Stephentown FD 1	Local and regional agency

Stakeholder	Type of Stakeholder
Taborton 1	Local and regional agency
Tsatsawassa 1	Local and regional agency
West Hoosick	Local and regional agency
West Sand Lake	Local and regional agency
Wynantskill FD	Local and regional agency
Troy FD	Local and regional agency
Rensselaer FD	Local and regional agency
East Greenbush Central School Dist.	Academia
AVERILL PARK CSD	Academia
Berlin CSD	Academia
BRUNSWICK CSD	Academia
Hoosic Valley CSD	Academia
Lansingburgh CSD	Academia
Questar III BOCES	Academia
Rensselaer City School District	Academia
SCHODACK CSD	Academia
Troy City School District	Academia
North Greenbush Common School District	Academia
Wynantskill Union Free School District	Academia
NYS Parks	Neighboring community
NYS Canal Corporation	Businesses and other private interests.
New York Power Authority	Businesses and other private interests.
NYSDEC	Local and Regional Agency
NYS Department of Transportation	Local and Regional Agency
NYS DHSES	Local and Regional Agency
NYS OEM	Local and Regional Agency
NYS Police, Troop G - Latham	Local and Regional Agency
National Weather Service	Local and Regional Agency
U.S. Army Corps of Engineers - New York District	Local and Regional Agency
Albany Engineering Corporation	Businesses and other private interests.
CPKC Railroad	Businesses and other private interests.
CSX Transportation	Businesses and other private interests.
Hudson River-Black River Regulating District	Agencies that have the authority to regulate development

Stakeholder	Type of Stakeholder
Brookfield Renewable	Businesses and other private interests.
Burden Lake Conservation Association	Businesses and other private interests.
Burden Lake Association	Businesses and other private interests.
Glass Lake Preservation Corporation	Businesses and other private interests.
Troy Sand & Gravel Co. Inc.	Businesses and other private interests.
Nassau Lake Park Improvement Association	Businesses and other private interests.
Rensselaer Land Trust	Businesses and other private interests.
Hoosic River Watershed Association	Local and regional agency
Rensselaer County Regional Chamber of Commerce	Agencies that have the authority to regulate development
Regeneron	Businesses and other private interests.
Mohawk Humane Society	Non-profit
Healthy Capital District	Health and social services
Unity House	Health and social services
Albany County	Neighboring community
Columbia County	Neighboring community
Saratoga County	Neighboring community
Washington County	Neighboring community

While a broad range of stakeholder input is important to the hazard mitigation plan update process, Emergency Action Plans (EAPs) were reviewed for content information and dam owners were specifically invited to participate in the plan update in order to meet the HHPD element requirement. These stakeholders represent dam subject matter experts, local dam owners, and/or the state dam safety agency.

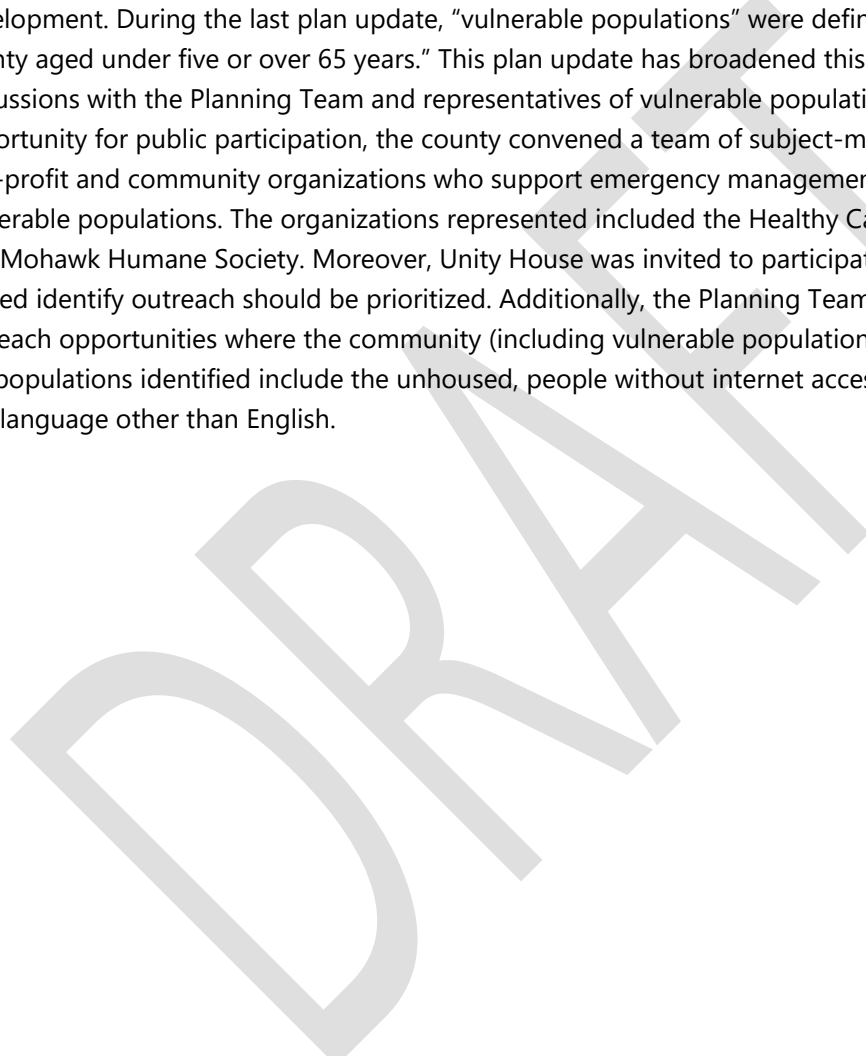
Table 6 Dam Owner and State Dam Safety Stakeholders Invited to Participate

Dam Stakeholder	HHPD Owner?
City of Rensselaer	Yes
City of Troy	Yes
NYS Parks	Yes
New York Canal Corporation	Yes
Hudson River - Black River Regulating District	Yes
NYSDEC	No
U.S. Army Corps of Engineers - New York District	No
Glass Lake Preservation Corp.	No
Troy Sand & Gravel Co. Inc.	No

Dam Stakeholder	HHPD Owner?
Burden Lake Preservation Corp.	No
Town of Brunswick	No

PUBLIC PARTICIPATION

As a part of this update, the planning process was designed to ensure that under-served communities and vulnerable populations within the planning area were provided opportunities for involvement in the plan’s development. During the last plan update, “vulnerable populations” were defined as “residents of the county aged under five or over 65 years.” This plan update has broadened this definition based on discussions with the Planning Team and representatives of vulnerable populations. To facilitate this opportunity for public participation, the county convened a team of subject-matter experts from local non-profit and community organizations who support emergency management and outreach to vulnerable populations. The organizations represented included the Healthy Capital District, Red Cross, and Mohawk Humane Society. Moreover, Unity House was invited to participate. These organizations helped identify outreach should be prioritized. Additionally, the Planning Team and consultant evaluated outreach opportunities where the community (including vulnerable populations) would gather. Some of the populations identified include the unhoused, people without internet access, and people who speak a first language other than English.



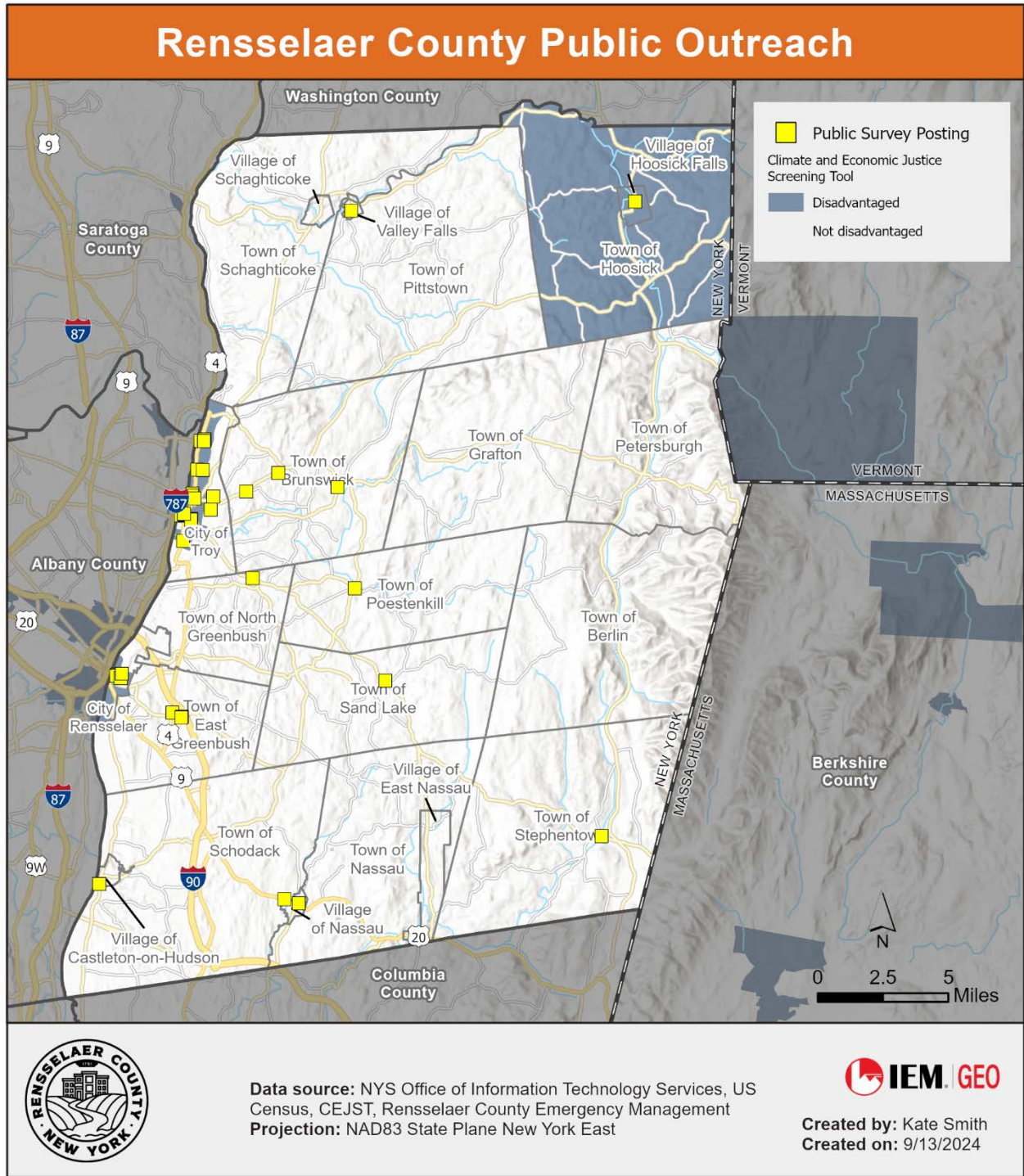


Figure 2: Rensselaer County Public Outreach

Further, based on the advice provided during the planning process, the outreach was focused on areas with economic need. Previously, these economic indicators have correlated with a broad range of characteristics that increase a population’s vulnerability to disaster events, including high poverty and unemployment rates, income inequality, housing affordability, and lower educational attainment.

According to Stanford Data Commons¹, zip codes 12180 and 12182 were identified as areas with the highest needs in Rensselaer County.

PUBLIC SURVEY

A public survey focused on hazard mitigation was conducted to enhance community safety and resilience. The survey link was posted on various social media platforms and community websites as well as in-person across the planning area. This survey is an essential tool that allows community members to share their insights, experiences, and concerns regarding potential hazards that affect the area. Feedback helps identify vulnerabilities and prioritize strategies to mitigate risks, ultimately contributing to a safer environment for everyone.

The survey results were presented to the planning partners during the plan update. Plan participants were encouraged to consider public feedback while developing their mitigation actions. Further, risks and vulnerabilities identified by the public were incorporated into the hazard profiles of this plan and can be used in future decision-making regarding mitigation, risks, and hazards. Appendix A of this volume summarizes the survey results and respondents' concerns about hazards.

Figure 3 to Figure 12 display examples of the public survey posted by the jurisdictions.

Rensselaer County 911 began to post information about the survey on its Facebook page on April 10, 2024, as shown in Figure 3 and Figure 4.

¹ Stanford Data Commons. "Ranking by Population (Below Poverty Level)."
https://datacommons.stanford.edu/ranking/Count_Person_BelowPovertyLevelInThePast12Months/CensusZipCodeTabulationArea/geoid/36083?h=zip%2F12040&pc=1&scaling=100&unit=%25

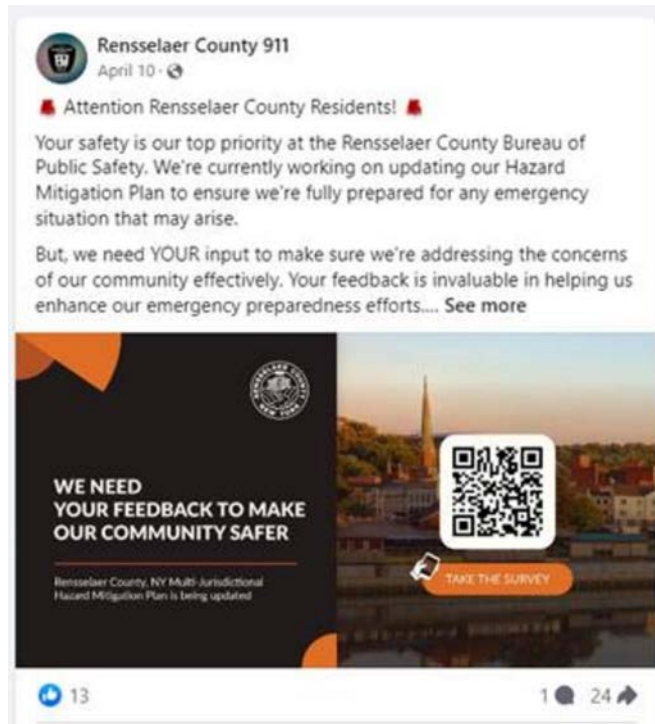


Figure 3: Rensselaer County 911 Facebook Site, Post 1



Figure 4: Rensselaer County 911 Facebook Site, Post 2

On May 20, 2024, Rensselaer County began to post information about the survey on its county website (see Figure 5). This was preceded by an email (sent April 18, 2024) with the survey link requesting all employees complete it.



Figure 5: Rensselaer County Website Hazard Mitigation Plan Public Survey Link

Schodack posted information about the survey on its website, as shown in Figure 6.



Figure 6: Town of Schodack Website Hazard Mitigation Public Survey Link

The Town of Hoosick posted the image shown in Figure 7 on its website.



Rensselaer County, NY Hazard Mitigation Plan Public Survey
What hazards concern you? We need your input on the risks from natural, man-made, and technological hazards that could affect Rensselaer County, and what actions should be taken to reduce those risks.

Figure 7: The Town of Hoosick Website Hazard Mitigation Public Survey Link

DRAFT

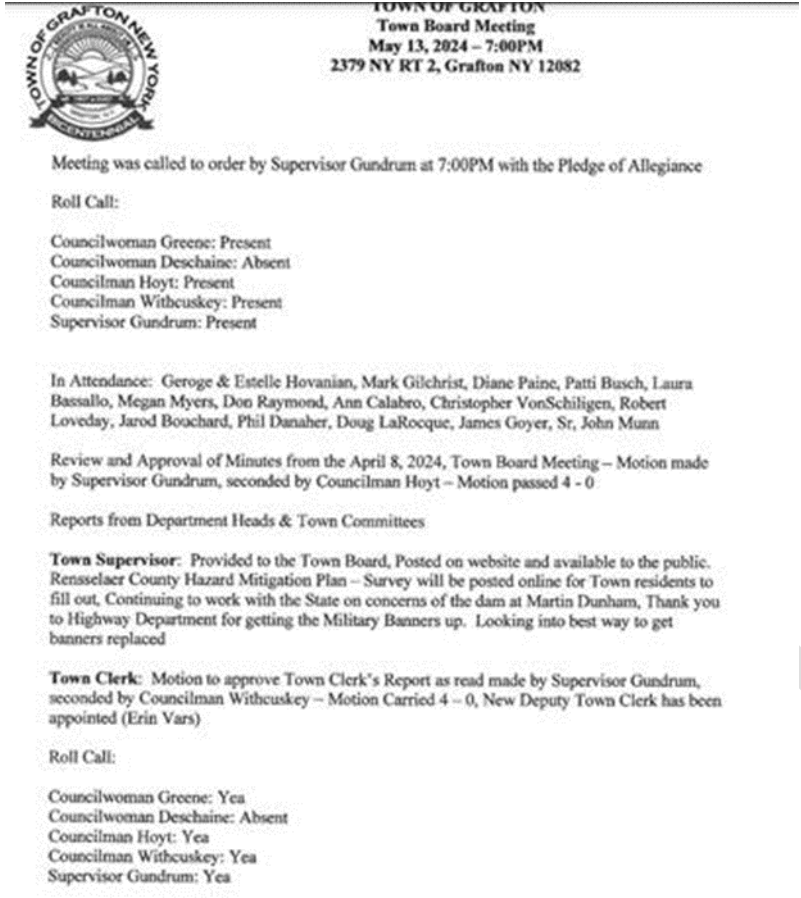


Figure 8: Grafton Town Board Meeting Addressing the Public Survey 05/13/2024.

Rensselaer County Hazard Mitigation Survey

Grafton residents are encouraged to participate in this survey to have input in updating our Rensselaer County Hazard Mitigation plan - Survey responses are due by June 1, 2024

<https://forms.office.com/pages/responsepage.aspx?id=EZ1Sy8zmvEeiH-vAWWJwR6-RR3YwSPRMqDK3Yh0yFkvUNEJZRkIGVjFEUTZTSjhGNjdfFSzIaWDJYOC4u&origin=QRCode>

Figure 9: Town of Grafton Website Hazard Mitigation Public Survey Link

The Town of Petersburg posted the survey on its website (Figure 10) and its Facebook page, as well as a copy of the flyer on the town’s public bulletin board.



HMS Flyer

Town of Petersburg Community Activities Survey

Figure 10: Town of Petersburg Website Hazard Mitigation Public Survey Link

Pittstown added the public survey to its website on May 07, 2024.



Figure 11: Pittstown Website Hazard Mitigation Public Survey Link

Schaghticoke added the public survey to its website on May 03, 2024.



Figure 12: Schaghticoke Website Hazard Mitigation Public Survey Link

Vulnerable populations were also considered when developing the public survey. Areas where vulnerable populations already gather, including grocery stores, libraries and shelters, were considered high-priority outreach locations in order to engage the most disadvantaged by disaster events. Additionally, flyers were posted on walls and left with employees for distribution in the following outreach locations:

- Unity House of Troy, Main Location
 - 2431 6th Ave, Troy, NY 12180
- Good Food Market, Capitol Roots

- › 598 River St, Troy, NY 12180
- Capitol Roots
 - › 594 River St, Troy, NY 12180
- Unity House Kathryn Allen Building (Domestic Violence Shelter)
 - › 6 102nd St, Troy, NY 12180
- The Arc of Rensselaer County
 - › 79 102nd St, Troy, NY 12180
- Collar City Animal Hospital
 - › 499 2nd Ave, Troy, NY 12182
- Lansingburgh Boys and Girls Club
 - › 501 4th Ave, Troy, NY 12182
- Troy Public Library, Lansingburgh Branch
 - › 27 114th St, Troy, NY
- Brunswick Community Library
 - › 4118 NY-2, Troy, NY 12180
- Stewart's Shops
 - › 2 Brick Church Road, Troy, NY 12180
- Brunswick Community Center
 - › 18 Keyes Lane, Troy, NY 12180
- MochaBlend Espresso Bar
 - › 720 Hoosick Road, Troy, NY 12180
- Capital District YMCA, Troy Branch
 - › 2500 21st St, Troy, NY 12180
- Boys and Girls Club of the Capital Area, Troy
 - › 1700 7th Ave, Troy, NY 12180
- Rensselaer County Ned Pattison Social Services Building
 - › 1600 7th Ave, Troy, NY 12180
 - › Outside Department of Motor Vehicles
 - › Outside Department of Health
 - › Outside Department of Mental Health
 - › Outside Department of Social Services

- Samaritan Hospital
 - > 2215 Burdett Ave, Troy, NY 12180
- Arts Center of the Capital Region
 - > 265 River St, Troy, NY 12180
- Café Euphoria
 - > 225 River St, Troy, NY 12180
- 518 Craft
 - > 200 Broadway, Troy, NY 12180
- Stewart's Shops
 - > 487 Fourth St, Troy, NY 12180
- Unity House, A Child's Place
 - > 435 Fourth St, Troy, NY 121280
- Rensselaer Public Library
 - > 676 East St, Rensselaer, NY 12144
- Albany-Rensselaer Train Station
 - > 531 East St, Rensselaer, NY 12144
- Boys and Girls Club of Southern Rensselaer County
 - > 544 Broadway, Rensselaer, NY 12144
- Son of Egg, Rensselaer
 - > 483 Broadway, Rensselaer, NY 12144
- East Greenbush Library
 - > 10 Community Way, East Greenbush, NY 12061
- Capital District YMCA, Greenbush
 - > 20 Community Way, East Greenbush, NY 12061
- Rensselaer County Office Building
 - > 99 Troy Road, East Greenbush, NY 12061
- North Greenbush Public Library
 - > 141 Main Ave, Wynantskill, NY 12198
- Sand Lake Town Library and Town Municipal Office
 - > 84285 Miller Hill Road, Sand Lake, NY 12153

- Poestenkill Library
 - > 9 Plank Road, Poestenkill, NY 12140
- Valley Falls Free Library
 - > 42 State Street, Valley Falls, NY 12185
- Cheney Library
 - > 73 Classic Street, Hoosick Falls, NY 12090
- Stewart's Shops
 - > 4702 NY-67, Hoosick Falls, NY 12090
- Stewart's Shops
 - > 3610 NY-43, West Sand Lake, NY 12196
- Stephentown Memorial Library
 - > 472 NY-43, Stephentown, NY 12168
- Nassau Free Library
 - > 18 Church St, Nassau, NY 12123
- Castleton Public Library
 - > 85 South Main Street, Castleton-on-Hudson, NY 12033
- Stewart's Shops
 - > 3516 US-20, Nassau, NY 12123



Figure 13: Images of Flyer Locations



Figure 14: Flyers Left at Locations

During the Public Health Week event, the Rensselaer County Department of Health featured the public survey poster, as seen in Figure 15.



Figure 15: Rensselaer County Department of Health Public Health Week Display

The survey received 179 responses.

PLANNING PROCESS

IEM, in consultation with the Planning Team, developed a planning schedule that included specific milestones and activities. This schedule was followed closely throughout the planning process. In so doing, the team was able to effectively use the condensed planning timeline to successfully develop an HMP that meets the state's objectives for this update. The following identifies steps taken in the planning process.

Task 1: Organizing the Planning Effort: This initial phase included assembling a diverse team of stakeholders, which consisted of community members, emergency responders, public health officials, and local government representatives. The objective was to establish a clear framework for collaboration, define roles and responsibilities, and develop a timeline for the planning process.

Task 2: Hazard Identification and Risk Assessment: In this stage, hazards that could potentially impact the community were identified. They include natural disasters, technological incidents, and health emergencies. A risk assessment was conducted to evaluate the likelihood of these hazards occurring and

their potential consequences on the community, helping to prioritize which risks needed immediate attention.

Task 3: Vulnerability Assessment: Here, an analysis was performed to identify the population, infrastructure, and resources that were most at risk when a hazard occurred. This process helps to pinpoint specific vulnerabilities and areas where additional support or resources may be needed to enhance resilience.

Task 4: Capability Assessment and Resource Integration: This step involved evaluating the community's existing capabilities to respond to identified hazards. It included assessing resources such as personnel, equipment, and financial assets. By integrating these resources, planners could identify gaps and potential enhancements to overall response capabilities.

Task 5: Mitigation Strategy: At this point, strategies were developed to reduce or eliminate the risks associated with identified hazards. This may involve building infrastructure, implementing policies, or implementing community education programs to enhance preparedness and resilience.

Task 6: Mitigation Actions and Plan Integration: The identified mitigation strategies were translated into actionable steps. These included developing specific projects and initiatives that will be undertaken, along with timelines and performance metrics to assess effectiveness.

Task 7: Implementation: This stage focused on implementing the plan. Assigning tasks and mobilizing resources according to the developed strategies ensures the community is prepared to respond to hazards effectively. Engaging with the community during this phase is crucial for fostering support and involvement.

Task 8: Plan Maintenance: Continuous assessment and plan updates are vital to adapt to changing circumstances, emerging risks, and feedback from ongoing implementation. Regular training, exercises, and community engagement ensure the plan remains relevant and effective.

Task 9: Draft Plan: Finally, all planning process elements are compiled into a comprehensive draft plan. This document outlines the established strategies, resources, and procedures necessary to manage risk and enhance community resilience. It is then reviewed, revised, and finalized based on stakeholder feedback before adoption.

PLAN ORGANIZATION

This plan's format was updated from the 2020 version. It now reflects a more traditional format for county HMPs. It is still designed to be accessible to subject-matter experts and the general readership. However, the new format highlights that the planning process and risk assessment inputs lead to developing mitigation actions based on community needs.

The Rensselaer County MJHMP update is organized into the following sections:

- Executive Summary

- Table of Contents
- Introduction and Planning Process
- Rensselaer County Overview
- Hazards, Risk Assessment, and Vulnerabilities
- Capabilities Assessment
- Mitigation Strategy
- Plan Maintenance and Implementation
- Jurisdictional Annexes

PLAN APPROVAL, ADOPTION, AND IMPLEMENTATION

The county will formally adopt the plan after FEMA reviews it and declares it “Approvable Pending Adoption (APA).” The assurances required by 44 CFR Part 201.4(c)(7) are included in the Executive Summary and the DHSES approval letter.

Overview

Introduction

Rensselaer County in eastern New York State has a rich history dating back to its founding in 1791. The county was named in honor of the prominent Dutch family of Kiliaen van Rensselaer, the original owners of the land in the area and one of the founders of the Dutch West India Company. With its picturesque landscapes, diverse culture, and vibrant communities, Rensselaer County is a fascinating destination for history buffs, nature lovers, and anyone looking to explore the beauty and history of upstate New York. It encompasses 652 square miles of land and 13 square miles of water, is one of 62 counties in New York, and has two cities, Troy and Rensselaer, representing the county’s two major population centers. In addition, it has 14 towns and 6 villages. Figure 16 shows the location of Rensselaer County in the state, and Figure 17 shows the jurisdictions in the county.

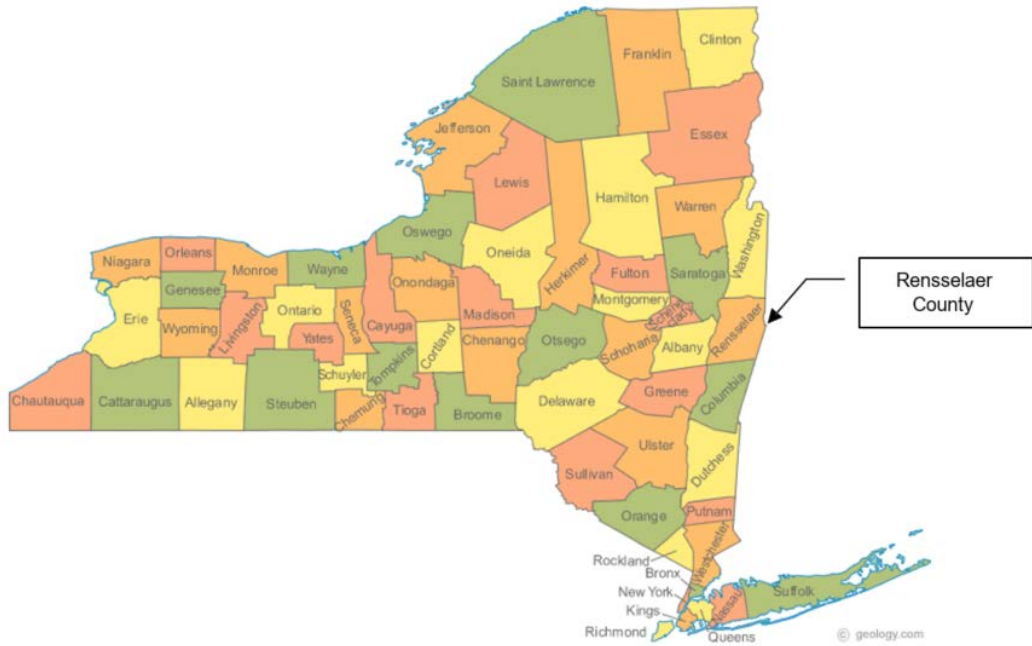
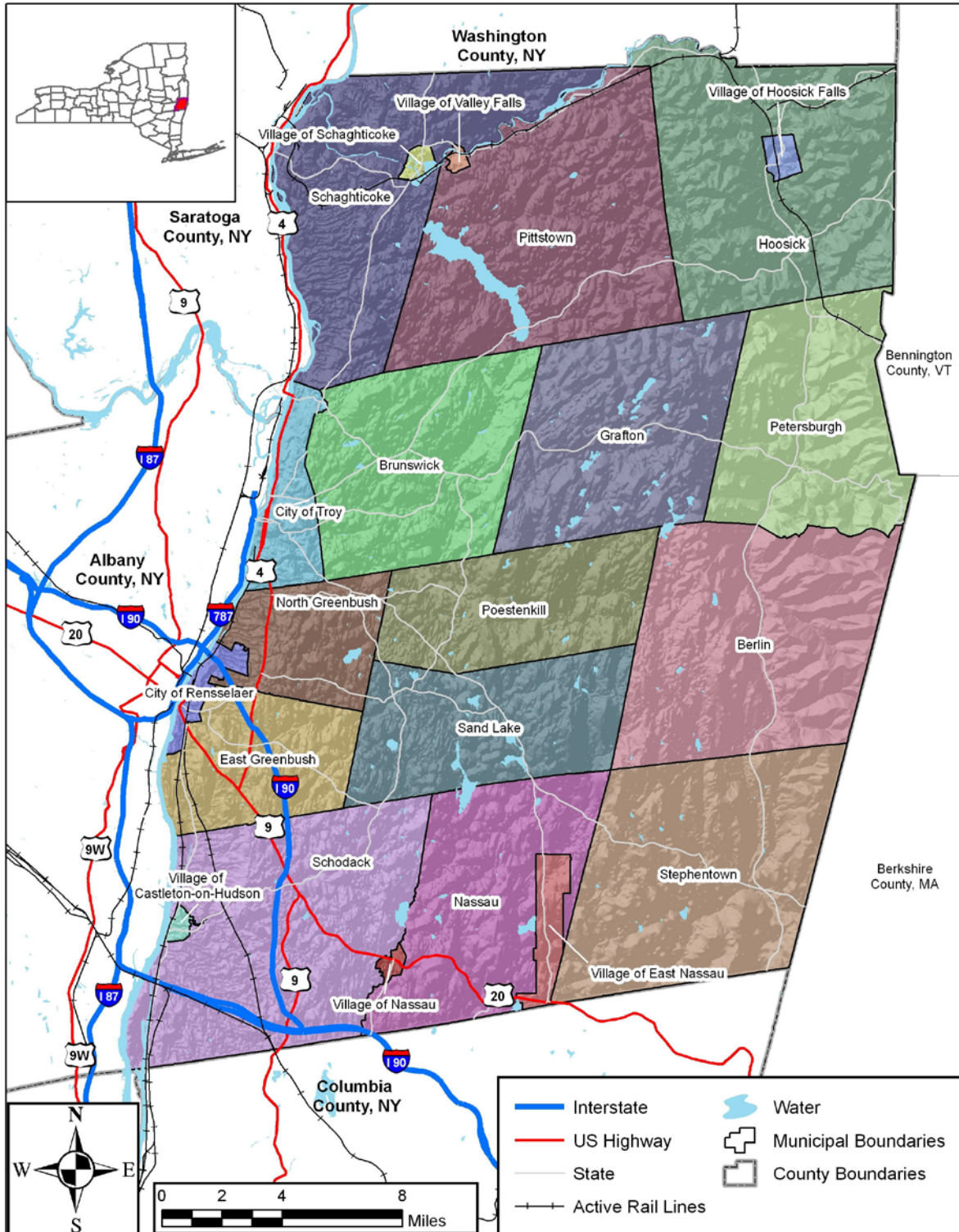


Figure 16: Location of Rensselaer County in the State of New York



SOURCE: ESRI, U.S. Counties, 2005; New York Major Roads, 2000; Rensselaer County BRIS, Rensselaer County Municipal Boundaries, 2009; Rensselaer County Street Centerlines, 2010; U.S. Census Bureau, Census Railroads, New York State, 2001; Rensselaer, Columbia, Albany, Saratoga, Washington Counties, Area Hydrography, 2007; USGS, 1-Arc Second National Elevation Dataset, 2009

Figure 17: Map of Rensselaer County Jurisdictions

Table 7 provides a short history of the origins of Rensselaer County jurisdictions.

Table 7: Origin History of Rensselaer County Jurisdictions

Cities	Date Chartered
City of Troy	Created as the Town of Troy from the Manor of Rensselaerwyck on March 18, 1791; incorporated as Village of Troy on April 2, 1801; chartered as City of Troy on April 12, 1816
City of Rensselaer	Chartered as City of Rensselaer from the Town of Greenbush on April 23, 1897

Towns	Date Founded or Incorporated	Created From
Berlin	Created as the Town of Berlin on March 21, 1806	Towns of Petersburg, Schodack, and Stephentown
Brunswick	Created as the Town of Brunswick on March 20, 1807	Town of Troy
East Greenbush	Created as the Town of Clinton on February 23, 1855; renamed Town of East Greenbush on April 14, 1858	Town of Greenbush; Town of Clinton
Grafton	Created as the Town of Grafton on March 20, 1807	Towns of Troy and Petersburg
Hoosick	Hoosick Patent granted June 3, 1688; designated District of Hoosick on March 24, 1772; created as the Town of Hoosick on March 7, 1788	Original
Nassau	Created as the Town of Philipstown on March 31, 1806; name changed to Town of Nassau on April 6, 1808	Towns of Petersburg, Schodack and Stephentown; Town of Philipstown
North Greenbush	Created as Town of North Greenbush on February 23, 1855	Town of Greenbush
Petersburgh	Created as Town of Petersburg on March 18, 1791; not sure when (or even whether) the final <i>h</i> was dropped; modern sources and maps use both spellings	Town of Stephentown
Pittstown	Designated a "township by patent" on July 23, 1761; created the Town of Pittstown on March 7, 1788	Original
Poestenkill	Created as the Town of Poestenkill on March 2, 1848	Town of Sand Lake

Towns	Date Founded or Incorporated	Created From
Sand Lake	Created as the Town of Sand Lake on June 19, 1812	Towns of Greenbush and Berlin
Schaghticoke	Designated a district on March 24, 1772; created Town of Schaghticoke on March 7, 1788	Original
Schodack	Created as Town of Schodack on March 17, 1795	Manor of Rensselaerwyck
Stephentown	Created as Town of Stephentown on March 29, 1784	Manor of Rensselaerwyck

Villages	Town in Which It Lies	Additional Info
Castleton-on-Hudson	Schodack	Incorporated in 1827
East Nassau	Nassau	Incorporated after 1996; was incorporated as a village before 1880; the original name was Schermerhorn's Village
Hoosick Falls	Hoosick	Incorporated on April 14, 1827
Nassau	Nassau	Chartered as Village of Nassau on 12 March 1819; charter revised 17 April 1866; the original name was Union Village
Schaghticoke	Schaghticoke	Formerly Village of Hart's Falls
Valley Falls	Pittstown	Formerly Pittstown Station

Topography

The topography of Rensselaer County, NY, includes rolling hills, forests, valleys, and waterways. The county is in the Hudson Valley with the Taconic Mountains to the east and the Hudson River on the western border, and it offers scenic views and recreational opportunities. The landscape is a mix of rural areas and urban centers, with diverse ecosystems and outdoor attractions.

Rensselaer County's average elevation is 784 ft., the minimum elevation is -7 ft., and the maximum elevation is 3,219 ft.

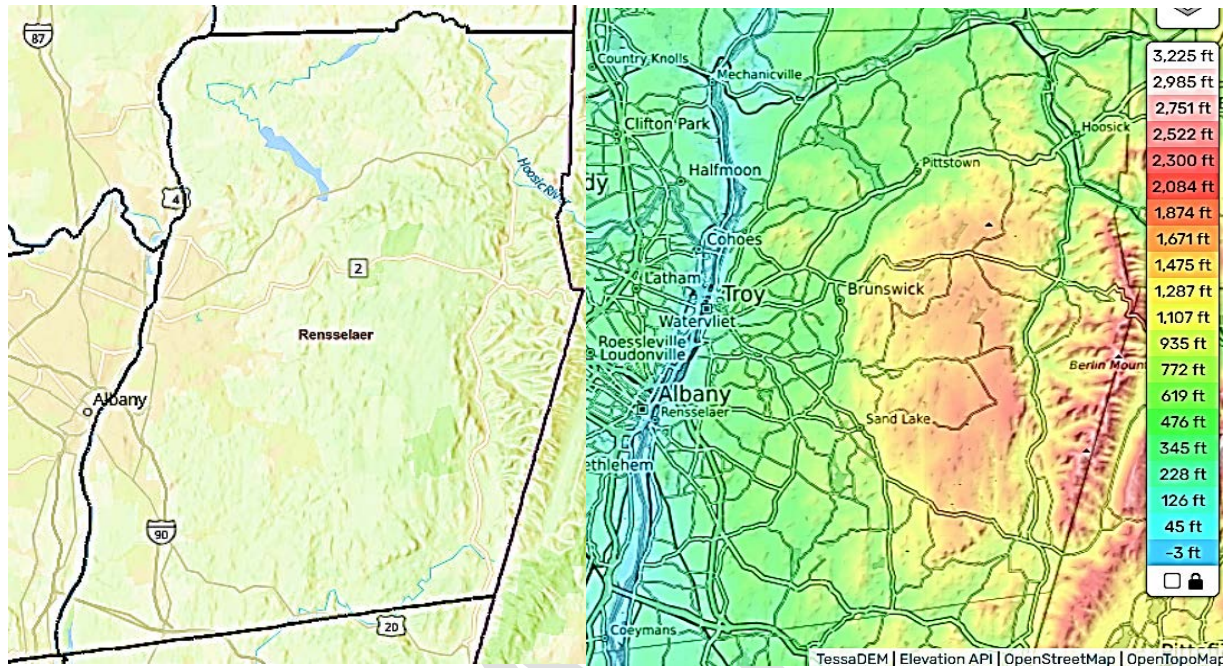


Figure 18 is a topographical map of the county.

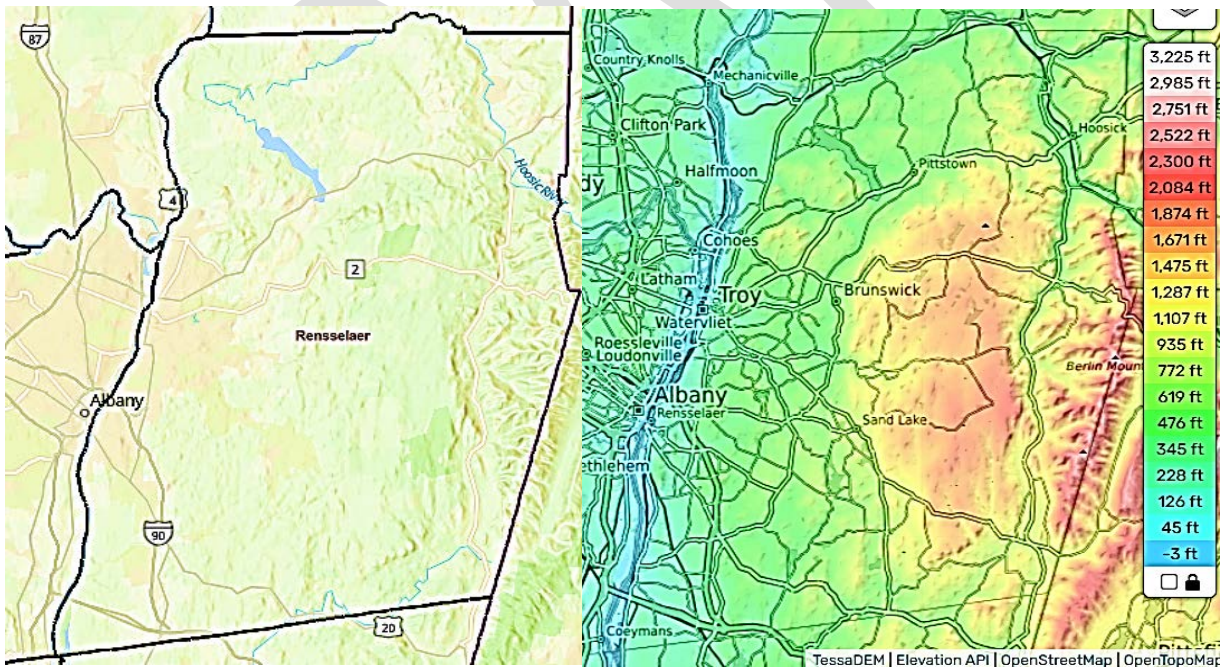


Figure 18: Topographic Map of Rensselaer County²

² Topographic-map.com, "Rensselaer County Topographic Map." <https://en-us.topographic-map.com/map-m23z4/Rensselaer-County/?base=2¢er=42.72583%2C-73.96818>

Geography

Rensselaer County, NY, is characterized by diverse geography. It features rolling hills, river valleys, and several waterways, including the Hudson and Hoosick Rivers. The landscape is dotted with forests, farms, and small towns, creating a mix of rural and semi-urban environments. This varied geography contributes to the county's rich natural beauty and makes it an attractive destination for outdoor enthusiasts and nature lovers.

GEOLOGY

Graywacke, a resistant sandstone, was created from volcanic sand sliding down offshore volcanoes. During the continental shift 440 million years ago, a volcanic arc was forced up and over the existing continent and formed the Taconic Range, which eroded into the Taconic Ridge and Rensselaer Plateau. As a result, the older Graywacke layer was shifted above newer layers. The Rensselaer Plateau is home to the oldest rock south of the Mohawk Valley and east of the Hudson River, and the Adirondack Mountains are older by a billion years. Figure 19 shows the layers of Graywacke sandstone. This unique geological formation has high value for constructing hard road surfaces, which has led to vigorous mining in Rensselaer County.³



Figure 19: Photo of Graywacke Sandstone

Ecosystems

Forests

Forest management is vital for a thriving economy, commercial production of forest products, tourism, and the health and well-being of the local population. Forest ecosystems help regulate climate, rainfall patterns, and watersheds. They purify water and filter the air, protect sources of drinking water, and

³ Rensselaer Plateau Alliance, "Geological History of the Rensselaer Plateau."
<https://www.rensse-laerplateau.org/geology>

produce oxygen. They serve as natural cooling systems and carbon sinks; they provide a place for recreation, wildlife preservation, and natural habitat.

New York Land Area: 30.2 million acres. State Population: 19.4 million:

- New York State Forest area: 18.6 million acres, 61 percent of land area, about one acre per resident
- Publicly owned forest land: at least 3.7 million acres
- Privately owned forest land area: 14.4 million acres; 76 percent of forest land; owned by 687,000 landowners
- Number of tree species: more than 100 commercial and non-commercial
- Most common forest type: maple/beech/birch (53 percent of forest land area)

The following illustrate the economic importance of New York’s forests. Figure 20 shows two views of forests in New York.

- \$300 million in annual payments to private landowners
- 488 million board feet of logs
- 2.1 million green tons of pulpwood and wood chips
- 25 percent of New York timber harvest is exported for processing.
- Economic contribution of manufacturing and services related to forest products: \$14 billion (US Census)
 - > Forest-related tourism: \$1.9 billion⁴

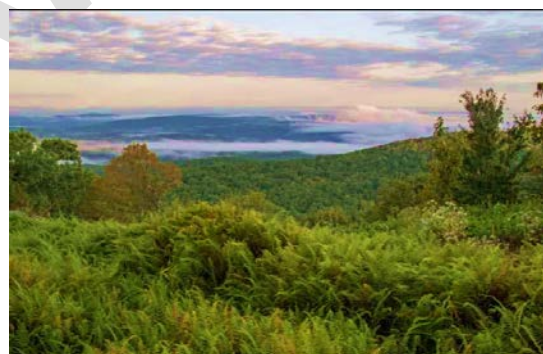


Figure 20: Photographs of New York Forests

⁴ New York State Department of Environmental Conservation, "Forests." [Forests – NYDEC](#)

Watersheds

A watershed is a geographic area that captures and funnels surface water and groundwater into a specific body of water, such as a stream, river, lake, or ocean. Natural boundaries define watersheds, which can vary in size from a few acres to millions of square miles. Rainfall and snowmelt in a watershed are collected by streams and rivers, which channel the water to larger bodies.

Gravity plays a significant role in directing the water across the landscape. Water flows downhill, following the path of least resistance, carving out channels and gullies along the way. The topography of area—such as the shape of hills and valleys—vegetation cover, and the types of soils influence the water flow in a watershed (see Figure 21).



Figure 21: Illustration of a Watershed⁵

The aim of watershed management is the sustainable use of land, forest, and water resources to ensure that the flora and fauna in the area are not harmed. It entails various objectives and methods, such as minimizing the number of pesticides and fertilizers flowing from agricultural fields into nearby water bodies. Conservation is closely associated with watershed management.⁶

There are 18 watersheds in Rensselaer County (see Figure 22).⁷

- Deep Kill
- Hoosic River
- Hudson River between Poestenkill and Mill Creek
- Hudson River between the Hoosic River and Poestenkill

⁵ Riverside–Corona Resource Conservation District, “What Is a Watershed?” <https://www.rcrcd.org/what-is-a-watershed>

⁶ National Geographic, “Watershed.” [Watershed \(nationalgeographic.org\)](https://www.nationalgeographic.org)

⁷ Rensselaer Land Trust, “Interactive Watershed Map.” [Watershed Map - Rensselaer Land Trust \(renstrust.org\)](https://www.renstrust.org)

- Kinderhook Creek
- Little Hoosic River
- Mill Creek
- Mill Hollow Brook and Hudson River
- Moordener Kill
- Papscanee Creek and Hudson River
- Poestenkill
- Schodack Creek
- Tomhannock Creek
- Upper Hoosic River
- Valatie Kill
- Vlockie Kill
- Walloomsac River
- Wyants Kill

DRAFT

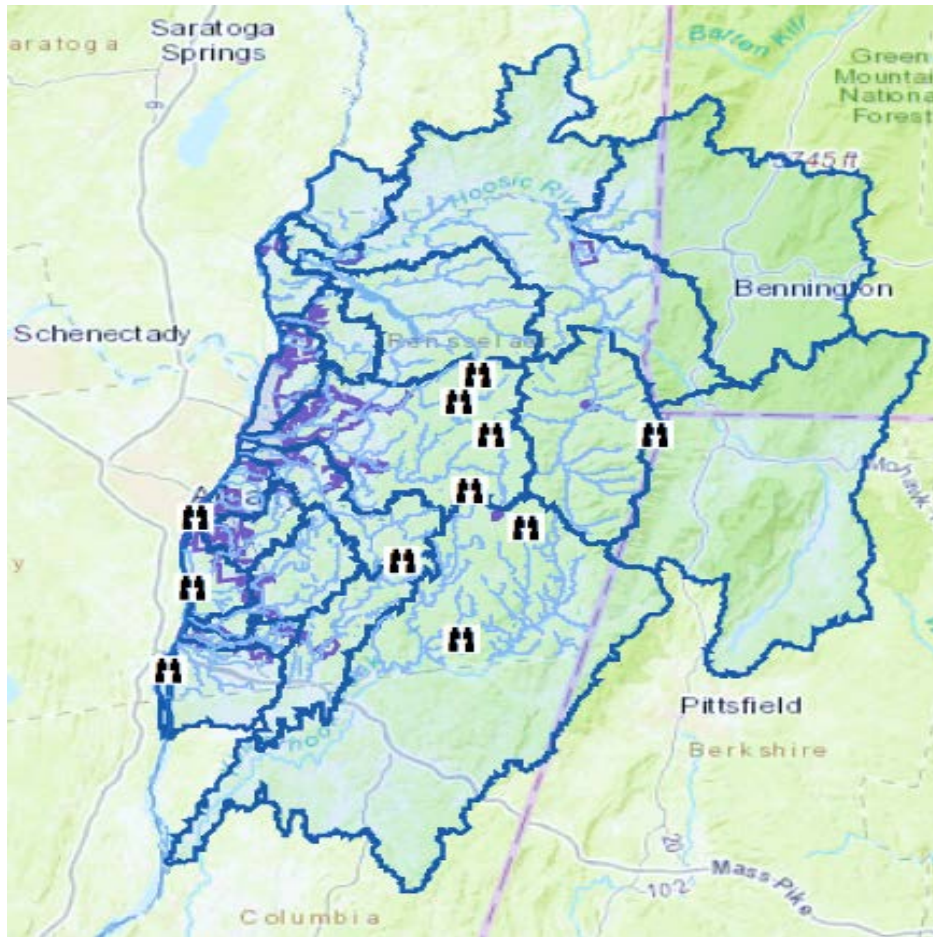


Figure 22: Map of Watersheds in Rensselaer County

Wetlands

Wetland ecosystems provide important functions and benefits to society, such as maintaining the flow of surface water during dry periods, improving and protecting water quality, protecting shorelines from erosion, and providing fish and wildlife habitats.

Wetland soil is black or gray because it is deprived of oxygen by its saturation with water. During some or all of the growing seasons, wetlands must be flooded with water. Some wetlands remain flooded year round, while others may dry up as summer arrives. Wetlands support plants adapted for life in wet soils, called hydrophytes. Hundreds of species of hydrophytes, including cattails, bulrushes, ferns, skunk cabbage, and asters, can be found across a watershed. Wetlands occur naturally in fresh, brackish, and saltwater.

Wetlands are crucial to the ecology of watersheds. Their shallow water and high nutrient levels create an ideal environment for the growth of organisms that form the foundation of the food web, which supports many species of fish, amphibians, shellfish, and insects. Wetlands also provide food, water, and shelter for

many species of birds and mammals, particularly during migration and breeding seasons. Figure 23 is a map of wetlands in Rensselaer County.

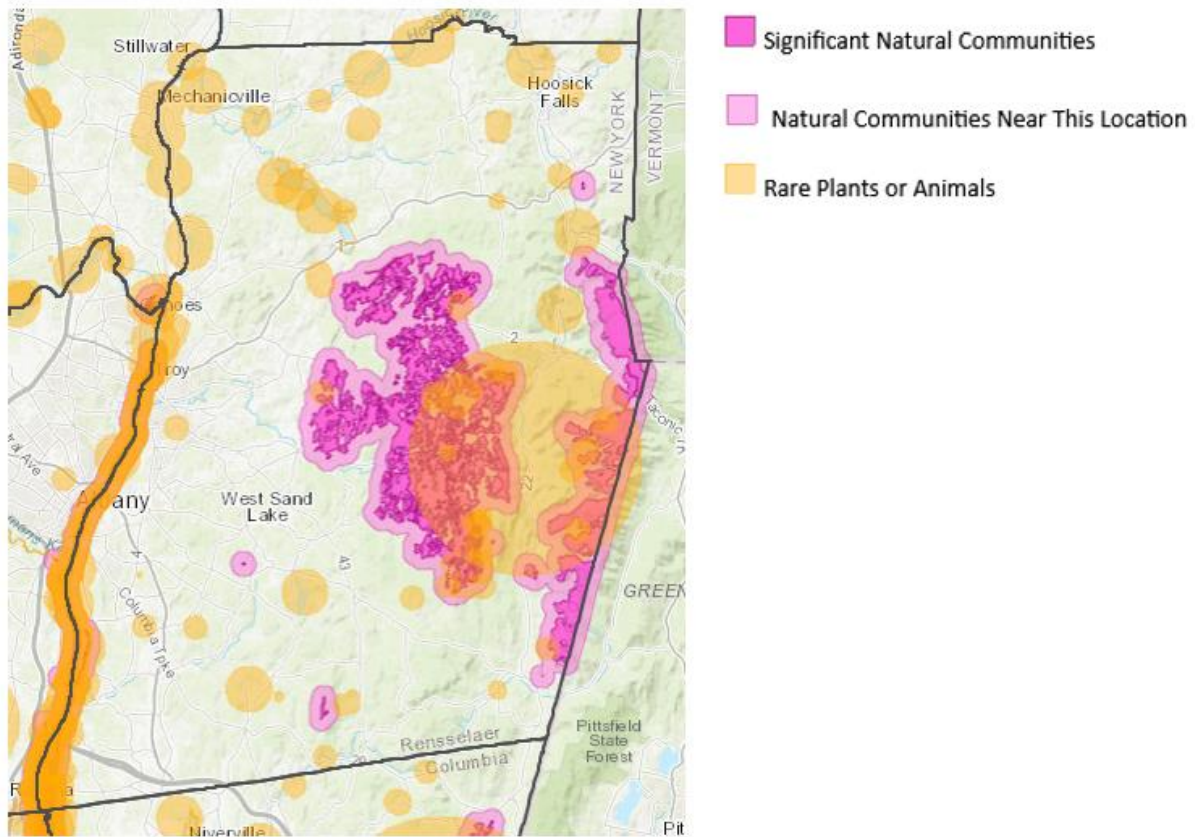


Figure 23: Map of the Most Significant Wetlands in Rensselaer County⁸

Climate

Weather refers to the atmospheric conditions that occur over a short period, while climate refers to changes in the atmosphere that occur over a longer period, typically 30 years or more. This is why it is possible to experience a particularly cold spell, even though, on average, global temperatures are increasing.

Rensselaer County has a humid continental climate characterized by warm/hot summers and cold winters. In July, the average high temperature is about 76 °F, while the average low temperature in January is around 21 °F. The county receives an average annual precipitation of approximately 43 inches, with most of the rainfall occurring in the spring and summer months. Snowfall levels vary from year to year, but

⁸ New York State Department of Environmental Conservation, "Environmental Resource Mapper." <https://giservices.dec.ny.gov/gis/erm/>

average about 70 inches per season.⁹ Figure 24 shows the climate zones in the United States, and Figure 25 shows them for Rensselaer County.

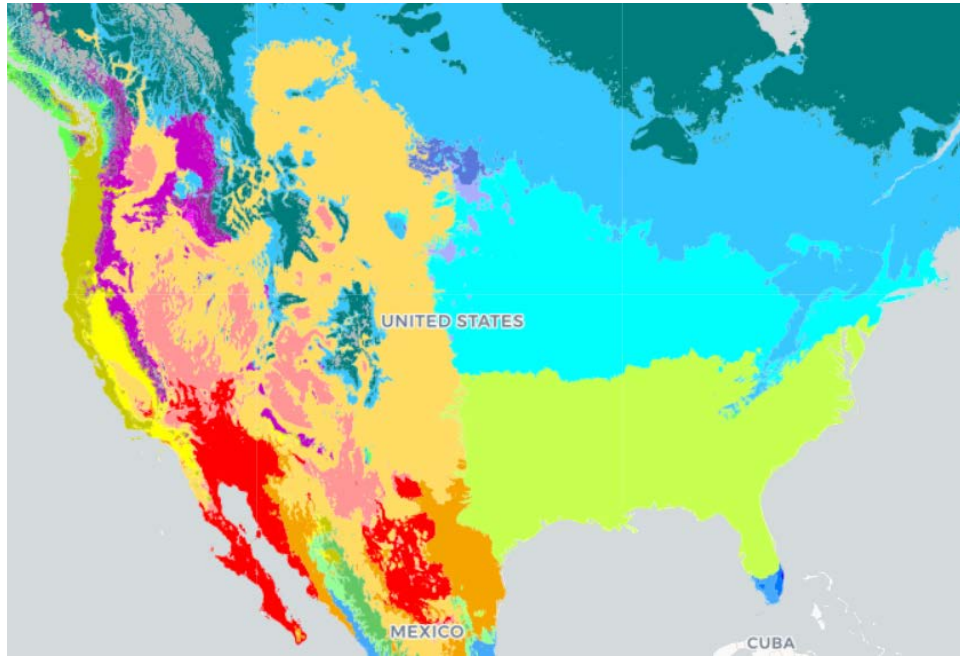


Figure 24: Climate Zones in the United States

⁹ Best Places, "Rensselaer County, NY Climate." [Rensselaer County, NY Climate \(bestplaces.net\)](https://www.bestplaces.net)

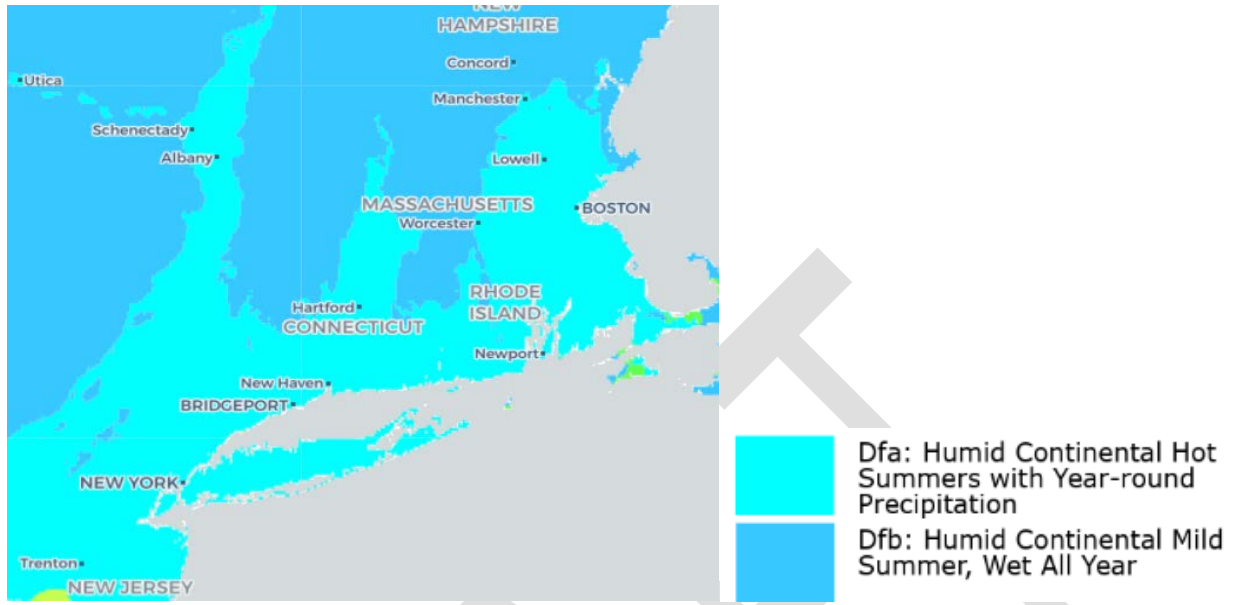


Figure 25: Climate Zones in Rensselaer County¹⁰

Temperature and Precipitation

Table 8 shows the average temperatures and precipitation levels throughout the year in Rensselaer County.

¹⁰ Commission for Environmental Cooperation, "North American Environmental ATLAS."
<http://www.cec.org/files/atlas/?z=9&x=-71.3919&y=41.2583&lang=en&layers=climatezones&opacities=100&labels=true>

Table 8: Temperature and Precipitation in Rensselaer County¹¹

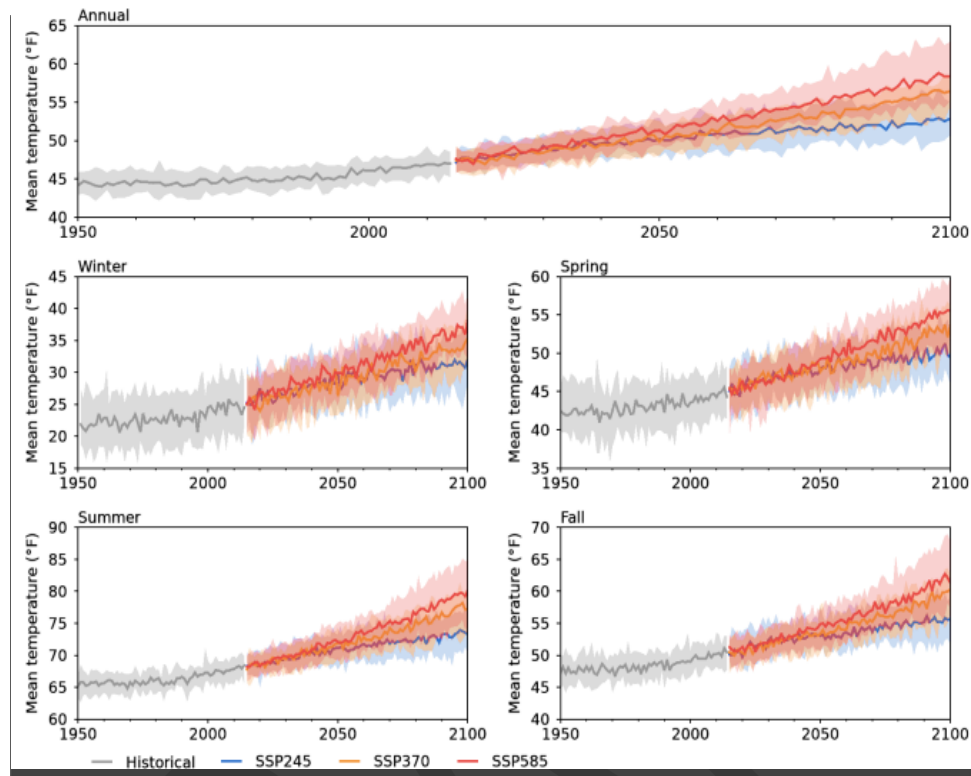
	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	-4.4 °C (24.1) °F	-2.9 °C (26.8) °F	1.4 °C (34.5) °F	8.4 °C (47.1) °F	14.7 °C (58.5) °F	19.5 °C (67.1) °F	22.6 °C (72.7) °F	21.9 °C (71.4) °F	18 °C (64.5) °F	11.1 °C (52) °F	4.9 °C (40.8) °F	-0.8 °C (30.6) °F
Min. Temperature °C (°F)	-8.2 °C (17.3) °F	-6.9 °C (19.5) °F	-2.9 °C (26.8) °F	3.7 °C (38.6) °F	10 °C (50) °F	15 °C (59) °F	18 °C (64.4) °F	17.4 °C (63.4) °F	13.8 °C (56.9) °F	7.5 °C (45.5) °F	1.7 °C (35.1) °F	-3.7 °C (25.3) °F
Max. Temperature °C (°F)	0.3 °C (32.5) °F	2.2 °C (35.9) °F	6.9 °C (44.4) °F	14.3 °C (57.7) °F	20.3 °C (68.5) °F	24.6 °C (76.3) °F	27.8 °C (82) °F	26.9 °C (80.4) °F	23 °C (73.4) °F	15.6 °C (60.1) °F	9.1 °C (48.4) °F	3 °C (37.4) °F
Precipitation / Rainfall mm (in)	83 (3)	74 (2)	98 (3)	100 (3)	102 (4)	113 (4)	101 (3)	96 (3)	103 (4)	116 (4)	87 (3)	102 (4)
Humidity(%)	68%	64%	64%	63%	68%	72%	68%	69%	72%	74%	74%	71%
Rainy days (d)	8	7	8	9	9	9	9	8	7	8	7	8
avg. Sun hours (hours)	5.0	5.8	6.8	8.1	9.0	10.0	10.8	9.5	7.6	6.1	5.3	4.4

Climate Change

As climate change progresses, a warmer and more variable climate will make many communities more susceptible to flooding, drought, and heat.

According to climate change modeling, the annual average temperatures in New York State are expected to rise between 4.1°F and 6.1°F by the 2080s. However, the effects of these changes will not be uniform across the state; some areas will be impacted more than others. By the year 2100, certain regions in New York could experience a temperature increase of more than 12°F. This means that summers will become hotter, and winters will become milder throughout the state. Figure 26 shows projected changes in temperature from 1950 to 2100.

¹¹ Climate Data, "Rensselaer Climate." [Rensselaer climate: Weather Rensselaer & temperature by month \(climate-data.org\)](https://climate-data.org)



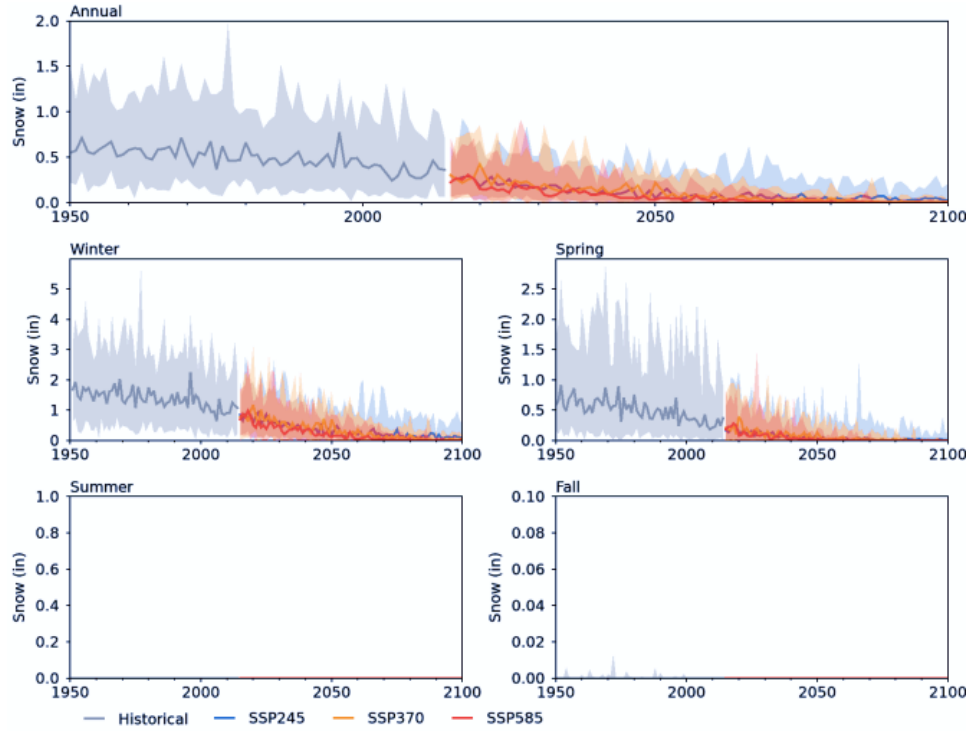
Note: Annual and seasonal time series of mean temperature for historical (gray), ssp245 (blue), ssp370 (orange), and ssp585 (red). The historical period ends in 2014, and the future periods begin in 2015. The median of CMIP6 models is indicated by the solid lines, and the ensemble 10th to 90th percentile range of the model is indicated by the respective shaded envelope.

Figure 26: Temperature Projections, 1950–2100¹²

As temperatures rise, the amount of snowfall is projected to decline (see Figure 27). Projections indicate that “extreme events” are much more likely, including heat, drought, and intense precipitation.¹³

¹² USGS, “Summary of New York.” [USGS National Climate Change Viewer - Summary Report \(oregonstate.edu\)](https://climate.usgs.gov/summary-of-new-york/)

¹³ [Observed and Projected Climate Change in New York State 2021 \(ny.gov\)](https://www.ny.gov/newsroom/observed-and-projected-climate-change-in-new-york-state-2021)



Note: Annual and seasonal time series of snow for historical (gray), ssp245 (blue), ssp370 (orange), and ssp585 (red). The historical period ends in 2014, and the future periods begin in 2015. The median of CMIP6 models is indicated by the solid lines, and the ensemble 10th to 90th percentile range of the model is indicated by the respective shaded envelopes.

Figure 27: Snow Projections from 1950 to 2100¹⁴

Demographics

Statistics from the 2020 U.S. Census:

- Populations and people: 161,30 with a median age of 40.1
- Employment rate: 60.8 percent
- Business and economy: 3,042 (Total Employer Establishments)
- Income: \$83,109 (Median household income)
- Housing: 74,197 (total housing units)
- Families and living arrangements: 66,238 (total Households)
- Education: 36.8 percent (bachelor’s degree or higher)

¹⁴ Ibid.

- Health: 3.1 percent (without healthcare coverage)
- Race and ethnicity: 9,483 (Hispanic or Latino)¹⁵

Population

Although Rensselaer experienced a population increase from 2010 to 2020,¹⁶ the growth rate has diminished in the past few years and is expected to continue to decline in the coming years (see Table 9 and Figure 28).

Table 9: Population Growth, 2010–2020¹⁷

Area	Population 2010	Population 2020	Change from 2010 to 2020	Percentage Population Change
Rensselaer County, NY	159,429	161,130	1,701	1.07%
New York State	19,378,088	20,201,249	823,161	4.25%
United States	312,471,161	334,735,155	22,263,994	7.13%

Year ∨	Population	Growth	Growth Rate
2029	153,644	-887	-0.57%
2028	154,531	-887	-0.57%
2027	155,418	-887	-0.57%
2026	156,305	-887	-0.56%
2025	157,192	-887	-0.56%
2024	158,079	-887	-0.56%

Figure 28: Projected Decline in Population in Rensselaer County

Ethnicity

In 2021, there were 13.5 times as many White (non-Hispanic) residents (132k people) in Rensselaer County, NY, as any other race or ethnicity. There were 9.8k Black or African American (non-Hispanic) and 5.68k Two+ (non-Hispanic) residents, the second and third most common ethnic groups.

- 5.23 percent of the people in Rensselaer County, NY, are Hispanic (8.43k people).
- 97.2 percent of residents in Rensselaer County are U.S. citizens.

¹⁵ 2020 US Census: https://data.census.gov/profile/Rensselaer_County,_New_York?g=050XX00US36083

¹⁶ US Census: [U.S. Census Bureau QuickFacts: Rensselaer County, New York](https://www.census.gov/quickfacts/RensselaerCountyNewYork)

¹⁷ Ibid.

Age Vulnerability

Older individuals are often less mobile, more likely to suffer from chronic illnesses, and less accepting of disruptions in their living environments. Young children unable to care for themselves might not be able to communicate their needs during a disaster or catastrophic event. The community must consider these groups when developing policies and procedures to address all four phases of emergency management: disaster mitigation, planning, response, and recovery. U.S. Census data show that 18.7 percent of the population in Rensselaer County is 65 years or older, and 4.9 percent of the residents are 5 or younger.¹⁸

Disabled

The U.S. Census data indicate that from 2018 to 2022, 10.7 percent of the population under 65 lived with a disability.

Race, Language, and Cultural Barriers

Language barriers may create unique challenges when a catastrophe occurs, especially if those in hazardous areas must evacuate. Such barriers may also limit the ability of those for whom English is not their native language to participate in the mitigation and planning processes. This kind of communication obstacle can adversely affect healthcare and medical treatment during and after disastrous events that cause upheaval in everyday life.

Homelessness

Homelessness is a pressing issue that affects hundreds of thousands of people in the United States. It is a complex problem that impacts the health, well-being, and dignity of those who experience it. Homelessness can lead to or worsen several physical and mental health issues, such as HIV infection, substance abuse, mental illness, malnutrition, and reduced life expectancy. In addition, people who are homeless often face many challenges in accessing healthcare, food, safety, social services, and suitable living conditions. It is a tragedy that requires legal and policy interventions from a public health perspective.

Each year, around 1,000 to 1,300 people in Rensselaer County, including both single individuals and families, become homeless. On a given night, there are almost 300 people living on the streets or in emergency shelters and transitional housing. Homelessness not only affects the individuals and families directly experiencing it but also has a wider impact on the community. Communities that do not take proper measures to address homelessness incur greater costs for taxpayer-funded services, such as emergency housing, substance abuse and mental health treatment, emergency services personnel, and hospital emergency rooms.

¹⁸ Ibid.

Homelessness is a widespread issue affecting all aspects of the community in Rensselaer County and across the nation. It does not discriminate based on age, education level, race, ethnicity, or socioeconomic background. However, low-income and vulnerable populations are more likely to be impacted due to inadequate safe and affordable housing, and low wages. There is no single cause of homelessness, and there is no single solution to end it. Poverty, lack of decent and affordable housing, domestic violence, mental illness, substance abuse, physical disability, and other life challenges are among the factors that contribute to homelessness. Furthermore, it has become increasingly difficult for extended families to care for disabled or impoverished family members.¹⁹

Education

In the 2022 American Community Survey, in Rensselaer County, the greatest percentage, 24.3 percent, had a high school or equivalent degree, and the second highest percentage, 22.4 percent, had a bachelor’s degree (see Figure 29).²⁰

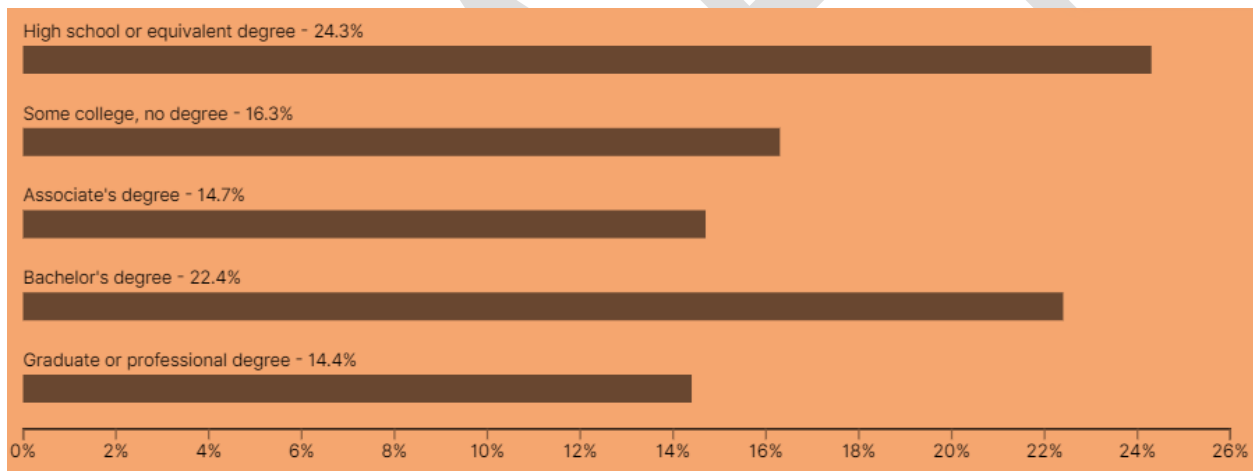


Figure 29: Education Attainment (Populations 25 Years or Older) in Rensselaer County²¹

Income

The average median income in Rensselaer County by type of family is shown in Figure 30.

¹⁹ St. Paul Center: <https://stpaulscenter.com/wp-content/uploads/2019/03/Rensselaer-County-Plan-to-End-Homelessness.pdf>

²⁰ Data USA: <https://datausa.io/profile/geo/rensselaer-county-ny>

²¹ US Census: [U.S. Census Bureau QuickFacts: Rensselaer County, New York](https://www.census.gov/quickfacts/rensselaer-county-new-york)

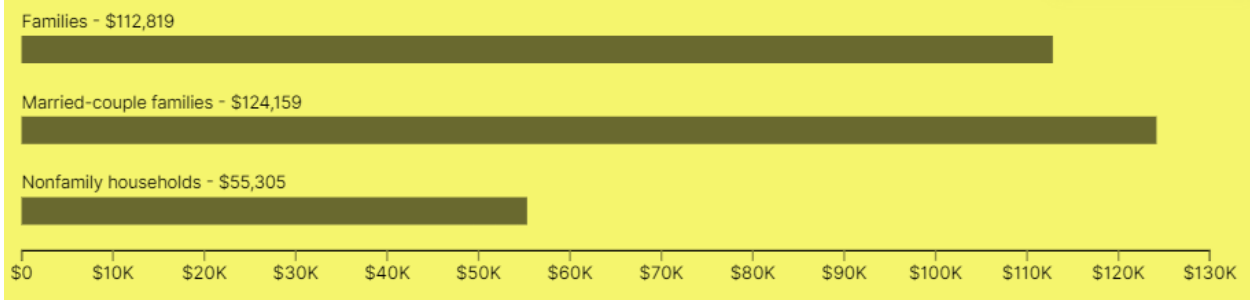


Figure 30: Income in Rensselaer County by Type of Household²²

Mobility and Home Occupancy

The graph below reflects residential mobility in Rensselaer County in the last year. The highest percentage is attributed to moving in the county itself.²³

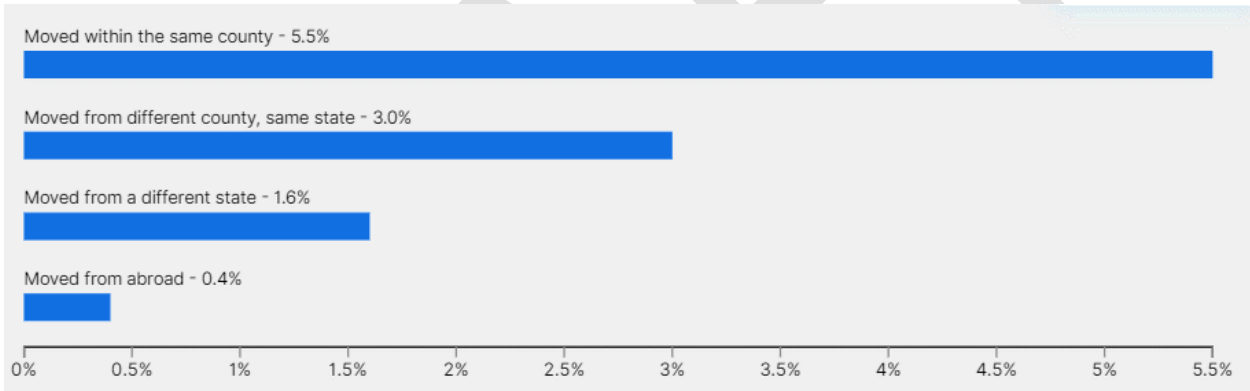


Figure 31: Mobility of Residents²⁴

A majority of homes are owned rather than rented, and of those, most are married families, as seen in Figure 32.

²² Ibid.

²³ [https://data.census.gov/profile/Rensselaer County, New York?g=050XX00US36083](https://data.census.gov/profile/Rensselaer%20County,%20New%20York?g=050XX00US36083)

²⁴ Ibid.

Household Type	Count ∨	Average Size	Owner	Renter
All	66,088	2.34	62.8	37.2
Married	28,294	3.01	85.2	14.8
Non Family	26,461	1.3	45.1	54.9
Female	8,519	3.06	45.3	54.7
Male	2,814	3.26	57.5	42.5

Figure 32: Home Owners and Renters by Household Type²⁵

Economy

The top three industries in Rensselaer County are as follows:

- Educational Services, Health Care, and Social Assistance at 26.6 percent
- Professional, Scientific and Management, Administrative and Waste Management Services at 13.3 percent²⁶
- Manufacturing at 10.1 percent Roadways and Bridges

Roadways

Rensselaer County has 145 county routes (CRs). They do not enter cities or incorporated villages, except for CRs 117 and 118 in Valley Falls. County route numbers are assigned in clusters by town, with the number indicating the town in which most of the route lies:

- 1–9: Schodack
- 15–21: Nassau
- 23–33: Stephentown
- 36–42: Berlin
- 43–44: Poestenkill
- 45–53: Sand Lake
- 54–63: East Greenbush
- 65–76: North Greenbush
- 79–88: Grafton
- 90–98: Petersburg

²⁵ [Rensselaer County, New York Population 2024 \(worldpopulationreview.com\)](https://worldpopulationreview.com/us-counties/rensselear-county-new-york/)

- 100–105: Hoosick
- 109–115, 117–118, and 123: Pittstown
- 116, 119–122, and 124–127: Schaghticoke
- 128–145: Brunswick

Figure 33²⁷ shows the roads in Rensselaer County, and Figure 34²⁸ adds recreation resources to the map of highways.

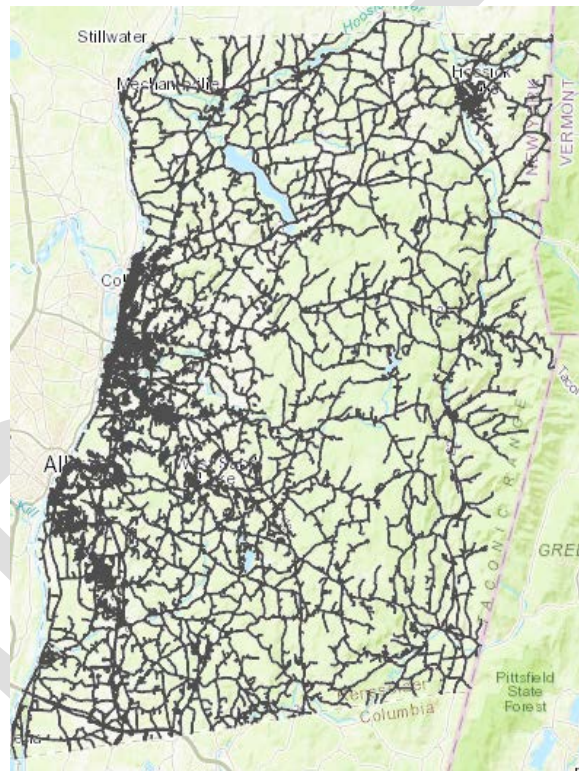


Figure 33: Road Network in Rensselaer County

²⁷ <https://databasin.org/maps/new/#datasets=18483947f797468e82b550d4706259db>

²⁸ <https://www.rensco.com/DocumentCenter/View/990/Rensselaer-County-Highway-Map-with-Recreation-Guide-PDF>

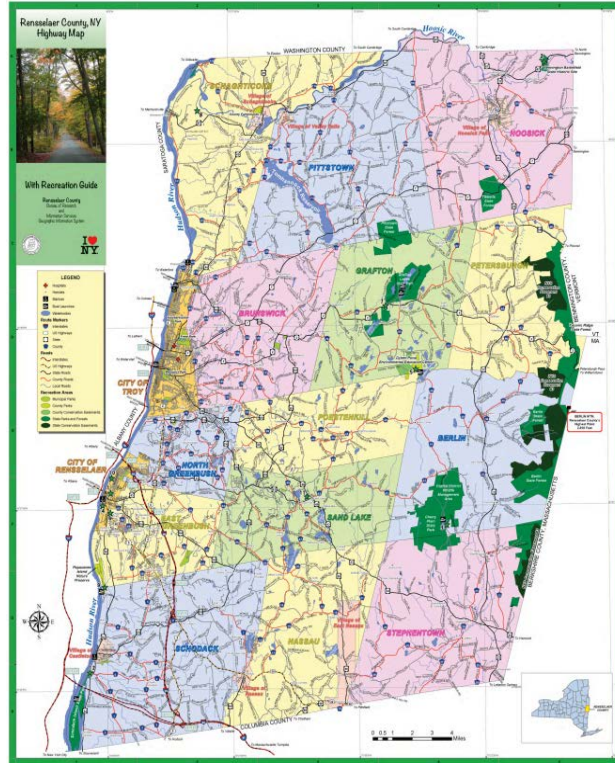


Figure 34: Highways and Recreation Resources in Rensselaer County

Bridges

Bridges are essential components in the nation’s roadway network, providing transportation connectivity to safely cross waterways, railways, and geographic obstacles—offering crucial access between cities and regions while linking workers to their jobs, delivering goods to markets, and people to key services.

Rensselaer County has a total of 278 inspected bridges. Table 10 presents the current conditions of the bridges, based on the inspection summary.

Table 10: Bridges in Rensselaer County

Bridge Description	Number	Percentage
Total Number of Bridges	278	
Bridges in Need of Repair or Corrective Action	55	19.78%
Closed	3	1.08%
Rated Poor by USDOT	39	14.03%
Structurally Deficient	40	14.39%

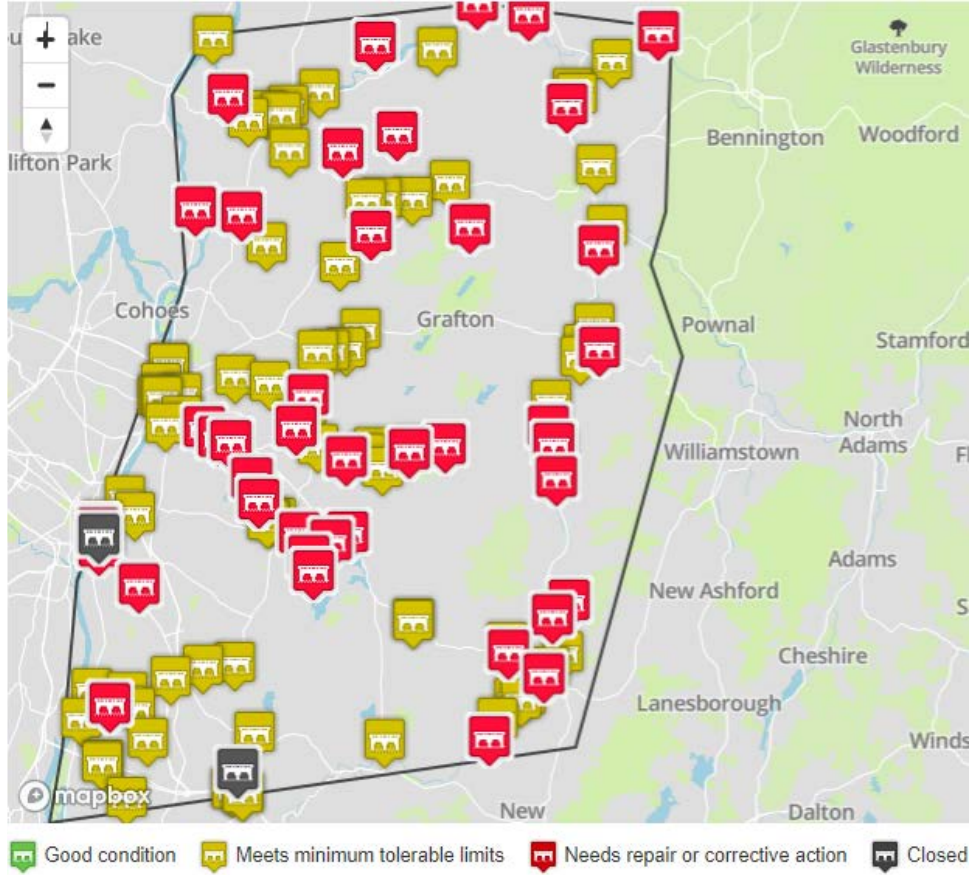


Figure 35: Map of Bridges in Rensselaer County²⁹

Other Transportation Infrastructure

Airports

The one airport in Rensselaer County, called 5B7, is in Troy. It is a privately owned, publicly used landing strip with a runway in poor condition. It serves mostly small aircraft. Passenger air services are immediately accessible to local residents at the nearby Albany International Airport.

Railroads

Amtrak’s passenger rail service at the City of Rensselaer has been rated among the top 10 busiest in the nation. It services the entire northeast. Commercial rail services include CSX Transportation, the Canadian Pacific Railway, and the Guilford Rail System. Figure 36 is a map of the railroads in the State of New York.

²⁹ [Rensselaer County, New York Bridge Inspections | news-press.com](https://www.news-press.com/story/news/local/2018/07/18/renselaer-county-new-york-bridge-inspections/)

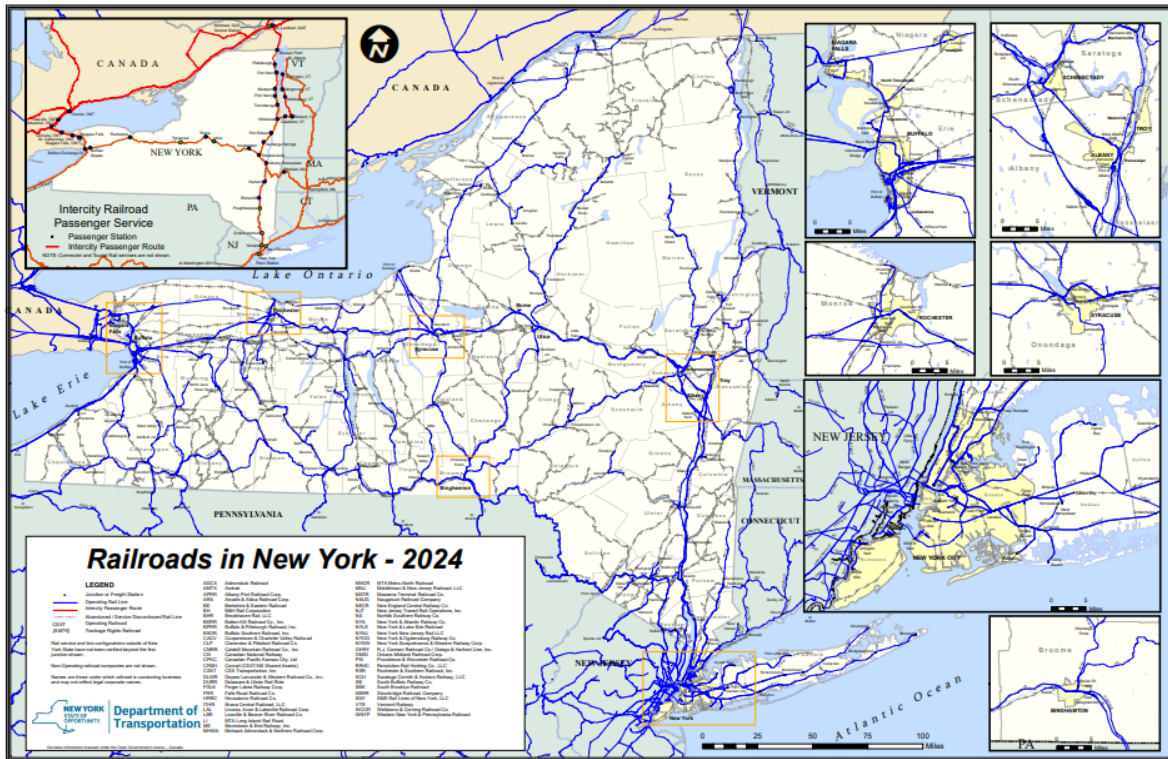


Figure 36: Map of New York Railroads³⁰

Other Transportation Services

In Rensselaer County, the Greyhound bus service provides convenient and affordable transportation for commuters and travelers. Greyhound offers routes connecting various cities and towns in the county and destinations beyond the local area. Rensselaer County has several taxi companies which provide on-demand transportation to those needing taxi services. These companies offer reliable transportation for short-distance travel, airport transfers, and other services. In addition, ride-sharing services are available in Rensselaer County, providing another convenient option for getting around the area.

Rensselaer County offers specialized medical transportation services for the elderly and disabled. Nonemergency medical transportation providers convey individuals to medical appointments, rehabilitation sessions, and other healthcare-related destinations. These services are designed to accommodate the specific needs of elderly and disabled passengers, ensuring safe and comfortable transportation to and from medical facilities.

³⁰ <https://www.dot.ny.gov/divisions/operating/opdm/passenger-rail/passenger-rail-repository/2024%20NYS%20Rail%20Map.pdf>

Energy

Rensselaer County uses a combination of energy sources to meet its power needs. They include traditional sources, such as natural gas, and renewable energy sources, such as solar and wind power. Several large and small energy companies operate in the area to provide electricity and natural gas services to residential, commercial, and industrial customers. The energy companies operating in the county include National Grid, New York State Electric & Gas (NYSEG), and various local and regional energy providers. These companies work to ensure a reliable and sustainable energy supply for the county's residents and businesses. In addition, there is a growing emphasis on renewable energy initiatives to reduce carbon emissions and promote environmental sustainability in the region.

Drinking Water, Stormwater, and Wastewater

A reliable infrastructure that can collect, treat, and distribute drinking water, wastewater, and stormwater is crucial in maintaining public health, economic vitality, and overall well-being. However, despite having adequate water and the necessary infrastructure, states like New York are facing various challenges that represent the broader challenges faced by the nation. Funding for water-related projects has declined, while the needs have increased. Furthermore, newer regulations, extreme weather events, and changing demographics continue to shape the management, planning, and policies related to sustainable water infrastructure.

Drinking Water–Water Quality

Surface water quality can be severely impacted by various contaminants, making the water unsuitable for consumption or recreational activities. A significant problem in New York State's water bodies is the presence of harmful algal blooms (HABs), which arise from a combination of natural and human-made factors. In addition, the direct release of contaminants into ground and surface waters at or below the microgram per liter level is another major issue. Such contaminants are called "micropollutants" and can include various chemical and biological substances.³¹

Natural Environment

Streams

For a single classification, rivers, brooks, and creeks are defined here as "streams." There are 48 streams in Rensselaer County and they play a significant role in the natural environment of the county. They provide habitats for various species of plants and animals, contribute to the biodiversity of the area, and support ecosystems that rely on the presence of water. In addition, streams can influence the local climate, help regulate water flow, recharge groundwater, and contribute to the environment's overall health. However,

³¹ [WRI Research Themes | CALS \(cornell.edu\)](#)

streams can also be affected by human activities, such as urbanization, industrial pollution, and agriculture, which can lead to habitat degradation and water quality issues. Protection and conservation efforts are essential to maintaining the balance and health of these natural environments. Figure 37 shows the streams in Rensselaer County.

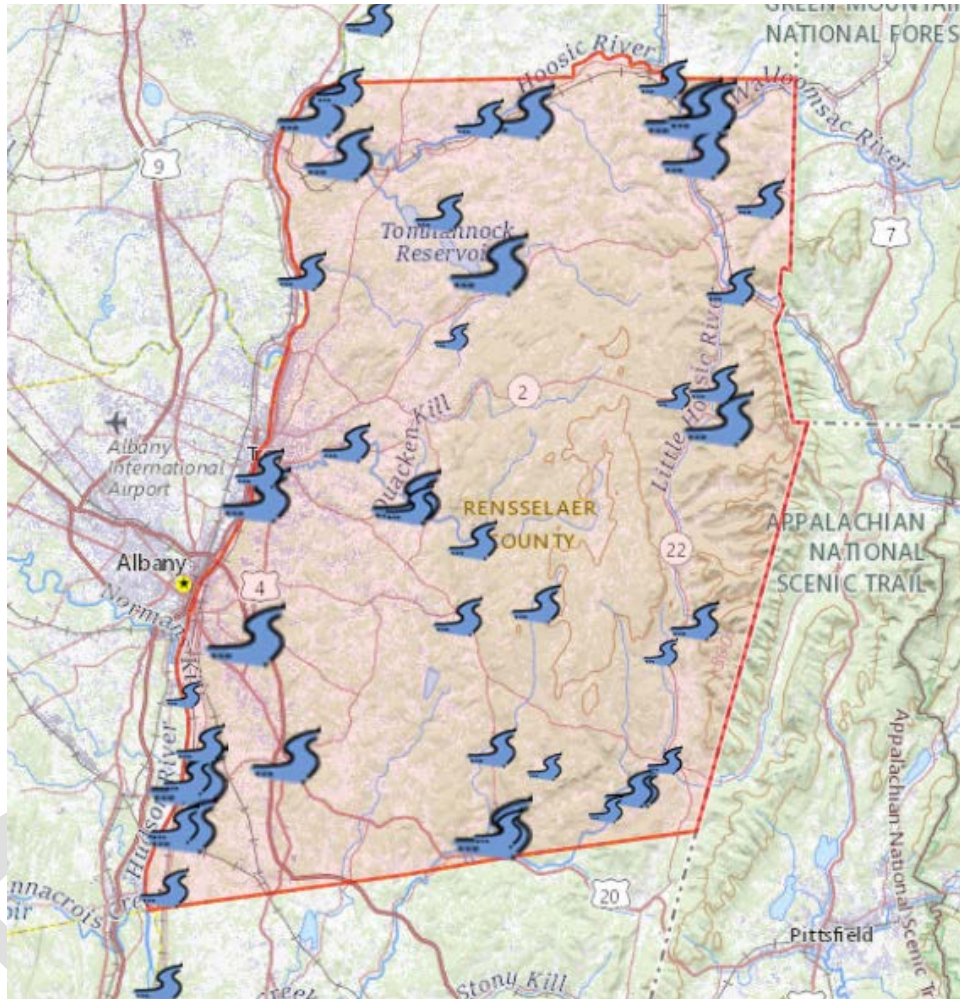


Figure 37: Streams in Rensselaer County

Lakes

A lake is a large body of water surrounded by land. It is larger and deeper than a pond and is often formed in basins or depressions on the Earth’s surface. Lakes can be natural or human-made and are often a key feature of the landscape, providing habitats for various plants and animals. They are important for drinking water, irrigation, recreation, and hydroelectric power.

Rensselaer County has 53 lakes and 13 reservoirs (see Figure 38). These inland water bodies provide drinking water, flood control, recreation, tourism, agriculture, fishing, power generation, and manufacturing. They also regulate the local climate, maintain water quality, and provide habitats for

aquatic plant and animal life.³² However, human activities, such as pollution, overfishing, and habitat destruction, can affect lakes and lead to environmental degradation. Therefore, protection and conservation efforts are important for maintaining the balance and health of these natural environments.

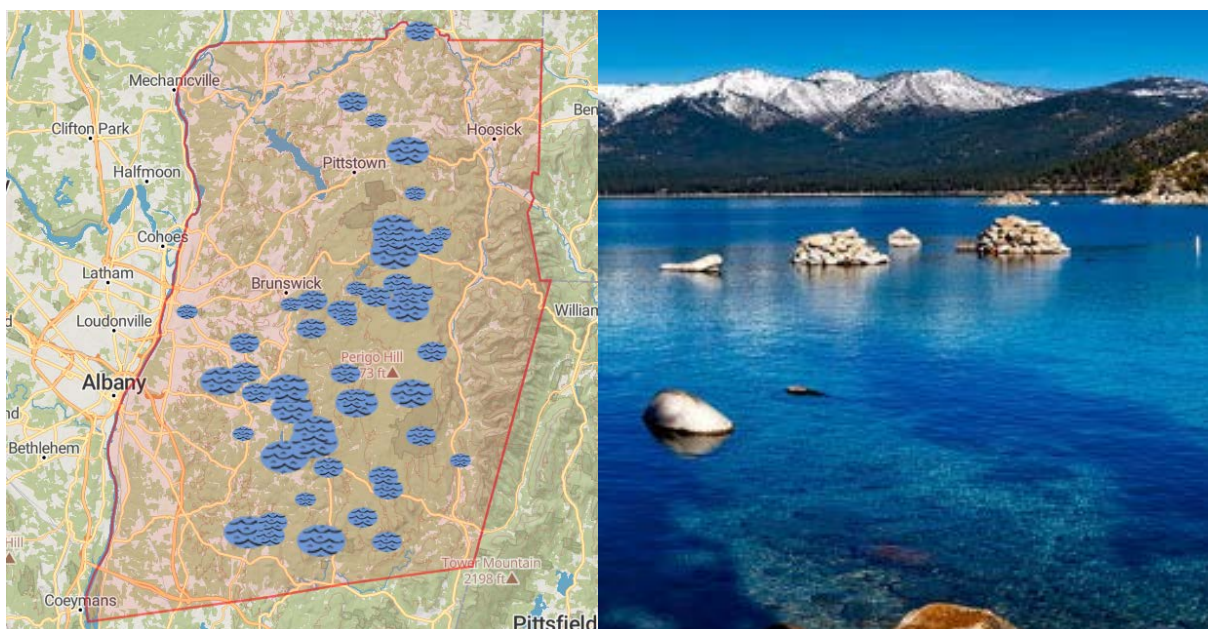


Figure 38: Mapped Locations of Lakes in Rensselaer County and a Picture of One of Them

Aquifers

An aquifer is a rock and/or sediment formation that retains groundwater. Groundwater is rainwater that seeped through the soil beyond the surface and amassed in underground voids.³³

The permeability of the aquifer material determines the water movement in aquifers. Permeable materials consist of interconnected cracks or spaces that allow the free flow of water. When water is extracted from wells faster than replenished, the water table can decrease, creating a “cone of depression” around the well. Overpumping can lead to significant drops in the water table, causing wells to run dry. Groundwater movement varies based on geological and hydrological characteristics, and it can exit the aquifer through springs, seep into streams, or be extracted from the ground by wells. Water confined in aquifers under impermeable rock layers may be under artesian pressure, resulting in water flow from the well onto the land surface.³⁴ Groundwater is naturally filtered as it travels through tiny pores and between sediments in aquifers, effectively removing substances. However, this natural filtration process may not eliminate all contaminants.

³² <https://www.anyplaceamerica.com/directory/ny/rensselaer-county-36083/lakes/>

³³ National Geographic, “Aquifers.” <https://education.nationalgeographic.org/resource/aquifers/>

³⁴ USGS, “Aquifers and Groundwater.” <https://www.usgs.gov/special-topics/water-science-school/science/aquifers-and-groundwater>

Schodack Terrace aquifer is a principal aquifer in Rensselaer County and yields 50–1050 gal/min, averaging 305 gal/min. A 1960 study estimated the average annual recharge at 16.3 and 7.1 inches per square mile.³⁵ The recharge rate of groundwater is a critical factor in assessing groundwater continuity. Groundwater in Rensselaer County, New York, is primarily used for public and rural domestic supplies and agricultural and industrial purposes. Rensselaer County, New York's aquifers are renewed mainly by rain and melting snow. This annual recharge process replenishes the aquifers, and a portion of the recharged groundwater then discharges to the surface, helping to maintain the base flow levels of the streams. Varying river stages and water elevations can also recharge aquifers. These processes collectively contribute to the renewal of the county's aquifers.

Figure 39 displays the aquifers in or near Rensselaer County. Please note that the Valatiekill Aquifer is in Columbia County.

³⁵ NY.gov, "New York State Department of Environmental Conservation Division of Environmental Remediation Site Classification Report." <https://extapps.dec.ny.gov/data/DecDocs/442021/Report.HW.442021.2012-03-28.Delist.Package-FINAL.pdf>

TOWN OF SCHODACK
SCHODACK TERRACE AND VALATIEKILL AQUIFERS
 TOWN OF SCHODACK
 RENSSELAER CO. N. Y.

PLATE 1: AQUIFER PROTECTION ZONES

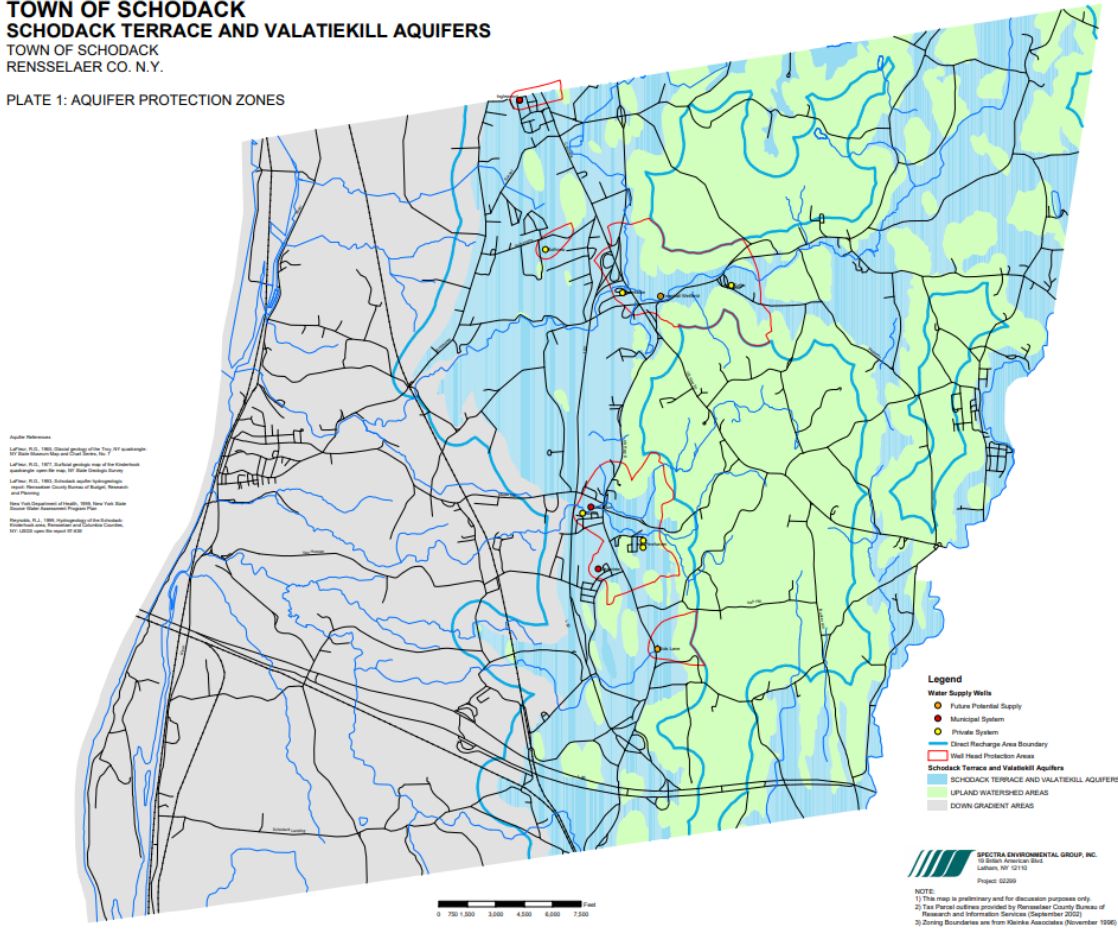


Figure 39: Schodack Terrace and Valatiekill Aquifers³⁶

Hazard Profiles, Risk Assessment, and Vulnerability Analysis

Risk Assessment Overview

This section assesses the various hazard risks to which Rensselaer County is exposed, which helps identify a strategy to mitigate each hazard. Having identified the categories of hazards, emergencies, disasters, and catastrophes, this section profiles the major natural, technological, and human-caused hazards by describing the geographic extent (including a worst-case scenario), identifying previous occurrences,

³⁶ Town of Schodack, "Town of Schodack: Schodack Terrace and Valatiekill Aquifers." https://www.schodack.org/sites/g/files/vyhlf1186/f/uploads/aquifer_map.pdf

evaluating the future likelihood of occurrence, and the potential impact from climate trends and variations.

Assessing the risks from natural hazards measures their potential impacts on life, property, and the economy. The intent of risk assessment is to identify, as much as practicable, given the data available, the qualitative and quantitative vulnerabilities of a community. A risk assessment provides a better understanding of the impacts of natural hazards on the community. It provides a foundation on which to develop and prioritize mitigation actions (see Mitigation). The aim is to reduce damage from natural disasters through increased preparedness and response times and to allocate resources to areas of greatest vulnerability.

This risk assessment followed the methodology described in the *FEMA Local Mitigation Planning Handbook 2023*, which outlines a five-step process:

1. **Identify hazards.** This step helps clarify what hazards may occur in the planning area.
2. **Describe hazards.** This step includes gathering more information about the hazards. It looks at where they can happen, how impactful they have been in the past, and how often and with what intensity they might occur in the future.
3. **Identify community assets.** This step examines which assets are most vulnerable to loss during a disaster. It must include changes in development that have taken place since the previous plan was created.
4. **Analyze impacts.** This step describes how each hazard could affect the assets of each community.
5. **Summarize vulnerability.** This step brings all the analysis together. It uses the risk assessment to draw conclusions. From these conclusions, the planning team can develop a strategy to increase the resilience of residents, businesses, the economy, and other vital assets.

Identifying Hazards

This section provides a complete overview and definition of each hazard that could potentially affect Rensselaer County, New York. The planning team identified hazards with potential for impacting the county based on a review of planning documents, previous incidents, historical knowledges, recent events across the state, and developing trends. A complete understanding of each hazard better prepares decision-makers, local agencies, and residents for the causes, potential damages contributed to, and possible scenarios of each hazard. The table below provides an overview of the hazards profiled in the 2025 HMP update.

Table 11: Rensselaer County Identified Hazards

Atmospheric Hazards	Hydrologic Hazards	Geologic Hazards	Other Hazards	Human-Caused
Extreme Temperature	Drought	Earthquakes	Wildfire	Terrorism

Hurricane/Tropical Storm	Flooding	Landslides		Civil Unrest
Lightning	Ice Jams			Hazardous Materials
Tornado	High-Hazard Dam Failure			Utility & Infrastructure Failure
High Winds				
Winter Storm (Ice Storm/ Heavy Snow/Blizzard)				

Initial Prioritization of Hazards

After the risk assessment meeting, each participating jurisdiction was responsible for prioritizing the identified hazards. Considerations included examining the probability of future occurrences and the spatial extents of each hazard, if measurable. The jurisdictions added “Response Capacity” as a factor to consider when prioritizing hazards. Response capacity is particularly important for smaller rural communities, which may not have the same resources to respond to hazards as larger jurisdictions. This prioritization reflects the fact that vulnerability can differ across jurisdictions. Table 13 presents the results of the hazard prioritization process, also known as the Priority Risk Index (PRI), for Rensselaer County. The PRI provides a standardized numerical value to compare hazards. PRI scores were calculated using five categories:

- Probability
- Potential Consequences
- Warning Time
- Duration
- Spatial Extent

Each degree of risk is assigned a value (1–4) and a weighting factor. To calculate the Risk Factor for a given hazard, the assigned risk value for each category is multiplied by the weighted factor, and the sum of all six categories is totaled together for a final score. The highest possible Risk Factor is 4.0.

Each jurisdiction ranked the hazards on a worksheet based on perceived notions of the probability of future occurrences, spatial extent of the hazard, and historical events. The results of this process are included in the jurisdictional annexes.

Table 12: Guidelines for Hazard Prioritization

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
Probability What is the likelihood of the hazard occurring?	1	Unlikely	Less than 1% probability of occurrence in the next year or a recurrence interval of greater than every 100 years.	30%
	2	Occasional	1%–10% probability of occurrence in the next year or a recurrence interval of 11–100 years.	
	3	Likely	11%–90% probability of occurrence in the next year or a recurrence interval of 1–10 years.	
	4	Highly Likely	91%–100% probability of occurrence in the next year or a recurrence interval of less than 1 year.	
Potential Consequences What will be the overall impact in terms of injuries, damage, death, continuity of operations, and environmental and economic impacts?	1	Negligible	Very few injuries, if any. Only minor property damage and minimal disruption of quality of life. Temporary shutdown of critical facilities.	30%
	2	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.	
	3	Critical	Multiple deaths/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities more than one week.	
	4	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	
Warning Time	1	Self-defined	More than 24 hours	10%
	2	Self-defined	12–24 hours	

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
How long between when it is recognized the hazard is approaching and when the hazard will begin to affect the community?	3	Self-defined	6–12 hours	
	4	Self-defined	Less than 6 hours	
Duration What is the length of time the hazard will remain active, including how long emergency operations will need to continue after the hazard event?	1	Brief	Up to 6 hours	10%
	2	Intermediate	Up to one day	
	3	Extended	Up to one week	
	4	Prolonged	More than one week	
Spatial Extent How large of an area could be impacted by a hazard event? Are impacts localized or regional?	1	Negligible	Less than 1% of area affected	20%
	2	Small	1%–25% of area affected	
	3	Moderate	25%–50% of area affected	
	4	Large	Greater than 50% of area affected	

The following equation was used to calculate the total Risk Factor (RF) Value for each jurisdiction:

RISK FACTOR EQUATION

$$RF \text{ Value} = [(Probability \times .30) + (Magnitude \times .30) + (Onset \times .10) + (Duration \times .10) + (Frequency \times .20)]$$

Hazards with a risk factor value of 2.5–4.0 are considered high risk. Those with values of 2.0–2.4 are considered moderate, and those with values less than 2.0 are considered low risk.

Table 13:Rensselaer County Risk Assessment

Hazard	Probability	Potential Consequences	Warning Time	Duration	Spatial Extent	Overall Risk
Drought	1	2	1	4	4	2.2
Earthquake	1	3	4	3	4	2.7
Extreme Temperatures (cold waves and heat waves)	2	2	1	2	4	2.3

Hazard	Probability	Potential Consequences	Warning Time	Duration	Spatial Extent	Overall Risk
Flooding	4	4	3	4	2	3.5
Hazardous Materials	3	2	4	4	1	2.5
High Winds	4	1	2	2	3	2.5
Hurricane/Tropical Storms	2	4	1	3	4	3.0
Landslide	3	2	4	4	1	2.5
Lightning	4	1	2	2	3	2.5
Terrorism	1	3	4	3	2	2.3
Tornado	1	4	4	3	2	2.6
Utility & Infrastructure Failure	3	3	4	4	2	3.0
Wildfire	1	1	4	3	2	1.7
Winter Storm (Ice Storm, Heavy Snow, Blizzard)	4	3	1	3	3	3.1

The FEMA National Risk Index provides a composite risk score for 18 natural hazards at the county and Census tract levels. These include avalanches, coastal flooding, cold waves, drought, earthquakes, hail, heat waves, hurricanes, ice storms, landslides, lightning, riverine flooding, strong wind, tornadoes, tsunamis, volcanic activity, wildfire, and winter weather. The NRI divides the risk into the expected annual loss, social vulnerability, and community resilience, creating an overall composite score for the community. The following equations outline how expected annual loss and risk are calculated. Table 14 shows the county’s overall risk of the above hazards.

EXPECTED ANNUAL LOSS AND RISK

Expected Annual Loss = Exposure * Annualized Frequency * Historical Loss Ratio

Risk Index = Expected Annual Loss * Social Vulnerability / Community Resilience

The following tables provide an overview of the hazards profiled for Rensselaer County and the risk associated with each hazard. Figure 40 is a map showing the risk of hazards for Rensselaer County.

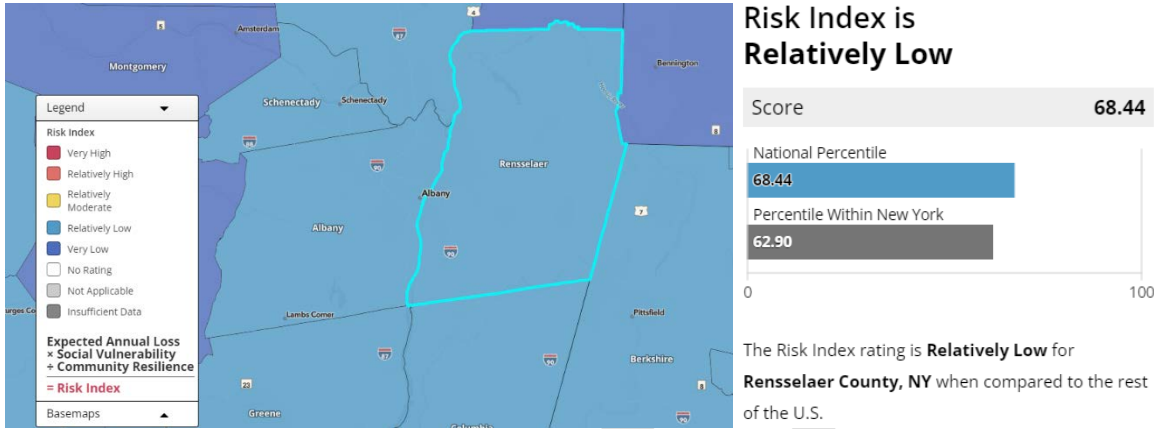


Figure 40: Rensselaer County Hazards Risk Index³⁷

Table 14: National Risk Index Summarization of Risk to Eighteen Natural Hazards for Rensselaer County, New York³⁸

Expected Annual Loss	Social Vulnerability	Community Resilience	Overall Risk Rating
Relatively Low	Relatively Low	Very High	Relatively Low

The discussion of each hazard profile includes the historical context for identifying the hazards. Figure 41, Figure 42, and Figure 43 show the number of FEMA Presidential disaster declarations awarded to Rensselaer County broken down by the number of declarations, incident type, and yearly totals.

³⁷ FEMA, "National Risk Index." <https://hazards.fema.gov/nri/map>

³⁸ Ibid.

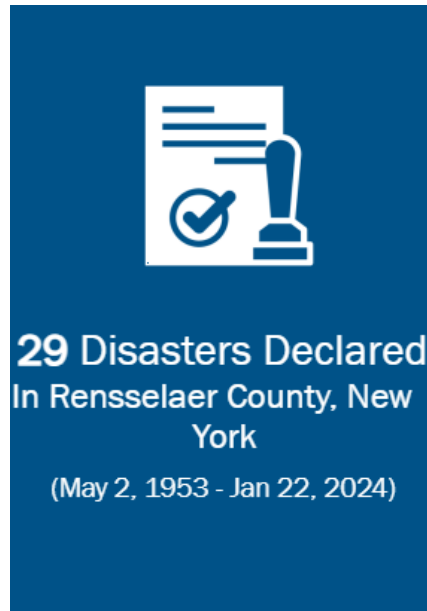


Figure 41: Rensselaer County Disaster Declarations May 2, 1953–Jan. 22, 2024³⁹

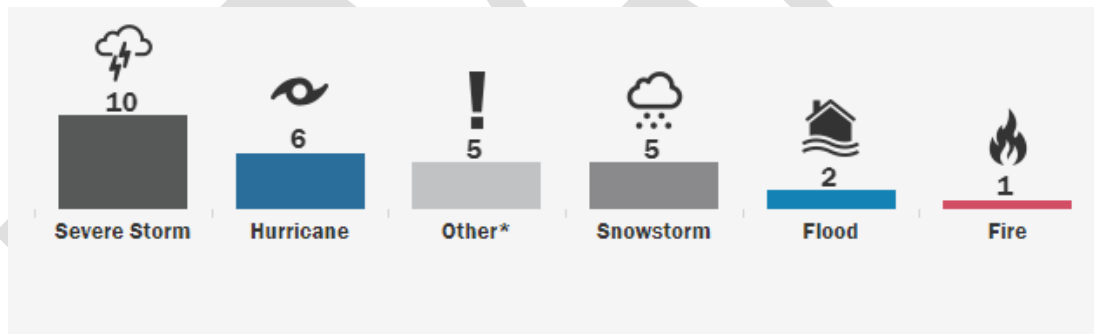


Figure 42: Rensselaer County Disasters by Incident Including Subcategories⁴⁰

³⁹ FEMA, "Disaster Declarations for States and Counties." <https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties>

⁴⁰ Ibid.

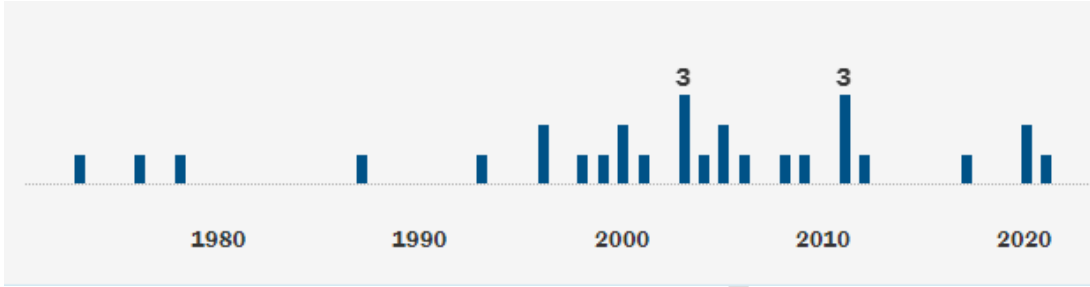


Figure 43: Disasters by Year Rensselaer County⁴¹

Data Limitations

The National Centers for Environmental Information (NCEI) Storm Events Database is the primary source of historical data used in the risk assessment. This database provides natural hazard event information from 1950 to the present. To determine the future probability and frequency of a hazard occurring, the NCEI Storm Events Database was evaluated for the last 29 years (1996–2024), consistent with climatological studies.

The planning process made every effort to use the best available data. A significant portion of data showing the historic occurrences of natural hazards was obtained through the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI). The NCEI Storm Events Database contains data from January 1950 to 2024, although storm events were recorded differently before 1996.

The NCEI Storm Events Database only contains information on tornado events from 1950 to 1954. Thunderstorms, wind, and hail events were added to the database for the period between 1955 and 1992. All event types identified in the NWS Directive 10-1605 (48 in total) are recorded from 1996 to the present. Moreover, property damage and crop damage estimates from the NCEI Storm Events Database are "best guess" estimates based on all available data at the time of the event publication.

It is important to note that the NCEI Storm Events Database does not record all events, only those with sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce. Additionally, events such as tornadoes or hailstorms rely heavily on eyewitness accounts, which creates a reporting bias in urban areas. The inception of Doppler radar in 1980 significantly decreased this bias, especially for tornado events. However, records before 1980 are not as detailed or complete as post-1980 records.

The Storm Prediction Center (SPC) National Weather Service Database examines convective/thunderstorm-related winds only and does not include wind data from hurricane or non-thunderstorm wind damage. This data contains measured and estimated wind gusts, and associated wind damage,

⁴¹ Ibid.

without estimated wind speeds. Many observed instances identify a severe thunderstorm wind event with no estimated or actual wind speed estimates.

Vulnerability Analysis Methodology

A vulnerability assessment offers a detailed representation of the losses that a community may incur in the event of a disaster. This is particularly valuable for county and city personnel and other decision-makers who must balance the costs of mitigation with the potential harm to residents and property. The assessment provides a standardized method to measure a community's exposure to natural hazards and helps identify which hazards and regions should be prioritized for disaster resilience efforts. Based on evaluating the assets at risk, hazard mitigation resources can be allocated where they are most needed, using the information provided in the hazard profiles.

To direct the vulnerability analysis effort for Rensselaer County, two distinct methodologies were applied. The first includes a quantitative analysis that relies upon the best available data and technology, while the second methodology includes a qualitative analysis that relies more on local knowledge and rational decision-making. Upon completion, the methodologies are combined to create a Vulnerability Analysis that allows for some degree of quality control and assurance. The quantitative assessment focuses on potential hazard loss estimates, while the qualitative assessment is comprised of a scoring system built around values assigned by the Planning Team as to the likelihood of occurrence, spatial extent, and potential impact of each hazard studied.

Quantitative Methodology

The quantitative methodology consists of utilizing Hazus (version 6.0), a FEMA geographic information system (GIS)-based loss estimation software, as well as a detailed GIS-based analysis approach independent of the Hazus software.

Hazus is a nationally standardized risk modeling methodology that can be used to estimate potential damage, economic loss, and social impacts from earthquake, flood, tsunami, and hurricane hazards. The Hazus software includes nationwide general GIS datasets on general building stock, critical facilities, transportation and utilities, and models potential impacts to these assets based on how these structures may be affected by different types of hazards. The loss estimates consider building area and value, population characteristics, costs of repairs, and other economic data.⁴² Hazus was utilized to model a 2,500-year probabilistic earthquake scenario, a 100-year flood scenario, and 100-year and 500-year hurricane scenarios.

Geospatial analysis can also be conducted by overlaying the natural hazard's spatial footprint on a map of people and assets. For hazards with an official and scientifically determined geographic extent available,

⁴² FEMA. "Using Hazus for Mitigation Planning." 2021.
https://www.fema.gov/sites/default/files/documents/fema_using-hazus-mitigation-planning.pdf.

GIS technology allows for the identification and analysis of potentially at-risk community assets such as people and infrastructure within that extent.

The National Risk Index also provides additional context for the risk of hazards for Rensselaer County

Qualitative Methodology

The qualitative assessment relies less on technology, but more on historical and anecdotal data regarding expected hazard impacts. The qualitative assessment completed Rensselaer County is based on the Priority Risk Index (PRI) described above. The purpose of the PRI is to prioritize all potential hazards, and then group them into three categories of high, moderate, or low risk to identify and prioritize mitigation opportunities.

Critical Facilities

Hazus includes default inventory of critical facilities for the entire country. An Hazus analysis using default inventory is referred to as a Level 1. However, model results are often improved when local data is used to substitute or supplement the default data, which is considered a Level 2 analysis. The GIS analysis for this project evaluated data for critical facilities from county, state, and federal sources to derive the most complete and accurate list of facilities available. The default Hazus data was used except for the following facility types, which were substituted with county or state data: fire stations, medical care facilities, schools, and wastewater systems.

A total of 238 critical facilities were identified in the planning area, including: 1 airport, 11 bus facilities, 4 communications facilities, 8 electric power facilities, 1 emergency operations center, 55 fire stations, 27 medical care facilities, 5 oil facilities, 17 police stations, 16 ports, 1 potable water facility, 1 rail facility, 66 schools, and 25 wastewater facilities.

Vulnerable Populations

Socioeconomic and demographic characteristics affect how people are impacted by disasters and their ability to access the resources needed to recover. These factors can include age (both children and elderly), gender, income, disabilities, housing conditions, English-speaking proficiency, racial and ethnic background, and access to transportation. People who exhibit one or more of these vulnerability characteristics often experience more severe effects from a disaster. To better understand the impacts of hazards on different demographic groups in Glenn County, a variety of tools and data were used.

A convenient way to get an overall understanding of vulnerability is to use an index, which summarizes a series of variables into a simplified value. The Social Vulnerability Index (SVI) summarizes 16 variables in four themes: Household Characteristics, Housing Type and Transportation, Racial and Ethnic Minority Status, and Socioeconomic Status (see Figure 45: Social Vulnerability Index: Household Characteristics to Figure 48). The urban area near the cities of Troy and Rensselaer showed moderately high to high vulnerability in all four themes. Unincorporated areas in the eastern area of the county showed higher

vulnerability in household characteristics and housing type/ transportation. These trends are considered when discussing possible impacts on the population in each hazard profile.

The Climate and Economic Justice Screening Tool (CEJST) is a tool from the Council on Environmental Quality to identify communities that are experiencing burdens in one or more of eight categories: climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. The tool was originally designed to identify communities that could benefit from investments in climate, clean energy, and other resources as part of the Justice40 initiative. However, it also serves as a reference for communities which are overburdened and underserved, and which might experience disadvantages in relation to natural hazards. The climate change threshold includes several indicators related to natural hazards, such as flooding, wildfire, and agricultural losses. Figure 49 shows the census tracts identified by CEJST as disadvantaged, and Table 11 identifies which thresholds for disadvantaged communities are met for one or more census tracts in one of the participating jurisdictions.

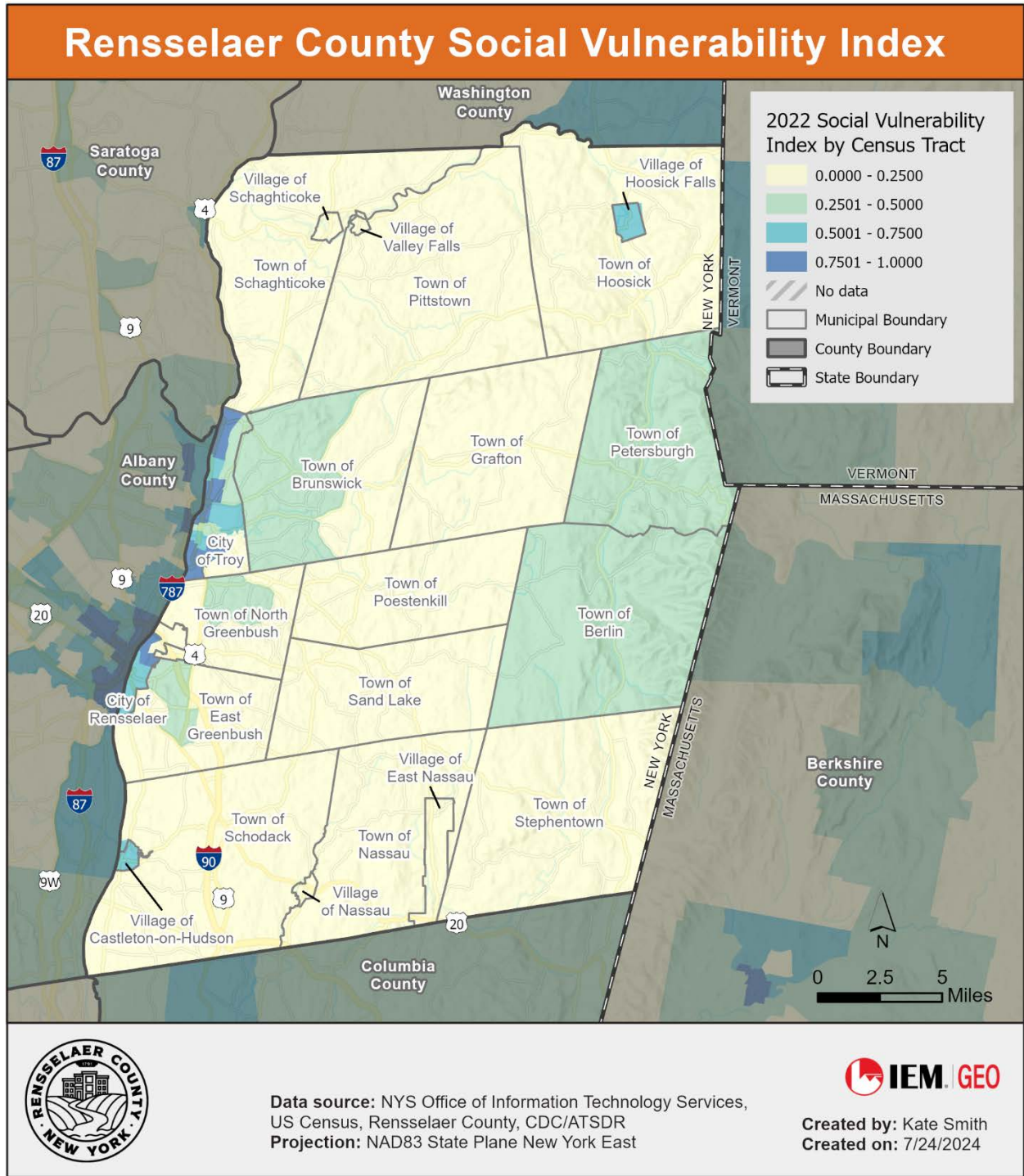


Figure 44: Social Vulnerability Index for Rensselaer County

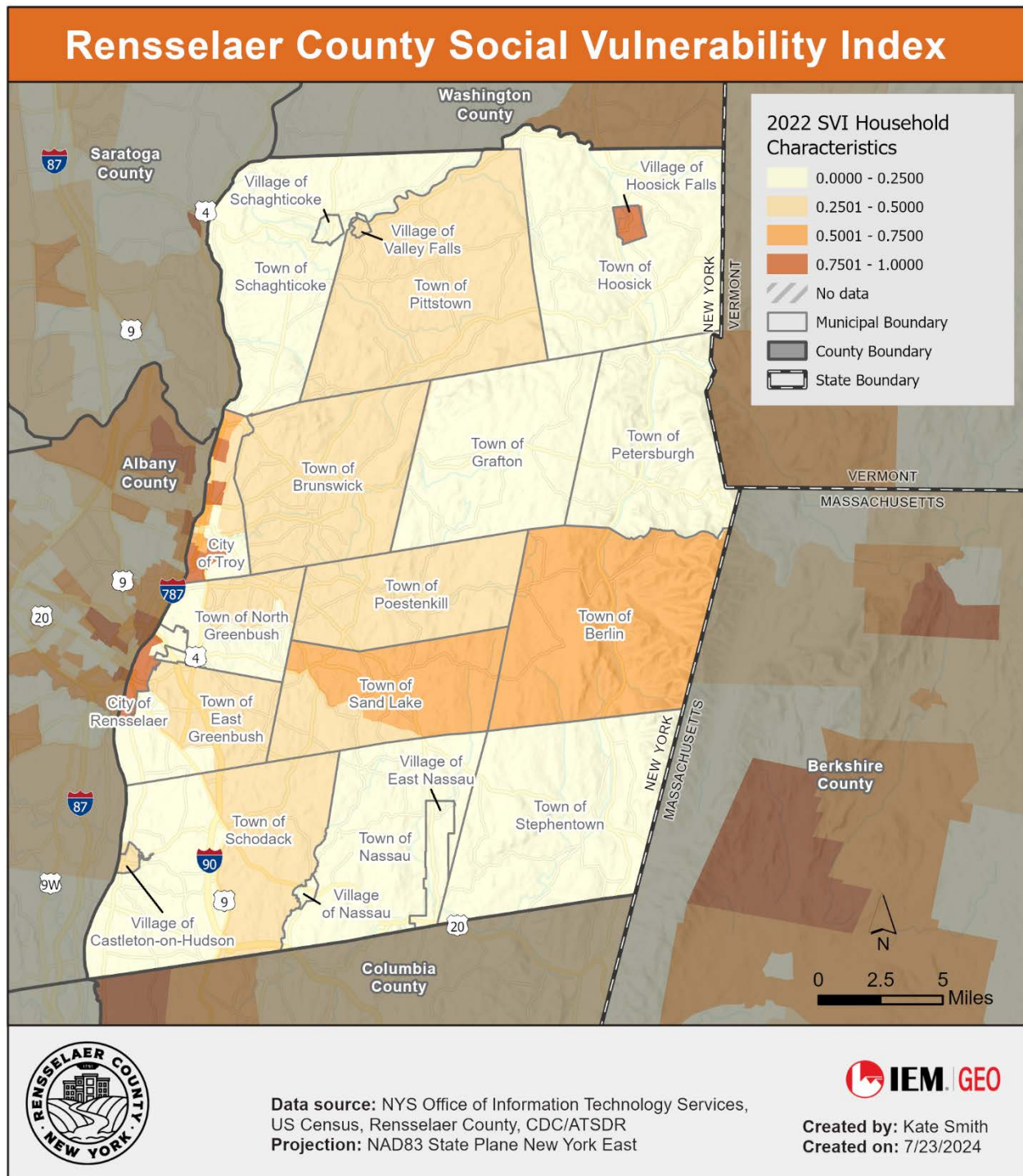


Figure 45: Social Vulnerability Index: Household Characteristics

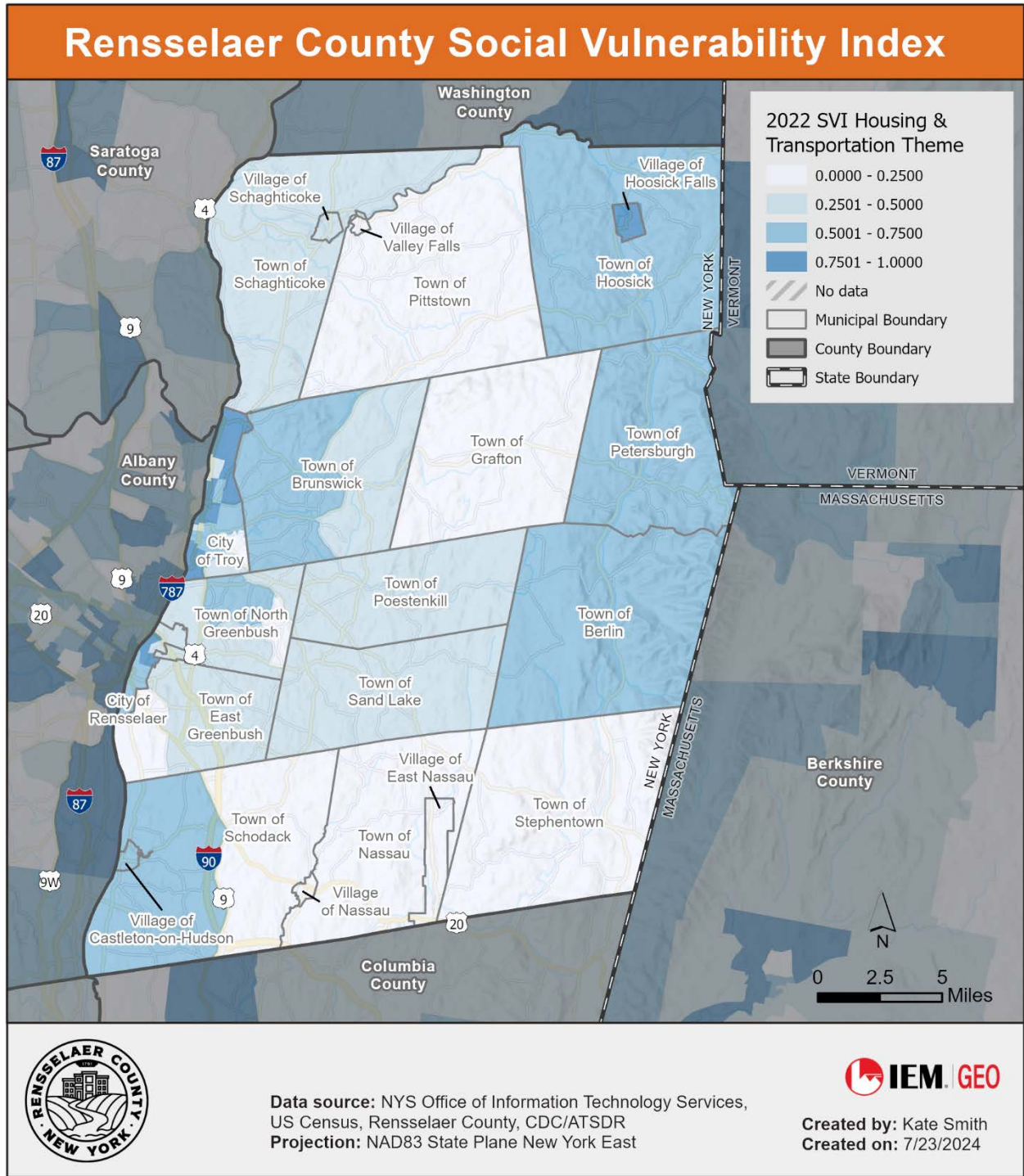


Figure 46: Social Vulnerability Index: Housing and Transportation Theme

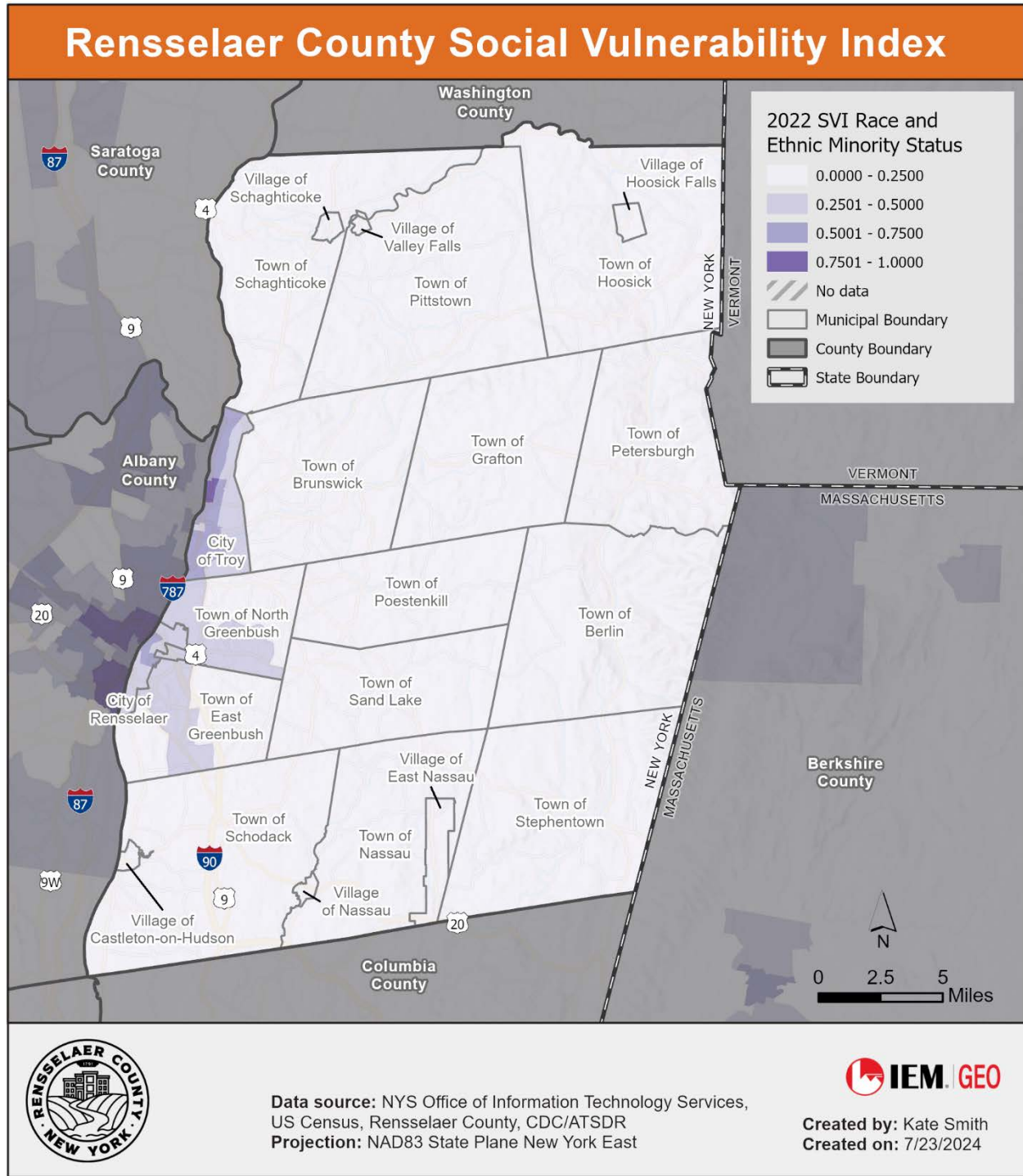


Figure 47: Social Vulnerability Index: Race and Ethnic Minority Status

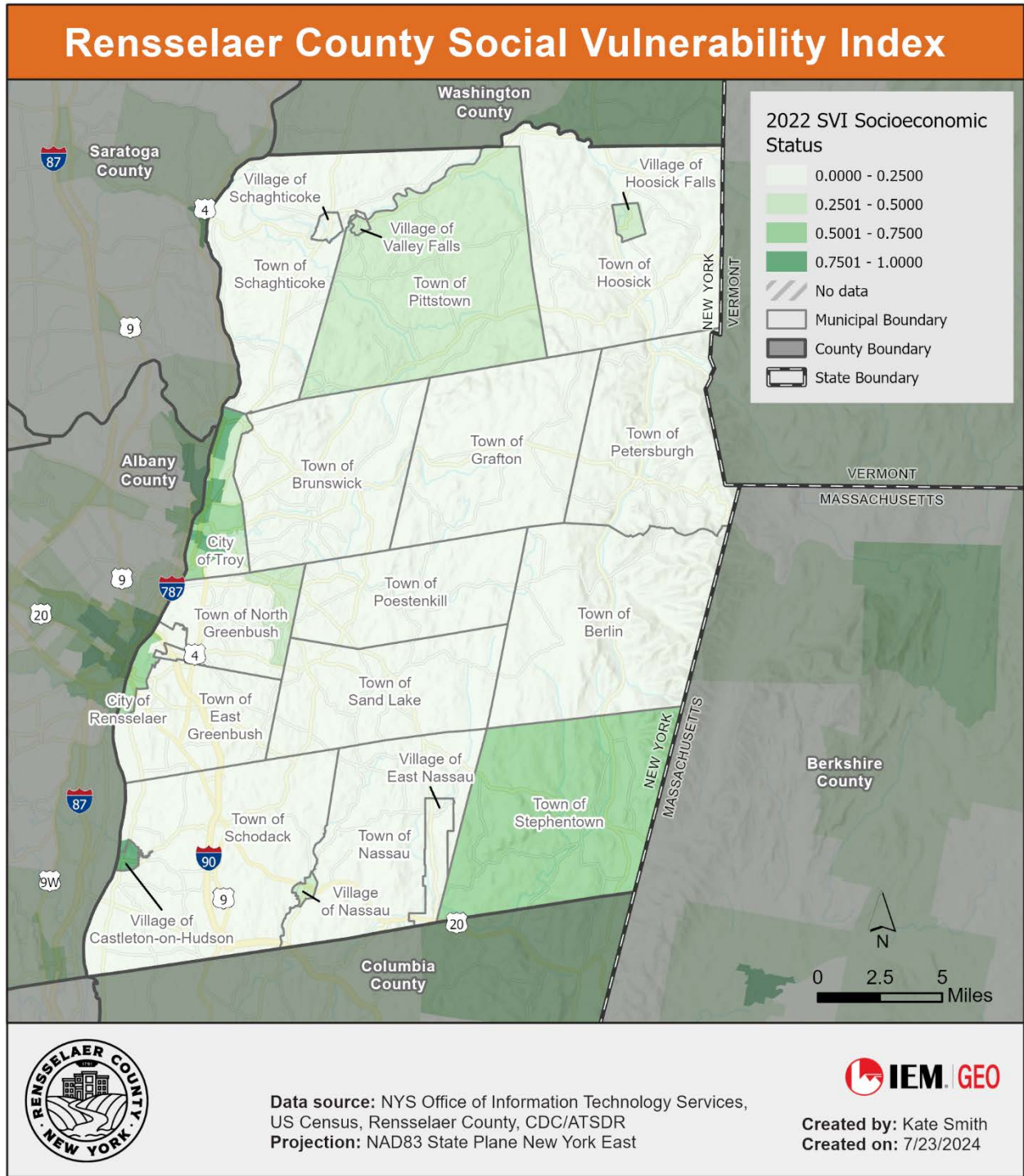


Figure 48: Social Vulnerability Index: Socioeconomic Status

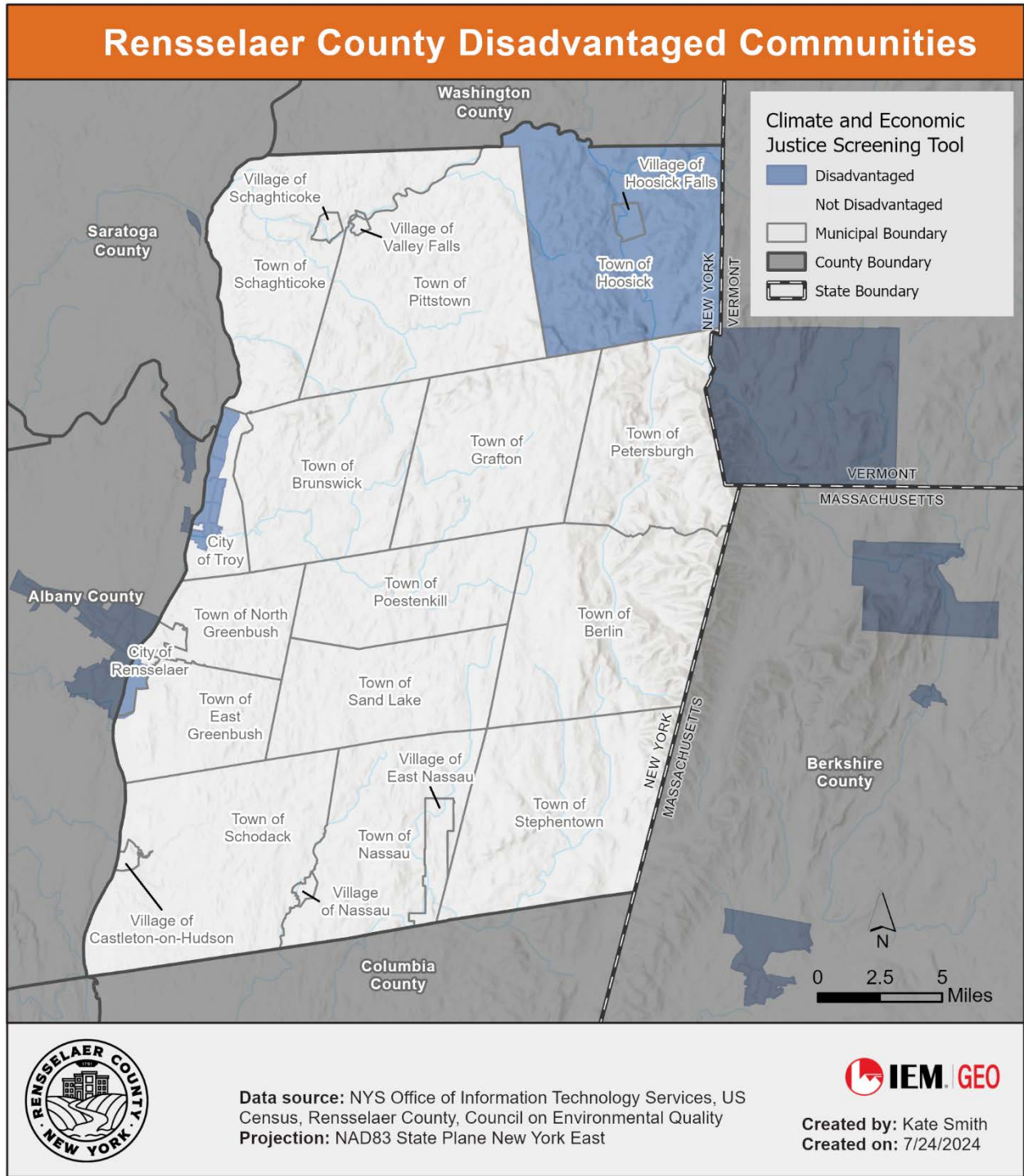


Figure 49: CEJST Disadvantaged Communities

Table 15: CEJST Threshold for Disadvantaged Communities

City of Troy	City of Rensselaer	Town of Hoosick Falls	Village of Hoosick Falls
Projected flood risk	Projected flood risk		
Energy Cost			
Asthma			
Low life expectancy			
Historic Underinvestment	Historic Underinvestment		
Housing Cost			
Lack of green space			
Lead Paint			
Proximity to hazardous waste facilities	Proximity to hazardous waste facilities		
		Transportation Barriers	
Underground Storage tanks and releases			
Low median income	Low median income		
Poverty	Poverty		
Unemployment			
High school education	High school education		
Low income	Low income	Low income	Low Income
			Surrounded by disadvantaged tracts

Projected flood risk: Risk to properties from projected floods in the next 30 years.
Energy Cost: Average annual energy costs divided by household income.
Asthma: Share of people who have been told they have asthma.
Low life expectancy: Average number of years a person can expect to live.
Historic Underinvestment: Census tracts with historically high barriers to accessing home loans.
Housing cost: share of households making less than 80% of the area median family income and spending more than 30% of income on housing.
Lack of green space: The amount of land, not including crop land, covered with artificial materials, such as concrete and pavement.
Lead paint: Share of homes that are likely to have lead paint.
Proximity to hazardous waste facilities: Count of hazardous waste facilities within 5 kilometers.
Transportation barriers: Average of relative cost and time spent on transportation.

Underground storage tanks and releases: Formula of the density of leaking underground storage tanks and number of all active underground storage tanks within 1500 feet of the census tract boundaries.

Low median income: Comparison of median income in the tract to median incomes in the area.

Poverty: Share of people in households where income is at or below 100% of the Federal poverty level.

Unemployment: Number of unemployed people as a part of the labor force.

High school education: Percent of people aged 25 years or older without a high school diploma.

Low income: People in households where income is less than or equal to twice the federal poverty level.

Surrounded by disadvantage tracts: a tract completely surrounded by disadvantaged tracts and also meets an adjusted low income threshold is considered disadvantaged.

Drought Hazard Profile

A drought is a deficiency in water availability over an extended period of time. Drought is a unique hazard in that, unlike other natural hazards, no specific threshold of “dryness” exists for declaring a drought. In addition, the definition of drought depends on stakeholder needs.

There are generally four different types of droughts, each defined in Table 16.

Table 16: Types of Drought

Type of Drought	Definition
Meteorological	When observed precipitation has been significantly lower than average or normal levels over a period of time
Agricultural	When precipitation and soil water storage cannot satisfy the demand for water in crops
Hydrological	When surface and subsurface water levels are significantly lower than average or normal levels
Socioeconomic	When water deficiencies begin to significantly impact the human population in an area

It is important to note that the lack of precipitation alone does not constitute drought; the season during which the precipitation is lacking has a major impact on whether drought occurs. For example, a week of no precipitation in July, when the solar energy to evaporate water and vegetation’s need for water to carry on photosynthesis are both high, may trigger a drought, while a week of no precipitation in January when evapotranspiration is low may not initiate a drought.

Each type of drought can be triggered or ended by different conditions. For instance, the onset (and end) of an agricultural drought tends to be quick, as crops need water every few days; once they get rainfall, they improve. But hydrologic drought sets in (and is alleviated) only over longer time periods. A few dry days will not drain a reservoir, but one week of slightly above normal rainfall cannot replenish it either. Moreover, different geographical regions define drought differently based on the deviation from local

normal precipitation. For example, in the more humid and wet eastern United States, the impacts of drought can happen quicker or be noticed sooner than in the naturally drier areas of the western United States.

Drought can occur anywhere, triggered by changes in the local-to-regional-scale atmospheric circulation over an area, or by broader-scale circulation variations such as the expansion of semipermanent oceanic high-pressure systems or the stalling of an upper-level atmospheric ridge in place over a region. The severity of a drought depends upon the degree and duration of moisture deficiency, as well as the size of the affected area. Periods of drought also tend to be associated with other hazards, such as wildfires and/or heat waves. Lastly, drought is a slow onset occurrence, causing less direct—but tremendous indirect—damage.

Droughts can have significant environmental, agricultural, health, and economic impacts. Common direct impacts of drought include diminished crop yields or total crop loss, the depletion of aquifers, livestock mortality, soil erosion, dust storms, wildfires, reduced electricity production from hydroelectric dams, and reduced water quality or availability.

Drought can impact both surface water and groundwater availability and can potentially have direct, disastrous effects on human populations. The indirect consequences of drought, such as unemployment, reduced tax revenues, increased food prices, reduced outdoor recreation opportunities, higher energy costs as water levels in reservoirs decrease and consumption increases, and water rationing, are not often fully known. This complex web of impacts causes drought to affect people and economies well beyond the area physically experiencing the drought.

It can be difficult to determine when a drought begins or ends, but there are several metrics and indicators of drought, such as departure from normal precipitation, departure from normal stream flow, or soil moisture deficits. Researchers have developed a number of drought indices to help define the onset, severity, and end of droughts; each drought index brings together data related to the supply of or demand for water in the environment.

The U.S. Drought Monitor is also widely used to track weekly drought development, persistence, or improvement across the United States. The U.S. Drought Monitor is a map released every Thursday, showing parts of the United States that are in drought using five categories to describe the intensity of drought conditions. The U.S. Drought Monitor relies on experts to synthesize the best available data from drought indices and other sources and work with local observers to interpret the information. The U.S. Drought Monitor also incorporates ground truthing and information about drought impacts, via a network of more than 450 observers across the country, including state climatologists, National Weather Service staff, Extension agents, and hydrologists.

Table 17: U.S. Drought Monitor Drought Intensity Scale (Source: National Drought Mitigation Center)

Range/Category	Description	Palmer Drought Severity Index Equivalent
D0	Abnormally Dry	-1.0 to -1.99

Range/Category	Description	Palmer Drought Severity Index Equivalent
D1	Moderate Drought	-2.0 to -2.99
D2	Severe Drought	-3.0 to -3.99
D3	Extreme Drought	-4.0 to -4.99
D4	Exceptional Drought	-5.0 or less

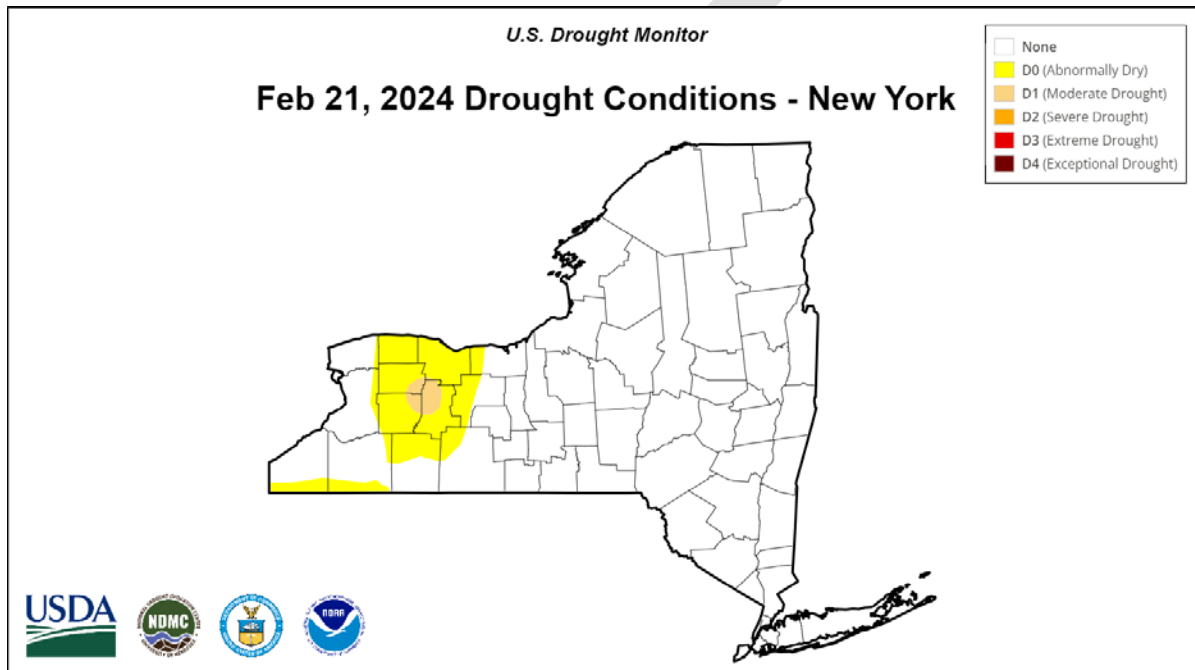


Figure 50: U.S. Drought Monitor Current Conditions in New York⁴³

Geographic Extent

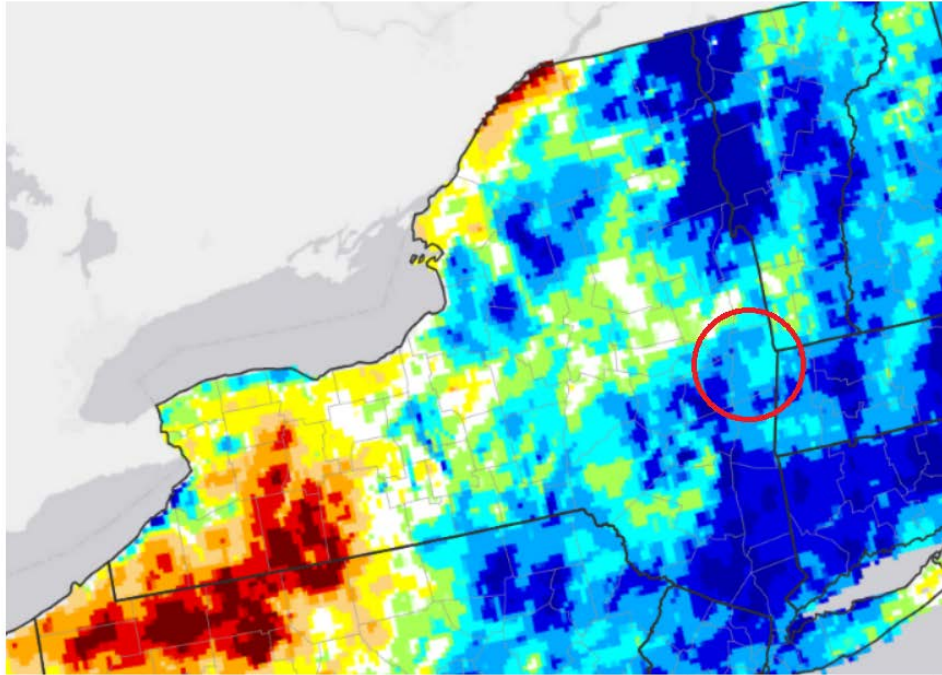
Droughts occur in all parts of the country and at any time of year, depending on temperature and precipitation over time. Similarly, droughts can occur in all parts of Rensselaer County at any time of year, depending on temperature and precipitation over time. While arid regions of the United States are more susceptible to long-term or extreme drought conditions, other areas such as Rensselaer County tend to be more susceptible to short-term, less severe droughts. It is impossible to delineate a drought hazard area for the county, but it is generally assumed that drought is a county-wide hazard, with drought conditions being possible in all geographic areas.

Drought is often measured using the Palmer Drought Severity Index (PDSI, also known operationally as the Palmer Drought Index). The PDSI, first developed by Wayne Palmer in a 1965 paper for the U.S.

⁴³ U.S. Drought Monitor. [Custom Map Request | U.S. Drought Monitor \(unl.edu\)](#)

Weather Bureau, measures drought through recent precipitation and temperature data with regard to a basic supply-and-demand model of soil moisture. It is most effective in long-term calculations.

Palmer Drought Severity Index (PDSI)



Basemap Sources: Esri, HERE, Garmin, INCREMENT P, © OpenStreetMap contributors, and the GIS user community

Dry Conditions (Relative)



Wet Conditions (Relative)



This new experimental implementation of the Palmer Drought Severity Index (PDSI) updates every 5 days, with a delay of 4 to 5 days, using the high-resolution gridMET gridded research dataset and USDA STATSGO soils data. A PDSI value >4 represents very wet conditions, while a PDSI <-4 represents an extreme drought. Source(s): UC Merced, Climate Engine

Source(s): UC Merced, Climate Engine

Data Valid: 01/20/24

Drought.gov

Figure 51: Palmer Drought Severity Index for New York⁴⁴

⁴⁴ NOAA National Integrated Drought Information System. <https://www.drought.gov/data-maps-tools/us-gridded-palmer-drought-severity-index-pdsi-gridmet>

Three other indices used to measure drought are the Palmer Hydrologic Drought Index (PHDI); the Crop Moisture Index (CMI), which is derived from the PDSI; and the Keetch-Byram Drought Index (KBDI), created by John Keetch and George Byram in 1968 for the U.S. Forest Service. The KBDI is used mainly to predict the likelihood of wildfire outbreaks. As a compromise, the PDSI is often used for droughts, since it is a medium-response drought indicator. The objective of the PDSI is to provide measurements of moisture conditions that are standardized so that comparisons using the index can be made between locations and between months.

Table 18: Palmer Drought Severity Index Classification and Range

Range	Palmer Classification
4.0 or more	Extremely Wet
3.0 to 3.99	Very Wet
2.0 to 2.99	Moderately Wet
1.0 to 1.99	Slightly Wet
0.5 to 0.99	Incipient Wet Spell
0.49 to -0.49	Near Normal
-0.5 to -0.99	Incipient Dry Spell
-1.0 to -1.99	Mild Drought
-2.0 to -2.99	Moderate Drought
-3.0 to -3.99	Severe Drought
-4.0 or less	Extreme Drought

The Standardized Precipitation Index (SPI) is another metric that can be used to quantify drought and periods of wetness by capturing how observed precipitation deviates from the climatological average.

Table 19: SPI Category and Value Definitions

SPI Category	SPI Value	Description
D4	≤-2	Exceptionally Dry
D3	-1.6 to -1.9	Extremely Dry
D2	-1.3 to -1.5	Severely Dry
D1	-0.8 to -1.2	Moderately Dry
D0	-0.5 to -0.7	Abnormally Dry
W0	+0.5 to + 0.7	Abnormally Wet
W1	+0.8 to +1.2	Moderately Wet
W2	+1.3 to +1.5	Severely Wet

SPI Category	SPI Value	Description
W3	+1.6 to +1.9	Extremely Wet
W4	≥2.0	Exceptionally Wet

**Interactive Map: Standardized Precipitation Index (SPI):
12-Month**

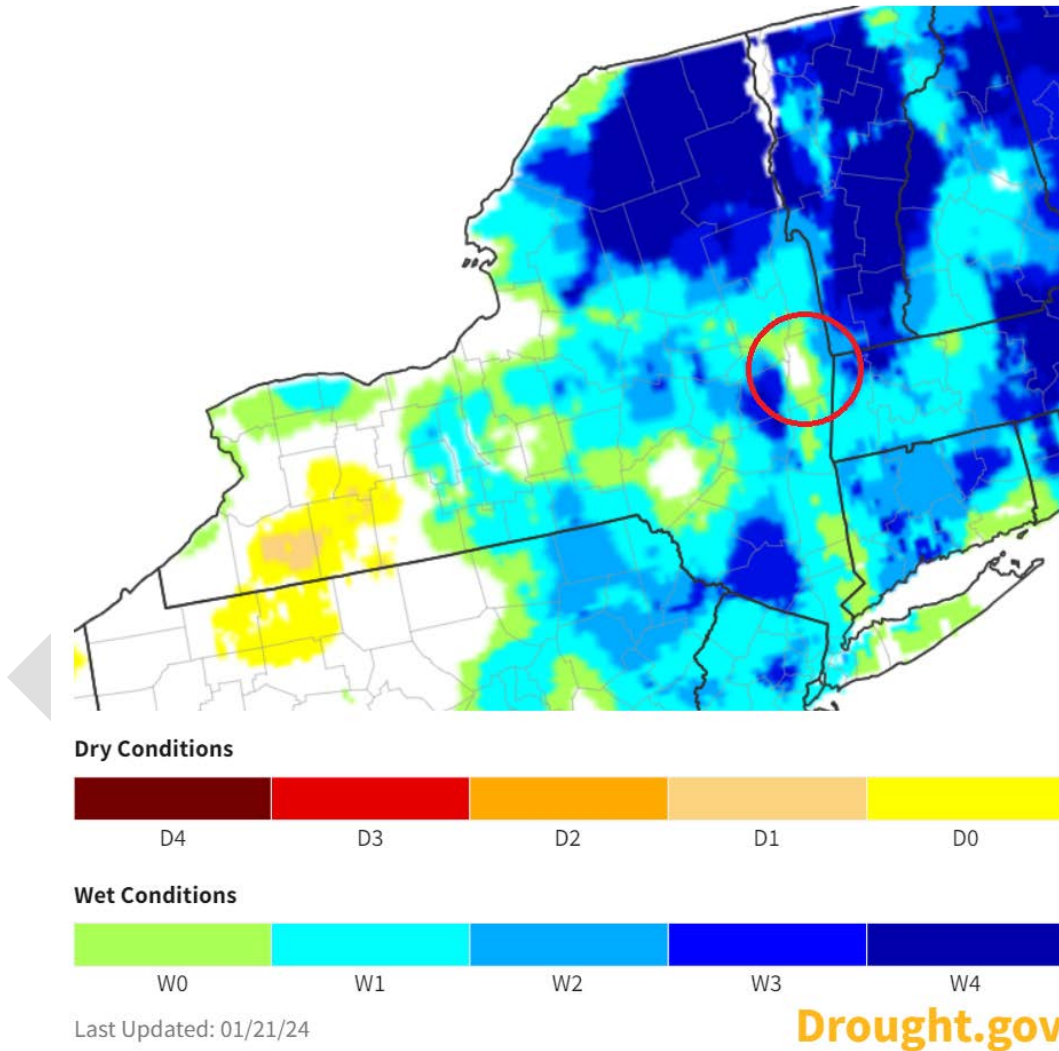


Figure 52: Twelve-Month Standardized Precipitation Index for New York⁴⁵

⁴⁵ NOAA National Integrated Drought Information System. <https://www.drought.gov/data-maps-tools/us-gridded-standardized-precipitation-index-spi-nclimgrid-daily>

Previous Occurrences

The National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI) Storm Events Database records two episodes of drought in Rensselaer County between 1996 and 2023. No deaths, injuries, property damages, or crop damages were identified in the database. Details are included in Table 20. No episodes are reported in the NCEI database since the last version of this plan was finalized in 2019.

The FEMA website (www.fema.gov/disasters) documents that New York State has received one major disaster declaration due to drought, as detailed in Table 20. No disasters or emergencies have been declared by FEMA since the initial plan was prepared in 2011.

Table 20: FEMA Drought Declarations, 1953–2023

Disaster/ Emergency Number	Declaration Type	Event	Incident Period	Eligible Assistance for Rensselaer County
DR-204	Major Disaster Declaration	New York Water Shortage	August 18, 1965	Affected counties are not available on the FEMA website or in the 2023 state hazard mitigation plan (SHMP). The 2023 SHMP does list affected counties; however, Rensselaer County is not included in the list.

Drought episodes are also recorded by the U.S. Department of Agriculture (USDA), whereby the USDA Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in counties that are contiguous to a designated county. Data is available for the years 2012 through 2023. USDA records indicate six drought declarations for Rensselaer County: two where Rensselaer was the primary declared county and four where Rensselaer was contiguous to a declared county (Table 21).

Table 21: USDA Drought Declarations, Rensselaer County, 2012–2023⁴⁶

Rensselaer County as Primary or Contiguous County Declared	Drought Begin Date	Declaration Approval Date	Description of Disaster	Crop Disaster Year
Primary	6/2/2012	10/24/12	Drought, excessive heat	2012
Primary	6/1/2015	9/9/2015	Drought	2015

⁴⁶ Source: USDA Disaster Declaration [Disaster Designation Information \(usda.gov\)](http://www.usda.gov/disaster-designation)

Rensselaer County as Primary or Contiguous County Declared	Drought Begin Date	Declaration Approval Date	Description of Disaster	Crop Disaster Year
Contiguous	4/26/2016	9/21/2016	Drought	2016
Contiguous	6/1/2020	11/12/2020	Drought	2020
Contiguous	8/18/2020	10/16/2020	Drought	2020
Contiguous	5/29/2022	9/29/2022	Drought, excessive heat	2022

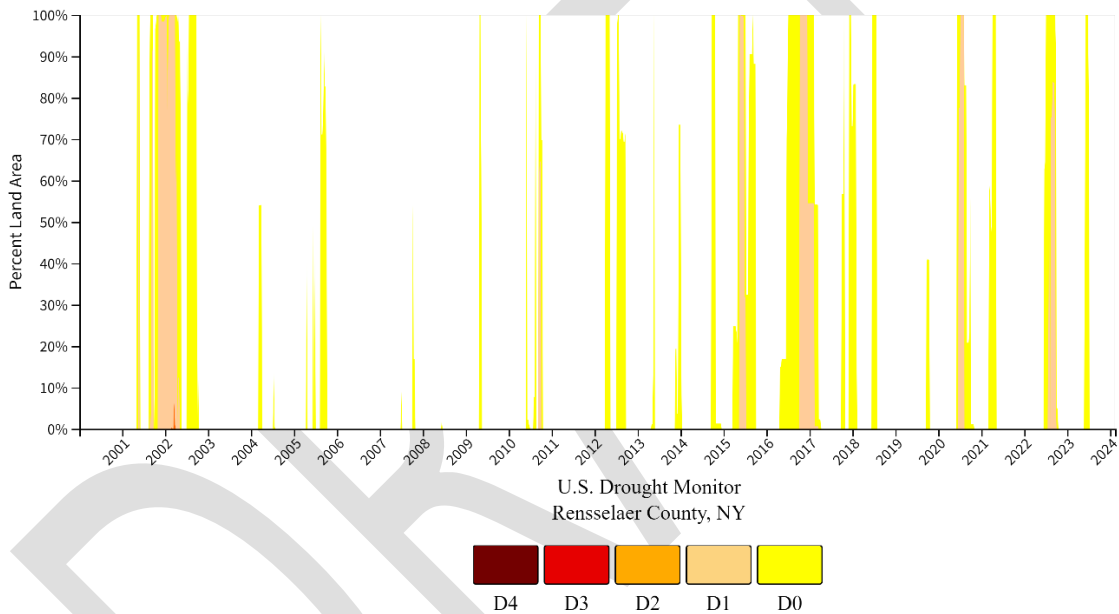


Figure 53: U.S. Drought Monitor for Rensselaer County 2000–2023⁴⁷

A brief summary of some of the more notable drought episodes follows:

THE 1960s

In the 1960s, New York State was impacted by two major drought occurrences. During that decade, an extended period of drought affected the entire state. The drought of the 1960s ended in 1967. The worst spell lasted from 1964 to 1965, severely affecting 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. A federal disaster declaration (DR- 204) was issued on August 18, 1965. Neither the 2023 SHMP nor the FEMA website lists declared counties for this declaration; however, the superseded 2014 SHMP does list declared counties, and Rensselaer County was not listed.

⁴⁷ Drought.gov. <https://www.drought.gov/states/new-york/county/renselaer>

Because of the widespread nature of this event, its summary is presented here to provide an overview of the types of affects that were observed during a widespread event such as this one.

AUGUST TO DECEMBER 1993

A prolonged period of drought starting in the summer of 1993 caused damaged to much of the agriculture in southern and eastern New York State. Counties hit hard by drought included Albany, Rensselaer, Columbia, and Greene. Estimates of feed grain losses in affected counties were well over 40 percent and in some cases nearly 100 percent. Hay and corn crops were especially hard hit, as well as fruits and vegetables. Total crop damages were estimated at \$50 million across the affected area. The SHELDT database lists crop damages of more than \$800,000 specific to Rensselaer County for this event.

APRIL 1999

April 1999 was officially the second driest April on record in Albany and the driest of this century. Only 0.60 inches of rain fell at the Albany International Airport and only 0.56 inches at the National Weather Service (NWS) office located on the University of Albany (SUNY) Campus. Rainfall amounts were a little bit higher to the south of Albany, but still fell well short of normal. The combination of low rainfall, along with frequent gusty winds, turned the underbrush into very dry tinder. These conditions led to numerous brush fires during the month across the Berkshires.

AUGUST 1999

August 1999 was the peak of the long-term drought across Eastern New York that began in July of 1998. The 14-month stretch ending in August saw rainfall and melted snowfall throughout the region only tallying up to about 80 percent of normal. At the Albany International Airport, 35.41 inches of water equivalent was recorded from July 1998 through August 1999, compared to the 30-year normal of 42.82 inches. The long-term drought combined with the heat of the summer resulted in a drought warning across much of the region as well as a declaration of agricultural disaster. The Mohawk Valley and Western Adirondacks were especially hard hit. The drought resulted in record low levels of the Mohawk River, numerous forest fires across the Adirondacks, and many wells going completely dry. Most communities implemented voluntary or mandatory water restrictions.

2016

The 2023 SHMP reports that the 2016 drought in New York State resulted from “an unusually low winter snowpack, followed by lower than average rainfall and higher than average temperatures during the 2016 growing season.” This event had a major impact on farmers in Western and Central New York, and the USDA-Farm Service Agency (FSA) declared “most counties” in Western New York to be “natural disaster areas.” According to the Cornell Institute for Climate Smart Solutions (CICSS): (a) crop loss estimates from a late summer survey of over 200 farmers suggest that more than 70 percent of rain fed field crop and pasture acreage had losses greater than 30 percent, with some reporting over 90 percent crop failure; and (b) most fruit and vegetable growers who irrigate lacked the irrigation capacity and water supplies to keep up with the drought, and estimated crop losses of up to 35 percent were reported.

Probability and Impacts of Climate Trends and Variations

It is estimated that Rensselaer County will continue to experience direct and indirect impacts of drought and its impacts on occasion, with the secondary effects causing potential disruption or damage to agricultural activities and creating shortages in water supply within communities.

Periods of drought have occurred regularly in Rensselaer County. Based on occurrences reported in NOAA’s NCEI Storm Events Database (1996–2023), Rensselaer County has about a 0.02 percent daily probability of a drought episode, or about 0.1 droughts per year. New York State’s normal variations in temperature and precipitation patterns can lead to drought episodes despite the state’s overall moderately humid climate.

Table 22: Countywide Statistics—Drought⁴⁸

Total Losses Reported (1996–2023)	\$0
Total Number of Episodes (1996–2023)	2
Annualized Losses Reported (1996–2023)	\$0
Annualized Number of Episodes (1996–2023)	0.1
Daily Probability	0.02%
Total Injuries (1996–2023)	0
Total Fatalities (1996–2023)	0

The 2023 SHMP concludes the following with respect to the effect of climate change on drought probability:

- It is anticipated that climate change may increase the frequency and intensity of droughts in New York State.
- Warmer temperatures will increase evaporation and reduce surface water levels, leading to drier soil.
- Variability of precipitation may increase, meaning there will be more periods of extreme precipitation and more periods of little-to-no precipitation, the latter of which can spur a drought.
- Some studies project that late-summer, short-duration droughts will become more common due to climate change.
- Currently, climate change has yet to meaningfully affect drought occurrence in New York.

⁴⁸ National Centers for Environmental Information, “Storm Events Database.” [Storm Events Database - Search Results | National Centers for Environmental Information \(noaa.gov\)](https://www.ncei.noaa.gov/stormevents/)

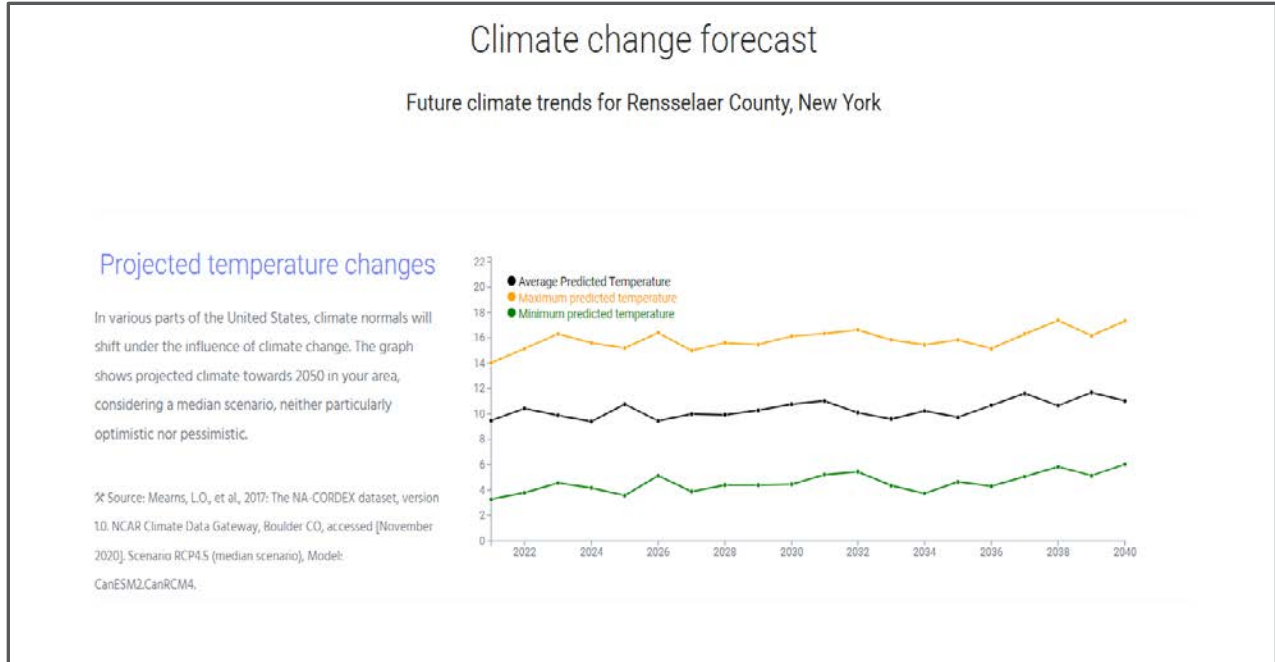


Figure 54: Rensselaer County Climate Change Forecast⁴⁹

Vulnerability Assessment

EXPOSURE

To understand its vulnerability to natural hazards, a community must determine the assets that are exposed or vulnerable in the hazard area. All of Rensselaer County has been identified as a hazard area for drought. Therefore, all assets in the county (i.e., population, structures, critical facilities, and lifelines) are vulnerable. Figure 55 illustrates New York State Department of Environmental Conservation’s nine drought-management regions based loosely on drainage basins and county lines, depicting the diverse geographical landscape. Rensselaer County is in Region IV Mohawk/Upper Hudson.

⁴⁹ Augurisk, Mearns, L.O., et al., 2017: The NA-CORDEX dataset, version 1.0. NCAR Climate Data Gateway, Boulder CO, accessed [November 2020]. Scenario RCP4.5 (median scenario), Model: CanESM2.CanRCM4. "Rensselaer County Climate Change Forecast." <https://www.augurisk.com/risk/state/new-york/rensselaer-county/36083>

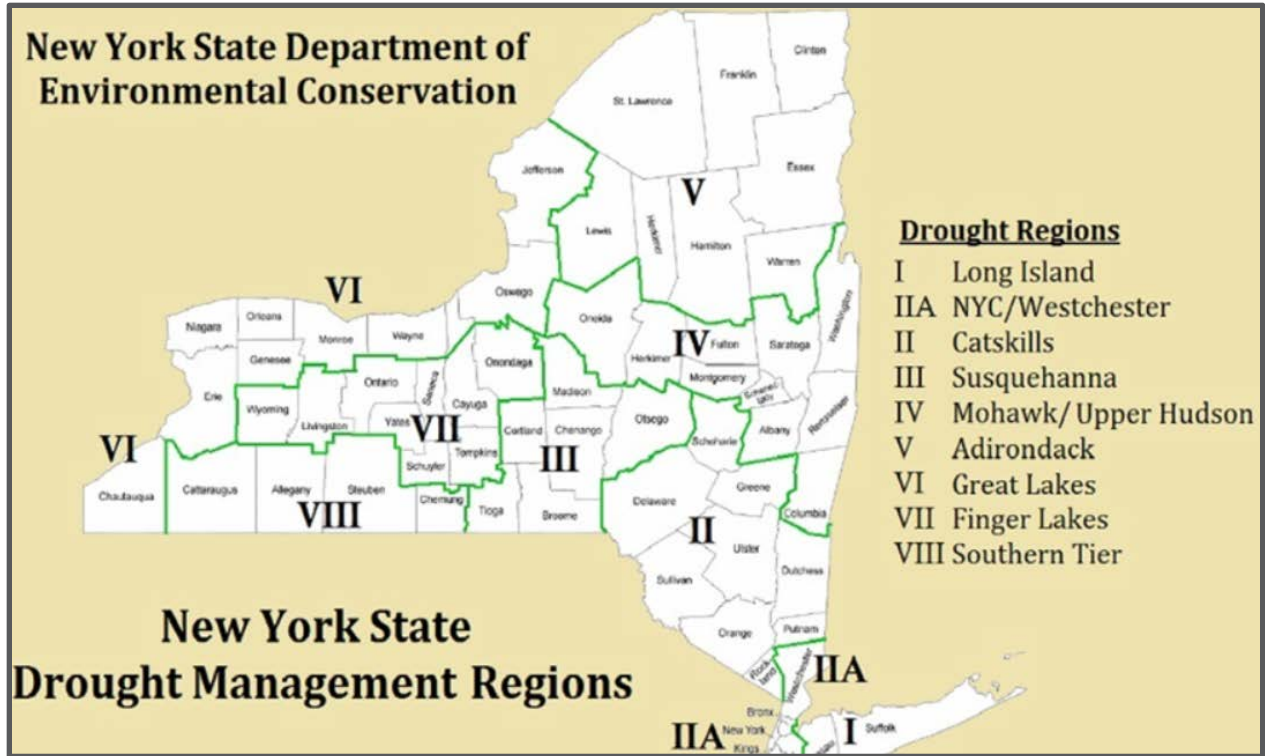


Figure 55: Mitigate NY⁵⁰

ESTIMATED IMPACT AND POTENTIAL LOSSES

Droughts are slow onset hazards, but over time, they can severely affect crops, municipal water supplies, recreational resources, and wildlife. If drought conditions extend over a number of years, the direct and indirect economic impacts can be significant. High temperatures, high winds, and low humidity can worsen drought conditions and also make areas more susceptible to wildfire. In addition, human actions and demands for water resources can accelerate drought-related impacts. Drought impacts occur over large areas and cross jurisdictional boundaries. All existing and future buildings, facilities, and populations are considered to be exposed to this hazard and could potentially be impacted. However, drought impacts are mostly experienced in water shortages and crop losses on agricultural lands and have no impact on buildings.

Crop failure is one common impact of drought. According to the USDA Census of Agriculture of 2017, there were 470 farms in Rensselaer County, with a market production value of more than \$41 million. About 59 percent of this value is accounted by crop sales, with livestock and poultry products accounting for about 41 percent. The county's 470 farms occupy approximately 82,766 acres. While agricultural losses during a drought, specifically losses to crops and produce, could be significant to individual farm operators, the overall impact of agricultural losses on the county economy is likely to be slight. When drought begins, the agricultural sector is usually the first to be impacted because of its heavy reliance on

⁵⁰ https://hazardmitigation.ny.gov/hazards_of_concern/drought/drought_risk_profile

stored soil water, which can rapidly be depleted during extended dry periods. When precipitation returns to normal, impacts on the agricultural sector are quick to diminish again due to the reliance on stored soil moisture.

Table 23: Cultivated Cropland in Rensselaer County

Jurisdiction	Total Acres Cultivated Cropland (Acres)	Percentage of Total Cultivated Cropland in Rensselaer County
Berlin, Town of	217	1.34%
Brunswick, Town of	2,143	13.18%
Castleton-on-Hudson, Village of	0	0.00%
East Greenbush, Town of	559	3.44%
East Nassau, Village of	1	0.01%
Grafton, Town of	32	0.20%
Hoosick, Town of	0	0.00%
Hoosick Falls, Village of	1,763	10.85%
Nassau, Town of	134	0.82%
Nassau, Village of	0	0.00%
North Greenbush, Town of	139	0.86%
Petersburgh, Town of	796	4.90%
Pittstown, Town of	2,136	13.15%
Poestenkill, Town of	416	2.56%
Rensselaer, City of	19	0.12%
Sand Lake, Town of	353	2.17%
Schaghticoke, Town of	4,793	29.50%
Schaghticoke, Village of	6	0.04%
Schodack, Town of	2,339	14.40%
Stephentown, Town of	385	2.37%
Troy, City of	9	0.06%
Valley Falls, Village of	7	0.04%
Rensselaer County Total	16,246	100%

*Slight inaccuracies in calculated results may occur due to rounding errors, which can lead to discrepancies between the true value and the rounded value. In the case of the tabled information, there is a 0.01% discrepancy.

Water supply shortages are a second effect of drought. While water shortages and use restrictions imposed as a result of drought conditions have a detrimental effect on many businesses, particularly certain sectors of the manufacturing industry, calculating actual dollar losses resulting from shortages and use restrictions is beyond the current scope of this study. Rensselaer County's total withdrawal of fresh water for public supply is 18.37 million gallons per day, with 10 percent from groundwater sources and 90 percent from surface water sources. Groundwater is fairly resistant to drought conditions, while surface water is more immediately susceptible to the effects of drought. The extent to which crops in the participating communities are vulnerable to drought conditions will depend to a great extent on from where they draw their water supply. The greatest source of agricultural losses under drought conditions is likely to be from those nursery, greenhouse, or floriculture businesses that rely predominantly on surface water supplies.

A third common effect of drought is fish and wildlife mortality. Nearly 55 percent of the county is undeveloped land (either used for agricultural purposes, vacant, or dedicated parkland/open space) with diverse populations of fish and wildlife, and abundant creeks, aquifers, and reservoirs providing essential water resources. Because Rensselaer County has significant undeveloped land, aquatic and other wildlife habitat is fairly significant; therefore, losses to fish and wildlife could potentially be significant.

The increased incidence and severity of wildfires is a fourth common effect of drought. The baseline risk of wildfire in Rensselaer County is significant, with 84 percent of the land area and 46 percent of the total estimated improved value located within wildfire hazard areas as defined in this plan. In the planning area, wildfire fuel tends to be most plentiful in areas where development densities are lowest. Since Rensselaer County is largely rural in nature, and the majority of the wildfire hazard areas consist of undeveloped protected land, this works to reduce possible property damages and loss of life; however, the wildland-urban interface would be particularly vulnerable as well as transportation routes. Wildfires are a unique hazard addressed separately in this plan.

Figure 56 illustrates the National Risk Index rating the Expected Annual Loss for Rensselaer County at \$0 from drought, with a rating of no expected annual losses, and a risk score of 0.0.

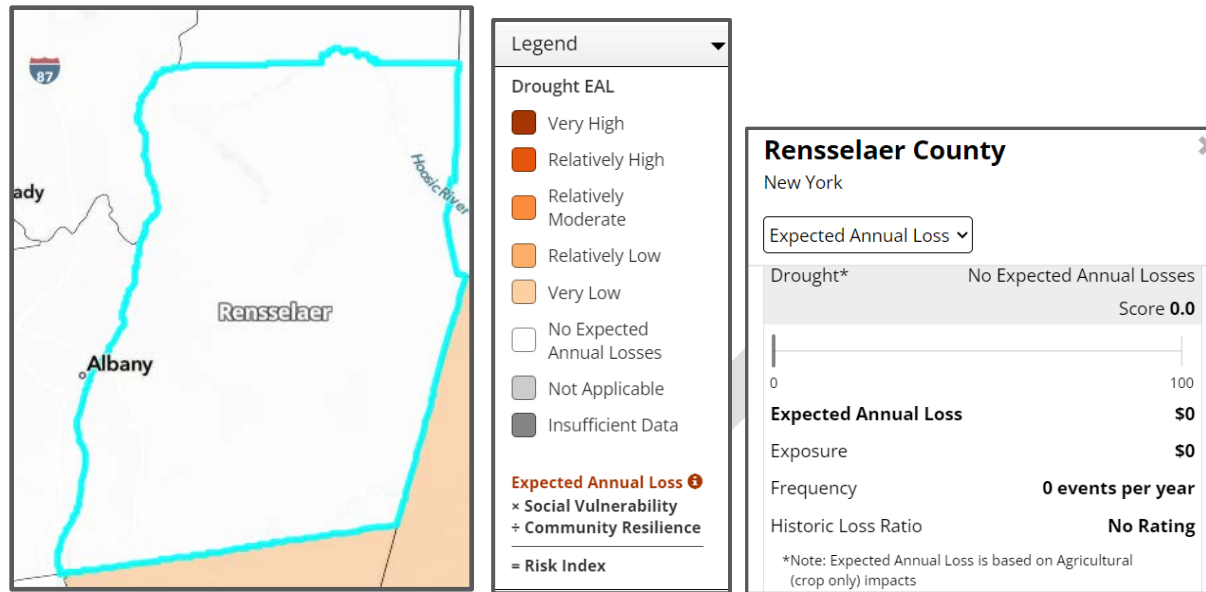


Figure 56: Expected Annual Loss-Rensselaer County⁵¹

Vulnerable Populations

Social vulnerability is a broad concept examining the differential impact of hazards on society based on the existing sociodemographic conditions and community characteristics. A person’s vulnerability to disaster is influenced by many factors, exacerbated by the increasing number of natural hazard events and disasters in the United States, a trend that is expected to continue to affect “the capacity to anticipate, cope with, resist, and recover from the impact” of a discrete and identifiable disaster in nature or society. However, there are many more actions that can be taken on the local scale to combat hazard and climate related inequalities.

Rensselaer County communities generally have access to an ample amount of water supply used for agriculture, recreation, industrial, medical, residential, and drinking needs. Primarily, drought impacts rural areas that may experience loss of well and pond water for livestock or irrigation. Municipal water supplies are generally not threatened and in the past have only restricted outdoor watering to reduce demand. The most immediately quantifiable effects of drought in the county are likely to be experienced by farmers, who can suffer heavy financial losses due to crop damage or loss. Figure 57 presents a breakdown of agricultural land by agricultural district, created by Cornell University Institute for Resource Information Sciences. Also shown in Table 8 and Table 9 for Rensselaer County land use data from the New York State Agriculture and Markets District Profile; it is evident from the maps that a significant proportion of the municipal areas in the northern, eastern, and western portions of the county are devoted to agriculture in some form.

⁵¹ [Map | National Risk Index \(fema.gov\)](https://www.fema.gov/national-risk-index)

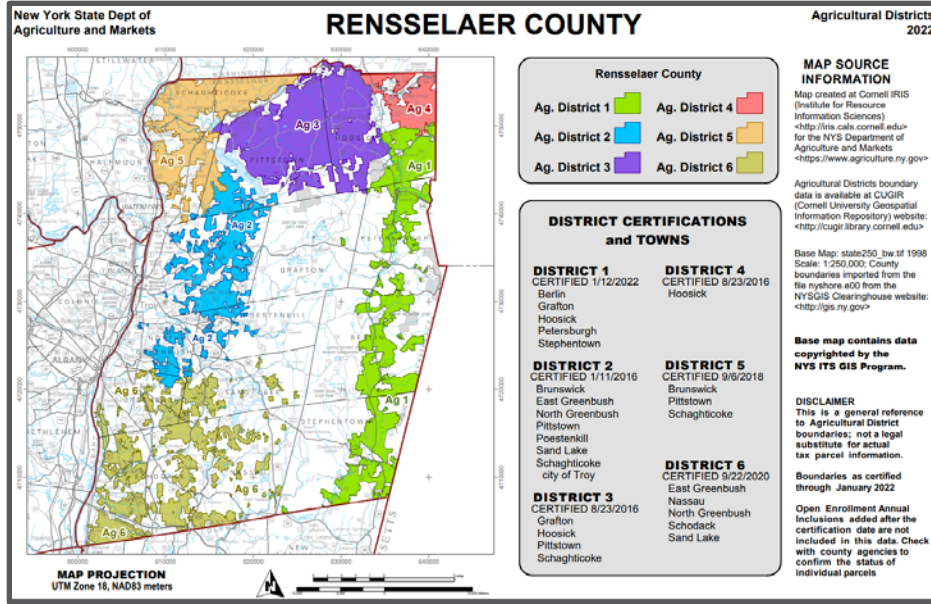


Figure 57: Agricultural Districts, Rensselaer County NY, 2022⁵²

Table 24: Distribution of Agricultural Land in Rensselaer County (Rensselaer County GIS, 12/31/2022)⁵³

District Number	Towns	Total Area (Acres)	Farmed (Acres)	Cropped (Acres)	Number of Farms
1	Hoosick, Petersburgh, Berlin, Stephentown, Grafton	32,340	18,461	9,600	33
2	Schaghticoke, Pittstown, Brunswick, Poestenkill, N. Greenbush, E. Greenbush, Sand Lake, And City Of Troy	24,094	12,531	7,018	41
3	Grafton, Hoosick, Pittstown, Schaghticoke	38,611	25,565	14,060	58
4	Hoosick	7,618	4,578	2,426	23
5	Brunswick, Schaghticoke, Pittstown	24,848	19,437	8,424	42

⁵² [Agricultural Districts, Rensselaer County NY, 2022 - CUGIR \(cornell.edu\)](https://www.agriculture.ny.gov/AgDistricts/AgDistricts-Rensselaer-County-NY-2022-CUGIR-cornell.edu)

⁵³ [agdistrictprofile.pdf \(ny.gov\)](https://www.agriculture.ny.gov/agdistrictprofile.pdf)

District Number	Towns	Total Area (Acres)	Farmed (Acres)	Cropped (Acres)	Number of Farms
6	E. Greenbush, Nassau, N. Greenbush, Schodack, Sand Lake	31,797	17,328	9,172	60
ALL DISTRICTS	ALL TOWN TOTALS	159,308	97,900	50,700	257

Impact on County Assets

Risk, for the purpose of hazard mitigation planning, is the potential for damage, loss, or other impacts created by the interaction of natural hazards with community assets. The exposure of people, property, and other community assets to natural hazards can result in disasters, depending on the impacts. Impacts are the consequences or effects of the hazard on the community and its assets. The type and severity of impacts are based on the extent of the hazard and the vulnerability of the community’s assets, as well as the community’s ability to mitigate, prepare for, respond to, and recover from events.

Risk assessment is a methodology used to assess exposure and estimated losses associated with hazards. It includes four steps:

- Identify and describe (profile) hazards
- Identify and inventory community assets (built, natural, social, economic)
- Analyze risk (exposure, potential loss, etc.)
- Summarize vulnerability

Historical and cultural assets located in Rensselaer County potentially at risk by drought hazard are presented in Table 25. According to New York State Historic Preservation Office and National Register of Historic Places data, there are eight such assets georeferenced and registered in the planning area. According to the available records, state and federally listed historical assets are located in 15 of the 22 municipalities covered by this hazard mitigation plan.

Table 25: Historic and Cultural Resources in Rensselaer County

Municipality	Historic Structure or Landmark Name	Location or Address
Brunswick, Town of	Morrison Farmstead	3842 NY 2
East Greenbush, Town of	Craver Farmstead	115 Craver Road
Hoosick, Town of	Bennington Battlefield	NY 67, on Vermont state line
Nassau, Town of	Smith, Henry Tunis, Farm	South of Nassau on NY 203

Municipality	Historic Structure or Landmark Name	Location or Address
North Greenbush, Town of	Defreest Homestead	South of Troy at US 4 and Jordan Road
North Greenbush, Town of	Sharpe Homestead and Cemetery	44 Laura Lane
Pittstown, Town of	Sherman Farm	35 Sherman Road
Schodack, Town of	Elmbrook Farm	2567 Brookview Road

Community Lifelines

Community facilities are the buildings, land, equipment, and activities provided on the public’s behalf by government and/or private organizations. These facilities are important components to the quality of life of a municipality. Critical facilities are necessities for the health, safety, well-being, and stability of communities. Critical infrastructure systems are essential for life safety and economic viability and include transportation, power, communication, and water and wastewater systems.

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Community lifelines are essential for the well-being of any community. They provide support and assistance to individuals who require help, especially during times of crisis. FEMA Community Lifelines are a critical component of emergency management in the United States. These lifelines are designed to address the essential needs of a community during and after a disaster. There are eight lifelines, each with its own focus and purpose (Figure 58).



Figure 58: Community Lifelines⁵⁴

⁵⁴ FEMA, “Community Lifelines Toolkit 2.0.” <https://www.fema.gov/sites/default/files/2020-05/CommunityLifelinesToolkit2.0v2.pdf>

During a drought, the essential requirements are Food, Hydration, and Shelter. Water is crucial for all living organisms, including humans, animals, and crops, to survive and thrive. Without it, they become stressed and eventually die. Drought also affects shelter as the soil contracts, leading to structural damage in buildings, bridges, and other constructions. To overcome drought, Rensselaer County must prioritize conservation, creative thinking, and innovation to maintain its current standard of living.

Vulnerability Scores

In Rensselaer County, droughts are not particularly common and, while their potential consequences are high, they have not historically caused significant damages. The National Risk Index (NRI) includes data on the expected annual losses to individual natural hazards, historical loss, and overall risk at a county and census tract level. The following table provides an overview of each category at the county level.

Table 26: National Risk Index—Drought

Drought	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Low	High	Low	\$0	Low

Based on the NRI, Rensselaer County has no rating for the risk index and a score of **0** for drought, which is relatively lower than the national percentile.

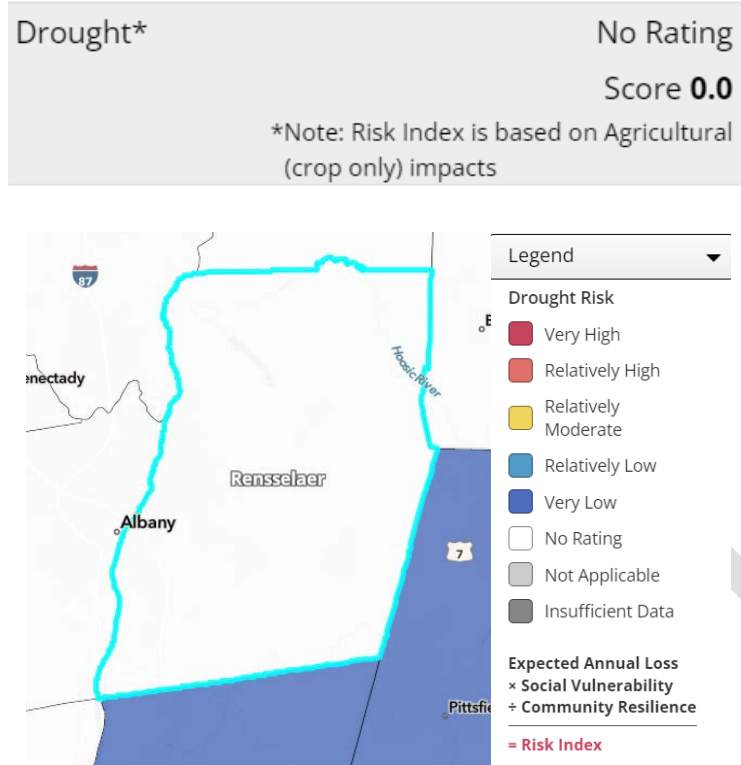


Figure 59: FEMA National Risk Index Map⁵⁵

Earthquake Hazard Profile

The 2023 SHMP defines the term “earthquake” as a sudden, rapid shaking of the ground caused by the breaking and shifting of rock beneath the Earth’s surface. According to the U.S. Geological Survey (USGS) Earthquake Hazards Program, most earthquakes (approximately 90 percent) occur at the boundaries where the plates meet, although it is possible for earthquakes to occur entirely within plates. New York State is not on a seismically active fault line, and Rensselaer County is significantly distant from any plate boundaries. Regardless of where they are centered, earthquakes can impact locations at—and well beyond—their point of origin. They are often accompanied by “aftershocks,” secondary quakes in the earthquake sequence. Aftershocks are typically smaller than the main shock and can continue over a period of weeks, months, or years from the main shock. In addition to the effects of ground shaking, earthquakes can also cause landslides and liquefaction under certain conditions. Liquefaction occurs when unconsolidated, saturated soils exhibit fluid-like properties due to intense shaking and vibrations experienced during an earthquake. Together, ground shaking, landslides, and liquefaction can damage or destroy buildings, disrupt utilities (i.e., gas, electric, phone, water), and sometimes trigger fires.

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is a quantification of the energy release of an earthquake at its source, as determined by seismographs. Intensity is most

⁵⁵ [Map | National Risk Index \(fema.gov\)](https://www.fema.gov)

commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. A detailed description of the MMI Scale of earthquake intensity and its corresponding magnitude is given in Table 27.

Table 27: Magnitude/Intensity Comparison for Earthquakes⁵⁶

Magnitude	Typical Maximum MMI	Abbreviated Modified Mercalli Intensity Scale
1.0–3.0	I	I. Not felt except by a very few under especially favorable conditions.
3.0–3.9	II–III	II. Felt only by a few persons at rest, especially on upper floors of buildings.
		III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
4.0–4.9	IV–V	IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
		V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0–5.9	VI–VII	VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
		VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6.0–6.9	VII–IX	VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
		VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
		IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.

⁵⁶ Source: US Geological Survey (http://earthquake.usgs.gov/learn/topics/mag_vs_int.php, page last modified September 29, 2014)

Magnitude	Typical Maximum MMI	Abbreviated Modified Mercalli Intensity Scale
7.0 and higher	VIII or higher	VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
		IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
		X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
		XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
		XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

The 2023 SHMP also presents the Richter Scale, using 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. While most well-known, in practice it is not commonly used anymore, except for small earthquakes recorded locally, for which magnitude level and short-period surface wave magnitude (M_{blg}) are the only magnitudes that can be measured. In New York State, this is often the case, which is why previous occurrences are largely categorized in this way. For all other earthquakes, the moment magnitude (M_w) scale is more accurate measure of the earthquakes.

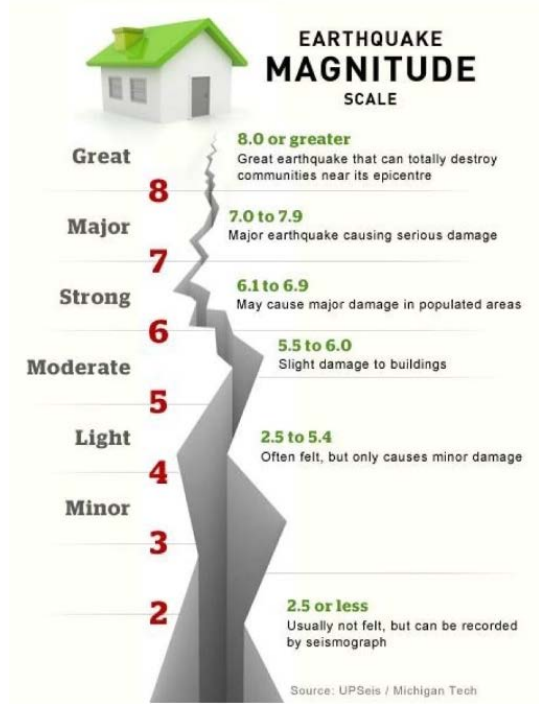


Figure 60: Richter Scale⁵⁷

Rensselaer County is mapped in a region of low earthquake hazard, and earthquakes could potentially affect any of Rensselaer County’s communities. Figure 61 shows relative seismic risk for the United States.

⁵⁷ Source: 2023 SHMP

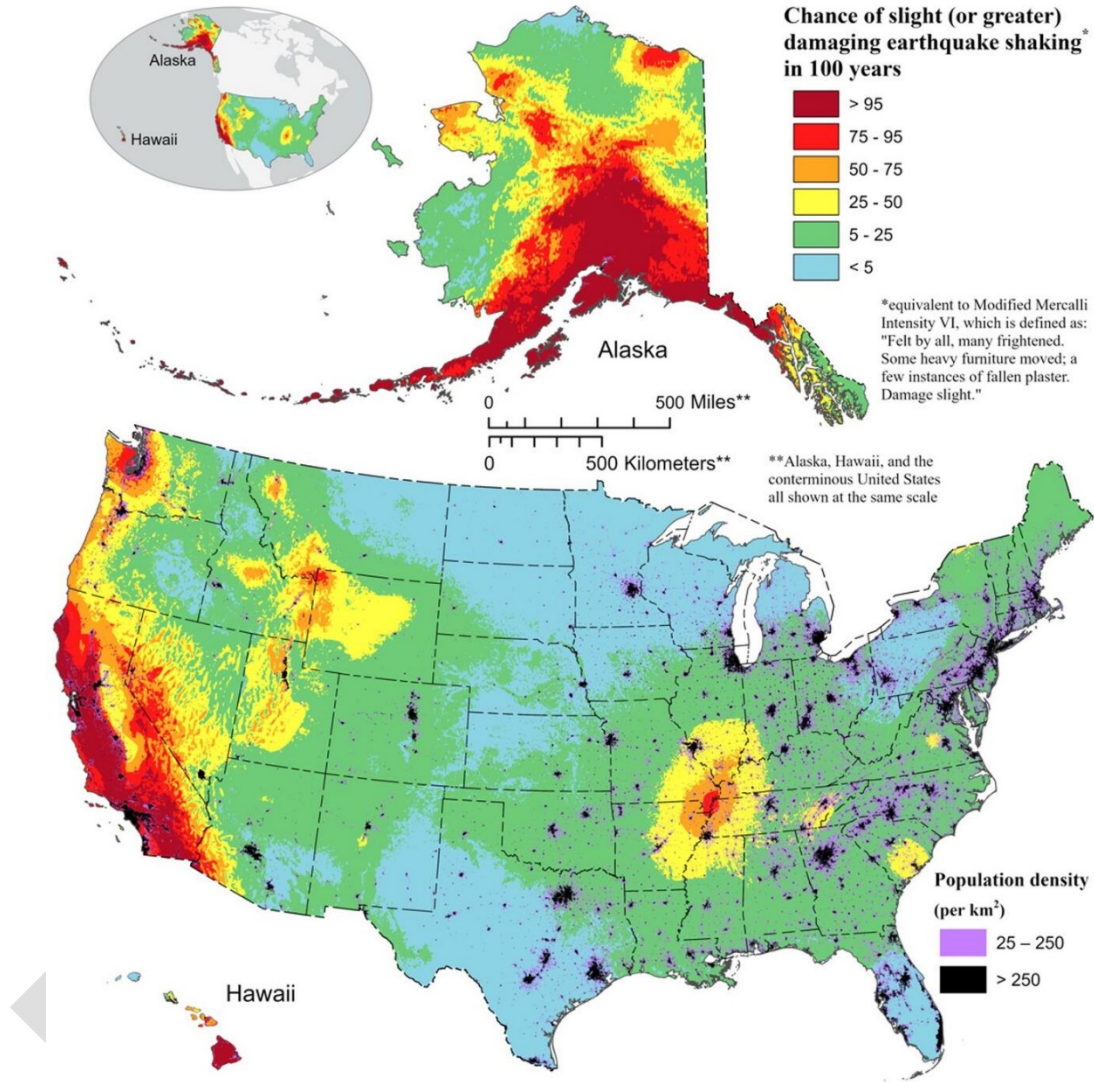


Figure 61: National Seismic Hazard Model (Source: USGS, 2023)⁵⁸

Geographic Extent

As noted in the 2023 SHMP, despite the low likelihood of a major earthquake that would cause catastrophic structural damage, ground failure due to soil liquefaction is possible. Even structures that are adequately designed to survive earthquakes are susceptible to damage or destruction if they rest on or within soils that liquefy. Several areas in New York State are potentially susceptible to liquefaction because of earthquakes. Vulnerability to liquefaction depends on soil type. Table 28 shows soil types in five basic

⁵⁸ [National Seismic Hazard Model \(2023\) - Chance of Damaging Earthquake Shaking | U.S. Geological Survey \(usgs.gov\)](https://www.usgs.gov/national-seismic-hazard-model-2023)

categories with varying degrees in likelihood of amplifying the effects of an earthquake, with Category A being far less likely to amplify the effects of seismic motion than Category E.

Table 28: Geological Soil Classifications

Category	Soil Type
A	Hard Rock
B	Rock
C	Very Dense Soil / Soft Rock
D	Stiff Soil
E	Soft Soil

In 2000, the National Earthquake Hazard Reduction Program (NEHRP) classified New York soils into five categories:

- Very hard rock (e.g., granite, gneisses, and most of the Adirondack Mountains)
- Rock (sedimentary/0 or firm ground)
- Stiff clay
- Soft to medium clays or sands
- Soft soil (including fill, loose sand, waterfront, lakebed clays)

Areas with soft to medium clays or sands and soft soil are most susceptible to liquefaction.

NEHRP nationwide maps show some increased soil risk in northern New York based on these soil classifications. USGS mapping shows greater detail and more complex soil type analysis.

Table 29 tabulates the area of soft soils (Category E) for each municipality in Rensselaer County. Soil types are mapped in Figure 62.

Table 29: Soils That Could Amplify the Effects of an Earthquake

Municipality	Total Acres	Category E (Soft Soils)	
		Acres	%
Berlin, Town of	38,227	1,583	4%
Brunswick, Town of	28,284	5,576	20%
Castleton-on-Hudson, Village of	531	490	92%
East Greenbush, Town of	15,672	7,274	46%

Municipality	Total Acres	Category E (Soft Soils)	
		Acres	%
East Nassau, Village of	3,029	671	22%
Grafton, Town of	29,711	5	<1%
Hoosick, Town of	950	345	36%
Hoosick Falls, Village of	39,361	3,781	10%
Nassau, Town of	25,558	3,177	12%
Nassau, Village of	442	410	93%
North Greenbush, Town of	12,079	3,764	31%
Petersburgh, Town of	26,683	1,004	4%
Pittstown, Town of	41,256	4,518	11%
Poestenkill, Town of	20,727	2,407	12%
Rensselaer, City of	2,191	2,191	100%
Sand Lake, Town of	23,088	3,126	14%
Schaghticoke, Town of	32,545	14,280	44%
Schaghticoke, Village of	640	299	47%
Schodack, Town of	40,217	22,700	56%
Stephentown, Town of	37,263	5,467	15%
Troy, City of	7,066	5,000	71%
Valley Falls, Village of	308	4	1%
Rensselaer County Total:	425,825	88,078	21%

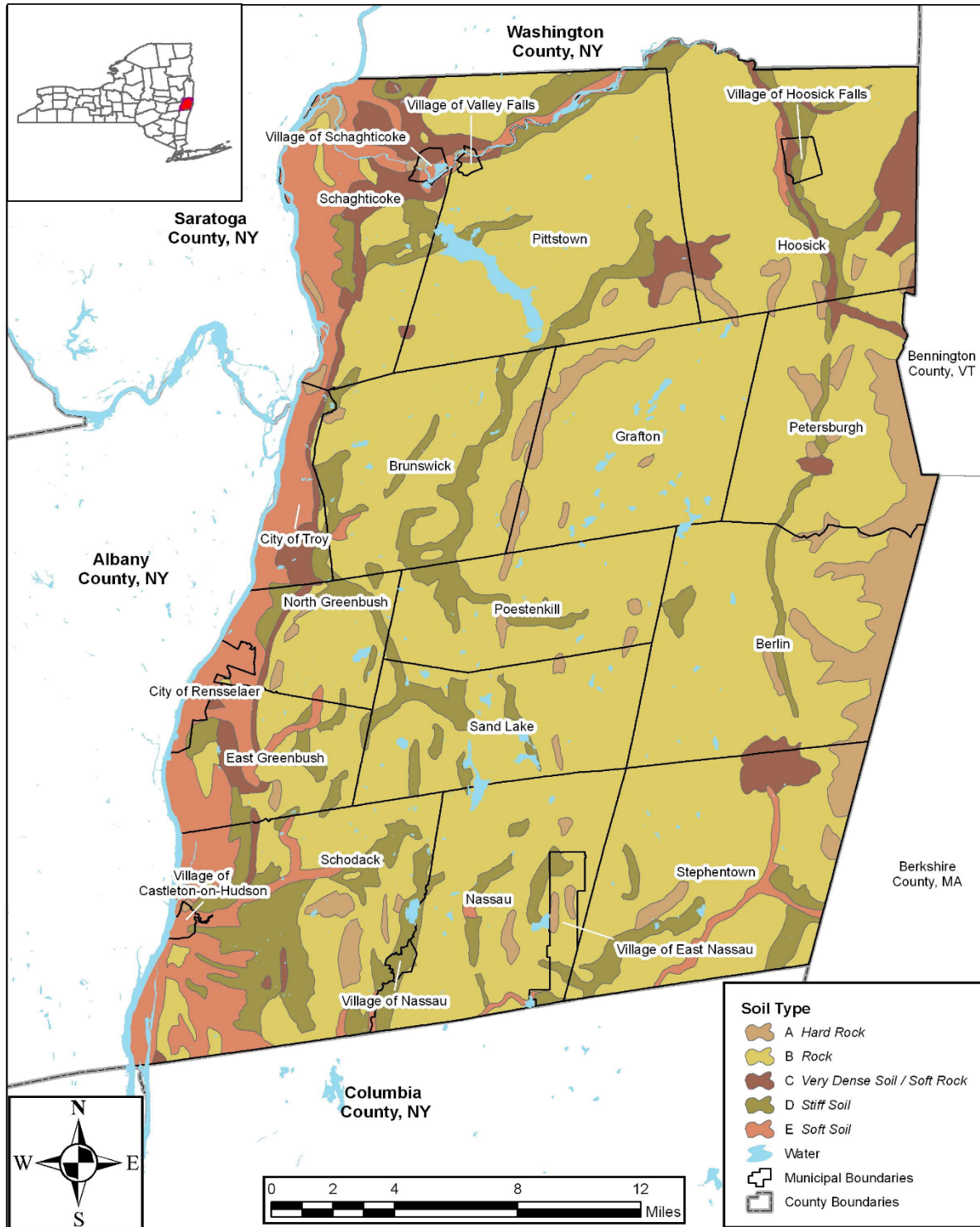


Figure 62: Rensselaer County Geological Soil Classification Map⁵⁹

⁵⁹ Source: Rensselaer County Soil and Water Conservation District: <https://www.renscosoilandstormwater.org/map-services>

Previous Occurrences

The National Center for Environmental Information (NCEI) storm database, one source for historic information presented within the data of this plan, does not capture earthquake events in the same way as other hazards. However, several other entities provide additional data to support historic analysis, such as the Northeast States Emergency Consortium, Earthquake Track, and the USGS Earthquake Map.

As noted in the 2023 SHMP, although the probability of damaging earthquakes in New York State is low, earthquakes do have a history of occurring on a regular basis. Figure 63 illustrates the location of historic earthquake epicenters in New York, as obtained from the 2023 SHMP. Earthquakes with a magnitude larger than 4.0 are shown in Figure 64, along with the level of earthquake risk from the FEMA National Risk Index (NRI). According to the NRI, earthquake risk in Rensselaer County is relatively low and very low (see Figure 65).

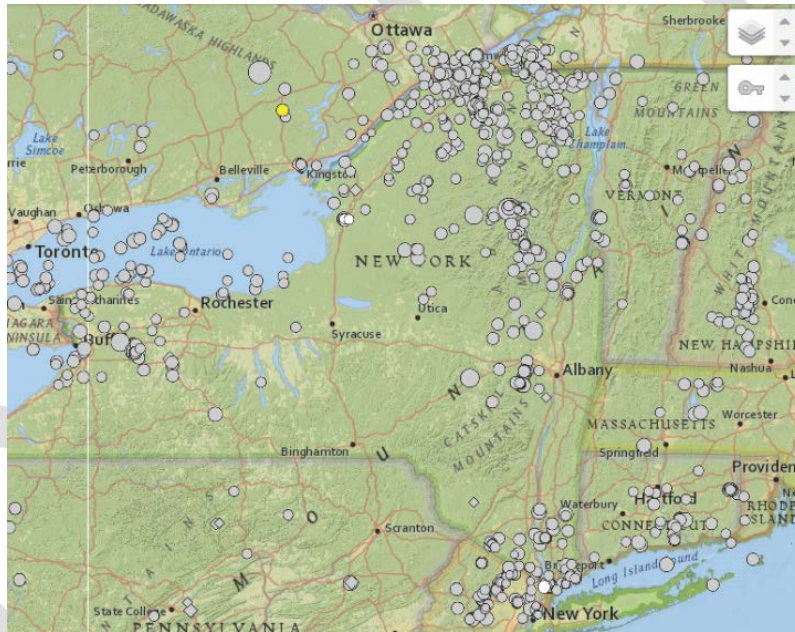


Figure 63: Significant Earthquake Epicenters in New York State⁶⁰

⁶⁰ Source: 2023 SHMP

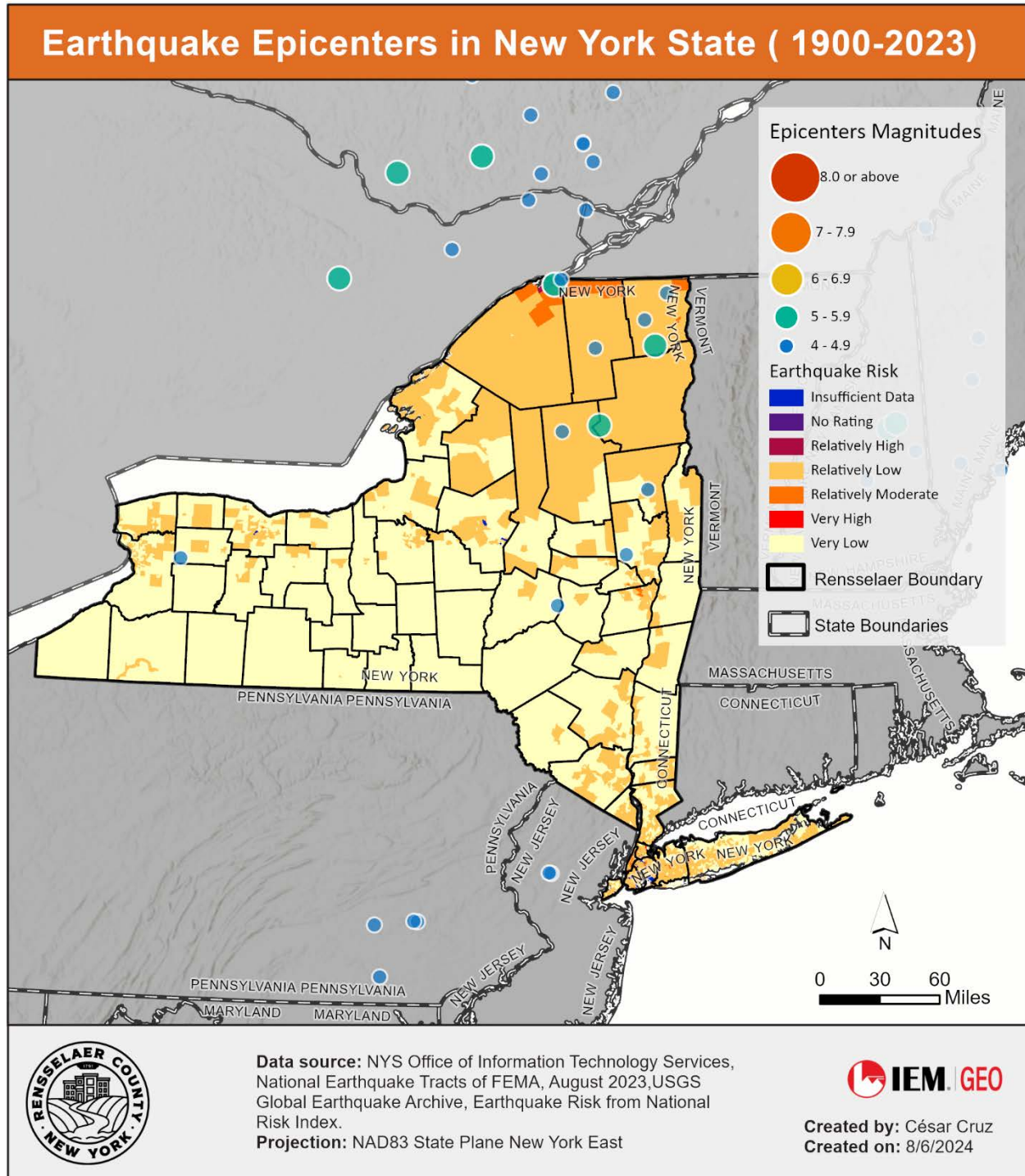


Figure 64: Historic Earthquake Epicenters and Earthquake Risk for New York State

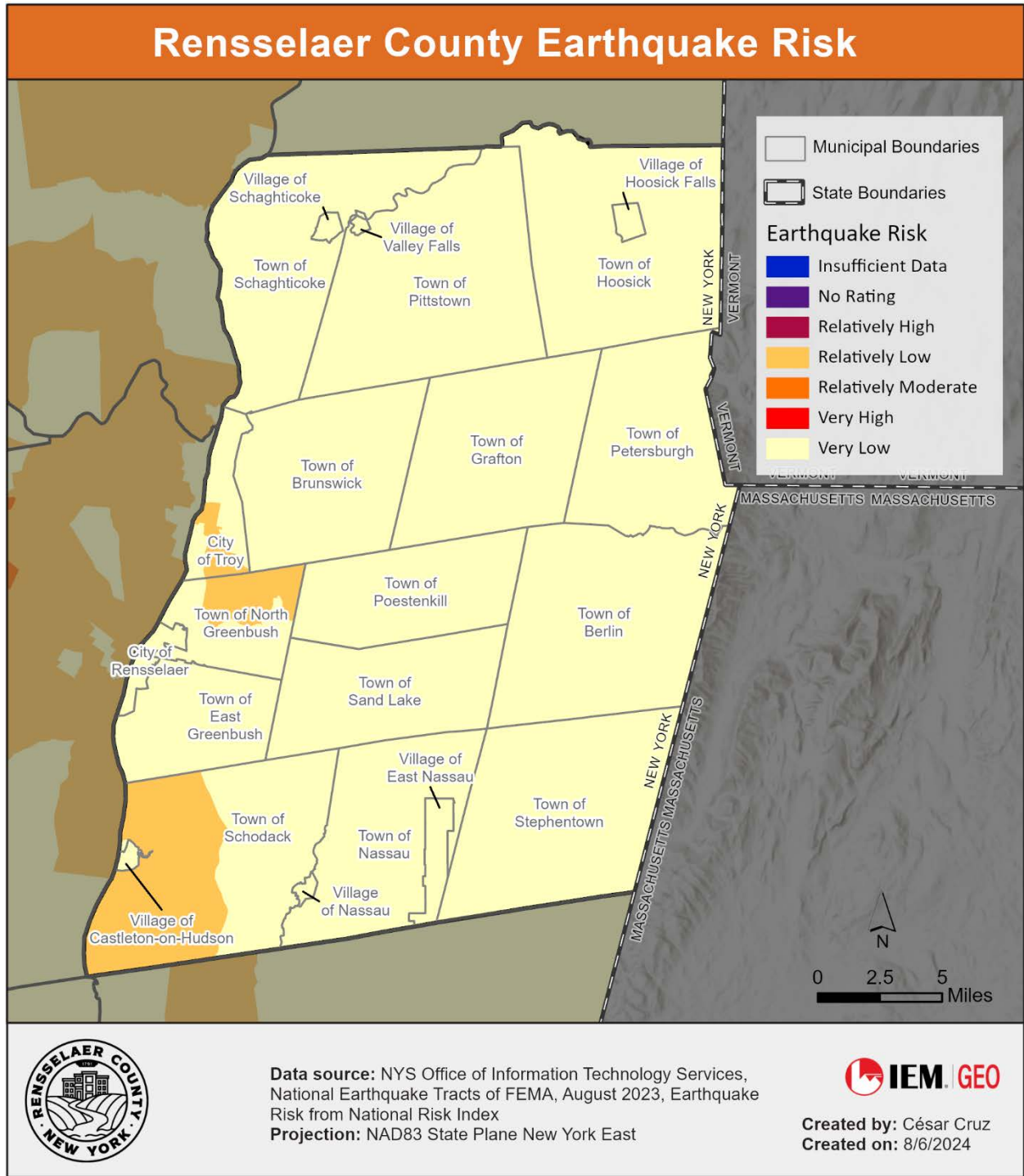


Figure 65: Earthquake Risk for Rensselaer County

Table 30 on the following page summarizes the history of earthquakes in New York State. No significant earthquakes have occurred in, or caused damage in, Rensselaer County.

Strong earthquakes centered outside of New York State can also be felt—sometimes strongly—within the state. One of the strongest recent events of this type on August 23, 2011, when the magnitude 5.9

earthquake centered at Mineral, VA, was felt strongly up and down the east coast, including in New York State, but caused no reported damage.

There has been one federally declared disaster in New York State over the last 25 years due to an earthquake (DR-1415) following an event of magnitude 5.1 on the Richter Scale and causing \$2.5 million in damages, that occurred in the far northeastern part of the state in April 2002 (with aftershocks in May 2002). Rensselaer County was not affected by this event. Figure 63 illustrates the most recent events in the past 9 years in and around Rensselaer County.

Table 30: New York State Earthquakes, 1996–2023

Type	Magnitude	Impacts	Number of Earthquakes 1996–2023	Comments
Minor	≤2.51	Usually not felt, but can be recorded by seismograph	457	
Light	2.51–5.4	Often felt, but only causes minor damage	61	Of the 61 light earthquakes, only 18 were greater than magnitude 3, and only 1 was greater than magnitude 5 (a magnitude 5.3 event on April 20, 2002; Rensselaer County was not affected by this event)
Moderate	5.5–6.0	Slight damage to buildings	0	
Strong	6.1–6.9	May cause minor damage in populated areas	0	
Major	7.0–7.9	Major earthquake causing serious damage	0	
Great	≥8.0	Great earthquake that can totally destroy communities near its epicenter	0	
Total New York State:			518	
Total Rensselaer County:			0	

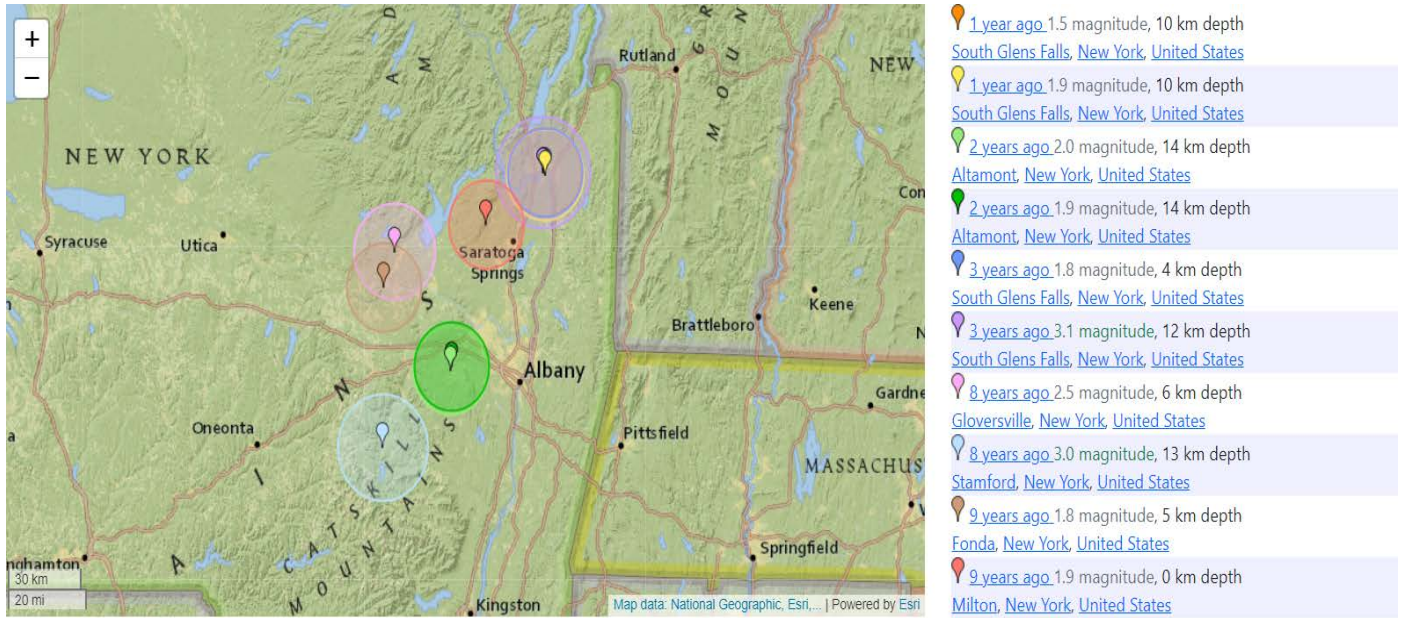


Figure 66: Rensselaer County⁶¹

Probability/Impacts of Climate Trends and Variations

Since the first recorded earthquake on December 19, 1737, New York has had over 550 earthquakes centered within its state boundaries. The state has also experienced strong ground shaking from earthquakes centered in nearby U.S. states and Canadian provinces. Most of the earthquakes in New York have taken place in the greater New York City area, the Adirondack Mountains region, and the western part of the state. The probability of significant, damaging earthquake events in or affecting Rensselaer County is very low. From 1996 through 2023, the annual number of events was 0.

Rensselaer County has a low earthquake risk, with a total of 0 earthquakes since 1931. The USGS database shows that there is a 1.06 percent chance of a major earthquake within 50 kilometers of Rensselaer County within the next 50 years (see Figure 65). More destructive earthquakes are very rare, low probability events for Rensselaer County with highly infrequent recurrence periods.

⁶¹ [Earthquakes in Rensselaer, New York, United States - Most Recent \(earthquake.usgs.gov\)](https://earthquake.usgs.gov/earthquakes/feed/v1.0/summary/2.5-4.9/nearby/)

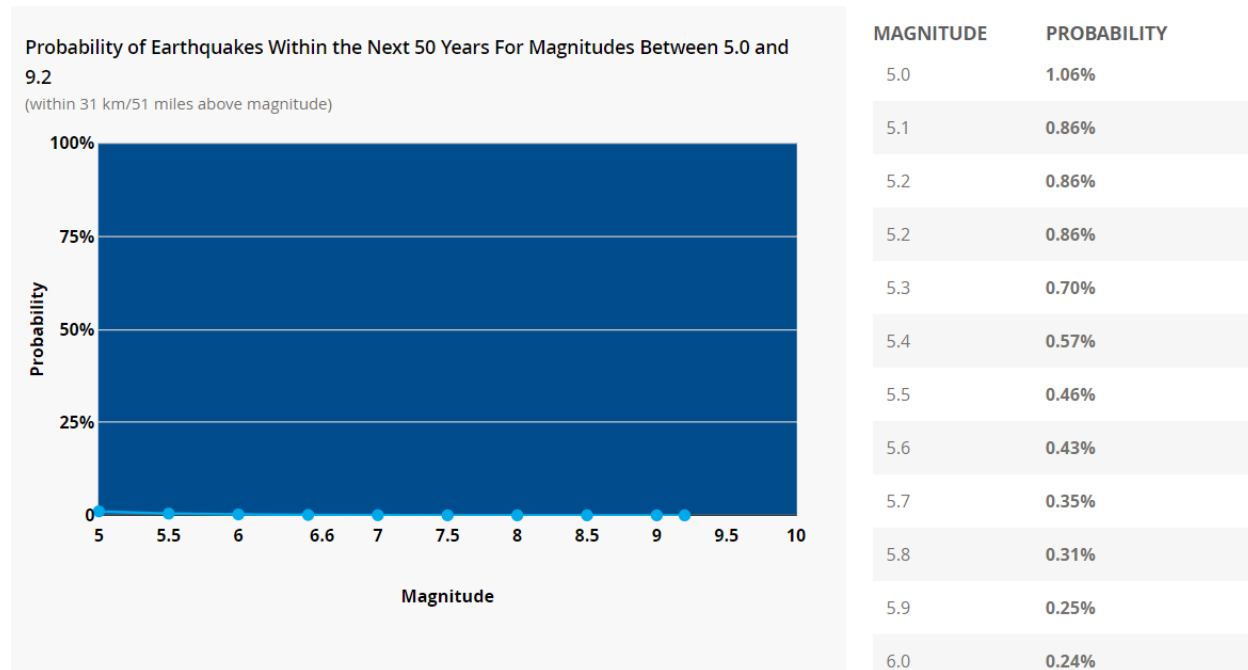


Figure 67: Earthquake Probability for Rensselaer County, NY⁶²

The impacts of climate trends and variations on earthquake frequency are largely unknown; however, there are some USGS and NASA scientists who believe melting glaciers could induce tectonic activity due to the tremendous amount of weight that is shifted on the earth’s crust as water melts and runs off. This newly freed crust can experience post-glacial isostatic uplift, which could cause seismic plates to slip and stimulate seismic activity as it returns to its original, pre-glacial shape. Additionally, secondary impacts such as liquefaction may increase due to soils that have been saturated from repetitive precipitation instances.

The 2023 SHMP states the following related to climate change and earthquakes:

- Earthquakes are unlikely to be affected by climate change.
- The cause of earthquakes are largely unaffected by atmospheric changes brought on by climate change.
- There are some indications that earthquakes became more frequent as glaciers melted thousands of years ago, and more common earthquakes in Greenland may be tied to warming temperatures, but the links between these phenomena and anthropogenic climate change are uncertain at best and have not affected New York.

⁶² [Rensselaer County, NY Earthquake Data & Risk | Homefacts](#)

- Earthquakes are not discussed in local, regional, or national climate impact assessments, highlighting that climate change is not expected to impact their frequency or intensity in the United States.

Vulnerability Analysis

To understand its vulnerability to natural hazards, a community must determine the assets that are exposed or vulnerable in the hazard area. All of Rensselaer County has been identified as a hazard area for earthquakes. Therefore, all assets in the County (i.e., population, structures, critical facilities, and lifelines), are vulnerable.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Earthquakes usually occur without warning and can impact areas a great distance from their point of origin. The extent of damage depends on the extent and duration of the shaking, the density of population, and building and infrastructure construction in the area shaken by the quake. Some areas may be more vulnerable than others based on soil type, the age of the buildings, and building codes in place. Most earthquake-related property damage and deaths are caused by the failure and collapse of structures due to ground shaking. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (in mountain regions and along hillsides), and liquefaction.

According to USGS data, damage caused by an earthquake will begin at a level of ground shaking (peak ground acceleration, or PGA) of approximately 10 percent of the force of gravity (0.1g, or 10%g). Below this level, damages are typically very slight except in unusually vulnerable facilities. Damages from ground shaking at 10%g to 20%g tend to be minor to moderate, with only unusually poor buildings being subject to potential collapse. Events in the range of 20%g to 50%g may cause significant damage in some modern buildings and very high levels of damage (include collapse) in poorly designed buildings. Events more than 50%g may cause higher levels of damage in many buildings, even those designed to resist seismic forces.

The probability of significant, damaging earthquake events affecting Rensselaer County is low. According to the USGS, an earthquake with a 10 percent probability of exceedance over 50 years in Rensselaer would have PGA values between 3%g and 5%g, which would often be able to be felt, but only would be expected to cause minor damage. More destructive earthquakes are very rare, low probability events for Rensselaer County with highly infrequent recurrence periods.

Earthquakes can cause a variety of impacts such as structural damage to buildings, fires, damage to bridges and highways, initiation of slope failures, and liquefaction. The types of impacts depend on factors such as the location of the earthquake, the level of development of the area, and the ability of infrastructure to withstand shaking. Earthquakes can also cause death, injury, destruction of homes, disruption of transportation and communication networks, and water supply contamination. This is all dependent upon the magnitude of the earthquake, the depth of the focus, the distance from the epicenter, the population density, and the mitigation actions in effect to disrupt the impacts of the earthquake.

Using the Hazus Earthquake model, a 100-year earthquake event with a magnitude of 7.5 was analyzed to determine the total number of buildings damaged and the severity of the damage from a potential occurrence for the state of New York. The following tables show the total number of buildings damaged and the severity of the damage by Hazus earthquake model classification for damage. To assess the vulnerability of Rensselaer County to earthquakes, probabilistic scenarios of various potential events were completed using HAZUS 6.1. Hazus is a nationally standardized risk modeling methodology that can be used to estimate potential damage, economic loss, and social impacts from hazards. It includes nationwide datasets on general building stock, critical facilities, and infrastructure. When available, local critical facility data were used to augment Hazus data for greater accuracy.

The earthquake scenario for this plan was based on a 2,500-year probabilistic event with a magnitude of 5.0. This 2,500-year return period has a 2 percent probability of being exceeded in 50 years. Ground shaking is modeled based on the Hazus default ground motion data, based on the USGS National Seismic Hazard maps. The resulting loss estimates will generally describe the scale and extent of damage that may results from the modeled earthquake event.

Hazus inventory estimates that there are 55,000 buildings in the region with a total value of \$27.2 billion (B). Hazus estimates that 655 buildings will sustain at least moderate damage, and 5 will be damaged beyond repair. The estimated damage states for different building types is summarized in Figure 68.

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	455.08	0.87	25.96	1.05	5.26	0.89	0.65	1.08	0.06	1.12
Commercial	2673.82	5.09	196.84	7.94	77.61	13.14	12.64	21.18	1.10	21.28
Education	63.27	0.12	4.75	0.19	1.72	0.29	0.24	0.41	0.02	0.44
Government	174.06	0.33	11.84	0.48	4.47	0.76	0.58	0.97	0.05	0.98
Industrial	748.11	1.42	52.50	2.12	21.79	3.69	3.36	5.64	0.23	4.54
Other Residential	11682.54	22.22	629.98	25.41	182.91	30.98	7.52	12.60	0.06	1.07
Religion	193.58	0.37	16.21	0.65	6.08	1.03	1.01	1.70	0.11	2.11
Single Family	36582.67	69.58	1541.51	62.17	290.63	49.22	33.66	56.42	3.54	68.46
Total	52,573		2,480		590		60		5	

Figure 68: Expected Building Damage by Occupancy for Earthquake Scenario

The total value of transportation systems in the county is \$5.8B, and \$5.7B for utility systems. Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. Ground failure maps were not included in this level of analysis, so damage estimates to those assets were not computed. Utility systems include the following facilities: potable water, wastewater, natural gas, oil systems, electrical power, and communication. The Hazus model did not anticipate any damages or loss of functionality to utility facilities but did indicate the possibility of impacts to water pipelines. Potable water could experience 4 breaks and 17 leaks, and wastewater could have 2 breaks and 9 leaks. However, a

system performance analysis indicated no loss of power or water service to households. As indicated in Table 31, minimal damage and service interruption is expected to critical facilities in this scenario.

Table 31: Expected Damage to Critical Facilities from Earthquake

Facility Type	2500 – Year Event				
	Total Count of Facilities	Number with Moderate Damage	Number with Complete Damage	Number Functional on Day 1	Number Functional on Day 30
Hospitals	26	0	0	26	26
Police	17	0	0	17	17
Fire	55	0	0	55	55
Schools	66	0	0	66	66
EOCs	1	0	0	1	1

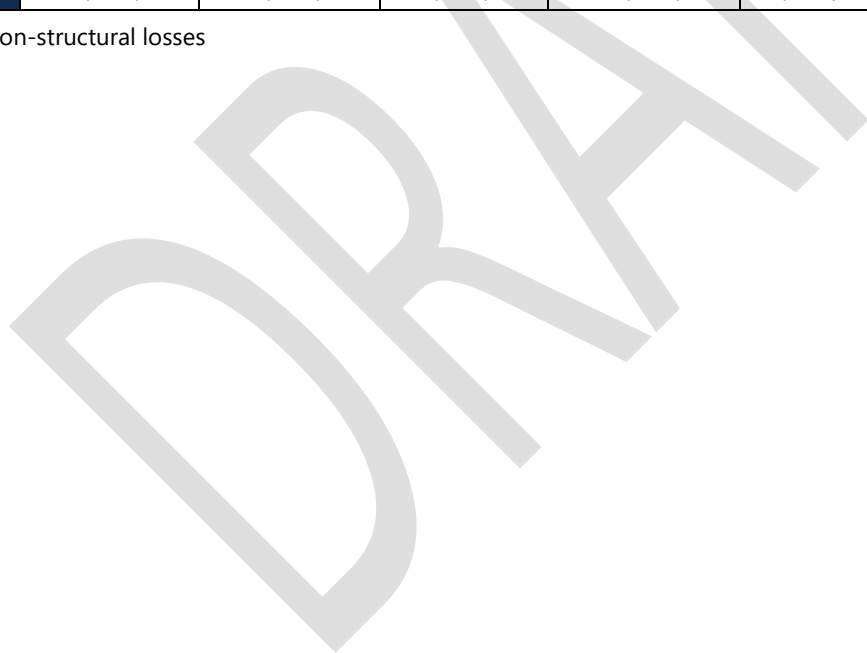
Loss estimates include direct building losses based on the costs to repair or replace damaged buildings and their contents and business interruption losses associated with the inability to operate a business following damage sustained during an earthquake. Total building losses in this scenario totaled \$155.12 million, with 83 percent as direct losses and 17 percent as business interruption losses. Residential occupancies account for 48 percent of the total loss value. Table 32 summarizes the estimated direct and business interruption losses for each jurisdiction in the planning area.

Table 32: Estimated Damage to Structures, Earthquake

Jurisdiction	Building Loss*	Content Loss	Inventory Loss	Relocation Costs	Income Loss	Rental Loss	Wage Loss	Total Loss
City of Rensselaer	\$4,035,240	\$1,620,630	\$108,950	\$414,890	\$164,180	\$206,390	\$206,080	\$6,756,370
City of Troy	\$29,176,140	\$11,314,470	\$341,240	\$3,616,780	\$1,875,930	\$2,170,140	\$2,225,740	\$50,720,430
Town of Berlin	\$1,382,870	\$533,700	\$76,600	\$191,870	\$46,830	\$77,510	\$63,310	\$2,372,690
Town of Brunswick	\$7,317,260	\$2,584,460	\$262,970	\$664,400	\$240,210	\$308,320	\$371,950	\$11,749,570
Town of East Greenbush	\$10,398,090	\$4,346,130	\$354,310	\$1,264,390	\$568,580	\$473,690	\$808,840	\$18,214,030
Town of Grafton	\$1,049,590	\$421,290	\$20,310	\$67,200	\$25,780	\$34,690	\$43,420	\$1,662,270
Town of Hoosick	\$2,522,140	\$1,119,310	\$273,640	\$236,610	\$95,180	\$93,770	\$149,820	\$4,490,480
Town of Nassau	\$1,116,060	\$384,570	\$25,510	\$96,900	\$28,270	\$35,820	\$37,850	\$1,724,970
Town of North Greenbush	\$8,007,760	\$2,968,810	\$169,690	\$808,160	\$355,060	\$371,760	\$412,040	\$13,093,280
Town of Petersburg	\$738,950	\$282,200	\$24,170	\$54,010	\$6,330	\$20,530	\$6,660	\$1,132,850
Town of Pittstown	\$2,718,580	\$930,160	\$110,650	\$213,340	\$72,440	\$75,920	\$128,180	\$4,249,270
Town of Poestenkill	\$2,053,250	\$793,700	\$53,050	\$151,690	\$93,260	\$57,440	\$87,610	\$3,290,000
Town of Sand Lake	\$3,556,040	\$1,300,990	\$63,870	\$286,760	\$97,280	\$102,540	\$126,880	\$5,534,350
Town of Schaghticoke	\$4,007,460	\$1,547,310	\$95,220	\$320,750	\$470,790	\$166,470	\$477,270	\$7,085,260
Town of Schodack	\$8,399,540	\$3,116,960	\$200,850	\$752,300	\$343,710	\$347,560	\$450,950	\$13,611,860
Town of Stephentown	\$1,261,950	\$447,390	\$34,700	\$95,840	\$12,480	\$34,460	\$16,580	\$1,903,400
Village of Castleton-on-Hudson	\$1,331,060	\$424,360	\$24,220	\$114,210	\$216,230	\$148,540	\$503,730	\$2,762,350

Jurisdiction	Building Loss*	Content Loss	Inventory Loss	Relocation Costs	Income Loss	Rental Loss	Wage Loss	Total Loss
Village of East Nassau	\$208,830	\$71,820	\$4,770	\$18,150	\$5,280	\$6,680	\$7,060	\$322,600
Village of Hoosick Falls	\$1,519,500	\$583,840	\$37,430	\$160,000	\$127,570	\$100,080	\$168,090	\$2,696,500
Village of Nassau	\$413,370	\$164,810	\$7,720	\$42,970	\$15,210	\$23,830	\$28,580	\$696,490
Village of Schaghticoke	\$389,730	\$157,100	\$12,350	\$33,320	\$60,600	\$17,250	\$52,610	\$722,960
Village of Valley Falls	\$205,520	\$72,440	\$8,040	\$16,370	\$10,070	\$6,320	\$12,820	\$331,570
Total	\$91,808,900	\$35,186,430	\$2,310,270	\$9,620,890	\$4,931,270	\$4,879,690	\$6,386,080	\$155,123,550

*Combined structural and non-structural losses



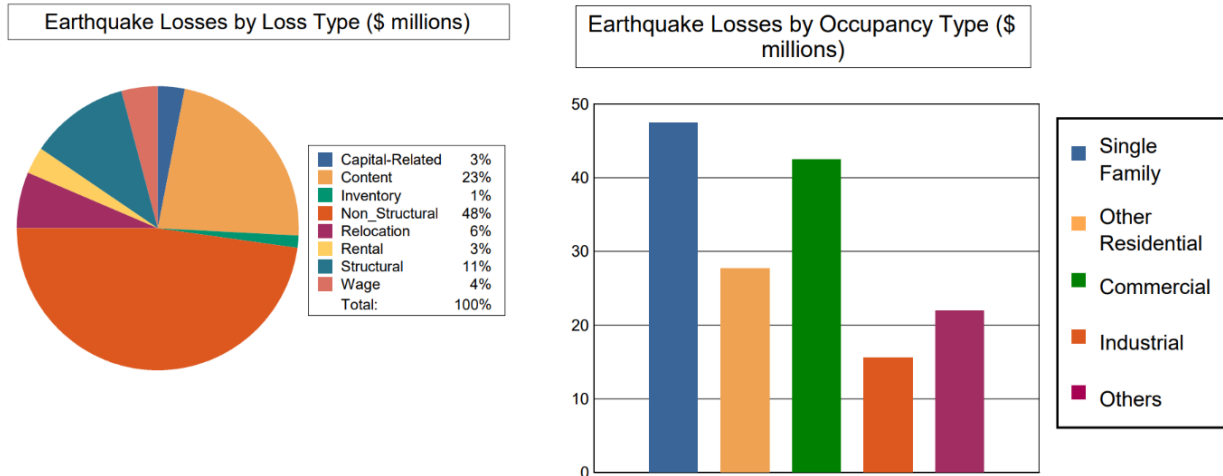


Figure 69: Earthquake Building Losses by Category and by Building Occupancy

Structural damage can result in debris following an earthquake. An estimated 27,000 tons of debris will be generated in this scenario, which would require an estimate 1,080 truckloads to remove. In addition, residential damage can lead to individuals being displaced from their homes. The model estimates that 11 households will be displaced in this scenario, with 5 individuals seeking public shelter. Table 33 summarizes potential injuries to populations within the scenario area based on the event occurring at different times of day.

Table 33: Estimated Casualties, 2500 Year Earthquake Event

Level of Severity	Time of Day		
	2:00 AM	2:00 PM	5:00 PM
Minor Injuries – no hospitalization	12	19	13
Injuries require hospitalization but not life-threatening	1	3	2
Injuries require hospitalization and could be life-threatening	0	0	0
Casualties	0	0	0

Figure 70 illustrates the National Risk Index rating the Expected Annual Loss for Rensselaer County at \$228K from earthquake, with a rating of very low expected annual losses, and a risk score of 59.3 percent.

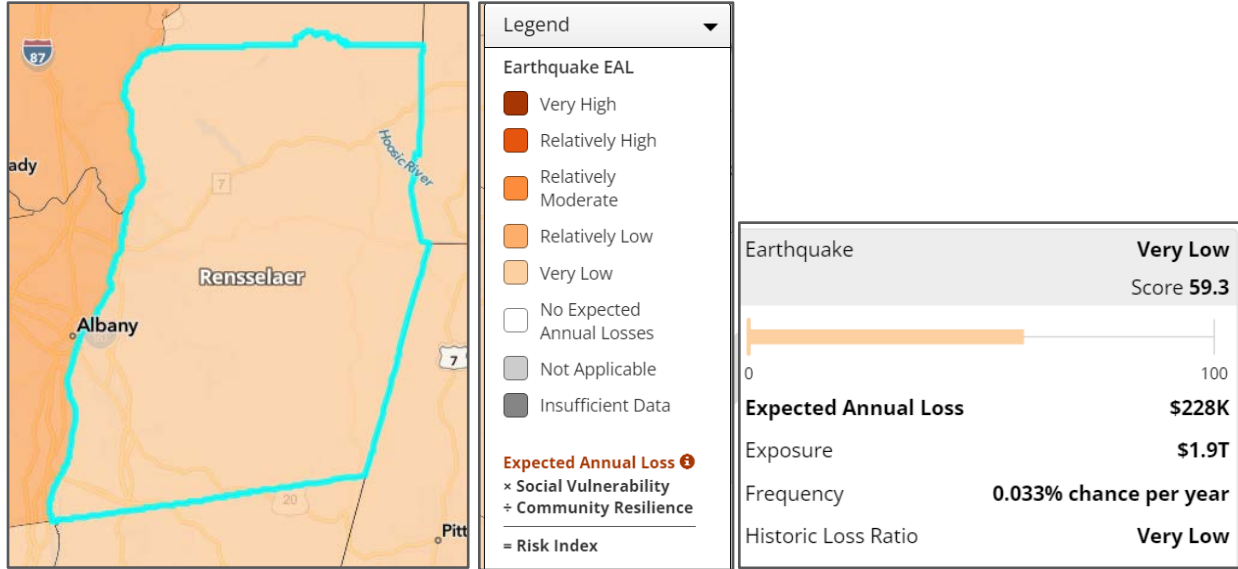


Figure 70: Expected Annual Loss, Rensselaer County⁶³

VULNERABLE POPULATIONS

When an earthquake damages buildings and infrastructure, the people around and within are in danger. Individuals and families can suffer injury and death during and following an earthquake. Debris and damage can trap people in buildings, creating unknown survival conditions depending on the extent of building damage and resources available. When buildings collapse, roads crack, or bridges suffer damage, resulting injuries to those in the vicinity can range from minor to extensive to the point of permanent disability or death. Following a severe earthquake with extensive damage, entire communities can become homeless and emergency services within can be stressed beyond capacity. This type of devastation can have lasting effects on people’s physical, emotional, and mental well-being.

Earthquakes can have immediate and long-term impacts on health. Immediate health impacts from earthquakes include trauma-related deaths and injuries from building collapse and trauma-related deaths and injuries from secondary effects such as burns from fires. Long-term health effects from earthquakes can include such conditions as posttraumatic stress disorder (PTSD), depression, and severe anxiety. Earthquakes strike quickly with no warning, putting those in affected areas in danger. Because of the unpredictable nature of earthquakes, it is normal for people to experience emotional distress. Feelings such as overwhelming anxiety, trouble sleeping, and other depression-like symptoms are common responses to these types of disasters.

⁶³ [Map | National Risk Index \(fema.gov\)](https://www.fema.gov/national-risk-index)

IMPACT ON COUNTY ASSETS

Infrastructure is highly susceptible to damage as a result of an earthquake. When the ground shakes or cracks, utility poles can fall, snapping power or communication lines and disrupting service. Natural gas, water, and sewage lines and aging infrastructure such as water mains might be more vulnerable and can break, which can (at a minimum) disrupt public and private access to essential utility services, and lead to a series of health and safety concerns including hazardous waste contamination, gas leaks, and contaminated water.

Transportation networks are extremely vulnerable to earthquake damage. An earthquake can crack the ground, split roads, warp and break railroad tracks, and break landing strips for aircraft, rendering them unusable. An earthquake can destabilize a bridge by creating cracks in the foundation, leading to potential collapse. The liquification that often occurs as a result of an earthquake can cause bridge supports to sink, which might crack a bridge frame before collapsing. Liquification can also cause roads to sink into the ground and break apart, not only cutting off transportation routes but also endangering an occupant of a vehicle on the road or bridge at that time.

There are a myriad of cascading impacts of such infrastructure destruction. Response and recovery efforts can take longer and become costlier and more complicated to accomplish. If an earthquake damages power stations and creates blackouts, facilities such as hospitals and wastewater treatment plants may be limited in operability or completely shut down until roads can be repaired to allow access to the power station. Earthquakes can also cause water treatment facilities to be polluted and lead to water shortages. If the contamination is not noticed because the facility is unreachable for maintenance, people may drink contaminated water, leading to a public health crisis on top of limited medical capabilities and limited communication capabilities from power outages.

COMMUNITY LIFELINES

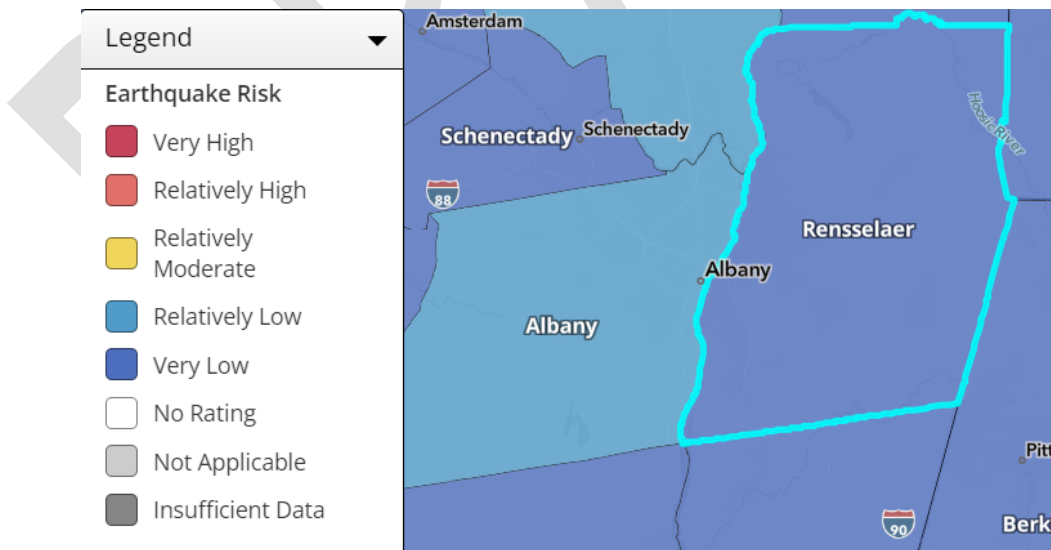
Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Community lifelines are essential for the well-being of any community. They provide support and assistance to individuals who require help, especially during times of crisis. FEMA Community Lifelines are a critical component of emergency management in the United States. These lifelines are designed to address the essential needs of a community during and after a disaster. There are eight lifelines, each with its own focus and purpose (Figure 71).



Figure 71: Community Lifelines-⁶⁴

VULNERABILITY SCORE

The National Risk Index (NRI) includes data on the expected annual losses to individual natural hazards, historical loss, and overall risk at a county and Census tract level. Based on the NRI, Rensselaer County has a very low risk of earthquake and a risk index score of **57.3** for earthquake which is lower than the national percentile (Figure 72).



⁶⁴ <https://www.fema.gov/sites/default/files/2020-05/CommunityLifelinesToolkit2.0v2.pdf>

Earthquake

Very Low

Score 57.3

Figure 72: FEMA National Risk Index Earthquake, Legend and Score for Rensselaer County⁶⁵

Extreme Temperature (Heat and Cold) Hazard Profile

Extreme temperatures, be they hot or cold, can severely impact human health and infrastructure. Heat waves and cold snaps can cause primary and secondary effects, such as power outages and burst pipes, posing a significant threat to communities. The definition of “extreme cold” or “extreme heat” varies from region to region, depending on how well the local population is acclimatized and prepared for such events. Therefore, it is essential to understand the local conditions and prepare accordingly to mitigate the risks and impacts of extreme temperatures.

Extreme Heat

Extreme heat occurs when the weather is much hotter and/or more humid than usual for a location at that time of year. According to FEMA, extreme heat occurs when temperatures exceed 90°F, combined with humidity, significantly increasing the heat index for two to three consecutive days for most of the United States.⁶⁶

Heat is the primary cause of weather-related deaths in the United States and can significantly affect the human body. Infants and young children, pregnant women, and people with chronic medical conditions are at a higher risk of heat-related illnesses. The relationship between humidity and heat can influence the severity of extreme heat events. Prolonged exposure to excessive heat can negatively affect cultivated land systems, damage crops, harm livestock, and increase the risk of wildfire. Furthermore, extended periods of extreme heat can cause power outages, as the heavy demand for air-conditioning taxes the power grid.

The National Weather Service (NWS) has developed a Heat Index (HI)—also known as the apparent temperature—which considers the chances of experiencing a heat disorder based on temperature and humidity levels. It measures how hot it feels to the human body when relative humidity is combined with air temperature. This index is particularly important in hot and humid climates, as high humidity levels can make the air feel much hotter than it is. In such conditions, the human body may be unable to cool itself efficiently through sweating, leading to heat-related illnesses, such as heat cramps, heat exhaustion, and heat stroke. Therefore, monitoring the HI is crucial for ensuring the safety and well-being of individuals exposed to high temperatures and humidity, such as outdoor workers, athletes, and the elderly.

⁶⁵ Source: [Map | National Risk Index \(fema.gov\)](https://www.fema.gov/national-risk-index)

⁶⁶ FEMA, “Extreme Heat.” <https://community.fema.gov/ProtectiveActions/s/article/Extreme-Heat#:~:text=In%20most%20of%20the%20United,on%20the%20hazard's%20Information%20Sheet.>

The HI used as a standard guide to issue excessive heat alerts. Such alerts are triggered when the maximum daytime heat index is expected to be 105°F or higher and the nighttime minimum HI is 80°F or higher for at least two consecutive days. Figure 73 presents the likelihood of heat disorders based on the HI, and Figure 74 describes the effects of different temperatures on the body.

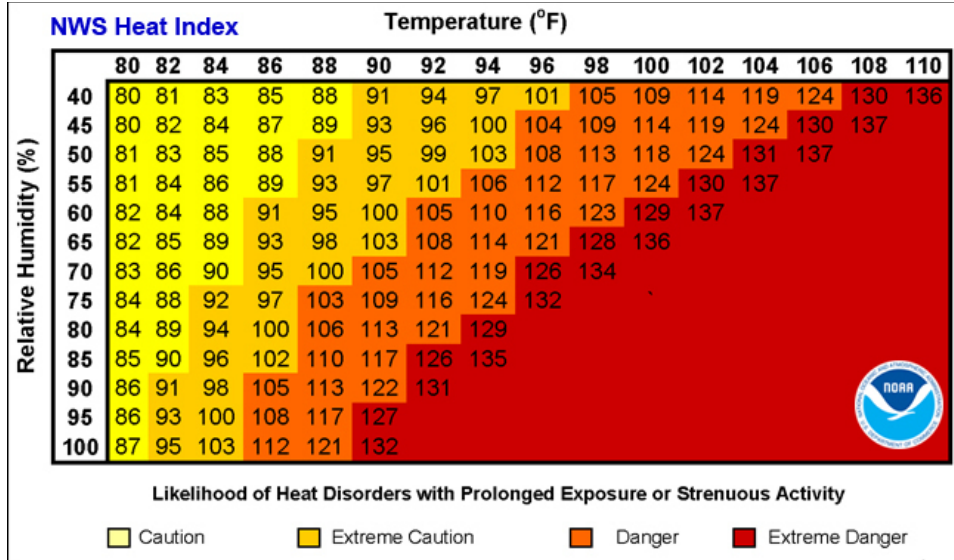


Figure 73: National Weather Service Heat Index Chart⁶⁷

Classification	Heat Index	Effect on the body
Caution	80°F - 90°F	Fatigue possible with prolonged exposure and/or physical activity
Extreme Caution	90°F - 103°F	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103°F - 124°F	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125°F or higher	Heat stroke highly likely

Figure 74: Heat Classifications⁶⁸

The thresholds for heat warning and advisory are currently the same throughout. Table 34 provides the warning and advisory thresholds established by the NWS offices covering the state of New York.

Table 34: NWS Warning and Advisory Thresholds for Extreme Heat, New York⁶⁹

Warning/Advisory Type	Description
Excessive Heat Warning	Heat indexes are forecasted to reach or exceed 105°F for at least two consecutive hours. The warning is issued within 24 hours of the event.

⁶⁷ National Weather Service, "What is the Heat Index." <https://www.weather.gov/ama/heatindex>

⁶⁸ Ibid.

⁶⁹ National Weather Service, "National Weather Service New York, NY Excessive Heat Page." <https://www.weather.gov/okx/excessiveheat#:~:text=Heat%20Advisory%3A%20Issued%20when%20the,for%20any%20length%20of%20time.>

Excessive Heat Advisory	Heat indexes are forecasted to reach 95°F–99°F for at least two consecutive days or 100°F–104°F for any length of time.
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The Wet Bulb Globe Temperature (WBGT), shown in Figure 75, measures the heat stress in direct sunlight, incorporating temperature, humidity, wind speed, sun angle, and cloud cover (solar radiation). This differs from the heat index, which considers only temperature and humidity. The WBGT is the preferred metric to use when activities are performed in direct sunlight. The WBGT has been adopted to manage workloads in direct sunlight by the Occupational Safety and Health Administration (OSHA), military agencies, various sports associations (especially high school sports), and some industries where most labor is performed outdoors.

Wet Bulb Globe Temperature Category Work/Rest and Water Intake								
Unacclimated and Acclimated Work/Rest and Water Intake Chart								
Heat Risk Category		Wet Bulb Globe Temp	Light Work		Moderate Work		Heavy Work	
			Work/Rest	Water Intake (quart/hr)	Work/Rest	Water Intake (quart/hr)	Work/Rest	Water Intake (quart/hr)
No Risk	Unacclimated	78 – 79.9	50/10 min	½	40/20 min	¾	30/30 min	¾
	Acclimated	78 – 79.9	continuous	½	continuous	¾	50/10 min	¾
Low	Unacclimated	80 – 84.9	40/20 min	½	30/30 min	¾	20/40 min	1
	Acclimated	80 – 84.9	continuous	½	50/10 min	¾	40/20 min	1
Moderate	Unacclimated	85 – 87.9	30/30 min	¾	20/40 min	¾	10/50 min	1
	Acclimated	85 – 87.9	continuous	¾	40/20 min	¾	30/30 min	1
High	Unacclimated	88 – 90	20/40 min	¾	10/50 min	¾	avoid	1
	Acclimated	88 – 90	continuous	¾	30/30 min	¾	20/40 min	1
Extreme	Unacclimated	> 90	10/50 min	1	avoid	1	avoid	1
	Acclimated	> 90	50/10 min	1	20/40 min	1	10/50 min	1

Adapted from: 1) USGS Survey Manual, Management of Occupational Heat Stress, Chapter 45, Appendix A. 2) Manual of Naval Preventive Medicine, Chapter 3: Prevention of Heat and Cold Stress Injuries. 3) OSHA Technical Manual Section III: Chapter 4 Heat Stress. 4) National Weather Service Tulsa Forecast Office, Wet Bulb Globe Temperature.

Figure 75: Wet Bulb Globe Temperature Scale for Exposure to Extreme Heat⁷⁰

Extreme heat has become increasingly severe over the past few decades, with rising frequency, duration, and intensity due to climate change. The summer of 2023 was particularly challenging, with escalating incidents of extreme heat and air quality issues around the globe, including in the United States. For example, June 2023 was the hottest June ever documented worldwide, and over 60 million individuals in the United States were exposed to air pollution caused by smoke from Canadian wildfires, which were driven by heat related to climate change. In August, prolonged dry conditions and high winds in Hawai‘i led to wildfires that caused massive destruction on the island of Maui and other areas, resulting in the most significant loss of life from wildfires in modern U.S. history.

According to the Community Resilience Estimates (CRE) for heat, a quarter of individuals in the United States are socially vulnerable if exposed to extreme heat, considering transportation exposure, housing

⁷⁰ IOP Conference Series: Earth and Environmental Science, “The thermal environment effect on the comfort of electronic factory worker.” <https://iopscience.iop.org/article/10.1088/1755-1315/126/1/012143/pdf>

quality, and financial hardship. Heat waves are responsible for more deaths than any other weather event, and fatality rates have risen each year since 2018, except in 2019, when there was a slight reduction.⁷¹

Extreme Cold

Extreme cold occurrences happen when temperatures drop significantly below average in a particular area. In places not used to winter weather, temperatures nearing the freezing point also can be considered extreme cold. According to the NWS Instruction 10-1605, cold weather is defined as a period of low temperatures or wind chill temperatures that reach or exceed locally or regionally defined advisory conditions (usually –18°F or colder). On the other hand, extreme cold can be defined as a period of extremely low temperatures or wind chill temperatures that reach or exceed locally or regionally defined warning criteria (typically around –35°F or colder). There may be cases where advisory criteria are unmet, but the combination of seasonably low temperatures and low wind chill values (approximately 15°F below average) may harm human health.

Although extreme low temperatures can occur throughout Rensselaer County, the severity varies depending on the topography and climate. A significant drop in temperature combined with increased wind speed can cause the body’s core temperature to fall rapidly, leading to an increased risk of illness, such as frostbite or hypothermia. Such illnesses can be life threatening and can affect anyone, though the elderly, the homeless, and infants are the most vulnerable. In addition, extreme cold can negatively impact infrastructure and housing due to the possibility of pipes bursting in areas with no heat or poor insulation. According to the NWS, cold weather can kill livestock and damage crops. In late spring or early fall, cold air outbreaks can harm or kill plants, flowers, and farm crops. A freeze occurs when temperatures drop below 32°F. Freezes and their effects are significant during the growing season. Frost forms on clear, calm nights and can occur when the air temperature is in the mid-30s. Each plant species has a different tolerance for low temperatures.

Table 35: Symptoms and Aids for Extreme Cold⁷²

Illness	Symptoms	Aid
Frostbite	An injury to the body caused by freezing body tissue. There will be a loss of feeling in the affected area, with the extremities (fingers, toes, ear lobes, or the tip of the nose) being the most susceptible parts of the body.	Medical attention is needed immediately . The area should be SLOWLY rewarmed.
Hypothermia	Abnormally low body temperature (below 95°F). Warning signs include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion.	Medical attention is needed immediately . If it is not available, begin warming the body SLOWLY .

⁷¹ KFF, “Continued Rise on Extreme Heat and Implications for Health Disparities.” <https://www.kff.org/racial-equity-and-health-policy/issue-brief/continued-rises-in-extreme-heat-and-implications-for-health-disparities/>

⁷² National Weather Service, “Wind Chill.” https://www.weather.gov/media/ict/handouts/WindChill_HeatWave.pdf

The severity of extremely low temperatures, or cold waves, is usually measured using the Wind Chill Temperature (WCT) Index. It uses a formula to calculate the dangers of winter winds and freezing temperatures. Essentially, it calculates the temperature felt when the effects of wind speed are added to the base air temperature. Figure 76 displays the NOAA NWS Wind Chill Chart.

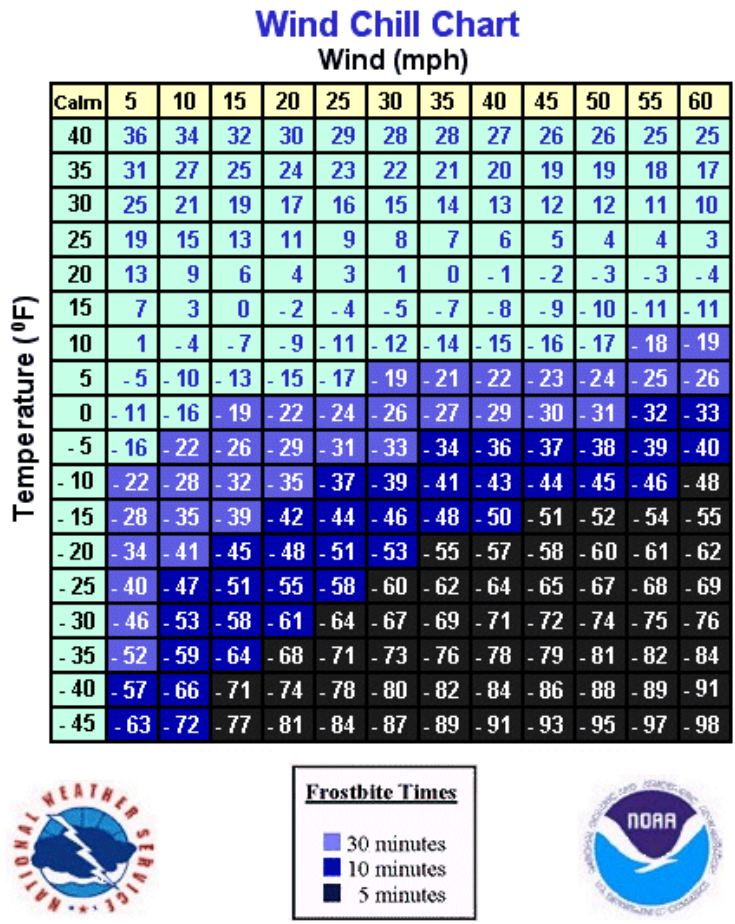


Figure 76: National Weather Service Wind Chill Chart⁷³

Table 36 provides the warning and advisory thresholds established by the NWS offices covering the state of New York.

Table 36: Warning and Advisory Thresholds for Extreme Cold in New York⁷⁴

Warning/Advisory	Description
Wind Chill Warning	Issued when wind chill values will reach -25°F or colder.

⁷³ National Weather Service, "Wind Chill Chart." <https://www.weather.gov/grb/windchill>

⁷⁴ National Weather Service, "National Weather Service New York, NY Watch Warning Advisory Definitions Page." https://www.weather.gov/okx/www_definitions

Wind Chill Advisory	Issued when wind chill values reach -15°F to -24°F .
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LOCATION

Excessive heat can occur across the United States, from the scorching deserts of the Southwest to the humid and muggy cities of the East Coast. During the summer months, many regions experience high temperatures and sweltering humidity levels, which can pose health risks to people and animals. Rensselaer County in New York can experience high temperatures and humidity levels during the summer, posing health risks to people and animals. Although the heat in Rensselaer County may not be as extreme as some of the scorching deserts of the Southwest, it is still important for residents to take necessary precautions during periods of excessive heat.

The winter season in the United States can be brutal, with extreme low temperatures affecting many regions nationwide. Even areas not typically known for cold weather, such as the southern states, can experience very low temperatures and dangerous wind chills.

Extreme cold can significantly impact daily life, causing everything from school closures to transportation disruptions. It can also lead to health risks, such as hypothermia and frostbite, particularly for those not adequately dressed for the weather.

Besides these immediate effects, extreme cold can cause long-term infrastructure damage, such as frozen pipes and power outages. It can even impact agriculture, with crops and livestock at risk of damage or death from the cold.

Overall, extreme cold is a severe weather phenomenon that can affect any region of the United States. By being prepared and taking the necessary precautions, individuals and communities can minimize the risks of this type of weather event.

EXTENT

Rensselaer County is situated in a region of the country that is prone to both cold waves and heat waves. These weather phenomena can occur anywhere in the county and often affect the entire planning area. However, specific locations in the county might have slightly higher or lower temperatures than the area-wide averages due to their characteristics. For instance, heavily wooded areas might have lower temperatures due to tree shade. In comparison, urban areas with less tree cover and a more built environment tend to absorb more heat and have higher temperatures. The speed of onset of extreme temperature events typically offers 24 hours or more of warning time. The duration of historic events in Rensselaer County is typically less than one week. Figure 77 displays the maximum heat index values recorded for Rensselaer County.

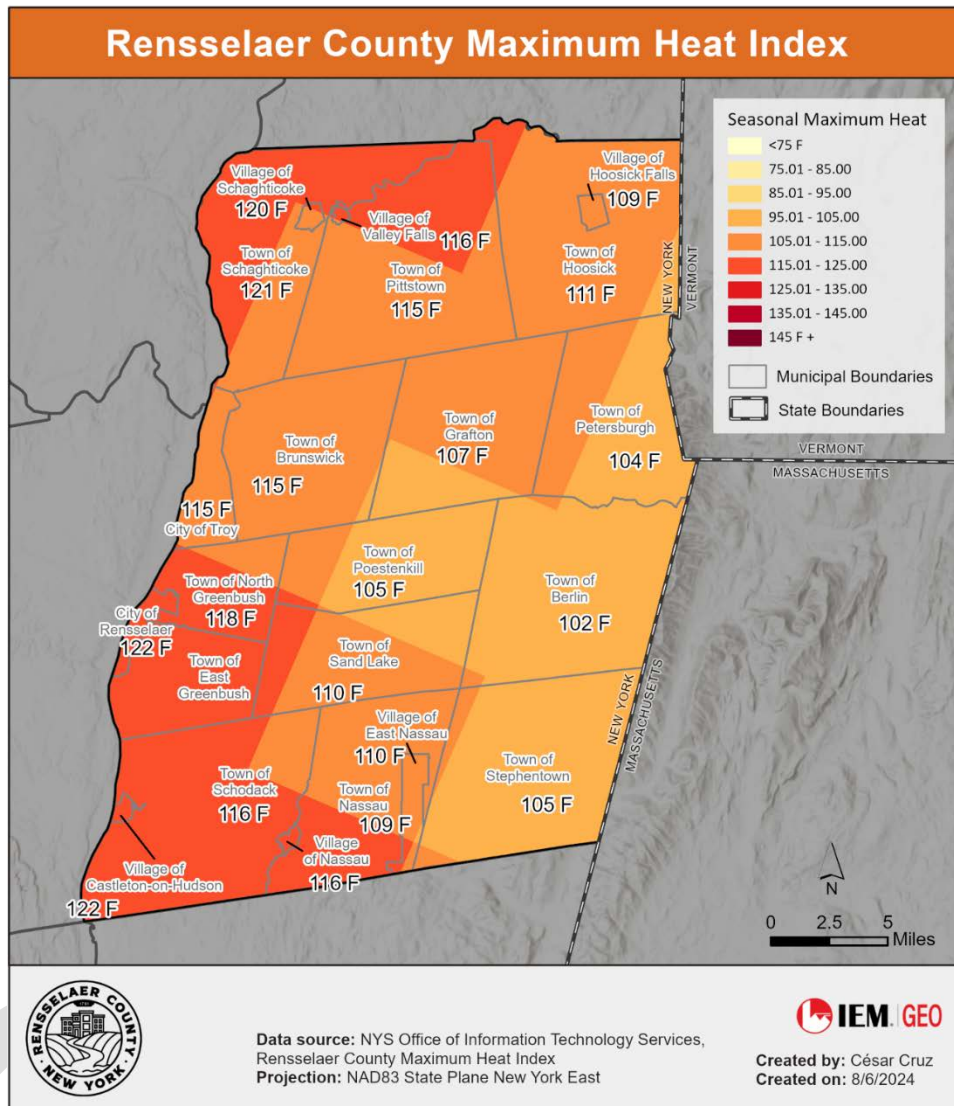


Figure 77: Maximum Heat Index, Rensselaer County

PREVIOUS OCCURRENCES/PROBABILITY

New York State has received no Federal Disaster or Emergency Declarations due solely to heat waves. According to the NOAA NCEI Storm Events Database, 46 heat wave events occurred in Rensselaer County from January 1, 2013, to November 30, 2023. No event records included reports of deaths, injuries, property damage, or crop damage. Table 37 lists all events and describes them.

Table 37: Rensselaer County Extreme Heat and Heat Jan. 01, 2013–Nov. 30, 2023⁷⁵

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Western Rensselaer	07/18/2013	Heat	0	0	0	0	During the week of July 15–19, a high-pressure ridge brought hot and humid air into eastern New York, resulting in temperatures exceeding 90°F each day and heat index values over 100°F at times. On July 19, the heat index values were between 105°F and 110°F. Power consumption reached a record high on that day. By the weekend, a cold front brought cooler and less humid air into the region.
Eastern Rensselaer	07/19/2013	Heat	0	0	0	0	A high-pressure ridge brought a warm and humid air mass into eastern New York, resulting in high temperatures exceeding 90°F for much of the week of July 15–19. Heat index values exceeded 100°F at times, with the hottest days on July 18–19. On July 19, heat index values were between 105 and 110 °F across portions of Ulster and Dutchess Counties. Power consumption reached a record high on Friday, July 19. A cold front brought cooler and less humid air into the region by the weekend.

⁷⁵ National Centers for Environmental Information, “Storm Events Database.”

https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Excessive+Heat&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=1950&endDate_mm=10&endDate_dd=31&endDate_yyyy=2023&county=RENSELAER%3A83&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=36%2CNEW+YORK

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Western Rensselaer	07/19/2013	Heat	0	0	0	0	A high-pressure ridge brought hot and humid weather to eastern New York on July 15–19. Temperatures exceeded 90°F, and heat index values exceeded 100°F at times. On July 19, heat index values reached 105°F–110°F in some places. Power consumption hit a record high on this day. The weather became cooler and less humid over the weekend due to an approaching cold front.
Western Rensselaer	09/11/2013	Heat	0	0	0	0	Warm and humid air moved into the region ahead of a storm system, causing temperatures to rise into the lower to middle 90s with heat index values between 100 and 105°F. Dewpoint values were in the lower to middle 70s. Heat index values were highest between 2 p.m. and 5 p.m., but they declined as temperatures dropped in the evening.
Western Rensselaer	08/12/2016	Heat	0	0	0	0	Eastern New York experienced high temperatures and humidity on August 12, with heat index values reaching 100°F to 105°F in some areas. Scattered thunderstorms occurred in the afternoon, with a few becoming severe and producing damaging wind gusts and a single lightning strike. Unfortunately, two people were struck by lightning in a park in Poughkeepsie and died.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Western Rensselaer	08/13/2016	Heat	0	0	0	0	On August 13, a warm front brought warm and humid weather, resulting in heat index values over 100°F in many valley areas. Thunderstorms developed in the afternoon, damaging trees and power lines and injuring multiple people. By evening, they moved across eastern Upstate New York, causing widespread wind damage and over 50,000 power outages. The storms ended with the passage of a cold front overnight.
Western Rensselaer	06/18/2018	Heat	0	0	0	0	Hot and humid air caused temperatures to reach the 90s with dew points in the 60s and 70s, leading to heat index values of 100°F–110°F. This unstable environment included severe thunderstorms, which knocked down trees and power lines, causing power outages for over 10,000 customers. A historic building in Poughkeepsie, NY, partially collapsed onto an occupied building, trapping, and injuring one woman.
Eastern Rensselaer	06/18/2018	Heat	0	0	0	0	Hot and humid air caused temperatures to reach the 90s with dew points in the 60s and 70s, leading to heat index values of 100°F to 110°F. This unstable environment included severe thunderstorms, which knocked down trees and power lines, causing power outages for over 10,000 customers. A historic building in Poughkeepsie, NY, partially collapsed onto an occupied building, trapping and injuring one woman.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Western Rensselaer	06/30/2018	Heat	0	0	0	0	Eastern New York experienced a hot and humid heat wave from June 30th through the Independence Day holiday. Cooling centers were opened throughout the region, with temperatures over 90°F and heat indices hovering around 100°F due to high dewpoints.
Western Rensselaer	07/01/2018	Excessive Heat	0	0	0	0	In early July, eastern New York experienced a hot and humid weather pattern that caused high heat indices. Temperatures soared to 99°F on July 1, with heat indices reaching nearly 110°F in the warmest valleys. From July 5, Albany, Glens Falls, and Poughkeepsie reached temperatures of 90°F for several consecutive days. The high temperatures combined with low overnight temperatures in the 70s caused heat-related problems. Cooling centers were opened across the region to provide relief.
Eastern Rensselaer	07/01/2018	Excessive Heat	0	0	0	0	Eastern New York had an extremely hot and humid air mass from the start of July until Independence Day. Temperatures peaked at 99°F on July 1, with heat indices reaching close to 110°F in the warmest areas. Albany and Glens Falls experienced 90°F temperatures for six consecutive days, while Poughkeepsie had seven. Low temperatures remained in the 70s, worsening heat-related issues and leading to the opening of multiple cooling centers.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Western Rensselaer	07/16/2018	Heat	0	0	0	0	Hot and humid weather on July 16 with temperatures in the 90s and dewpoints in the 60s to 70s caused heat indices to rise to the 90s. Isolated thunderstorms formed in the afternoon, with one causing wind damage and flash flooding in Ulster County.
Eastern Rensselaer	08/28/2018	Heat	0	0	0	0	A heat advisory was issued for areas below 1000 ft on August 28–29 due to hazy, hot, and humid weather. Heat index values ranged from low 90s to low 100s.
Western Rensselaer	08/28/2018	Heat	0	0	0	0	A heat advisory was issued for areas below 1000 ft on August 28–29 due to hazy, hot, and humid weather. Heat index values ranged from low 90s to low 100s.
Eastern Rensselaer	08/29/2018	Heat	0	0	0	0	A heat advisory was issued due to hazy, hot, and humid conditions on Aug 28–29 for all areas below 1000 ft. The maximum heat index ranged from the low 90s to the low 100s.
Western Rensselaer	08/29/2018	Heat	0	0	0	0	A heat advisory was issued due to hazy, hot, and humid conditions on August 28–29 for all areas below 1000 ft. The maximum heat index ranged from the low 90s to the low 100s.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Western Rensselaer	09/03/2018	Heat	0	0	0	0	Eastern New York experienced a late-season heat wave in early September. High temperatures in the 90s, dewpoints in the 70s, and heat index values reaching 95°F–105°F during the afternoon were reported. Albany set new daily record high temperatures on September 5–6 and a new daily record high minimum temperature on September 3. The heat prompted some schools to dismiss classes early and postpone sports practices.
Western Rensselaer	07/19/2019	Heat	0	0	0	0	Eastern New York experienced a heat wave on July 19–21. Temperatures rose to the low to mid-90s, with dewpoints in the low to mid-70s, leading to heat index values of 100°F to 110°F in the warmest spots of the Hudson Valley. On July 20, the hottest day, races at the Saratoga Racecourse were canceled due to the heat. It was the first cancellation since August 2006. The humid air also caused thunderstorms that resulted in wind damage and power outages, affecting over 1,700 customers in Saratoga and Schenectady Counties.
Western Rensselaer	07/20/2019	Excessive Heat	0	0	0	0	A heat wave hit eastern New York on July 19–21, resulting in temperatures in the low to mid-90s and dew points in the low to mid-70s. This created heat index values between 100°F and 110°F in the warmest spots of the Hudson Valley. Thunderstorms formed in the late afternoon of July 20 along the Lake Ontario shoreline due to the hot and humid air mass. The storms knocked out power to over 1,700 customers in Schenectady and Saratoga Counties.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Eastern Rensselaer	07/20/2019	Heat	0	0	0	0	A heat wave struck eastern New York on July 19–21, with temperatures in the low to mid-90s and dewpoints in the low to mid-70s. This resulted in heat index values of 100°F to 110°F in the warmest spots of the Hudson Valley. Cities extended pool and cooling center hours, and races at the Saratoga Racecourse were canceled for the first time since August 2006 due to the heat. Thunderstorms formed along the Lake Ontario shoreline, causing wind damage and power outages for over 1,700 customers in Schenectady and Saratoga Counties.
Western Rensselaer	07/30/2019	Heat	0	0	0	0	On July 30, eat Advisories were issued due to the high heat in the Capital District and the mid-Hudson Valley. Thunderstorms occurred in the afternoon and evening, causing wind damage, power outages, and one injury in Warren County.
Western Rensselaer	08/19/2019	Heat	0	0	0	0	Hot, humid air caused temperatures in the 90s and dew points in the 70s in the mid-Hudson Valley and Capital District.
Western Rensselaer	07/09/2020	Heat	0	0	0	0	A hot and humid air mass arrived on July 9, with heat indices ranging from 90°F to 100°F over the Hudson and Mohawk Valleys.
Western Rensselaer	07/11/2020	Heat	0	0	0	0	Hot and humid weather in the Hudson Valley on July 11 led to heat indices of 95°F in the afternoon and evening. This resulted in a severe thunderstorm in the mid-Hudson Valley, causing wind damage.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Western Rensselaer	07/19/2020	Heat	0	0	0	0	Temperatures soared into the 90s in eastern New York on July 19, prompting the opening of cooling centers and pools. A line of thunderstorms caused a few reports of wind damage in the Schoharie and mid-Hudson Valleys. Heat indices exceeded 95°F again on July 20 but were not as high as the previous day.
Eastern Rensselaer	07/19/2020	Heat	0	0	0	0	Temperatures soared into the 90s in eastern New York on July 19, prompting the opening of cooling centers and pools. A line of thunderstorms caused a few reports of wind damage in the Schoharie and mid-Hudson Valleys. Heat indices exceeded 95°F again on July 20 but were not as high as the previous day.
Western Rensselaer	07/27/2020	Heat	0	0	0	0	Eastern New York saw hot and humid weather on July 27–28. The heat index reached 95°F to 105°F on July 27 in the Hudson and Mohawk Valleys. On the same day, a severe thunderstorm caused wind damage. On July 28, heat indices exceeded 95°F again for portions of the mid-Hudson Valley. July 2020 was the hottest month on record, with an average temperature of 77.8°F.
Eastern Rensselaer	07/27/2020	Heat	0	0	0	0	Eastern New York saw hot and humid weather on July 27–28. The heat index reached 95°F to 105°F on July 27 in the Hudson and Mohawk Valleys. On the same day, a severe thunderstorm caused wind damage. On July 28, heat indices exceeded 95°F again for portions of the mid-Hudson Valley. July 2020 was the hottest month on record, with an average temperature of 77.8°F.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Western Rensselaer	08/10/2020	Heat	0	0	0	0	On August 10, the region experienced hot and humid weather and scattered thunderstorms. Some of these became severe, and one produced a tornado in Washington County. Flash flooding occurred in Ulster County. Heat indices reached 95°F to 100°F across the advisory area on August 10.
Western Rensselaer	06/07/2021	Heat	0	0	0	0	A hot and humid air mass from the western Atlantic Ocean caused high heat index values of around 95°F in some areas along the Hudson River on June 7.
Western Rensselaer	06/21/2021	Heat	0	0	0	0	A warm front brought hot and humid air, resulting in high heat indices across eastern New York. In the afternoon and evening, a cold front led to severe storms, causing damage to trees, power lines, and homes. No injuries were reported, but sporadic power outages occurred, and over 1,000 National Grid customers lost power in Washington County.
Western Rensselaer	06/27/2021	Heat	0	0	0	0	Eastern New York experienced a hot and humid air mass on June 27–30, with heat indices of 95°F to 105°F and temperatures in the 90s for all four days in Poughkeepsie and three days in Albany and Glens Falls.
Eastern Rensselaer	08/11/2021	Heat	0	0	0	0	On August 11–13, a high-pressure dome brought high heat and humidity to eastern New York, mainly in the afternoons. Heat indices reached 95°F–110°F. The Hudson Valley Regional Airport recorded an official heat wave with temperatures in the low to mid-90s.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Western Rensselaer	08/11/2021	Heat	0	0	0	0	On August 11–13, a high-pressure dome brought high heat and humidity to eastern New York, mainly in the afternoons. Heat indices reached 95°F–110°F. The Hudson Valley Regional Airport recorded an official heat wave with temperatures in the low to mid-90s.
Western Rensselaer	08/12/2021	Excessive Heat	0	0	0	0	A high-pressure dome brought a heat wave to eastern New York on August 11–13. Afternoons were particularly hot and humid, with heat indices up to 104°F. Areas along the Hudson River experienced the most intense heat, with temperatures reaching 110°F. The Hudson Valley Regional Airport recorded high temperatures in the low to mid-90s on all three days, marking an official heat wave.
Western Rensselaer	08/13/2021	Heat	0	0	0	0	A high-pressure dome caused a heat wave in eastern New York on August 11–13. Heat indices reached 95°F–110°F, and the Hudson Valley Regional Airport recorded high temperatures in the low to mid-90s for all three days.
Western Rensselaer	08/26/2021	Heat	0	0	0	0	Hot and humid weather with heat indices ranging from 95°F to 101°F affected most of eastern New York on August 26, due to an approaching cold front. On August 27, the heat indices remained high at around 95°F to 100°F in some parts of the mid-Hudson Valley before the cold front passed through.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Eastern Rensselaer	08/26/2021	Heat	0	0	0	0	Hot and humid weather with heat indices ranging from 95°F to 101°F affected most of eastern New York on August 26, due to an approaching cold front. On August 27, the heat indices remained high at around 95°F to 100°F in some parts of the mid-Hudson Valley before the cold front passed through.
Western Rensselaer	07/20/2022	Heat	0	0	0	0	Eastern New York experienced a prolonged period of hot and humid weather in late July. Heat indices reached 103°F due to high temperatures of 90°F or more for six consecutive days. Cooling centers were opened to provide relief to those affected.
Western Rensselaer	07/23/2022	Heat	0	0	0	0	Eastern New York experienced hot and humid weather in late July. Albany and Poughkeepsie had six consecutive days with temperatures of 90°F or above. The heat index peaked between 95°F and 103°F on July 20, 21, 23, and 24. Cooling centers were opened to assist those in need.
Western Rensselaer	08/04/2022	Heat	0	0	0	0	Eastern New York experienced hot and humid weather with heat indices between 95°F and 104°F on August 4–9. Record high temperatures of 99°F were set in Albany and Poughkeepsie on August 4. Cooling centers were opened in response to the heat.
Eastern Rensselaer	08/04/2022	Heat	0	0	0	0	Eastern New York experienced hot and humid weather with heat indices between 95°F and 104°F on August 4–9, 2022. Record high temperatures of 99°F were set in Albany and Poughkeepsie on August 4. Cooling centers were opened in response to the heat.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Eastern Rensselaer	08/08/2022	Heat	0	0	0	0	On August 4–9, a high-pressure dome caused hot and humid weather in eastern New York, with heat indices ranging from 95°F to 104°F. Record high temperatures of 99°F were set in Albany and Poughkeepsie on August 4. The hot weather led to the opening of cooling centers in the area.
Western Rensselaer	08/30/2022	Heat	0	0	0	0	On August 30, hot and humid weather caused heat indices between 95°F and 100°F in eastern New York. Severe thunderstorms in the Upper Hudson Valley and southern Herkimer County resulted in downed trees and wires, two house fires, and minor street flooding around Glens Falls.
Western Rensselaer	07/06/2023	Heat	0	0	0	0	On July 6, hot and humid conditions led to heat indices peaking at 95°F–100°F in eastern New York valleys.
Western Rensselaer	09/05/2023	Heat	0	0	0	0	Eastern New York experienced warm to hot temperatures on September 5–7, with Albany International Airport setting a record high temperature of 93°F. Heat indices climbed into the mid to upper 90s, leading to a Heat Advisory for most of the forecast area.

Rensselaer County has not received any Federal Disaster or Emergency Declarations because of cold waves. According to NOAA's NCEI Storm Events Database, between 2013 and 2023, there were 50 cold/wind chill/extreme cold event days in Rensselaer County. Almost all of these events occurred between December and February, which is the time of year when extreme cold events are common in the area. None of the event records mentioned any reports of deaths, injuries, or property damage. Table 38 lists all events and describes them.

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Table 38: Extreme Cold and Cold Wind Chill in Rensselaer County, January 2013–November 2023⁷⁷

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Eastern Rensselaer	01/24/2013	Cold/Wind Chill	0	0	0	0	Arctic air settled over the region on January 22. Cold fronts brought in more cold air and brisk winds, resulting in dangerously low wind chill values. Minimum temperatures dropped below zero each night, and daytime temperatures reached only the single digits through teens.
Western Rensselaer	01/02/2014	Cold/Wind Chill	0	0	0	0	A long-duration snow event brought cold air from Canada on January 2, causing temperatures to drop through the day. The next day, winds picked up, making wind chill values drop below -20°F. Wind chill values remained very low through Friday, with the lowest values in the higher terrain. On Saturday, very low temperatures continued to cause dangerous conditions.
Eastern Rensselaer	01/02/2014	Cold/Wind Chill	0	0	0	0	A snow event brought cold air from Canada on January 2, causing temperatures to fall through the day, with some areas reaching below zero. Wind chill values dropped below -20°F by Friday morning, with the lowest values in the Capital Region and Lake George area. Wind chill values remained very low through Friday and Friday night, with the lowest values in the southern and western Adirondacks. The frigid weather continued through early Saturday morning, causing dangerous conditions.

⁷⁷ Ibid.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Western Rensselaer	01/07/2014	Cold/Wind Chill	0	0	0	0	Bitter arctic air brought dangerous wind chill values as low as -15°F to -30°F after a strong cold front on January 7. Strong winds throughout the day continued the frigid weather, but light winds on January 8 ended the dangerously low wind chill values.
Eastern Rensselaer	01/07/2014	Cold/Wind Chill	0	0	0	0	Arctic air moved in on January 7. Strong winds caused wind chill values to be as low as -30°F. Wind chill values remained dangerously low until January 8 due to low temperatures and high pressure.
Eastern Rensselaer	01/21/2014	Cold/Wind Chill	0	0	0	0	On January 21–24, an arctic air mass brought frigid weather to the region. Daytime highs were in the single digits and teens, with nighttime readings frequently below zero. Wind chill values dropped to dangerously low levels, with some areas experiencing wind chill readings as low as -35°F. Shelters were opened for the homeless due to the prolonged period of extreme cold. Temperatures finally moderated, and the wind became light by the end of the week, ending the dangerously low wind chill values.
Western Rensselaer	01/21/2014	Cold/Wind Chill	0	0	0	0	On January 21–24, the region experienced an arctic air mass resulting in very low temperatures with highs only in the single digits and teens and below-zero readings at night. Wind chill values became dangerously low, reaching -35°F in the Adirondacks. The frigid weather led to the opening of shelters for the homeless. The weather was finally moderated by the end of the week.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Eastern Rensselaer	01/23/2014	Cold/Wind Chill	0	0	0	0	An arctic air mass caused temperatures to drop significantly between January 21 and January 24. Wind chill values dropped to dangerously low levels, reaching -35°F in some areas. Shelters were opened for the homeless due to the extended period of frigid air. By the end of the week, temperatures finally moderated, and wind speeds decreased, ending the extremely low wind chill values.
Eastern Rensselaer	01/26/2014	Cold/Wind Chill	0	0	0	0	Arctic air returned with gusty winds and wind chills as low as -20°F behind a fast-moving clipper system on, January 26. The cold threat ended by late morning, as temperatures rose and winds diminished.
Eastern Rensselaer	01/28/2014	Cold/Wind Chill	0	0	0	0	An arctic air mass caused extremely low wind chill values on January 28-29. The western and southern Adirondacks saw wind chill values as low as -10°F to -22°F. By late morning, the wind chill values had risen to safe levels. However, high terrain areas in the western Adirondacks and western Mohawk Valley saw dangerously low wind chills again on Tuesday night and Wednesday morning, with values as low as -15°F to -24°F. The wind chill values rose by late morning as the winds diminished and the temperatures rose.
Eastern Rensselaer	01/07/2015	Extreme Cold/Wind Chill	0	0	0	0	An arctic cold front brought bitter cold air to the region on January 7. Overnight lows were below zero, with wind chill values as low as -40°F. Shelters and warming stations were opened for residents due to the dangerously low temperatures. School districts delayed the start of school. Wind chill values improved by late morning on January 8.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Western Rensselaer	01/07/2015	Cold/Wind Chill	0	0	0	0	An arctic cold front brought bitter cold air to the region on January 7. Temperatures dropped to as low as -30°F. Strong winds made wind chill values as low as -40°F. Shelters and warming stations were opened for residents. Many school districts delayed the start of school. Wind chill values improved by late morning on January 8.
Eastern Rensselaer	01/30/2015	Cold/Wind Chill	0	0	0	0	A cold front brought very low temperatures to the region from Canada on January 30. With gusty northwest winds, wind chill values dropped significantly. Many cities and towns opened warming shelters due to the cold conditions. Wind chill values improved on Saturday, January 31, although temperatures remained very low.
Western Rensselaer	01/30/2015	Cold/Wind Chill	0	0	0	0	An arctic front brought very low temperatures and gusty winds to the region on January 30-31. Wind chill values dropped to between -15°F and -30°F, leading to the opening of warming shelters. Temperatures remained very low throughout the day on January 31, with gusty winds diminishing later.
Eastern Rensselaer	02/05/2015	Cold/Wind Chill	0	0	0	0	An arctic cold front brought frigid air and gusty northwest winds to eastern New York on February 5. Overnight, temperatures dropped to between 0°F and -20°F. Wind chill values ranged between -15°F and -30°F. Some schools delayed opening, and warming shelters were opened in some towns and cities.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Western Rensselaer	02/13/2015	Cold/Wind Chill	0	0	0	0	An arctic cold front brought frigid air and gusty winds to upstate New York on February 12–13. Temperatures dropped as low as –18°F with wind chill values of –15°F to –35°F. Some school openings were delayed, and warming shelters remained open due to the persistent cold weather. Frozen pipes and burst water mains also were reported in areas with older infrastructure.
Eastern Rensselaer	02/13/2015	Cold/Wind Chill	0	0	0	0	An arctic cold front brought frigid air and strong winds to upstate New York on February 12–13. Wind chill values dropped as low as –35°F, delaying some school openings and causing frozen pipes in some areas. Warming shelters remained open for residents.
Western Rensselaer	02/15/2015	Extreme Cold/ Wind Chill	0	0	0	0	On February 15, an arctic air mass poured into the region, causing very low temperatures and strong winds. Temperatures dropped below zero, and wind chill values were as low as –15°F to –45°F. Water mains burst, especially in areas with older infrastructure. By February 16, wind chill values rose, but it remained cold throughout the day.
Eastern Rensselaer	02/15/2015	Extreme Cold/ Wind Chill	0	0	0	0	On February 15, a coastal storm brought the region frigid arctic air and strong winds. Temperatures fell below zero, with wind chills as low as –45°F. Many towns kept warming shelters open due to the cold, and burst pipes were reported in some areas. By February 16, wind chill values had risen, but it remained cold throughout the day.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Eastern Rensselaer	02/19/2015	Cold/Wind Chill	0	0	0	0	Strong northwest winds brought frigid arctic air into the region on February 19, causing wind chill values as low as -15°F to -40°F. Temperatures improved by late morning on February 20, but they remained low throughout the day. Burst pipes and water mains were reported due to the month-long stretch of very cold weather, with over 100 water main breaks reported in the Capital Region.
Western Rensselaer	02/19/2015	Cold/Wind Chill	0	0	0	0	Strong northwest winds and very low temperatures hit the region on February 19–20, causing wind chill values as low as -15°F to -40°F. The cold weather caused several burst pipes and water main breaks in the Capital Region, with over 100 reported.
Eastern Rensselaer	02/23/2015	Cold/Wind Chill	0	0	0	0	Gusty winds brought a frigid air mass on February 23. Wind chills ranged from -10°F to -30°F until the early hours of February 24. Wind chills rose later that day.
Western Rensselaer	02/13/2016	Extreme Cold/Wind Chill	0	0	0	0	An arctic cold front brought very low temperatures and brisk northwesterly winds to eastern New York on February 13. Temperatures dropped to between -8°F and -33°F, with wind chill values of -15°F to -45°F. This caused water main breaks and emergency calls, including for house fires. On February 14, temperatures rose and winds diminished.
Eastern Rensselaer	02/13/2016	Extreme Cold/Wind Chill	0	0	0	0	An arctic cold front brought very low temperatures and brisk winds to eastern New York on February 13, resulting in water main breaks and emergency calls for house fires. The threat ended on February 14, as temperatures rose and winds diminished.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Eastern Rensselaer	12/15/2016	Cold/Wind Chill	0	0	0	0	An arctic air mass and gusty winds caused extremely low temperatures and wind chill values as low as -30°F in eastern New York on December 15. Warming shelters for the homeless were opened in many towns and cities. Although the threat of low chill values ended on Friday morning, the temperature was very low all day.
Eastern Rensselaer	12/27/2017	Cold/Wind Chill	0	0	0	0	Arctic air and gusty winds hit the region on December 27, bringing temperatures as low as -23°F over eastern New York. Wind chills dropped to -35°F on Wednesday night and continued through Thursday and Friday morning.
Western Rensselaer	12/27/2017	Cold/Wind Chill	0	0	0	0	An arctic air mass with gusty winds enveloped the region on December 27. Temperatures dropped to between zero and -23°F, with wind chill values as low as -35°F. The bitterly low wind chills persisted until Friday morning.
Western Rensselaer	12/31/2017	Cold/Wind Chill	0	0	0	0	Temperatures ranged from 0°F to -28°F in New York on New Year's Day, resulting in dangerous wind chills.
Eastern Rensselaer	12/31/2017	Cold/Wind Chill	0	0	0	0	Temperatures on December 31 dropped several degrees below zero due to a bitterly cold air mass. Wind chills ranged from -1°F to -31°F on January 1.
Eastern Rensselaer	01/01/2018	Extreme Cold/Wind Chill	0	0	0	0	Strong northwesterly winds and a frigid air mass caused dangerously low wind chills on the first two days of 2018. Wind chills dropped as low as -15°F to -35°F in many locations on New Year's morning.
Western Rensselaer	01/01/2018	Cold/Wind Chill	0	0	0	0	Dangerously low wind chills were experienced on the first two days of 2018 due to frigid air mass and northwesterly winds up to 15 mph, with wind chills as low as -15°F to -35°F in many locations.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Eastern Rensselaer	01/05/2018	Extreme Cold/Wind Chill	0	0	0	0	A low-pressure system intensified as it moved from Miami to Cape Cod, bringing moderate to heavy snowfall along the East Coast on January 3–4. The snowfall tapered off on the evening of January 4. The system also brought brutally cold arctic air, resulting in extremely cold conditions on January 5–7. One fatality from hypothermia was reported.
Western Rensselaer	01/05/2018	Extreme Cold/Wind Chill	0	0	0	0	A strong winter storm hit the East Coast of the United States on January 3–4, resulting in heavy snowfall and gusty winds. The snow tapered off on January 4, but brutally cold arctic air rushed southward into New York, resulting in an extended period of extremely cold conditions on January 5–7. One confirmed fatality from hypothermia was reported during this time.
Eastern Rensselaer	01/13/2018	Cold/Wind Chill	0	0	0	0	Rain turned to sleet and snow in eastern New York on January 12. Despite temperatures in the 50s, snowfall accumulated 6 to 12 inches over northern Herkimer County. Temperatures dropped further, with wind chills as low as –25°F by the morning of January 14.
Eastern Rensselaer	01/20/2018	Cold/Wind Chill	0	0	0	0	A snowstorm hit eastern New York on January 19–20, causing heavy snow and sleet. The snow was heaviest in the central Mohawk Valley, the southern Adirondacks, and Lake George–Saratoga region, where 1.5 to 2 foot totals were common. Many weekend activities and flights were cancelled, and states of emergency were declared for Albany and Saratoga Counties.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Western Rensselaer	01/20/2018	Cold/Wind Chill	0	0	0	0	A snowstorm hit eastern New York on January 19–20, with heavy snow, sleet, and freezing rain. Snow was heaviest in the central Mohawk Valley and the southern Adirondacks. The storm caused many cancellations, including flights from Albany International Airport, and states of emergency were declared for Albany and Saratoga Counties. Very low temperatures followed the snow, prompting school closures and the opening of warming shelters across the region.
Western Rensselaer	1/30/2018	Cold/Wind Chill	0	0	0	0	An arctic cold front brought heavy snow and frigid air to eastern New York on January 30. Wind chills the next day fell to –15°F to –35°F, causing school closures and water main breaks. Eight to 12 inches of lake effect snow fell in far northern Herkimer County.
Eastern Rensselaer	01/30/2018	Extreme Cold/Wind Chill	0	0	0	0	Eastern New York experienced a heavy snow squall accompanied by frigid air and strong westerly winds on the afternoon of January 30. Wind chills fell to –15°F to –35°F the next morning. A heavy band of lake effect snow also developed off Lake Ontario, bringing 8 to 12 inches of snow to far northern Herkimer County.
Western Rensselaer	02/01/219	Cold/Wind Chill	0	0	0	0	On February 1, wind chills fell to –15°F to –35°F due to an arctic air mass, leading to many school closures and delays.
Eastern Rensselaer	12/18/2019	Cold/Wind Chill	0	0	0	0	Arctic air combined with northerly winds resulted in wind chills ranging from –10°F to –25°F. The Southern Adirondacks experienced the lowest wind chills.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Eastern Rensselaer	01/28/2021	Cold/Wind Chill	0	0	0	0	An arctic air mass and gusty winds caused dangerously low wind chills across eastern New York on January 28–29. Low temperatures ranged from –10°F in the southern Adirondacks to 10°F in the mid-Hudson Valley. Wind chill values ranged from –28°F in the southern Adirondacks to 3°F in the mid-Hudson Valley.
Western Rensselaer	01/28/2021	Cold/Wind Chill	0	0	0	0	An arctic air mass and gusty winds caused dangerously low wind chills across eastern New York on January 28–29. Low temperatures ranged from –10°F in the southern Adirondacks to 10°F in the mid-Hudson Valley. Wind chill values ranged from –28°F in the southern Adirondacks to 3°F in the mid-Hudson Valley.
Eastern Rensselaer	01/29/2021	Cold/Wind Chill	0	0	0	0	Arctic air and winds caused low wind chills in eastern New York on January 29–30. Lows ranged from –18°F to 11°F, with wind chill values from –5°F to 8°F.
Western Rensselaer	01/29/2021	Cold/Wind Chill	0	0	0	0	On January 29–30, low wind chills occurred in Eastern New York due to an arctic air mass and winds. Low temperature ranged from –18°F to 11°F, with wind chill values ranging from –25°F to 8°F.
Western Rensselaer	01/14/2022	Cold/Wind Chill	0	0	0	0	Arctic high pressure caused very low temperatures. Wind chills were –10°F to –35°F on January 15.
Eastern Rensselaer	01/14/2022	Cold/Wind Chill	0	0	0	0	Eastern New York experienced dangerously low temperatures on January 14–15 due to an arctic high-pressure system, with wind chills dropping to –10°F to –35°F in most areas on the morning of January 15.
Eastern Rensselaer	01/20/2022	Cold/Wind Chill	0	0	0	0	Arctic air and increased winds brought below-zero wind chills to eastern New York on January 20–21, with wind chills as low as –15°F to –25°F.

Location	Date	Event	Deaths	Injuries	Property Damage	Crop Damage	Description
Eastern Rensselaer	01/29/2022	Cold/Wind Chill	0	0	0	0	Arctic air and strong winds led to below-zero wind chills across eastern New York on January 29–30, with temperatures as low as –25°F.
Western Rensselaer	02/03/2023	Extreme Cold/Wind Chill	0	0	0	0	An arctic air mass brought dangerously low wind chill values and strong winds to the region on February 3–4. Temperatures dropped to between –10°F and –25°F, with some pockets in the Adirondacks nearing –40°F. Strong winds caused downed trees and power lines, resulting in power outages, mainly in Ulster County. Warming centers opened to aid those who needed shelter from the cold. Some schools closed or delayed opening due to the cold.
Eastern Rensselaer	02/03/2023	Extreme Cold/Wind Chill	0	0	0	0	On February 3–4, an arctic air mass caused low wind chill values and strong wind gusts across the region. Temperatures dropped to –10°F to –40°F, with record lows in Albany and Glens Falls. Strong winds caused power outages and downed trees. Wind chill values ranged from –20°F to –50°F. Warming centers opened, and some schools closed or were delayed due to the cold. Key impacts included damage to trees and power lines, power outages, and school closures.

PROBABILITY OF FUTURE EVENTS

EXCESSIVE HEAT

The probability of excessive heat events in Rensselaer County is expected to increase due to rising temperatures, a decrease in precipitation, and higher emissions. As the number of days with maximum temperatures over 100°F increases, it is likely that the region will experience a higher evaporation rate, leading to lower soil moisture and water availability. In addition, with higher greenhouse gas emissions, the frequency of hot days is expected to increase significantly.

Furthermore, climate models predict that the region will experience a decrease in precipitation. This could exacerbate the impact of rising temperatures and lead to more frequent and severe extreme heat days. As a result, it is essential to reduce greenhouse gas emissions and mitigate the impact of climate change to prevent the probability of excessive heat increasing in Rensselaer County and other regions.

If we continue to emit greenhouse gases at high levels, the Earth's temperature could rise by several degrees Celsius by the end of the century. This would have catastrophic consequences, including rising sea levels, more frequent and severe natural disasters, and widespread food and water shortages.

Effective measures could include transitioning to renewable energy sources, improving energy efficiency, and reducing the use of fossil fuels. These actions could help preserve soil moisture, ensure adequate water availability, and slow down or reverse climate change. Figure 78 shows the gradual increase over annual days with temperatures over 100°F in Rensselaer County and the effects on temperature from lower or higher emissions.

Annual days with maximum temperature > 100°F

Lower emissions			
	Minimum Projection	Mean (Days)	Maximum Projection
Modeled History (1976-2005)	0.0	0.0	0.0
Early Century (2015-2044)	0.0	0.2	2.1
Mid Century (2035-2064)	0.0	0.6	4.6
Late Century (2070-2099)	0.0	1.4	7.6

Higher emissions			
	Minimum Projection	Mean (Days)	Maximum Projection
Modeled History (1976-2005)	0.0	0.0	0.0
Early Century (2015-2044)	0.0	0.3	1.6
Mid Century (2035-2064)	0.1	1.5	6.7
Late Century (2070-2099)	0.0	8.7	30.1

Figure 78: Future Temperature Increases in Rensselaer County under Two Scenarios⁷⁸

COLD WAVE

There has been an increase in extreme cold weather events around the world in recent years. This may seem counterintuitive in the face of global warming and rising temperatures, but it is a direct result of climate change. The increase in extreme cold weather can be attributed to the emission of greenhouse gases into the atmosphere, which traps heat and warms the planet. As a result, the Arctic is warming faster than the rest of the world, which alters the jet stream and causes more frequent cold snaps in regions that are not accustomed to them.

The warming of the Arctic also causes the melting of sea ice, which releases cold air and moisture into the atmosphere. This cold air can then travel southward and cause extreme cold weather events in regions far from the Arctic, such as Europe and North America. These extreme cold weather events can have devastating effects on human health and infrastructure, wildlife, and ecosystems.

⁷⁸ Esri Living Atlas, "Climate Mapping for Resilience and Adaption." <https://livingatlas.arcgis.com/assessment-tool/explore/details>

It is important to note that while extreme cold weather events may occur more frequently due to climate change, this does not invalidate the fact that the planet is warming and experiencing more extreme heat waves, droughts, and other weather events. The rise in extreme cold weather is just one facet of climate change's complex and multifaceted impact on the planet.

VULNERABILITY ANALYSIS

To understand its vulnerability to natural hazards, a community must determine the assets exposed or vulnerable in the hazard area. Excessive heat and extreme cold can significantly impact populations, structures, critical facilities, and community lifelines. At the population level, extreme heat and cold can lead to health issues, such as heat exhaustion, heat stroke, hypothermia, and other related illnesses. Vulnerable populations, such as the elderly, young children, and those with preexisting health conditions, are particularly at risk.

Besides the health impacts, extreme temperatures can cause economic losses and decreased productivity, as people may be unable to work or carry out daily activities.

At the structural level, excessive heat and cold can damage buildings, roads, and other critical infrastructure. High temperatures can cause equipment to malfunction or fail, leading to power outages and disruptions in transportation and other critical services. They also can increase the demand for water, strain supplies, and cause shortages. Extreme cold can cause pipes to freeze and burst, leading to water damage and potential health hazards.

Critical facilities, such as hospitals, power plants, and transportation systems, also are at risk during extreme temperatures. High temperatures can cause equipment to fail, disrupting critical services. Extreme cold can cause power outages and other issues that impact public health and safety.

Rensselaer County has identified extreme temperatures (cold and heat waves) as hazards. Therefore, all assets in the county (i.e., population, structures, critical facilities, and lifelines) are vulnerable.

ESTIMATED IMPACTS AND POTENTIAL LOSS

The National Centers for Environmental Information reports six excessive heat and/or extreme cold/wind chill events occurred since the last plan update in Rensselaer County. There were no reports of property loss or crop loss as a result of the events reported.

Although extreme temperatures are not expected to cause significant damage to existing buildings, infrastructure, and critical facilities in Rensselaer County, they pose a significant threat to the safety and well-being of its population. While historic damage caused by extremely low temperatures in some areas is associated with freezing water distribution lines, detailed repair costs are not available for these events. Although overall estimated property losses from extreme heat and cold events are expected to be relatively minimal, extreme temperatures pose a significant life and safety threat to the population of the planning area.

The National Risk Index (NRI) includes data on the expected annual losses (EAL) to individual natural hazards, historical loss, and overall risk at a county and Census tract level. The EAL for Rensselaer County for Cold Wave indicates a score of 76.1 and a rating of relatively moderate. The dollar amount for EAL is \$259K

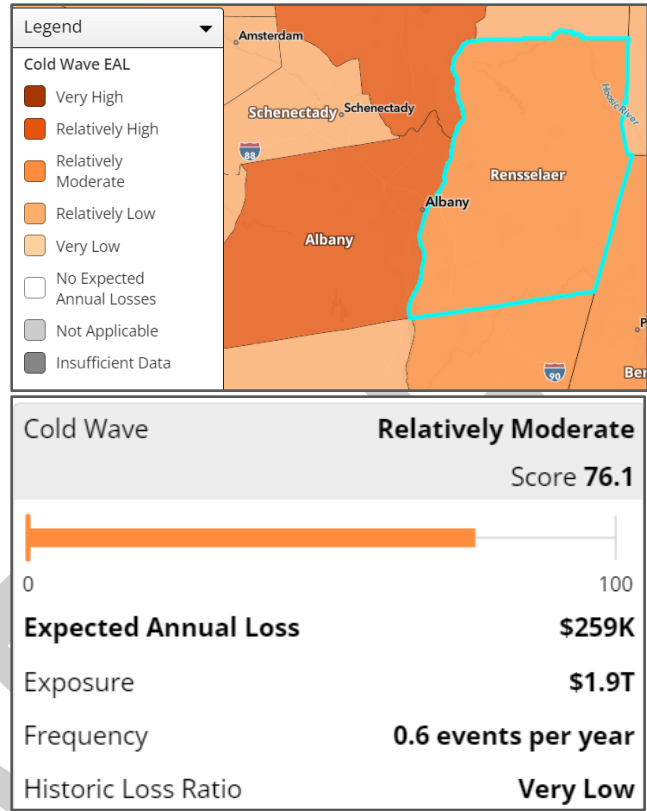


Figure 79: FEMA NRI Rensselaer County Cold Wave Score, Map and Legend⁷⁹

The EAL for Rensselaer County for Heat Wave indicates a score of 52.5 and a rating of relatively low. The dollar amount for EAL is \$78K

⁷⁹ FEMA National Risk Index, Expected Annual Loss Rensselaer County Cold Wave Score, Map, Legend [Map | National Risk Index \(fema.gov\)](https://www.fema.gov/national-risk-index)

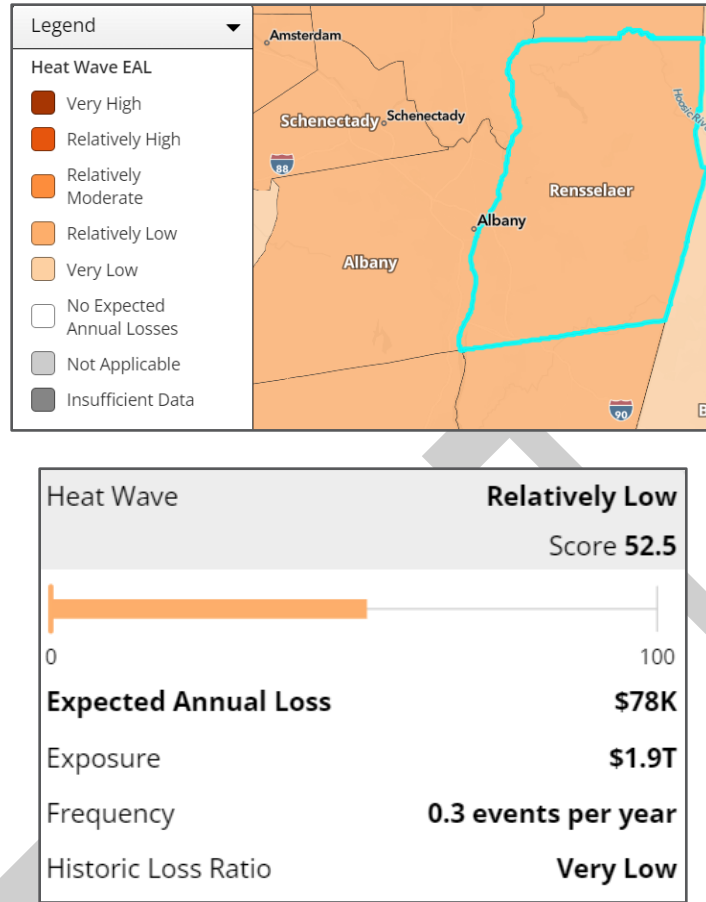


Figure 80: FEMA NRI Rensselaer County Heat Wave Score, Map and Legend

VULNERABLE POPULATIONS

Extreme temperatures can significantly threaten the safety and well-being of the population in each area. Heat-related casualties are often caused by inadequate air-conditioning or heat exhaustion. Many older housing units lack central air conditioning and people must buy window air conditioning units, which can pose financial challenges for low-income populations. The elderly, small children, and those with health issues or disabilities are the most vulnerable to heat-related illnesses, as they may live on low incomes and cannot run air-conditioning regularly. They may also be isolated, without friends or family to check on their well-being. Outdoor workers also are likely to be affected by extreme heat.

Extreme heat events typically affect the elderly and disadvantaged sections most heavily. The primary impacts of concern for extremely low temperatures include the life-threatening effects of overexposure to hypothermia, particularly in the elderly and disadvantaged populations.

Common impacts associated with extreme heat in Rensselaer County include swimming-related injuries and individuals seeking medical treatment due to heat-related illnesses, such as heat exhaustion, heat stroke, and heat stress. Power outages may also occur due to an associated strain on electrical networks.

Cooling centers are typically opened, and schools may alter class schedules or activities to ensure student safety.

Extreme cold also can be dangerous, resulting in casualties due to inadequate heating, carbon monoxide poisoning from unsafe heat sources, and frostbite. The elderly, small children, those with health issues or disabilities, and those in low-income households are at higher risk of cold-related illnesses and injuries, as they may not have access to regular heating and may not have anyone to look out for their well-being. Other significant impacts include strains on livestock and agriculture and the potential freezing of household water pipes and municipal water transmission systems.

Extreme temperatures pose a significant threat to livestock and agricultural crops and may occasionally threaten property and infrastructure, leading to disruptions in transportation systems. Furthermore, extreme temperatures can exacerbate the impact of other hazards, such as severe weather events that can cause widespread power outages. In extreme temperatures, emergency responders may be called upon to work with public officials and nonprofit agencies to provide heating or cooling venues and transport vulnerable populations to such places.

Although Rensselaer County is likely to experience relatively minor impacts from extreme temperatures, there may be a few injuries or sporadic property damage and minimal disruption to the quality of life. Critical facilities may shut down temporarily to reduce energy use, or employees may be unable to get to them.

Table 7 provides the population statistics of those considered age vulnerable to extreme heat and cold.

Table 39: Age Vulnerable Populations by Jurisdiction, 2022⁸⁰

Jurisdiction	= or >65 Years	<5 Years
Rensselaer County	29,968	7727
Berlin	175	62
Brunswick	2307	526
City of Rensselaer	1572	694
East Greenbush	3202	862
Grafton	427	154
Hoosick	1470	544
Nassau	850	279
North Greenbush	2727	555
Petersburgh	249	46
Pittstown	990	312
Poestenkill	697	369

⁸⁰ United States Census Bureau, "SO101|Age and Sex." <https://data.census.gov/table>

Jurisdiction	= or >65 Years	<5 Years
Sand Lake	1931	288
Schaghticoke	1457	370
Schaghticoke Village	124	58
Schodack	2764	778
Stephentown	516	85
Troy	6868	1997
Valley Falls	95	18
Village of Castleton-on-Hudson	258	70
Village of East Nassau	117	31
Village of Hoosick Falls	812	256
Village of Nassau	190	44

Table 40 provides information on residents who are below 125 percent of the poverty level.

Table 40: Individual Residents Living Below Poverty Level in Rensselaer County by Jurisdiction, 2022⁸¹

Jurisdiction	Population Estimate	Percent of Jurisdiction Population
Rensselaer County	17,539	11.5
Berlin	215	10.6
Brunswick	535	4.3
City of Rensselaer	1,829	19.9
East Greenbush	662	4.1
Grafton	243	12.7
Hoosick	561	8.5
Nassau	188	4.2
North Greenbush	435	3.4
Petersburgh	49	3.7
Pittstown	564	10.2
Poestenkill	192	4.4
Sand Lake	456	5.5
Schaghticoke	329	4.6

⁸¹ United States Census Bureau, "S1701|Poverty Status in the Past 12 Months. " <https://data.census.gov/table/ACSST1Y2022.S1701?q=Rensselaer%20County,%20New%20York&t=Income%20and%20Poverty>

Jurisdiction	Population Estimate	Percent of Jurisdiction Population
Schaghticoke Village	127	20.1
Schodack	482	3.7
Stephentown	165	6.0
Troy	10,884	23.3
Valley Falls	2	0.4
Village of Castleton-on-Hudson	155	11.0
Village of East Nassau	58	13.1
Village of Hoosick Falls	345	11.0
Village of Nassau	79	6.9

Table 41 provides information on individuals in Rensselaer County who have a disability.

Table 41: Rensselaer County Residents with a Disability⁸²

Jurisdiction	Population Estimate	Percent of Jurisdiction Population
Rensselaer County	20,760	13.1
Berlin	342	16.9
Brunswick	1563	12.5
City of Rensselaer	1782	19.3
East Greenbush	1718	10.5
Grafton	283	14.8
Hoosick	1196	18.0
Nassau	540	11.9
North Greenbush	1525	11.8
Petersburgh	204	15.4
Pittstown	648	11.8
Poestenkill	483	11.2
Sand Lake	935	11.2
Schaghticoke	563	7.7
Schaghticoke Village	45	7.1

⁸² United States Census Bureau, "S1810|Disability Characteristics." <https://data.census.gov/table/ACSST1Y2022.S1810?q=Rensselaer%20County,%20New%20York>

Jurisdiction	Population Estimate	Percent of Jurisdiction Population
Schodack	1594	12.5
Stephentown	392	14.0
Troy	9387	18.5
Valley Falls	49	10.7
Village of Castleton-on-Hudson	190	13.4
Village of East Nassau	104	23.7
Village of Hoosick Falls	798	25.2
Village of Nassau	233	20.0

COMMUNITY LIFELINES

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Community lifelines are essential for the well-being of any community. They provide support and assistance to individuals who require help, especially during times of crisis. FEMA community lifelines are a critical component of emergency management in the United States. These lifelines are designed to address the essential needs of a community during and after a disaster. There are eight lifelines, each with its own focus and purpose (see Figure 81).



Figure 81: FEMA Community Lifelines

All eight community lifelines are all impacted by extreme temperatures. In such weather conditions, vulnerable populations are at greater risk. Extreme heat can cause fatal heat stroke and related conditions, while extreme cold may cause hypothermia, frostbite, carbon monoxide poisoning due to improper use of generators, and heart attacks. Power outages and communication disruptions are more likely to occur during these weather events. Stable temperature is crucial for storing hazardous materials, especially those sensitive to extreme changes of temperature. Hazardous materials can become unstable and dangerous due to sudden fluctuations in temperature. In addition, ice accumulation and road buckling may make emergency services and food supplies inaccessible due to road conditions.

VULNERABILITY SCORE

FEMA’s National Risk Index (NRI) calculates a country’s vulnerability based on various factors, including exposure to natural hazards, the susceptibility of the population and infrastructure to specific hazards, and the ability to cope with and recover from the impacts of those hazards. A higher vulnerability score indicates a higher level of risk and greater potential for damage and loss in the event of a natural disaster. The NRI can also identify areas where additional resources may be needed to build resilience and reduce vulnerability to natural disasters. Figure 82 and Figure 83 shows the scores for Cold Wave and Heat Wave for Rensselaer County. Based on NRI data, the Cold Wave risk index score is 73.4, and a relatively moderate level of risk. The Heat Wave risk index score is 48.4, and a relatively low level of risk.

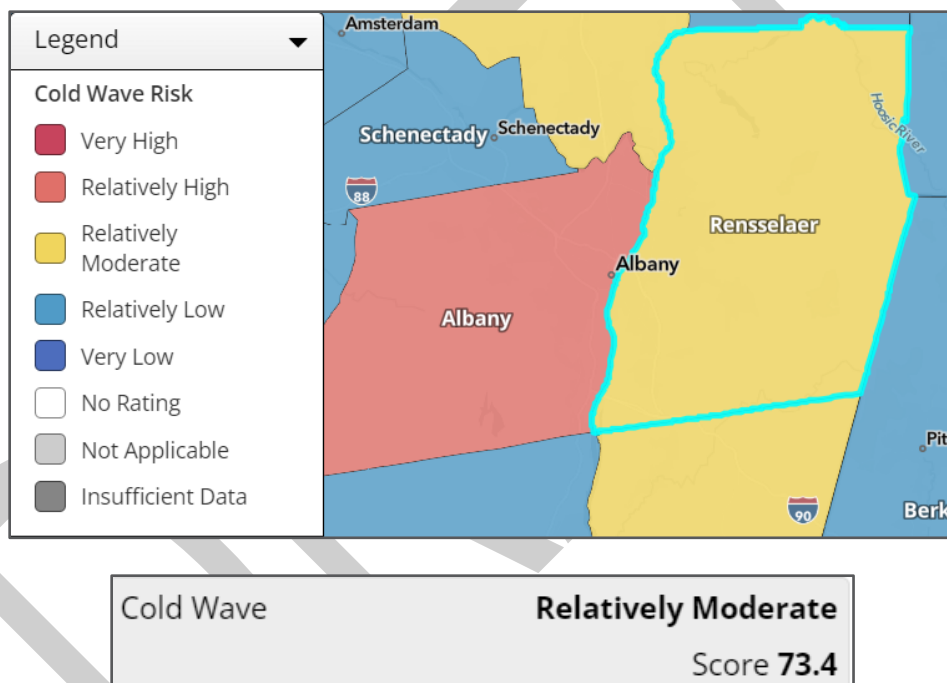


Figure 82: FEMA NRI Rensselaer County Cold Wave Index Score, Map and Legend⁸³

⁸³ FEMA National Risk Index, Map and Score, Cold Wave Rensselaer County, New York. [Map | National Risk Index \(fema.gov\)](https://www.fema.gov)

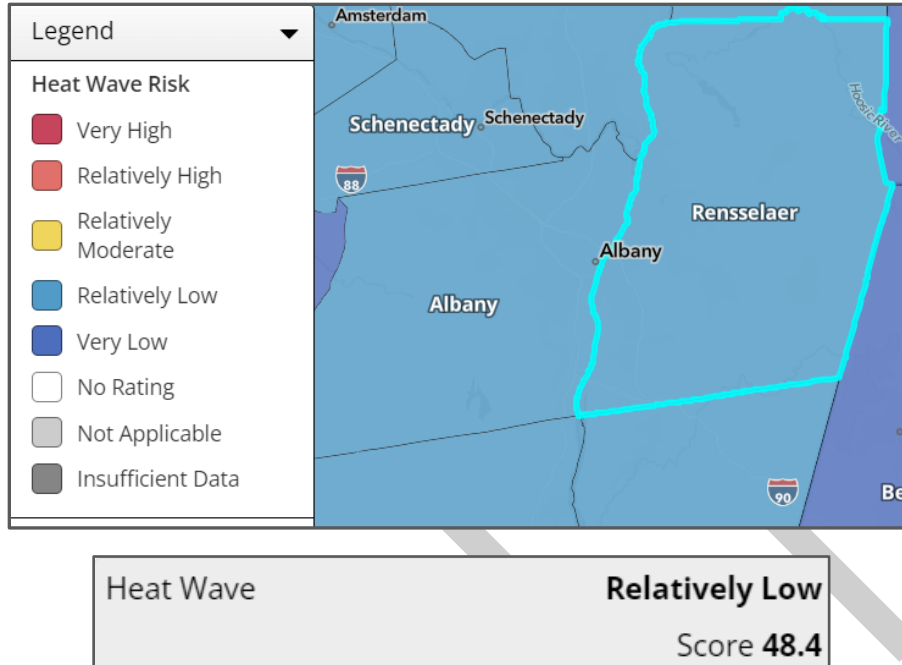


Figure 83: FEMA NRI Rensselaer County Heat Wave Index Score, Map and Legend⁸⁴

Flooding (Flooding, Dam Failure, and Ice Jams) Hazard Profile

A flood is a partial or complete inundation of normally dry land areas. The National Flood Insurance Program (NFIP) defines a flood as:

A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or two or more properties from overflow of inland or tidal waves, unusual and rapid accumulation or runoff of surface waters from any source, mudflow, or collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining causes by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above.

Floods are considered hazards when people and property are affected. Historically, development in floodplains was often a necessity, as water bodies provided a means of transportation, power, water supply, and often supported the livelihood of local residents (i.e., fishing, farming, etc.). Today, development in floodplains is more often spurred by the aesthetic and recreational value of the floodplain. Flooding is widely regarded as the most common major natural hazard in New York State. It is also the most significant of all natural hazards in Rensselaer County.

⁸⁴ FEMA National Risk Index, Map and Score, Heat Wave Rensselaer County, New York. [Map | National Risk Index \(fema.gov\)](https://www.fema.gov)

Factors influencing the type and severity of flooding include natural variables such as precipitation, topography, vegetation, soil texture, and seasonality, as well as human factors such as urbanization (extent of impervious surfaces), land use (agricultural and forestry tend to remove native vegetation and accelerate soil erosion), and the presence of flood-control structures such as levees and dams.

According to FEMA's *NFIP Floodplain Management Requirements: A Study Guide and Desk Reference for Local Officials* (FEMA-480), most floods fall into the following three main categories:

1. **Riverine flooding** is flooding that occurs along a channel (where a "channel" is defined as a feature on the ground that carries water through and out of a watershed, whether natural channels such as rivers and streams, or human-made channels such as drainage ditches). Riverine flooding occurs when excessive rainfall over an extended period of time causes a river to exceed its capacity. It can also be caused by heavy snow melt and ice jams. Ice jams are very common in the northeast United States, and according to data from the USACE Cold Region Research and Engineering Laboratory (USACE CRREL), 1,442 ice jam events have been recorded in New York State between 1867 and 2008, a number exceeded only by the State of Montana.
 - **Overbank flooding** occurs along a channel as excess flows overflow channel banks. Overbank flooding occurs when downstream channels receive more rain or snowmelt from their watershed than normal, or a channel is blocked by an ice jam or debris.
 - **Flash flooding** is a type of riverine flooding typically caused when a significant amount of rainfall occurs in a very short duration. It is characterized by a rapid rise in water level and high velocity flows. Flash floods can also be caused by ice jams (ice jam flooding, which can be upstream of an intact jam or downstream of a jam that has broken downstream) or dam breaks.
2. **Alluvial Fan Flooding** – Alluvial fan landforms pose unique flooding hazards that are not present on non-fan landforms—rivers and streams whose flooding hazards are commonly defined through FEMA regulatory floodplains. According to FEMA, alluvial fan flooding occurs "on the surface of an alluvial fan or similar landform which originates at the apex and is characterized by high-velocity flows; active process of erosion, sediment transport, and deposition; and unpredictable flow paths." Alluvial fan flooding is depicted on a Flood Insurance Rate Map (FIRM) as Zone AO, with a flood depth and velocity.⁸⁵
3. **Shallow flooding** is flooding that occurs in flat areas where a lack of channels means water cannot drain away easily.
 - **Sheet flow** occurs when there are inadequate or no defined channels, and floodwaters spread out over a large area at a somewhat uniform depth. Sheet flow occurs after intense or prolonged rainfalls during which rain cannot soak into the ground.
 - **Ponding** occurs when runoff collects in a depression and cannot drain out. Ponding floodwaters

⁸⁵ Federal Emergency Management Agency. 2020. "Alluvial Fan Flooding Definition." <https://www.fema.gov/about/glossary/alluvial-fan-flooding#:~:text=Flooding%20occurring%20on%20the%20surface%20of%20an%20alluvial,erosion%2C%20sediment%20transport%2C%20and%20deposition%3B%20and%20unpredictable%20flowpaths.>

do not move or flow away; they will remain until the water infiltrates into the soil, evaporates, or is pumped away.

- **Urban drainage flooding** occurs when the capacity of an urban drainage system is exceeded. An urban drainage system comprises the ditches, storm sewers, retention ponds and other facilities constructed to store runoff or carry it to a receiving stream, lake or the ocean. Urban drainage flooding can also occur in areas protected by levees, as water collects on the protected side of the levee when pump capacities are exceeded during severe storms.

1% Annual Chance Floodplain

It is essential to understand that the magnitude of any flood event for a particular area depends on the source of flooding and the area's location. The size of a specific flood event is defined through historic data of precipitation, flow, and discharge rates. Consequently, different 1% annual chance of occurrence (sometimes referred to as the 100-year flood event) can have very different impacts. The 1% chance flood event in two separate locations have the same likelihood to occur, but they do not necessarily have the same magnitude. For example, a 1% chance flood event for the Mississippi River means something completely different in terms of discharge values (ft³/s) than for the Cumberland River. Not only are the magnitudes of 1% chance events different between rivers, but they can also be different along any given river. A 1% chance event upstream is different from one downstream due to the change of river characteristics (volume, discharge, and topography). As a result, the definition of what constitutes a 1% chance event is specific to each location, river, and time, since floodplain and river characteristics change over time. Finally, it is important to note that each flood event is unique. Two hypothetical events at the same location, given the same magnitude of stream flow, may still produce substantially different impacts if there were different antecedent moisture characteristics, different times of day of occurrence (which indicates the population's probable activities at the flood's onset), or other characteristic differences.

The 1% chance flood event is of particular significance since it is the regulatory standard that determines the obligation (or lack thereof) to purchase flood insurance. Flood insurance premiums are set depending on the flood zone, as modeled by National Flood Insurance Program (NFIP) Rate Maps. The NFIP and FEMA suggest insurance rates based on Special Flood Hazard Areas (SFHAs). A SFHA is the land area covered by the floodwaters of the base flood the NFIP's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies for federally backed mortgages. The SFHA designates an area that is covered by the floodwaters of the base flood; that is, a flood that has on average a 1% chance of occurring in any given year. It is important to note that a base flood, also referred to as a 100-year flood, could occur during subsequent years or once every 10 years, not necessarily once every 100 years. The base flood is the standard that has been adopted for use in the NFIP. As indicated on FIRMs, base flood elevations (BFEs) indicate the elevation of surface water resulting from a flood that has a 1% chance of occurring in any given year. The BFE is the height of the base flood, normally in feet, relative to the geographic datum referenced in the Flood Insurance Study (FIS) report (i.e., National Geodetic Vertical Datum (NGVD) of 1929, North American Vertical Datum (NAVD) of 1988, etc.).

0.2% Annual Chance Floodplain

Another way of defining the magnitude of a flood is known as the 0.2% chance flood event, or 500-year flood event. This area is distinguished on FEMA FIRMs as the Zone B or X (Shaded) zone, a moderate flood risk area. While not typically used in local regulations to regulate development, building to higher standards can include building to protect structures and critical infrastructure from flooding in the 0.2% annual chance floodplain.

Ice Jam

Flooding in Rensselaer County may be caused by an ice jam. An ice jam is a blockage in a river or other body of water that occurs when floating ice accumulates and gets stuck at a particular point. This can happen when the temperature drops and the water begins to freeze, causing ice to form on the surface. As more and more ice forms and begins to move downstream, it can get stuck at a bend in the river, at a bridge, or against other obstacles. This can cause the water to back up behind the ice, leading to flooding and other problems. Ice jams can be dangerous and difficult to predict, so it is important to stay informed and take precautions if you live in an area that is prone to them.

Dam Failure

Rensselaer County is also potentially subject to flooding in the event of a dam failure. Dams are structures built to store, divert, or control water. They create reservoirs upstream and help provide essential services such as drinking water, flood protection, hydroelectric power, navigation, irrigation, and recreational activities. However, a dam failure can cause significant damage to the environment, resulting in economic disasters and loss of life. Dam failure is the breakdown, collapse, or other failure of a dam structure characterized by the uncontrolled release of impounded water that results in downstream flooding. Dam failure can result from natural events, human-induced events, or a combination of the two. Failure may be a cascading impact of other hazards, such as hurricanes, earthquakes, or landslides. These types of failures are particularly significant because there is little or no advance warning. Human-induced actions may include the deterioration of the foundation or the materials used in dam construction. In recent years, dams have also received considerably more attention in the emergency management community as potential targets for terrorist acts as well.

Dam failure can be categorized in terms of risk. There is inherent risk associated with the operation and failure of significant infrastructure like dams. According to the Rehabilitation of High Hazard Potential Dams grant program, all dam risk can include:

- **Incremental Risk** – The risk (likelihood and consequences) to the pool area and downstream floodplain occupants that can be attributed to the presence of the dam should the dam breach prior or subsequent to overtopping, or undergo component malfunction, where the consequences considered are over and above those that would occur without dam breach. The consequences typically are due to downstream inundation, but loss of the pool can result in significant consequences in the pool area upstream of the dam.

- **Non-Breach Risk** – The risk in the reservoir pool area and affected downstream floodplain due to normal dam operation of the dam (e.g., large spillway flows within the design capacity that exceed channel capacity) or overtopping of the dam without breaching scenarios.
- **Residual Risk** – The risk that remains after all mitigation actions and risk reduction actions have been completed. With respect to dams, FEMA defines residual risk as “risk remaining at any time). It is the risk that remains after decisions related to a specific dam safety issue are made and prudent actions have been taken to address the risk. It is the remote risk associated with a condition that was judged to not be a credible dam safety issue.⁸⁶

High hazard potential dams in Rensselaer County are a cause for concern because they pose a potential risk to the surrounding areas in the event of a dam failure. They are classified as such based on the potential for loss of life and property damage in the event of a failure.

Rensselaer County, located in the eastern part of New York State, is home to several high-hazard dams. The local authorities and the New York State Department of Environmental Conservation closely monitor these dams to ensure their safety and structural integrity. Consistent efforts are made to maintain and improve these dams to mitigate their risk. Emergency action plans outline the necessary steps to be taken in the event of a dam failure, and regular inspections are conducted to identify and address any potential issues.

Dam owners are generally responsible for the inspection and maintenance of their dams. However, the New York State Department of Environmental Conservation (DEC) has the authority to inspect dams to ensure public safety. DEC can also mandate owners to repair or remove dams that pose a threat of personal injury or significant property or natural resource damage. DEC's goal is to inspect high-hazard dams every two years and intermediate-hazard dams every four years. DEC dam safety regulations do not bind some state-owned dams, but DEC still inspects and monitors their safety programs as if they were subject to DEC regulation.⁸⁷

The following table provides information on high-hazard dams in Rensselaer County.

Table 42: Rensselaer County High-Hazard Dams⁸⁸

Name	EAP in Place?	Owner	Primary Purpose	Height in Feet	Year Completed	Last Inspection
Tomhannock Reservoir Dam	Yes	City of Troy	Water Supply	45	1905	01/05/2021

⁸⁶ FEMA (2020). Rehabilitation of High Hazard Potential Dam Grant Program Guidance June 2020. Rehabilitation of High Hazard Potential Dams. https://www.fema.gov/sites/default/files/2020-08/fema_hhpd_grant-guidance.pdf.

⁸⁷ Office of the New York Controller. “Dam Infrastructure: Understanding and Managing the Risks.” <https://www.osc.ny.gov/files/local-government/publications/pdf/dam-infrastucture-2018.pdf>

⁸⁸ National Inventory of Dams, “Rensselaer County.” <https://nid.sec.usace.army.mil/#/dams/search/sy=@countyState:Rensselaer,%20New%20York>

Name	EAP in Place?	Owner	Primary Purpose	Height in Feet	Year Completed	Last Inspection
Martin Dunham Reservoir Dam	Yes	NYS Parks, Recreation & Historic Preservation	Recreation	59	1913	01/03/2020
Bradley Lake Dam	Yes	City of Troy	Recreation	50	1859	01/05/2021
Wright Lake Dam	Yes	City of Troy	Recreation	46	1861	01/05/2021
Black River Pond Dam	Yes	NYS Parks, Recreation & Historic Preservation	Recreation	42	1935	03/04/2021
Quackenderry Creek Dam	Yes	City of Rensselaer	Flood Risk Reduction	17	2002	01/03/2020
Mill Pond Dam	Yes	NYS Parks, Recreation & Historic Preservation	Recreation	12	1918	01/03/2020
Second Pond Dam	Yes	NYS Parks, Recreation & Historic Preservation	Recreation	9	1975	01/03/2020
Long Pond Dam	Yes	NYS Parks, Recreation & Historic Preservation	Recreation	9	1918	01/03/2020

DEC oversees dam safety and regulation in the state. It classifies dams into four categories based on their potential hazards, as shown in Table 43. Table 44 provides a summary of Rensselaer County dams by hazard ranking.

Table 43: NYSDEC Downstream Hazard Classification System for Dams

NYSDEC Classification	Description
Class C	High Hazard Potential. A dam failure may result in widespread or severe damage to home(s); damage to main highways, industrial or commercial buildings, railroads, and/or essential utilities, including water supply, sewage treatment, fuel, power, cable or telephone infrastructure; or substantial environmental damage; such that the loss of human life or widespread substantial economic loss is likely.

NYSDEC Classification	Description
Class B	Intermediate Hazard Potential. A dam failure may result in damage to isolated homes, main highways, and minor railroads; may result in the interruption of essential utilities, including water supply, sewage treatment, fuel, power, cable, or telephone infrastructure; and/or is otherwise likely to pose the threat of personal injury and/or substantial economic loss or substantial environmental damage. Loss of human life is not expected.
Class A	Low Hazard Potential. A dam failure is unlikely to result in damage to anything more than isolated or unoccupied buildings, undeveloped lands, or minor roads such as town or county roads; it is unlikely to result in the interruption of essential utilities, including water supply, sewage treatment, fuel, power, cable or telephone infrastructure; and/or is otherwise unlikely to pose the threat of personal injury, substantial economic loss or substantial environmental damage.
Class D	Negligible or No Hazard. A dam that has been breached or removed, failed, or otherwise no longer materially impounds waters or a dam that was planned but never constructed. Class "D" dams are defunct dams posing negligible or no hazard. The department may retain pertinent records regarding such dams.

Table 44: NYSDEC Inventory of All Dams in Rensselaer County

NYSDEC Classification	Hazard Ranking	Number of Dams	Number with EAP Required	Number with EAP On File	Number with GIS Inundation Mapping Required	Number with GIS Inundation Mapping
C	High	10	10	10	10	0
B	Intermediate	13	13	7	0	0
A	Low	49	0	2	0	0
D	Negligible or No Hazard	24	0	0	0	0
Unassigned	Unassigned	1	0	0	0	0
Total		97	23	19	10	0

There are four locks on the Hudson River that are classified as dams. These locks span the river's width between Saratoga County to the west and Rensselaer County to the east. The NYSDEC Saratoga County inventory includes these locks. However, since the locks span the river between Rensselaer and Saratoga Counties, it is assumed that the breach or failure of these structures could impact both sides of the river. Therefore, all the locks have been identified here. The locks are Lock 3 in Mechanicville (C-high hazard), Lock 2 in Mechanicville (A-low hazard), Lock 1 in Waterford (A-low hazard), and the Federal Lock in Troy (B-moderate hazard). Lock 4 (A-low hazard) lies upstream of the county's northern boundary in Stillwater.

The NYS Canal Corporation owns and operates Locks 1 through 4, and the U.S. Army Corps of Engineers owns and operates the Federal Lock.

Table 20 presents details for all dams affecting Rensselaer County classified as of high or moderate hazard by the NYSDEC. The location of all high and moderate-hazard dams recorded in the NYSDEC inventory of dams is presented in Table 45 and Table 46.

Rensselaer County is also responsible for working with local dam owners and collecting EAPs. For this plan update, local dam owners were invited to attend meetings, contribute to a stakeholder survey, and participate in the plan review. Information shared includes the EAPs, which include an inundation map and stakeholder contact information. One concern related to dams was identified by the stakeholders regarding the debris dams along the Hoosick River, with a recommendation to remove the current concrete walls along the embankment to allow for greater dissipation over the floodplain. The Rensselaer County Planning Department also highlighted the Village of Castleton on Hudson (Dunham Reservoir), Village of Nassau (Nassau Lake), Town of Poestenkill (Dyken Pond), and Village of Valley Falls (Johnsonville Dam) as downstream communities potentially impacted by dams.

Table 45: All High Hazard Dams in Rensselaer County

Dam Name	River/Stream	Owner Type	Purpose	Location	Nearest Downstream Municipality	Year Built	EAP Status	Max Storage	Last Condition Rating
Black River Pond Dam	Black River	State	Recreation	Town of Berlin	Town of Stephentown	1935	On File	1,710	Unsound - Fair
Bradley Lake Dam	Piscawan Kill	Local Government	Recreation	City of Troy	City of Troy	1859	On File	215	Unsound - Fair
Johnsonville Dam	Hoosic River	Private	Hydroelectric	Town of Pittstown	Town of Pittstown, Town of Schaghticoke	1910	On File	6,430	Not Rated
Long Pond Dam	Tributary – Quacken Kill	State	Recreation	Town of Grafton	Town of Grafton	1918	On File	1,702	Not Rated
Martin Dunham Reservoir Dam	Quacken Kill	State	Recreation	Town of Grafton	Town of Grafton	1913	On File	4,500	Not Rated
Mill Pond Dam	Tributary – Quacken Kill	State	Recreation	Town of Grafton	Town of Grafton	1918	On File	173	Not Rated
Quackenderry Creek Dam	Quackenderry Creek	Local Government	Flood Control and Storm Water Management	City of Rensselaer	City of Rensselaer	2002	On File	61.5	No Deficiencies Noted
Second Pond Dam	Tributary – Quacken Kill	State	Recreation	Town of Grafton	Town of Grafton	1975	On File	415	Not Rated

Dam Name	River/Stream	Owner Type	Purpose	Location	Nearest Downstream Municipality	Year Built	EAP Status	Max Storage	Last Condition Rating
Tomhannock Reservoir Dam	Tomhannock Creek	Local Government	Water Supply - Primary	Town of Schaghticoke, Town of Pittstown	Town of Schaghticoke; Town of Pittstown	1905	On File	56,600	No Deficiencies Noted
Wright Lake Dam	Piscawan Kill	Local Government	Recreation	City of Troy	City of Troy	1861	On File	129	Unsound - Fair
NYS Canal Lock C-3	Hudson River	NYS Canal Corporation	Hydroelectric, Navigation	City of Mechanicville	City of Mechanicville, Town of Halfmoon, Town of Schaghticoke	1965	On File	8,785	Not Rated

Table 46: Intermediate Hazard Dams in Rensselaer County

Dam Name	River/Stream	Owner Type	Purpose	Location	Nearest Downstream Municipality	Year Built	EAP Status	Max Storage	Last Condition Rating
Burden Lake Dam	Tributary – Wynantskill	Private	Recreation	Town of Sand Lake	Town of Sand Lake	1916	None	7,600	Unsound - More Analysis Needed
Dyken Pond Dam	Poestenkill	Local Government	Recreation	Town of Berlin	Town of Berlin	1914	None	3,273	Unsound - More Analysis Needed

Dam Name	River/Stream	Owner Type	Purpose	Location	Nearest Downstream Municipality	Year Built	EAP Status	Max Storage	Last Condition Rating
Faith Mills Lower Dam	Wynants Kill	Private	Hydroelectric, Irrigation	Town of Sand Lake	Town of Sand Lake	1930	None	26	Not Rated
Glass Lake Dam	Wynants Kill	Private	Recreation	Town of Sand Lake	Town of Sand Lake	1916	On File	3,630	Not Rated
Hastings Power Dam	Wynants Kill	Private	Hydroelectric, Irrigation	Town of Sand Lake	North Greenbush	1920	None	22	Not Rated
Hoosic School Dam	Pine Valley Brook	Private	Recreation	Town of Hoosick	Village of Hoosick Falls	1950	On File	103	Not Rated
James Thompson Dam (Hoosic River Dam)	Hoosic River	Private	Hydroelectric	Town of Schaghticoke, Village of Valley Falls	Village of Valley Falls	1927	On File	320	Not Rated
Kane Dam	Wynants Kill	Private	Recreation	Town of Sand Lake	Town of Sand Lake	1923	None	50	Not Rated
Nassau Lake Dam	Valatie Kill	Private	Recreation	Towns of Schodack and Nassau	Village of Nassau	1792	On File	550	Not Rated
Rail Joint Mill Dam (Portec Dam)	Wynants Kill	Local Government	Irrigation	City of Troy	City of Troy	1903	None	10	Unsound - More Analysis Needed
Schaghticoke Dam	Hoosic River	Private	Hydroelectric	Town of Schaghticoke	Town of Schaghticoke	1909	On File	1,150	Not Rated
Troy Lock & Dam #1	Hudson River	Public Utility	Hydroelectric, Navigation	City of Troy	City of Troy	1914	On File	8,200	Not Rated

Dam Name	River/Stream	Owner Type	Purpose	Location	Nearest Downstream Municipality	Year Built	EAP Status	Max Storage	Last Condition Rating
Van Derheyden Reservoir Dam (Troy Reservoir Dam)	Piscawan Kill	Local Government	Recreation, Water Supply - Secondary	Town of Brunswick	City of Troy	1868	On File	79	Unsound – Deficiency Recognized

DRAFT

Location

Flooding is the primary natural hazard in Rensselaer County. While Rensselaer County and its jurisdictions experience several types of flooding, the vast majority of flooding in the county is riverine flooding and shallow flooding resulting from urban drainage issues. Ice jam flooding occurs occasionally and, because the Hudson River is tidal up to the federal dam at Troy, significant hurricanes can exacerbate riverine flooding on the Hudson River and its tributaries as a result of storm surge being pushed upstream. It is estimated that approximately 6% of lands within Rensselaer County are located in the FEMA 100-year floodplain.

Figure 84 illustrates the location of currently mapped special flood hazard areas for Rensselaer County. This figure is reflective of 2016 DFIRMs for six Rensselaer County communities (Town of Hoosick, Village of Hoosick Falls, Town of Pittstown, Town of Schaghticoke, Village of Schaghticoke, and the Village of Valley Falls) that were released in January 2016; and FEMA Q3 Flood Data (1996) for the balance of communities for which the Q3 still represents best readily available data. This includes Zones A/AE/AO (100-year floodplain), Zone X500 (500-year floodplain), and Zone X (areas higher than the elevation of the 500-year flood). There are no mapped areas of Zone V (100-year floodplain with wave action). Community land area in the 100-year floodplain is presented in Table 47. It is important to note that while FEMA digital flood data is recognized as best available data for planning purposes, it does not always reflect the most accurate and up-to-date flood risk. Flooding and flood-related losses often do occur outside of delineated special flood hazard areas—particularly in areas that were not included in detailed study areas or where significant development has occurred in the watershed since the last detailed studies were undertaken.

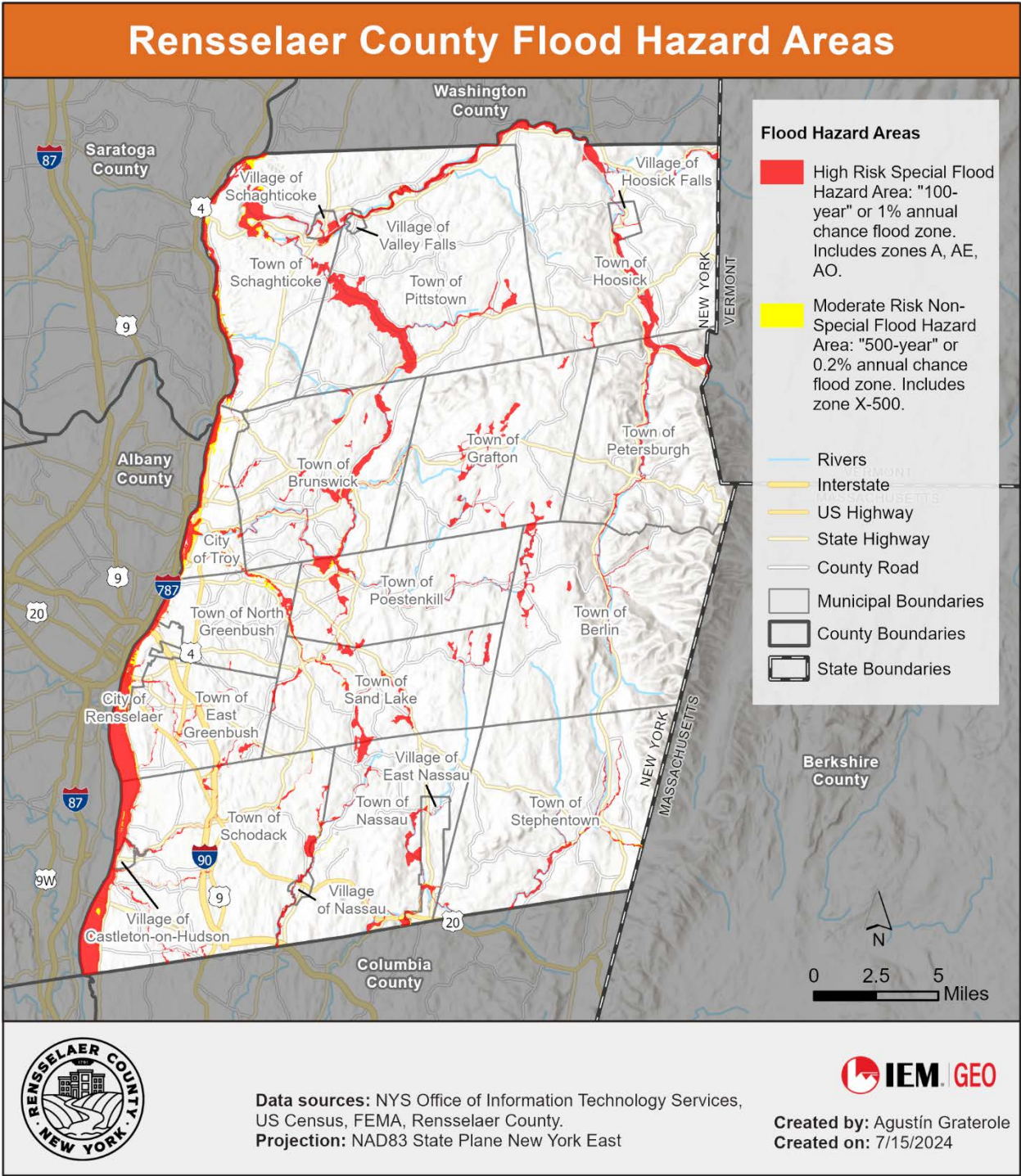


Figure 84: 2016 DFIRM Currently Mapped Special Flood Hazard Areas for Rensselaer County

Table 47: Land in the 100-Year Floodplain

Municipality	Land Area of Municipality (Acres)	Land in the 100-Year Floodplain (Acres)	Percent of Land in the 100-Year Floodplain (%)
Berlin, Town of	38,227	1,377	3.6
Brunswick, Town of	28,284	3,276	11.6
Castleton-on-Hudson, Village of	531	250	47.1
East Greenbush, Town of	15,672	3,278	20.9
East Nassau, Village of	3,029	415	13.7
Grafton, Town of	29,711	1,793	6.0
Hoosick Falls, Village of	950	163	17.2
Hoosick, Town of	39,361	3,387	8.6
Nassau, Town of	25,558	1,873	7.3
Nassau, Village of	442	91	20.6
North Greenbush, Town of	12,079	884	7.3
Petersburgh, Town of	26,683	1,750	6.6
Pittstown, Town of	41,256	5,056	12.3
Poestenkill, Town of	20,727	1,836	8.9
Rensselaer, City of	2,191	1,368	62.4
Sand Lake, Town of	23,088	2,410	10.4
Schaghticoke, Town of	32,545	5,263	16.2
Schaghticoke, Village of	640	377	58.9
Schodack, Town of	40,217	6,623	16.5
Stephentown, Town of	37,263	1,242	3.3
Troy, City of	7,066	1,936	27.4
Valley Falls, Village of	308	42	13.6
Total:	425,825	44,690	3.6

ICE JAMS

Ice jams have a history of occurrence on the following watercourses in Rensselaer County: (listed in order of the number of past events) Hoosic River, Poestenkill, Moordener Kill, Little Hoosick River, and the Hudson River. Ice jam hazard area mapping does not exist at this time to incorporate into this plan.

Ice jams can occur in any body of water that experiences freezing temperatures, such as rivers, lakes, and streams. They are most common in areas with cold climates with significant ice and snow accumulation during winter. Ice jams can also occur in areas where there is a rapid thaw after a period of heavy snow or ice buildup.

DAM FAILURES

Dam failures can occur in various locations, but some areas are more susceptible. One of the primary factors contributing to dam failure is the dam's geological setting. Dams built on unstable or weak geological formations, such as soft rock, alluvial soil, or loose sediment, are likelier to fail than those built on stable bedrock.

The dam's location with respect to fault zones and seismic activity is also critical. Dams near active faults or earthquake-prone areas are vulnerable to damage or failure due to ground shaking. Climate also plays a role—dams located in areas with heavy rainfall or snowmelt are at a higher risk of failure due to flooding and overtopping.

The location of dam failures is influenced by multiple factors, including geological settings, proximity to fault zones, seismic activity, climate, and human factors. The location of the dams, in particular the high hazard dams, are noted as places where dam failure may occur in or near Rensselaer County.

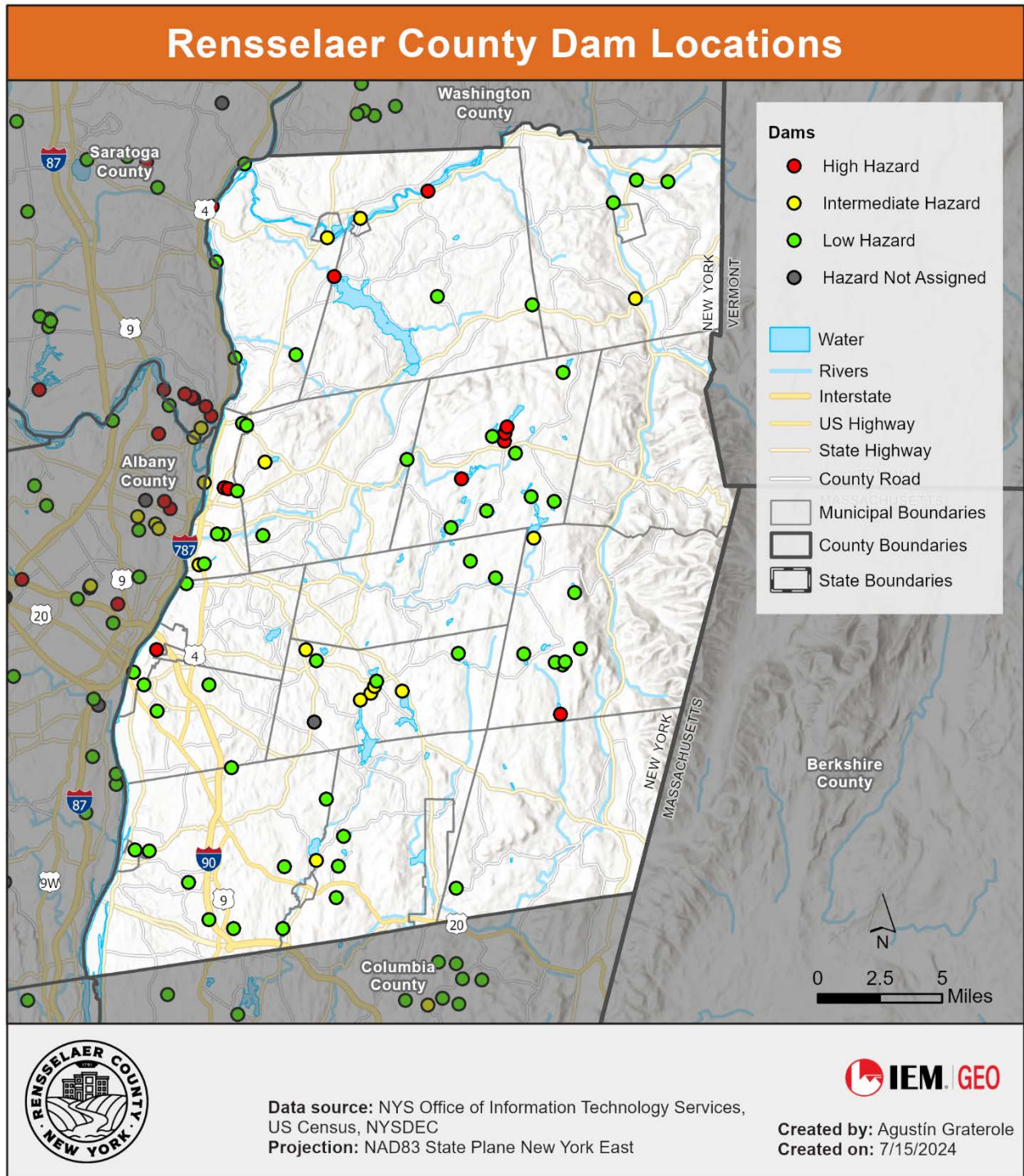


Figure 85: Rensselaer County Dams

Extent

The National Weather Service (NWS) categorizes the extent (magnitude or severity) of riverine and flash flooding in which a river has reached the flood stage as minor, moderate, and major. The categories are based on property damage and public threat and are as follows:

- **Minor flooding** – Minimal or no property damage but possibly some public threat or inconvenience.
- **Moderate flooding** – Some inundation of structures and roads near streams; some evacuations of people and/or transfer of property to higher elevations.
- **Major flooding** – Extensive inundation of structures and roads; significant evacuations of people and/or transfer of property to higher elevations.

The severity of a flood depends not only on the amount of water that accumulates within a certain period but also on the management of the water. The size of rivers and streams is important, and the capacity of land to absorb water is equally as important. Soil acts as a sponge when it rains. When the land is saturated or frozen, infiltration into the ground slows, and water that does not infiltrate flows as runoff.

The extent of flooding associated with a 1% annual probability of occurrence (the base flood or 100-year flood) is the standard regulatory boundary for many organizations. Also referred to as the special flood hazard area (SFHA), this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities. Many communities have maps that show the extent and likely depth of flooding for the base flood. In order to mitigate risk to new and existing structures, it is important to understand for floodplain management and community development, corresponding water-surface elevations, as they describe the elevation of water that will result from a given discharge level. The most recent FEMA Flood Insurance Study conducted in 2005 indicated floodway data for the Hoosick River and evaluated base flood water-surface elevation levels using six cross sections, with four indicating between 0.2 and 0.4 feet increase in levels. The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point.⁸⁹

ICE JAMS

The magnitude or severity of riverine ice jam flooding can be affected by the amount of snowpack in the watershed, rate of snowmelt, water level at freeze-up, characteristics of both the ice itself as well as the channel, and local weather conditions. Ice jams can have various characteristics, depending on the ice present, the water flow rate, and weather conditions. Some common characteristics of ice jams which impact their severity include:

⁸⁹ FEMA. Flood Map Service Center. 2024.

<https://map1.msc.fema.gov/data/36/S/PDF/360674V000A.pdf?LOC=13f2d307c12134a76bb52921268725bf>.

- **Blockage:** Ice jams occur when large chunks of ice get stuck in a river or stream, causing a blockage. This blockage can cause water to back up and flood the surrounding areas.
- **Pressure:** As water flows downstream, it can push against the ice jam, creating pressure. This pressure can cause the ice to break apart or shift, worsening the blockage and increasing the risk of flooding.
- **Height:** The height of an ice jam can vary depending on the amount of ice present and the water flow rate. Sometimes, ice jams can be several feet high, increasing the risk of flooding.
- **Location:** Ice jams can occur in different parts of a river or stream, such as near bends or constrictions. The location of an ice jam can affect the severity of its impact on the surrounding areas.

DAM FAILURE

Two factors that influence the potential severity of a full or partial dam failure are the amount of water that is impounded and the density, type, and value of downstream development and infrastructure. Predicting the likelihood of dam failures is difficult, but the National Dam Safety Program (NDPS) produces hazard rankings based on potential impact. Flood severity from a dam failure is measured as low, medium, or high as follows:

- **Low severity** – No buildings are washed off their foundations; structures are exposed to depths of less than 10 feet.
- **Medium severity** – Homes are destroyed but trees or mangled homes remain for people to seek refuge in or on; structures are exposed to depths of more than 10 feet.
- **High severity** – Floodwaters sweep the area clean and nothing remains. Locations are flooded by the near instantaneous failure of a concrete dam or an earthfill dam that washes out in seconds rather than minutes or hours. The extent of damage and impact caused by a dam failure downstream can vary depending on multiple factors, such as the dam's size, the amount of water stored behind it, and the area's topography. In some cases, a dam failure can lead to catastrophic floods affecting the communities downstream of the dam. The floodwaters can cause significant damage to infrastructure, including roads, bridges, buildings, and other structures, resulting in loss of life, displacement of people, and long-term economic and environmental damage. Economically, the loss of property and infrastructure can devastate a community, with potential damages in the millions or even billions of dollars. Additionally, disruption in water supply and irrigation systems can significantly impact local agriculture and industry. Environmentally, the sudden release of large amounts of water can cause significant damage to ecosystems downstream of the dam. This can include habitat destruction and the displacement or death of wildlife. The increased sedimentation and erosion can also affect water quality and aquatic life in the long term.

Previous Occurrences

NOAA's NCEI Storm Events Database records 102 flooding⁹⁰ episodes in Rensselaer County between 1996 and 2024 causing over \$16.45 million in property damage, \$40,000 in crop damage, and two injuries. Details of damages for these events are summarized by event type in Table 48.

Table 48: Flooding Episodes Summary, 1996–2024

Event Type	Number of Episodes ⁹¹	Reported Fatalities	Reported Injuries	Reported Property Damage	Reported Crop Damage
Flood	42	0	2	\$6,651,000	\$0
Flash Flood	60	0	0	\$9,802,000	\$40,000
Total		0	2	\$16,453,000	\$40,000

1920S–1930S DAM FAILURES

The Woods Brook Dam failure in the 1920s caused damage and flooding in the Village of Hoosick Falls, and the failure of another dam on the Quackenkill river, which caused damage in Brunswick in the 1930s. The U.S. Army Corps of Engineers completed a project to remove a dam and construct floodwalls in the Village of Hoosick Falls in 1952.

DATES UNKNOWN

Flooding due to ice jams caused damage to residential properties on the Tackawasick and South Kinderhook Creeks in the Town of Nassau, City of Rensselaer on the Hudson River, and Town of Schaghticoke in the Johnsonville area.

The FEMA website (www.fema.gov/disasters) documents Rensselaer County has received eight Major Disaster Declarations and one Emergency Declarations due to flooding disasters between the years of 1996 and 2018, as detailed in Table 49. None of these are related to dam failure or ice jams. Almost half (4 out of 9, or roughly 44%) of the declarations are related to impacts from tropical systems (hurricanes and tropical storms). Two Major Disaster Declarations and one Emergency Declaration have been declared by FEMA since the initial hazard mitigation plan was completed in 2011.

⁹⁰ Database query included the following event types: flood, flash flood, and lakeshore flood. The output included only records of flood and flash flood. This section does not tally episodes from flooding during hurricane/tropical storm events. Please refer to the Hurricane/Tropical Storm section for discrete information regarding that hazard.

⁹¹ Note: Six episode dates had both flood and flash flood event types.

Table 49: FEMA Flood Disasters for Rensselaer County, 1996–2012

Disaster/ Emergency Number	Declaration Type	Event	Incident Period	Eligible Assistance for Rensselaer County ⁹²
DR-1095	Major Disaster Declaration	Flooding	01/19/1996– 01/30/1996	IA and PA
DR-1296	Major Disaster Declaration	Tropical Storm Floyd	09/15/1999– 09/18/1999	IA
DR-1335	Major Disaster Declaration	Severe Storms/Flooding	05/03/2000– 9/14/2000)	PA
DR-1486	Major Disaster Declaration	Summer Storms	07/21/2003– 08/11/2003	IA
DR-1589	Major Disaster Declaration	Severe Rains/Floods	04/02/2005– 04/04/2005	IA and PA
DR-1650	Major Disaster Declaration	Severe Storms/Flooding	01/19/2006– 01/30/2006	IA and PA
DR-4020	Major Disaster Declaration	Hurricane Irene	08/26/2011– 09/05/2011	IA
EM-3341	Emergency Declaration	Tropical Storm Lee	09/07/2011– 09/11/2011	PA (Category B- Emergency Protective Measures)
DR-4322	Major Disaster Declaration	Hurricane Sandy	10/27/2012– 11/8/2012	PA (Category B- Emergency Protective Measures)

Details from a sampling of some more notable flood events in Rensselaer County since 1996 are provided below:

- January 19, 1996** – An intense area of low pressure located over the Mid-Atlantic region on the morning of January 19 produced unseasonably warm temperatures, high dew points, and strong winds. This resulted in rapid melting of one to three feet of snow. In addition to the rapid snowmelt, one to three inches of rain fell as the system moved northeast along the coast. This resulted in widespread flooding across Rensselaer County. Small streams flooded across the entire county, resulting in several road washouts. Extensive flooding also occurred along the Hudson and Hoosic

⁹² Through the Public Assistance (PA) Program, FEMA provides supplemental Federal disaster grant assistance for debris removal, Emergency Declaration protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The Individual Assistance Program (IA) provides money or direct assistance to individuals, families and businesses in an area whose property has been damaged or destroyed and whose losses are not covered by insurance. It is meant to assist with critical expenses that cannot be covered in other ways, rather than to restore damaged property to its condition before the disaster.

Rivers. The hardest hit areas within the county were East Greenbush and the Cities of Troy and Rensselaer. In the City of Troy extensive damage occurred along the Hudson River, where fifteen businesses flooded. Some of the businesses included Troy Brew Pub, Castaway Grille, City Hall, Taylor Apartments, and a submerged mobile home park in Lansingburgh. Severe damage also occurred to the city marina and Riverfront Park. At Leonard Hospital located in Lansingburgh, 50 patients were evacuated due to basement flooding. In Castleton several residents were evacuated and route 9J near Castleton was closed due to flooding. This event resulted in Federal Disaster Declaration DR-1095. The NCEI Database records \$6 million in damages in Rensselaer County as a result of this event.



Figure 86: 1996 Flood Event- City of Troy

- **January 1996** – In January 1996, eastern New York experienced a flood due to warm temperatures, heavy rains, and rapid snowmelt that caused ice jams along the Mohawk River. Two ice dams formed and broke at different times, causing damage to trees and structures along the river edge. The highest ice scar elevations occurred between Lock 8 and the Stockade in Schenectady, where two possible jam points were identified. The first sharp elevation increase occurred between the Freemans Bridge and

the D&H railroad bridge, while the second sharp elevation drop occurred upstream of the old Burr Bridge. The ice dam at the old Burr Bridge broke shortly before the flood crest. Both jam points occurred where human activity restricted the flood plain, causing a severe restriction in flow.

- February 22, 1996** – Ice Jam Flooding: The NWS reported an ice jam on the Poestenkill in Poestenkill, New York, flooded Plank Road. Two more ice jams were reported on the creek between Fifty-Six Road and Cropsey Road in Poestenkill. Plank Road (Route 40) was closed from Barbersville to the hamlet of East Poestenkill due to several washed-out sections. Twenty-five families were also evacuated along Plank Road as several homes were flooded. By February 24, the jams were decreasing in size and water receded to within its banks.
- June 8, 1996** – A stationary front that extended across eastern New York on June 9 produced isolated severe thunderstorms and flooding. In northern Rensselaer County, training showers and thunderstorms resulted in flash flooding when approximately 6 inches of rain fell during the late afternoon. Dirt roads were washed out in Pittstown, Raymertown and Boyntonville. Homes were evacuated and flooded in Pittstown and Boyntonville. Around 20 families were evacuated at Pittstown in the County Acres Trailer Park. Three hundred thousand dollars in damages is recorded for this event in the NCEI database.



Figure 87: 1996 Flood Event -Road Washed Away in Rensselaer County

- January 8, 1998** – From January 8 to January 12, the Hudson River flooded from its headwaters to where it crosses into Greene and Columbia Counties, due to a combination of significant rain and snowmelt. In Rensselaer County, flooding occurred along Riverfront Park behind City Hall and in low lying areas especially in Lansingburgh. Approximately 34 homes in the City of Troy sustained flood damage. Several roads were flooded elsewhere in the county. The Hoosic River in northern Rensselaer also flooded, due to a combination of significant rain and snowmelt. The river crested approximately one foot over flood stage at Eagle Bridge during the morning of January 9. Flooding occurred along State Highways 7 and 22 in Rensselaer County. County Highway 103 was also flooded from Route 67 to the covered bridge. The Hoosic River spilled into the Buskirk Fire House and Circuit Materials Plant. A total of \$815,000 in damages is included in the NCEI record for this event.

- **January 19, 1999** – Ice Jam Flooding: An ice jam occurred on the Hoosick River at Buskirk. As a result of this ice jam, and also rain and snowmelt, water overflowed onto Route 103 and River Road near the Buskirk covered bridge. Ice extended from Buskirk most of the way to Eagle Bridge and was clogging parts of the river. The flood waters affected some low lying homes in the area and there was minor flooding along River Road and Route 103 near Buskirk.



Figure 88: 1999 Ice Jam Event – Hoosick River

- **September 16, 1999** – Tropical Storm Floyd: Declared Disaster DR-1296. The storm brought both high winds and exceptionally heavy rainfall to eastern New York, which included 6.12 inches at nearby Albany Airport. Widespread flooding was reported across the region. Total damages for this event as recorded in the NCEI storm events database are \$1,500,000.
- **July 15–16, 2000** – This event occurred during a pattern of severe weather in the summer of 2000, resulting in Federal Disaster Declaration DR-1335. Severe storms caused flooding throughout the county. A state of emergency was declared in the City of Rensselaer. The worst hit area in the city was The Hollow, where many places were flooded. A man had to be evacuated by boat from his house. The city's pumping equipment was damaged. Rapid movement of water uprooted trees and severe flood damage resulted in the loss of power, natural gas, and water to many streets in Rensselaer. Roads also flooded in Schodack and were closed in Nassau. Six roads were impassable in East Greenbush and several homes were endangered by rising water. The Village of Castleton noted street and sidewalk washouts throughout the village, mostly in hilly areas. Damages of \$235,000 are recorded in the NCEI database for this event in Rensselaer County.
- **February 13, 2003** – Ice Jam Flooding: An ice jam obstructed the flow of water in the Hoosick River, causing the water to back up behind the jam and overflow the banks of the river near the Buskirk Bridge. The water flowed through a cornfield and affected several buildings. Heavy rain exacerbated this situation. The ice jam resulted in flooding on County Route 103.
- **October 9, 2005** – Moderate flooding occurred along the Hoosick River at Eagle Bridge. Roads were reported to be flooded at Buskirk, and several evacuations were made. There were two fatalities at

Hoosick Falls. A 6-year-old boy accidentally fell into the river and drowned. A 39-year-old man drowned while trying to save him.



Figure 89: 2005 Flood Event-Hoosick River at Buskirk Bridge

- August 11, 2008** – Very heavy rainfall from strong thunderstorms led to significant urban and small stream flash flooding in and near the City of Rensselaer. This was due to a microburst, and approximately three inches of rain fell in a relatively short period of time in Rensselaer County. A state of emergency was declared in the City of Rensselaer as numerous roads were closed, with six or more feet of standing water reported on city streets. Evacuations of 50 to 75 homes occurred due to the flooding. Flooding was mainly concentrated along and near the banks of Quackenderry Creek, as well as near Mill Creek. The Amtrak Station in Rensselaer was also closed due to the flooding. Flash flooding also closed Routes 9 and 20, a portion of Route 151, and Luther Road, in East Greenbush. The NCEI database records \$4M in damages in Rensselaer County from this event.
- July 29, 2009** – Significant flash flooding occurred in central and southern Rensselaer County Wednesday afternoon and evening, as a result of training thunderstorms that produced excessive rainfall and caused Kinderhook Creek to overflow its banks. Numerous roadways and bridges were

closed, some of which were washed out. The hardest hit areas included, but were not limited to, Nassau, Stephentown, Schodack, and Sand Lake. In Nassau, a state of emergency was declared, and State Route 43 between Pikes Pond Road and Reno Road was closed due to flooding. In Stephentown, the bridge at State Route 22 and Provost Road was deemed unsafe, resulting in the closure of a portion of Route 22. In addition, flooding closed a portion of South Stephentown Road between Garfield Road and Andrews Lane. In Sand Lake, Bauer Road was closed due to a bridge washout. In Schodack, Clove Road off State Route 43 was closed due to flooding. Roads were flooded on Route 22 in Stephentown.



Figure 90: Flooding on Route 22 in Stephentown, July 2009

- **August 11, 2011** – Tropical Storm Irene brought heavy to extreme rainfall and widespread flash flooding and river flooding across eastern New York. Portions of Route 43 in West Sand Lake were reported closed due to flooding, including between Geiser Road and Mammouth Spring Road, and between Route 150 and Route 351. Route 9J in Castleton-on-Hudson was closed due to flooding between Knickerbocker Road and Brickyard Road. Route 2 was closed across Rensselaer County due to numerous reports of flooding and some wash outs. The Poestenkill and Quacken Kill run along and cross Route 2. In Troy, a mudslide occurred on Route 2 (Brunswick Road) at Route 66 (Pawling Avenue) causing a house to collapse, two other houses to be knocked from their foundations by about 8 feet, and the destruction of an automobile shop. A home was destroyed in Poestenkill on Franklin Street by flood waters from the Poestenkill. Route 7 across Rensselaer County was closed due to numerous reports of flooding. Major flooding occurred on the Hoosic River. Route 103 in Buskirk was reported flooded approximately one mile south of Route 67. Route 136, Whiteview Road, in Wynantskill was closed at Brookside Avenue due to flooding. Route 22 in Petersburg was closed due to flooding and a washout between Smith Road and Church Hollow Road. Portions of Route 20 were reported closed due to flooding, including Route 9 in the Town of Schodack, and between Lords Hill Road and Coldwater Tavern Road in Nassau. Wynantskill Creek was reported flowing out of its banks

with water on Thais Road at the intersection of Springer Road. Route 66 in Wynantskill was reported closed due to flooding.

- June 25, 2014** – Heavy rain led to flash flooding on North Street in Valley Falls. Rapid runoff led to the erosion of the ground beneath a 100 year old, two-apartment house. The home's owner estimated that about 300 cubic yards of land was lost beneath the home in about a five minute period. Although the home's foundation remained intact, a small porch lost all the ground underneath it. Ten thousand dollars in damages are identified in the NCEI event record.
- July 1, 2017** – A creek flooded over Cooksboro Road in Raymertown. One lane of Route 7 was washed out in two places between the Hoosic River and Potter Hill. The shoulder was washed out in places as well. This resulted in a 20-mile road closure from Brunswick to the Vermont state line. Portions of County Routes 95 and 103 were also closed in the Town of Hoosick. Tamarac Road was closed with water running over the road. Severe flooding occurred in the Village of Hoosick Falls as heavy rain resulted in a partial collapse of the culvert (Woods Brook flood protection system). A nearby rain gauge reported 1.63 inches of rain in an hour, and an additional 1.23 inches in the next two hours. The brook spilled out of its banks and coursed through the village, causing water and debris to rush into yards and residences. Numerous houses reported basement flooding, with a few reporting flooding on the first floor, leading to evacuations. Three sinkholes developed, one the size of two tractor trailers. Several roads remained closed well into the following day, and flood waters washed out a portion of the train tracks that pass through the village. A local state of emergency was declared. The Village of Hoosick Falls was hit particularly hard by flash flooding, with many residences experiencing basement and first-floor flooding and several roads washed out as Woods Brook overwhelmed its flood protection system and coursed through the town. A state of emergency was declared for the village, where an estimated \$300,000 in damage occurred.



Figure 91: 2017 Flood Event-Village of Hoosick Falls



Figure 92: July 14, 2021, Heavy Downpours Damage Roads in Central and Southern Rensselaer County, Including This portion of Taborton Road in the Town of Sand Lake⁹³

- January 25, 2019** – On January 25, 2019, strange weather caused ice jams in the Hudson River between Troy and Albany. At least six unmanned boats were pushed down the river and hit several bridges. The Captain JP Cruise ship, a popular summer party spot, was one of the boats that broke free and hit the Livingston Avenue Bridge, causing some damage. Several bridges were closed due to safety concerns, and rescue crews quickly arrived to stop the boats. This event remains an unforgettable moment in the history of the Capital Region.⁹⁴
- July 14, 2021** – Thunderstorms repeatedly hit the central and southern parts of the county, washing out pavement and raising the levels of creeks and streams. Ground already saturated from weeks of rain could not absorb the downpours, contributing to flash flooding. The storms also caused power outages and customers remained without service in pockets around the area. Throughout the county, several roads remain closed after bridges were washed out during the storm. In Averill Park, the school district has had to rip up floors after parts of the building flooded. The county declared a state of emergency due to flooding and damaged roads.
- February 4, 2022** – It was reported that an ice jam along the Hoosic River near Eagle Bridge caused minor flooding pushing water onto County Route 103 between Route 67 and the covered bridge.

⁹³ Times Union, Kenneth C. Crowe II, Pete DeMola. July 15, 2021. "Major Damage from Heavy Rains in Rensselaer County." [Major damage from heavy rains in Rensselaer County \(timesunion.com\)](https://www.timesunion.com/news/story/major-damage-from-heavy-rains-in-rensselaer-county-2021-07-15/).

⁹⁴ Q105.7. "In 2019, Ice Jams Dislodged Boats on the Hudson River in Albany and Troy." <https://q1057.com/in-2019-ice-jams-dislodged-boats-on-the-hudson-river-in-albany-and-troy/>.

- **January 13, 2023** – Waves of rainfall, which at times were heavy, Thursday evening January 12 into Friday morning January 13, combined with runoff from southern Vermont may have been the cause of a culvert overflowing and collapsing in the town of Hoosick Falls. Route 7 closed between Route 22 and South St. in the town of Hoosick due to the culvert overflowing and collapsing.
- **July 9–11, 2023** – A couple of rounds of showers and thunderstorms resulted in wind damage and flash flooding over parts of eastern New York. One round occurred during the early morning hours, which resulted in some downed trees and wires, as well as some street flooding and washouts, primarily across the mid-Hudson Valley. The second round moved through during the afternoon leading to some flooding and flash flooding across Rensselaer County.
- **July 24, 2023** – Garfield Road/County Route 26 in Stephentown was damaged from flooding after the beaver dam was breached.
- **December 18, 2023** – [Heavy rain caused localized flooding](#) in several communities. The town of Schodack implemented temporary closure of Reno Road. Flooding in Wynantskill caused some roads to close. [The North Greenbush Police Department](#) closed Brookside Avenue between Whiteview Road and Hidley Road Extension and portions of Ridge Road in East Greenbush. Parts of Main Avenue had some standing water. The police reported the Wynantskill had risen above the retaining walls.

Insured Flood Losses and the National Flood Insurance Program

Floods have occurred in Rensselaer County's communities in the past and will continue to do so in the future. Rensselaer County and its component municipalities have generally been impacted by riverine flooding and shallow flooding. A picture of the flooding history of Rensselaer County in terms of damage to private property over the last several decades or so can be derived from the recorded flood losses and payments data under FEMA's National Flood Insurance Program (NFIP).

NFIP was established by Congress with the passage of the National Flood Insurance Reform Act of 1968. Through this program, federally backed flood insurance is made available to homeowners, renters, and businesses in a community if that community adopts and enforces a floodplain management ordinance to reduce future flood damages within its floodplains. This includes not only preventative measures for new development, but also corrective measures for existing development. FEMA also administers the Community Rating System (CRS), a program under which communities choosing to implement floodplain management actions that go beyond the minimum requirements of the NFIP become eligible for discounts on flood insurance premiums for properties within that community. As of the time of this plan update, every individual municipality in Rensselaer County is an active member of the NFIP with the exception of the Village of Valley Falls. No Rensselaer County communities are presently participating in the CRS program (as per April 2024 NFIP Flood Insurance Manual).

All communities in Rensselaer County are susceptible to flooding and have FEMA mapped floodplains. According to the latest FEMA flood insurance records,⁹⁵ there are 536 active flood insurance policies in Rensselaer County. Insurance In Force is more than \$146 million and Premiums In Force are approximately \$1.4 million. There have been 552 flood losses reported through the NFIP since 1972, totaling \$8,196,836 in claims payments and increase of \$197,957 since last plan update and 17 claims. Of the county's 22 municipalities, 21 participate in the NFIP and are in good standing in the program.⁹⁶ The position title of the Floodplain Administrator (the person responsible for ensuring that development activities comply with floodplain management ordinances and NFIP regulations) for each jurisdiction is included in each Jurisdictional Annex.

Under the NFIP's CRS, communities that implement floodplain management actions that go beyond the minimum requirements of the NFIP are eligible to apply for discounts on flood insurance premiums for their policyholders. No Rensselaer County communities are presently participating in the CRS.⁹⁷

This data is presented in Table 50 along with the total number of current policies and key dates associated with the municipalities' participation in the NFIP. All data in Table 50 is current as of December 31, 2024. Actual flood losses are likely to be higher than insured flood losses shown in the table, since this value only includes NFIP payouts and does not include losses incurred by non-policy holders, losses for which a claim was not submitted, losses for which payment on a claim was denied, or other uncovered losses. Last plan update, there were 126 reported policies in force. The number of current policies in force has increased from the prior plan. This may reflect a change in how the data is reported or increased interest in flood insurance following flood events. The largest change was noted in the City of Troy, which contains the majority of the county's NFIP policy holders.

Table 50: NFIP Policies In Effect in Rensselaer County

Community Name	Community Number	Date Entered NFIP	Current Effective FIRM Date ⁹⁸	Policies In Force
Berlin, Town of	360672#	08/17/1979	08/17/1979	3
Brunswick, Town of	361130#	06/04/1980	12/06/2000	3
Castleton-on-Hudson, Village of	360673#	11/15/1984	11/15/1984	15
East Greenbush, Town of	361133#	03/18/1980	03/18/1980	10
East Nassau, Village of	360257#	10/05/2007	09/05/1984	5

⁹⁵ FEMA Policy and Claims Data accessed June 21, 2024, current as of May 29, 2024. <https://www.fema.gov/openfema-data-page/fima-nfip-redacted-claims-v2>.

⁹⁶ FEMA Community Status Book-New York State, June 24, 2024.

⁹⁷ As per the FEMA's list of Community Rating System Eligible Communities accessed May 2, 2024.

⁹⁸ Village of Valley Falls is not participating in the National Flood Insurance Program, and therefore residents are not eligible for NFIP insurance, as of the time of this plan update.

Community Name	Community Number	Date Entered NFIP	Current Effective FIRM Date ⁹⁸	Policies In Force
Grafton, Town of	361150#	10/13/1978	10/13/1978	4
Hoosick Falls, Village of	360674#	05/16/1980	01/06/2016	6
Hoosick, Town of	361154	08/01/1987	01/06/2016	3
Nassau, Town of	361155#	09/05/1984	09/05/1984	13
Nassau, Village of	360675	08/11/1978	05/18/1979	1
North Greenbush, Town of	361164#	06/18/1980	06/18/1980	27
Petersburgh, Town of	361165#	09/01/1978	09/01/1978	6
Pittstown, Town of	361166#	02/01/1988	01/06/2016	6
Poestenkill, Town of	360676#	09/02/1981	09/02/1981	10
Rensselaer, City of	361032#	03/18/1980	03/18/1980	78
Sand Lake, Town of	361167#	05/15/1980	05/15/1980	22
Schaghticoke, Town of	361168#	07/16/1984	01/06/2016	10
Schaghticoke, Village of	361058#	06/11/1982	01/06/2016	0
Schodack, Town of	361169#	08/15/1984	08/15/1984	3
Stephentown, Town of	361170#	08/03/1981	08/03/1981	5
Troy, City of	360677#	03/18/1980	03/18/1980	306
Valley Falls, Village of*	361469#	01/17/2016 (Sanctioned)	01/06/2016	0
Total				536

Repetitive and Severe Repetitive Loss Properties

The NFIP tracks Repetitive Loss (RL) properties, which are NFIP-insured properties that, since 1978 and regardless of any changes in ownership during that period, have experienced any of the following:

- Four or more paid losses in excess of \$1,000
- Two paid losses in excess of \$1,000 within any rolling 10-year period
- Three or more paid losses that equal or exceed the current value of the insured property

The NFIP also tracks Severe Repetitive Loss (SRL) properties, which are NFIP-insured properties that, since 1978 and regardless of any changes in ownership during that period, have experienced any of the following:

- Four or more separate claim payments have been made under a Standard Flood Insurance Policy issued pursuant to this title, with the amount of each such claim exceeding \$5,000, and with the cumulative amount of such claims payments exceeding \$20,000
- At least 2 separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceed the fair market value of the insured building on the day before each loss

Table 51 presents information about each property on the RL list. The average repetitive loss property in Rensselaer County has experienced 3.2 loss events, with an average paid claim of approximately \$7,703 for each event.

Table 51: NFIP Repetitive Loss Properties in Rensselaer County

Municipality	Property Type	Flood Hazard Zone	Number of Losses	Total Claims Paid	Average Claims Paid
Brunswick, Town of 1 RL	Single Family	C	2	\$24,379	\$12,189
	Subtotal, Town of Brunswick:		2	\$24,379	\$12,189
East Greenbush, Town of 1 RL	Single Family	X	2	\$156,267	\$78,134
	Subtotal, Town of East Greenbush:		2	\$156,267	\$78,134
Hoosick Falls, Village of 4 RLs	Single Family	AE	5	\$119,429	\$23,886
	Single Family	X	4	\$88,080	\$22,020
	Single Family	X	3	\$84,884	\$28,295
	Single Family	A	5	\$94,693	\$18,939
	Subtotal, Village of Hoosick Falls:		17	\$387,086	\$93,140
Hoosick, Town of 1 RL	Single Family	A	5	\$93,481	\$18,696
	Subtotal, Town of Hoosick:		5	\$93,481	\$18,696
North Greenbush, Town of 1 RL	Single Family	A04	2	\$53,533	\$26,767
	Subtotal, Town of North Greenbush:		2	\$53,533	\$26,767
Poestenkill, Town of 1 RLs	Single Family	A	2	\$86,034	\$43,017
	Subtotal, Town of Poestenkill:		2	\$86,034	\$43,017
Rensselaer, City of 7 RLs	Single Family	A12	3	\$12,772	\$4,257
	Single Family	A11	4	\$21,331	\$5,333
	Single Family	AE	3	\$21,858	\$7,286
	Single Family	A05	4	\$29,599	\$7,399
	Single Family	C	3	\$77,077	\$25,692
	Single Family	A05	4	\$33,352	\$8,338
	Single Family	AE	2	\$18,060	\$9,030

Municipality	Property Type	Flood Hazard Zone	Number of Losses	Total Claims Paid	Average Claims Paid
Subtotal, City of Rensselaer:			23	\$214,049	\$67,335
Sand Lake, Town of 2 RLs	2-4 Family	A12	2	\$9,420	\$4,710
	Other Nonresidential	A04	3	\$22,122	\$11,061
	Subtotal, Town of Sand Lake:			5	\$31,542
Schaghticoke, Town of 4 RLs	Single Family	X	2	\$10,058	\$5,029
	Single Family	A	8	\$61,669	\$7,709
	Single Family	A10	2	\$58,296	\$29,148
	Single Family	A	2	\$30,016	\$15,008
	Subtotal, Town of Schaghticoke:			14	\$160,039
Troy, City of 6 RLs	2-4 Family	A11	2	\$19,101	\$9,551
	Other Nonresidential	A12	3	\$428,819	\$142,940
	Other Residential	A11	2	\$20,351	\$10,176
	Business - Nonresidential	B	3	\$206,759	\$68,920
	Business - Nonresidential	A11	2	\$23,892	\$11,946
	Single Family	A11	2	\$14,013	\$7,006
	Subtotal, City of Troy:			14	\$712,935
Total, Rensselaer County 28 RLPs			86	\$1,919,345	\$7,703

Specific data regarding the exact locations of repetitive loss structures is subject to the 1974 Privacy Act. This legislation prohibits the public release of any information regarding individual NFIP claims or information which may lead to the identification of associated individual addresses and property owners. However, while this information is not available to the general public, municipal authorities have access to comprehensive RL property data directly from FEMA Region 2 for the purposes of targeted mitigation of RL areas or individual RL structures, on the condition that all such data is treated as strictly confidential and the required privacy procedures are strictly followed.

Severe Repetitive Flood Losses

FEMA Region 2 SRL data for Rensselaer County was provided by FEMA to Rensselaer County to support this plan update. Rensselaer County has 1 SRL property, located in the Village of Hoosick Falls. This property is a single-family home. Flash flooding from Woods Brook has been a problem in the village.

Neighboring properties to this SRL are on the RL list. This area would be a particularly favorable candidate for a hazard mitigation project (i.e., acquisition, elevation) depending on the level of homeowner interest.

Probability/Impacts of Climate Trends and Variations

Flooding has a long and well-documented history of frequent occurrence throughout Rensselaer County and the probability of future flood events in Rensselaer County is certain. It is estimated that Rensselaer County will continue to experience direct and indirect impacts of flooding annually. With 117 floods in the last 28 years (1996 to 2024), the probability of future events is 2.5 events per year or greater than a 100 percent chance of flooding in any given year.

Due to the nature of the terrain and the climate in Rensselaer County, ice jams are certain to occur in the future, although whether or not such events will cause significant damage is less easy to predict, since detailed records of actual damage caused by ice jams are scarce. The probability of ice jam flooding is lower than the probability of flooding overall, with eight recorded ice jam flood events in the last 22 years (0.36 events per year) and, based on historic occurrences, may be more likely to occur along the Hoosick River, Poestenkill, Moordener Kill, Little Hoosick River, and the Hudson River.

The probability of a dam failure occurrence in Rensselaer County is relatively low due to routine inspection, repair and maintenance programs carried out by the NYSDEC, which serves to ensure the safety and integrity of dams in New York and, thereby, protect people and property from the consequences of dam failures. However, the possibility of a future failure event is likely increasing due to aging dam structures that may be in need of repair or reconstruction, and occasional problems related to private dam owners' degree of cooperation with state regulatory agencies.

The 2023 SHMP concludes that climate change will alter the probability of extreme flood events, making them more likely to occur. Given that projected climate change will affect the frequency and intensity of flood events, its impacts will likely change recurrence intervals. Climate change will primarily affect flooding in New York through changing precipitation patterns and sea-level rise. Climate change can have a significant impact on dams and dam failures. As temperatures rise and precipitation patterns change, dams are more likely to experience extreme weather events such as heavy rainfall and intense storms. This can lead to increased stress on dam structures and a higher risk of failure.

Climate change can have a significant impact on ice jams in rivers and other waterways. As temperatures rise, more precipitation falls as rain instead of snow, which can lead to less snow accumulation and earlier snowmelt. This can cause a sudden increase in water flow in rivers, which can break up ice and create ice jams. Additionally, warmer temperatures can cause ice to melt more quickly, creating more ice jams as the ice moves downstream. These ice jams can cause flooding and damage to infrastructure, such as bridges and buildings. Overall, climate change is expected to increase the frequency and severity of ice jams, making them a growing concern for communities that are located near rivers and other bodies of water.

Vulnerability Analysis

To understand its vulnerability to natural hazards, a community must determine the assets that are exposed or vulnerable in the hazard area.

ESTIMATED IMPACT AND POTENTIAL LOSSES

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. Any type of agricultural, commercial, residential, and recreational development and natural communities (e.g., wetlands, marshes) located in a floodplain (inland, alluvial fan) are vulnerable to flooding. Increased urbanization, and thus increase in paved surfaces, enhances the threat of flooding where drainage systems cannot cope with the increased input of stormwater runoff and decrease in natural water infiltration into the soil (increasing runoff).

In rural areas, property damage caused by flooding can be devastating to agriculture. When flooding occurs during the growing season, farmers can suffer widespread crop loss. Livestock farmers may lose livestock if they are unable to find safe ground during rising floodwaters. This threat to agricultural areas is primarily associated with flash flooding. Flooding can also pose several threats to industrial, residential, and commercial properties. Industrial facilities of all types typically handle and store various quantities of hazardous materials for their operations. These materials can potentially come into contact with flood waters and be released into the environment impacting local water sources, natural resources, and threaten public health.

Buildings can experience significant water-related damage, sometimes beyond repair, due to flooding. Household furnishings and business inventories can be lost if there is not adequate time to remove items to safe locations. In addition to being at risk because of floodwater, people face the threat of explosions and fires caused by leaking gas lines along with the possibility of being electrocuted. Even wild animals, forced out of their homes and brought into contact with humans by floodwaters, can be a threat.

Post-flood concerns could include mold growth on structures, creating an increased health concern. Severe flooding can cause extensive damage to public utilities and disruptions to the delivery of services. Loss of power and communications can be expected. Drinking water and wastewater treatment facilities may be temporarily out of operation. Impacts of flooding on transportation are particularly noteworthy. Flooded streets and roadblocks make it difficult for emergency vehicles to respond to calls for service. Floodwaters can washout sections of roadway and bridges. Most importantly, the majority of fatalities that occur in floods are the result of people trying to drive on roads covered by floodwaters.

A Hazus analysis was conducted to estimate the potential loss from the flood hazard. Hazus 6.1 was used to estimate potential losses in Rensselaer County resulting from potential riverine flood events. Hazus was

used to estimate floodplain boundaries, potential exposure, and loss estimates based on probabilistic scenarios for various flood events using a Level 1 analysis. Table 52 shows the estimated losses from a 100-year flooding event scenarios. The City of Troy would suffer the greatest amount of building and business losses from a 100-year flood event, followed by the Village of Castleton-on-Hudson. Figure 93 shows the number of buildings anticipated to be affected by flooding. Residences account for the highest number of structures impacted, followed by commercial properties. Table 52 estimates critical facilities affected by flooding.

Figure 93 shows the expected amount of damage for different building types in the study region.

Occupancy	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	21	31	29	43	10	15	2	3	2	3	3	4
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	8	30	16	59	2	7	0	0	0	0	1	4
Religion	1	100	0	0	0	0	0	0	0	0	0	0
Residential	196	56	80	23	13	4	5	1	4	1	52	15
Total	226		125		25		7		6		56	

Figure 93: Expected Building Damage by Occupancy

The total economic loss estimate for this scenario is \$783.02 million. Building related losses are broken into two categories in Hazus. Direct building losses are the estimated costs to repair or replace the damage caused to a building, contents, and inventory by a flood. These losses total \$378.68 million, which is 48% of the total losses for the scenario. The remaining 52% of losses are due to business interruption losses associated with the inability to operate a business because of flood damage. This includes relocation costs, income and wage losses, and loss of rental income from people displaced from their homes. Table 53 shows these different categories of losses for each participating jurisdiction. Residences make up over 20% of the total losses, valued at \$120.23 million.

An estimated 161,042 people reside in the study region. Hazus estimates that 3,108 households, approximately 9,324 people, will be displaced in this flood scenario. Of these, 1,437 are anticipated to seek temporary public shelter.

Hazus also generates loss estimates for critical facilities, transportation systems and utility systems. A 100-year flood would result in an estimated \$57,620 in damage to highway bridges. Waste Water Treatments systems are estimated to experience \$21,113,000 in damage. Impacts to critical facilities are summarized in Table 52.

Table 52: Expected Damage to Critical Facilities

Facility	Count	At Least Moderate Damage	Loss of Functionality (Days)
Emergency Operations Center	1	0	0
Fire Stations	55	2	2
Hospitals	26	3	0
Police Stations	17	1	0
Schools	66	1	1

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Table 53: Hazus Loss Estimates for 100-Year Flood Scenario

Jurisdiction	Building Loss	Contents Loss	Inventory Loss	Relocation Cost	Income Loss	Rental Income Loss	Wage Loss	Total Loss
City of Rensselaer	\$2,902,000	\$6,668,000	\$926,000	\$1,805,000	\$3,680,000	\$1,208,000	\$8,940,000	\$26,129,000
City of Troy	\$76,755,000	\$108,294,000	\$8,450,000	\$30,584,000	\$71,773,000	\$24,746,000	\$71,214,000	\$391,816,000
Town of Berlin	\$3,397,000	\$4,707,000	\$827,000	\$1,006,000	\$1,912,000	\$561,000	\$20,105,000	\$32,515,000
Town of Brunswick	\$4,129,000	\$5,845,000	\$366,000	\$1,234,000	\$2,774,000	\$462,000	\$7,868,000	\$22,678,000
Town of East Greenbush	\$9,570,000	\$22,702,000	\$3,018,000	\$1,602,000	\$2,729,000	\$665,000	\$5,346,000	\$45,632,000
Town of Grafton	\$481,000	\$412,000	\$3,000	\$59,000	\$381,000	\$35,000	\$268,000	\$1,639,000
Town of Hoosick	\$6,849,000	\$8,754,000	\$2,469,000	\$798,000	\$3,839,000	\$612,000	\$6,804,000	\$30,125,000
Town of Nassau	\$754,000	\$585,000	\$7,000	\$158,000	\$252,000	\$57,000	\$255,000	\$2,068,000
Town of North Greenbush	\$2,173,000	\$3,557,000	\$482,000	\$1,456,000	\$3,161,000	\$871,000	\$3,576,000	\$15,276,000
Town of Petersburg	\$6,879,000	\$5,616,000	\$1,121,000	\$898,000	\$1,830,000	\$349,000	\$1,282,000	\$17,975,000
Town of Pittstown	\$2,139,000	\$2,184,000	\$635,000	\$342,000	\$225,000	\$231,000	\$601,000	\$6,357,000
Town of Poestenkill	\$1,981,000	\$1,640,000	\$158,000	\$656,000	\$634,000	\$186,000	\$1,134,000	\$6,389,000
Town of Sand Lake	\$6,785,000	\$9,348,000	\$454,000	\$2,271,000	\$6,085,000	\$946,000	\$10,683,000	\$36,572,000
Town of Schaghticoke	\$9,317,000	\$7,431,000	\$478,000	\$1,375,000	\$425,000	\$465,000	\$10,699,000	\$30,190,000
Town of Schodack	\$7,239,000	\$4,831,000	\$274,000	\$1,092,000	\$974,000	\$460,000	\$4,153,000	\$19,023,000

Jurisdiction	Building Loss	Contents Loss	Inventory Loss	Relocation Cost	Income Loss	Rental Income Loss	Wage Loss	Total Loss
Town of Stephentown	\$395,000	\$416,000	\$27,000	\$52,000	\$163,000	\$20,000	\$779,000	\$1,852,000
Village of Castleton-on-Hudson	\$6,721,000	\$11,909,000	\$631,000	\$1,824,000	\$3,486,000	\$1,332,000	\$58,430,000	\$84,333,000
Village of East Nassau	\$408,000	\$532,000	\$0	\$114,000	\$133,000	\$33,000	\$3,537,000	\$4,757,000
Village of Hoosick Falls	\$391,000	\$553,000	\$3,000	\$179,000	\$562,000	\$99,000	\$660,000	\$2,447,000
Village of Nassau	\$576,000	\$741,000	\$35,000	\$177,000	\$510,000	\$111,000	\$499,000	\$2,649,000
Village of Schaghticoke	\$634,000	\$970,000	\$92,000	\$46,000	\$251,000	\$1,000	\$551,000	\$2,545,000
Village of Valley Falls	\$40,000	\$16,000	\$0	\$0	\$0	\$0	\$0	\$56,000
Total	\$150,515,000	\$207,711,000	\$20,456,000	\$47,728,000	\$105,779,000	\$33,450,000	\$217,384,000	\$783,023,000

Figure 94 illustrates the National Risk Index rating the Expected Annual Loss for Rensselaer County at \$3.9M from riverine flooding, with a rating of **relatively moderate** expected annual losses, and a risk score of **91.5**.

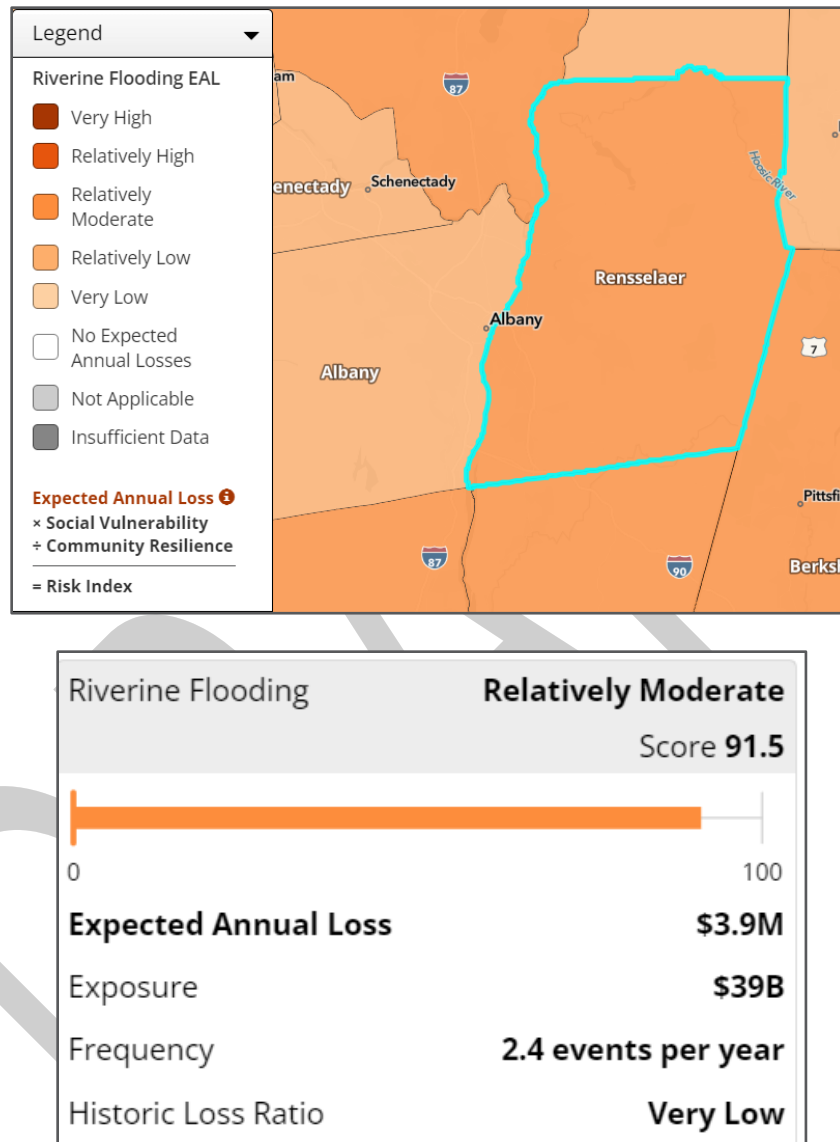


Figure 94: National Risk Index Rensselaer County Riverine Flooding Expected Annual Loss Score, Map, and Legend⁹⁹

The estimated annualized loss for ice jams is not available. However, an ice jam can create several vulnerabilities for a community. Firstly, it can cause flooding, which can damage homes, roads, and other infrastructure. The pressure of the water and ice can also be dangerous, potentially causing structural damage to buildings and bridges. Additionally, an ice jam can disrupt transportation and access to essential services, such as hospitals and grocery stores. Finally, prolonged exposure to extreme cold

⁹⁹ FEMA, National Risk Index. "Rensselaer County Riverine Flooding Expected Annual Loss Score, Map and Legend."
<https://hazards.fema.gov/nri/map>.

weather conditions associated with ice jams can also pose health risks to individuals, particularly those who are elderly or have preexisting medical conditions.

The estimated annualized loss for dam failures is not available. The effects of dam failure on a community's vulnerability can be devastating. When a dam fails, it can result in catastrophic flooding that can cause property damage, loss of life, and displacement of residents. The water released from a failed dam can also be contaminated with hazardous materials, increasing the risk of illness and disease.

In addition to the immediate impact, the long-term effects of dam failure can also be severe. A community that relies on the dam for its water supply may face shortages or contamination of their drinking water. Dam failure can also disrupt transportation routes, making it difficult for emergency services to reach those in need. The estimated loss of agriculture from dam failure can vary depending on several factors such as the size of the dam, the location, and the type of crops grown in the area. However, the impact on agriculture can be significant, as it can cause damage to crops, soil erosion, and loss of irrigation water. This can have a ripple effect on the local economy, affecting not only farmers but also suppliers, processors, and distributors. In addition, a dam failure could potentially harm the surrounding wildlife and ecosystems, which could have long-lasting effects on the environment. Moreover, the cost of repairing or rebuilding the dam and the affected areas could be very high, further burdening the community.

Vulnerable Populations

Much of the population of Rensselaer County is concentrated along the western boundary of the county along the Hudson River. This places a large proportion of the population in close proximity to areas subject to flooding. Vulnerable populations may be impacted directly by flood damage to their homes and places they work, as well as disruptions to services and transportation. Flooding along the Hoosic River, Tomhannock Creek, Wynants Kill, Poestenkill, Valatie Kill, and other tributaries has the potential to impact other smaller communities in the county as described in the rest of this section.

The flood hazard areas throughout the planning area are subject to periodic inundation, which may result in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, of which adversely affect public safety. Further, debris would present a threat to public safety and debris removal would drain local resources and be an economic detriment to the area.

A property's vulnerability to a flood depends on its location and proximity to the floodplain. Structures that lie along banks of a waterway are the most vulnerable and are often repetitive loss structures. These flood losses are created by the cumulative effect of obstructions in floodplains which cause an increase in flood heights and velocities, and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, flood-proofed, or otherwise protected from flood damage.

Flooding is the deadliest natural disaster that occurs in the United States each year, and it poses a constant and significant threat to the health and safety of the people in the Rensselaer County planning area. Impacts to the planning area can include the following:

- Flood-related rescues may be necessary at swift and low water crossings or in flooded neighborhoods where roads have become impassable, placing first responders in harm's way.
- Evacuations may be required for entire neighborhoods because of rising floodwaters, further taxing limited response capabilities and increasing sheltering needs for displaced residents.
- Health risks and threats to residents are elevated after the flood waters have receded due to contaminated flood waters (untreated sewage and hazardous chemicals) and mold growth typical in flooded buildings and homes.
- Significant flood events often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage can result in an increase in structure fires and/or carbon monoxide poisoning as individuals attempt to cook or heat their home with alternate, unsafe cooking or heating devices, such as grills.
- Floods can destroy or make residential structures uninhabitable, requiring shelter or relocation of residents in the aftermath of the event.
- First responders are exposed to downed power lines, contaminated and potentially unstable debris, hazardous materials, and generally unsafe conditions, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.
- Emergency operations and services may be significantly impacted due to damaged facilities.
- Significant flooding can result in the inability of emergency response vehicles to access areas of the community.
- Critical staff may suffer personal losses or otherwise impacted by a flood event and unable to report for duty, limiting response capabilities.
- City or county departments may be flooded, delaying response and recovery efforts for the entire community.
- Private sector entities that the jurisdiction and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Damage to infrastructure may slow economic recovery since repairs may be extensive and lengthy.
- Some businesses not directly damaged by the flood may be negatively impacted while utilities are being restored or water recedes, further slowing economic recovery.
- When the community is affected by significant property damage it is anticipated that funding would be required for infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, and normal day-to-day operating expenses.

- Displaced residents may not be able to immediately return to work, further slowing economic recovery.
- Residential structures substantially damaged by a flood may not be rebuilt for years and uninsured or underinsured residential structures may never be rebuilt, reducing the tax base for the community.
- Large floods may result in a dramatic population fluctuation, as people are unable to return to their homes or jobs and must seek shelter and/or work outside of the affected area.
- Businesses that are uninsured or underinsured may have difficulty reopening, which results in a net loss of jobs for the community and a potential increase in the unemployment rate.
- Flooding may cause significant disruptions of clean water and sewer services, elevating health risks and delaying recovery efforts.
- The psycho-social effects on flood victims and their families can traumatize them for long periods of time, creating long term increases in medical treatment and services.
- Extensive or repetitive flooding can lead to decreases in property value for the affected community.
- Flood poses a potential catastrophic risk to annual and perennial crop production and overall crop quality leading to higher food costs.
- Flood related declines in production may lead to an increase in unemployment.
- Large floods may result in loss of livestock, potential increased livestock mortality due to stress and water borne disease, and increased cost for feed.
- The overall extent of damages caused by floods is dependent on the extent, depth, and duration of flooding and the velocities of flows in the flooded areas. The level of preparedness and pre-event planning done by government, businesses, and citizens will contribute to the overall economic and financial conditions in the aftermath of a flood event.

Table 54: Vulnerable Populations Rensselaer County¹⁰⁰

Jurisdiction	Total Population 2022	Under 5 Years	Percent of Municipal Total	65 Years and Over	Percent of Municipal Total	Total Vulnerable Population	Percent of Municipal Total
Berlin, Town of	2030	86	4.2	358	17.6	444	21.8
Brunswick, Town of	12542	526	4.2	2307	22.5	2833	26.7

¹⁰⁰ U.S. Census Bureau. "S0101|Age and Sex." <https://data.census.gov/table/ACSST1Y2022.S0101?q=city%20of%20Troy%20city,%20Rensselaer%20County,%20New%20York&y=2022>

Jurisdiction	Total Population 2022	Under 5 Years	Percent of Municipal Total	65 Years and Over	Percent of Municipal Total	Total Vulnerable Population	Percent of Municipal Total
Castleton-on-Hudson, Village of	1480	70	4.7	258	17.4	328	22.1
East Greenbush, Town of	16680	862	5.2	3202	19.2	4064	24.4
East Nassau, Village of	444	31	7.0	117	26.4	148	33.4
Grafton, Town of	1914	154	8.0	427	22.3	581	30.3
Hoosick, Town of	6713	544	8.1	1470	21.9	2014	30
Hoosick Falls, Village of	3225	256	7.9	812	25.2	1068	33.1
Nassau, Town of	4555	279	6.1	850	18.7	1129	24.9
Nassau, Village of	1169	44	3.8	190	16.3	234	20.1
North Greenbush, Town of	13263	555	4.2	2727	20.6	3282	24.8
Petersburgh, Town of	1325	46	3.5	249	18.8	295	22.3
Pittstown, Town of	5540	312	5.6	990	17.9	1302	23.5
Poestenkill, Town of	4330	369	8.5	697	16.1	1066	24.6
Rensselaer, City of	9252	697	7.5	1569	17.0	2266	24.5
Sand Lake, Town of	8360	288	3.4	1931	23.1	2219	26.5
Schaghticoke, Town of	7414	370	5.0	1457	19.7	1827	24.7
Schaghticoke, Village of	631	58	9.2	124	9.6	182	18.8

Jurisdiction	Total Population 2022	Under 5 Years	Percent of Municipal Total	65 Years and Over	Percent of Municipal Total	Total Vulnerable Population	Percent of Municipal Total
Schodack, Town of	12956	778	6.02	2764	21.3	3542	27.32
Stephentown, Town of	2801	85	3.0	516	18.4	601	21.4
Troy, City of	80009	3657	4.6	6540	8.2	10197	12.8
Valley Falls, Village of	451	18	3.9	95	20.6	113	24.5

Populations living in flood-prone areas near rivers and streams are vulnerable to ice jams. Ice jams occur when floating ice accumulates and blocks the flow of water, causing flooding upstream. Areas with colder climates and regions that experience frequent freeze-thaw cycles are particularly susceptible to ice jams. Additionally, areas with steep river gradients and sharp bends are more likely to experience ice jams.

Impact on County Assets

Figure 95 below shows the location of critical facilities located in high and moderate risk flood hazard areas in the county. These critical facilities are identified from county and state data, where available, and supplemented with the Hazus 6.1 baseline data.

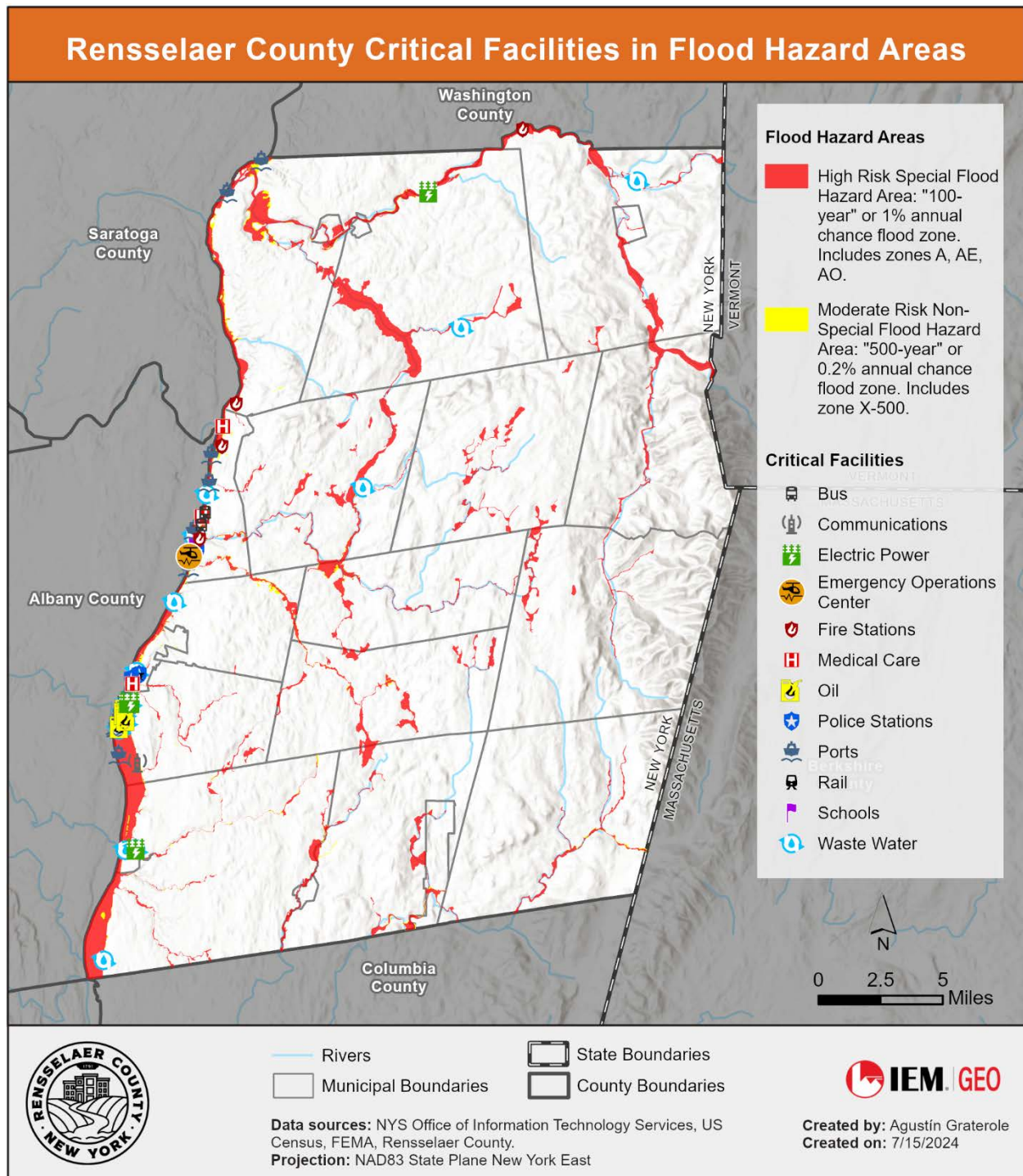


Figure 95: Critical Facilities and Flood Hazard Areas in Rensselaer County

COMMUNITY LIFELINES

In the event of flooding, ice jams, and dam failure, all eight lifelines are at risk of failure. This can result in catastrophic loss of life and property. Flooded roads can make transportation impossible, making it

difficult for emergency services to reach affected communities. The infrastructure may also be damaged or washed away. Crops and livestock may be destroyed, and power outages can lead to a loss of energy-dependent structures and services, hazardous waste may be displaced, and additionally, clean drinking water may be scarce or unattainable.



Figure 96: FEMA Community Lifelines

Vulnerability Score

Flooding, including flooding caused by ice jams and dam failure, is a particular concern to the planning area. The NRI indicates that riverine flooding is the hazard of greatest concern in Rensselaer County. Figure 97 indicates that Rensselaer County has a NRI rating for riverine flooding of 89.6 – relatively moderate risk.

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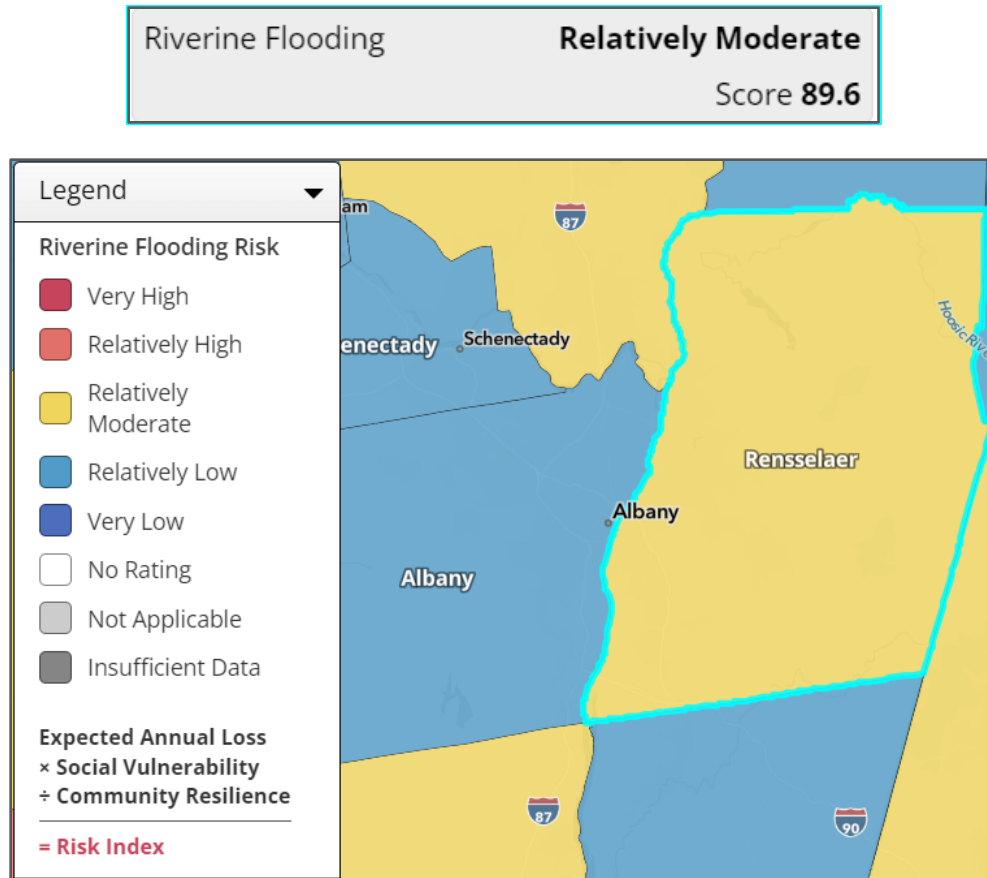


Figure 97: National Risk Index Rensselaer County Flood Score, Map and Legend¹⁰¹

Hazardous Materials Hazard Profile

Hazardous materials, also known as HAZMAT, are substances that threaten human health, safety, and the environment and are classified as either physical hazards or health hazards. Physical HAZMAT can explode, catch fire easily, or react dangerously with water or other substances. They include explosives, flammable gases and liquids, organic peroxides, oxidizers, pyrophorics, and unstable/reactive materials. Health hazard materials can cause harm to human health if ingested, inhaled, or absorbed through the skin. They include toxic, highly toxic, and corrosive substances. These materials can be gases, liquids, or solids. HAZMAT can be found in many settings, such as workplaces, homes, and transportation systems. The classification of HAZMAT is based on National Fire Protection Association (NFPA) codes and standards.

NFPA 704 must be used when other federal, state, or local regulations or codes require it. This standard does not specify when a container, tank, or facility should be labeled, but it provides guidance on labeling when another code, standard, or an authority having jurisdiction (such as the local fire department)

¹⁰¹ FEMA. "National Risk Index Rensselaer County Flood Score, Map and Legend." <https://hazards.fema.gov/nri/map>.

requires it. It applies to industrial, commercial, and institutional facilities that manufacture, process, use, or store HAZMAT, but it does not apply to transportation, public use, or other specific situations.

The NFPA 704 standard aims to provide a straightforward, easily recognizable, and comprehensible system of markings that can convey a general understanding of the hazards associated with a substance and the severity of such hazards. This identification system is designed to help first responders determine whether evacuating the area or initiating emergency control procedures is necessary. In addition, it provides relevant information to assist in choosing firefighting tactics and emergency procedures. Figure 1 identifies the degree of severity of health, flammability, and instability hazards.

Common examples of HAZMAT situations include:

Chemical spills can happen when containers of hazardous chemicals are dropped, leaking, or ruptured. The chemicals can then be released into the air, water, or soil, contaminating drinking water supplies, making people sick, and damaging the environment. Common chemicals in hazardous spills include chlorine, sulfuric acid, and benzene.

Oil spills are caused when crude oil or other petroleum products are released into the environment during tanker accidents, well blowouts, or pipeline leaks. These spills can contaminate water supplies, make people sick, and harm wildlife.

Radiological accidents occur when radioactive materials are released into the environment. They can happen during a nuclear power plant accident, a radiological terrorism incident, or the demolition of an X-ray booth or other structure used in radiological testing or storage. Radiological accidents can contaminate water supplies and make people sick.

Fires can spread HAZMAT through the air, water, or soil, releasing harmful chemicals into the atmosphere.

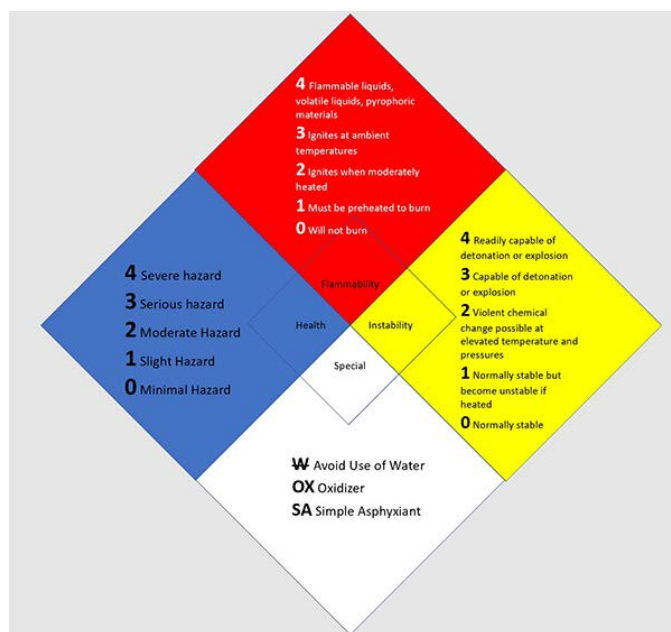


Figure 98: Degrees of Severity of Hazardous Materials¹⁰²

Explosions can occur when HAZMAT is improperly stored or handled. They release harmful chemicals into the air, causing property damage and injuries to people and wildlife nearby.

Natural disasters, such as hurricanes, floods, and earthquakes, can cause accidental releases of HAZMAT from storage facilities or factories. These releases can contaminate water supplies, make people sick, and damage homes and buildings where HAZMAT is stored.¹⁰³

LOCATION

Unfortunately, HAZMAT incidents are not uncommon and can happen anywhere in the world. However, some areas are more prone to them for various reasons, such as industrial facilities that handle HAZMAT, natural disasters, and human error. These incidents can cause significant damage to property and infrastructure, disrupt daily life, and even cause loss of life.

For instance, areas with a high concentration of industrial facilities handling HAZMAT are more susceptible to spills, leaks, or explosions. These incidents can lead to environmental damage, injuries, and fatalities and disrupt the local economy and community. Throughout Rensselaer County, there are environmental remediation sites, oftentimes the locations of former manufacturing or pharmaceutical companies.

¹⁰² NFPA, "Hazardous Materials Identification." <https://www.nfpa.org/news-blogs-and-articles/blogs/2021/11/05/hazardous-materials-identification>

¹⁰³ Lone Star HAZMAT, "What is a HAZMAT situation?" <https://lonestarhazmat.com/what-is-a-hazmat-situation/#:~:text=A%20HAZMAT%20incident%20is%20any,cylinder%20to%20a%20chemical%20spill.>

Trains carrying toxic or HAZMAT cross the state, and many pass through highly populated urban areas and communities. After a train derailment in East Palestine, Ohio, in 2023, concerns about mitigation steps to address and prevent potential catastrophes have come to the forefront. Senator Schumer has long advocated holding railroads accountable for higher safety standards. After the Ohio incident, he sent a letter to Norfolk Southern, CSX, and other major railroads demanding “that companies outline the steps they are taking to improve rail safety and better communicate notifications” to prevent a tragedy like the one in Ohio.¹⁰⁴

ASKRAIL

The AskRail app was introduced in 2014 as a safety tool for first responders. It gives real-time information about the type of HAZMAT being carried in a railcar, thus helping them make informed decisions in case of an emergency.

Figure 99 lists the percentage of carloads of HAZMAT by the U.S. Department of Transportation (DOT) hazard class that moved through New York between January 1 and December 31, 2022, with flammable liquids at the highest percentage (40%).¹⁰⁵

Class 1 - Explosives	<1%
Class 2 - Gases	23%
Class 3 - Flammable Liquids	40%
Class 4 - Other Flammable Substances	1%
Class 5 - Oxidizing Substances & Organic Peroxides	1%
Class 6 - Toxic (Poisonous) & Infectious Substances	2%
Class 7 - Radioactive Material	<1%
Class 8 - Corrosives	13%
Class 9 - Miscellaneous Hazardous Materials	20%
Total	100%

Figure 99: Carloads of Hazardous Materials That Moved Through New York, 2022

Several petrochemical/pharmaceutical companies near Rensselaer County could put the area at risk of contamination and HAZMAT incidents; Table 55 lists some of these.

¹⁰⁴ Senate Majority Leader Chuck Schumer, “Schumer: Following Catastrophic Rail Accident, Spotlight turns to Upstate New York, Where Trains Carrying Hazardous Materials Regularly Run; Senator Reveals 10 Questions He is Demanding Railroads answer to Improve Rail Safety for Update Communities Now.”

<https://www.schumer.senate.gov/newsroom/press-releases/schumer-following-catastrophic-rail-accident-spotlight>

¹⁰⁵CSX, “Hazardous Material in New York.” <https://www.csx.com/index.cfm/about-us/safety/hazardous-materials1/new-york/>

Table 55: Petrochemical/Pharmaceutical Companies near or in Rensselaer County

Corporation	Description
Surpass Chemical Co. Inc.	Surpass Chemical Company, Inc., is a contract formulator of water and industrial treatment chemicals. The company also provides bleaching agents, dyes, and industrial chemicals to the textile industry.
Dynasty Chemical Company	Dynasty Chemical Corp supplies cleaning products, such as dishwashing products, degreasers, disinfectants, sanitizers, glass cleaners, laundry and floor care products, and bathroom cleaners.
Regeneron Pharmaceuticals	
Petroleum Fuel & Terminal Co.	Gasoline, distillate, biodiesel, kerosene, ethanol, fuel oil
Polsinello Lubricants	Polsinello Fuels, Inc. was founded in 1952 by Lou Polsinello Sr. and Sue Polsinello in Rensselaer, NY. Originally, the company delivered heating oil and performed oil burner services. Over time, Polsinello Fuels, Inc. grew into a regional supplier of heating oil, propane, gasoline, diesel, motor oils, and lubricants.
Albany Molecular Research/Curia	Albany Molecular Research/Curia is a contract research and manufacturing organization that provides drug discovery, development, Current Good Manufacturing Practice (cGMP) manufacturing, and aseptic fill and finish to the pharmaceutical and biotechnology industries.
PeroxyChem	PeroxyChem is a leading global supplier of hydrogen peroxide, peracetic acid, persulfates, and adjacent technologies.

Furthermore, areas prone to natural disasters, such as hurricanes, floods, and earthquakes, can increase the likelihood of HAZMAT incidents. In these situations, HAZMAT can be released into the environment, contaminating soil and water sources, and causing air pollution. Regions with heavy industries or transportation infrastructure may be at greater risk of industrial accidents or transportation-related incidents.

EXTENT

The effects of HAZMAT on a community can be severe and long lasting. Exposure to these substances can cause a range of health problems, from mild irritation to severe illness or even death. HAZMAT spills or releases can also harm the environment, polluting air, soil, and water. Depending on the spill’s severity, cleanup efforts can take weeks, months, or even years.

Besides the physical effects, HAZMAT incidents can cause significant psychological and economic damage to a community. Evacuations, loss of property, and disruptions to daily life all can take a toll on affected individuals and families. HAZMAT incidents can also have a ripple effect on the local economy, with businesses and industries suffering from decreased productivity or revenue. Table 56 lists the different HAZMAT incident levels.

Table 56: HAZMAT Incident Levels¹⁰⁶

Incident Level	Type	Description
Level 1	Minor Hazard	Involves hazardous materials that can be contained, extinguished, and/or abated using immediately available public sector responders having jurisdiction." <ul style="list-style-type: none"> Level 1 incidents present little risk to the environment and to public health with containment and cleanup.
Level 2	Moderate Hazard	Involves hazardous materials beyond the capabilities of the first responders on the scene and could be beyond the capabilities of the public sector responders having jurisdiction." <p>These incidents can pose immediate and long-term risk to the environment and public health and may need state- or federal-level level emergency assistance.</p>
Level 3	Serious Hazard	Involves hazardous materials "beyond the capabilities of a single state or regional response team and requires additional assistance." <p>These incidents generally pose extreme, immediate, or long-term risk to the environment and public health.</p>

The severity of a HAZMAT incident can be measured by the type and quantity of HAZMAT involved, the location and extent of the release or spill, and the potential impact on human health, the environment, and property. The severity can also be influenced by factors, such as weather conditions, population density, and the response time of emergency services. In general, HAZMAT incidents can range in severity from minor spills that can be quickly contained and cleaned up to major incidents that can have long-lasting and devastating effects on the surrounding area.

PREVIOUS OCCURRENCES

Hazardous materials incidents can have serious consequences, including environmental damage, injuries, and fatalities. These incidents highlight the need for all industrial facilities in Rensselaer County to

¹⁰⁶ Safeopedia, 2025, National Fire Protection Association, "Three Emergency Response Levels", <https://www.safeopedia.com/what-are-the-levels-of-hazmat-and-what-are-they-used-for/2/7097>

prioritize safety measures and emergency response plans to prevent and mitigate the consequences of HAZMAT incidents.

- March 23, 2022:** On Wednesday, emergency crews responded to a HAZMAT incident on the SUNY East campus. At around 4:30 p.m., an employee was injured when acid was spilled in a laboratory. The Rensselaer County Hazardous Materials Response and Decontamination Teams were called to assist. Firefighters immediately neutralized the acid, while the HAZMAT team prepared the contaminated materials for disposal and made the lab area safe. The Decontamination Team then decontaminated everyone who had entered the lab. The injured employee was taken to the hospital for treatment.¹⁰⁷

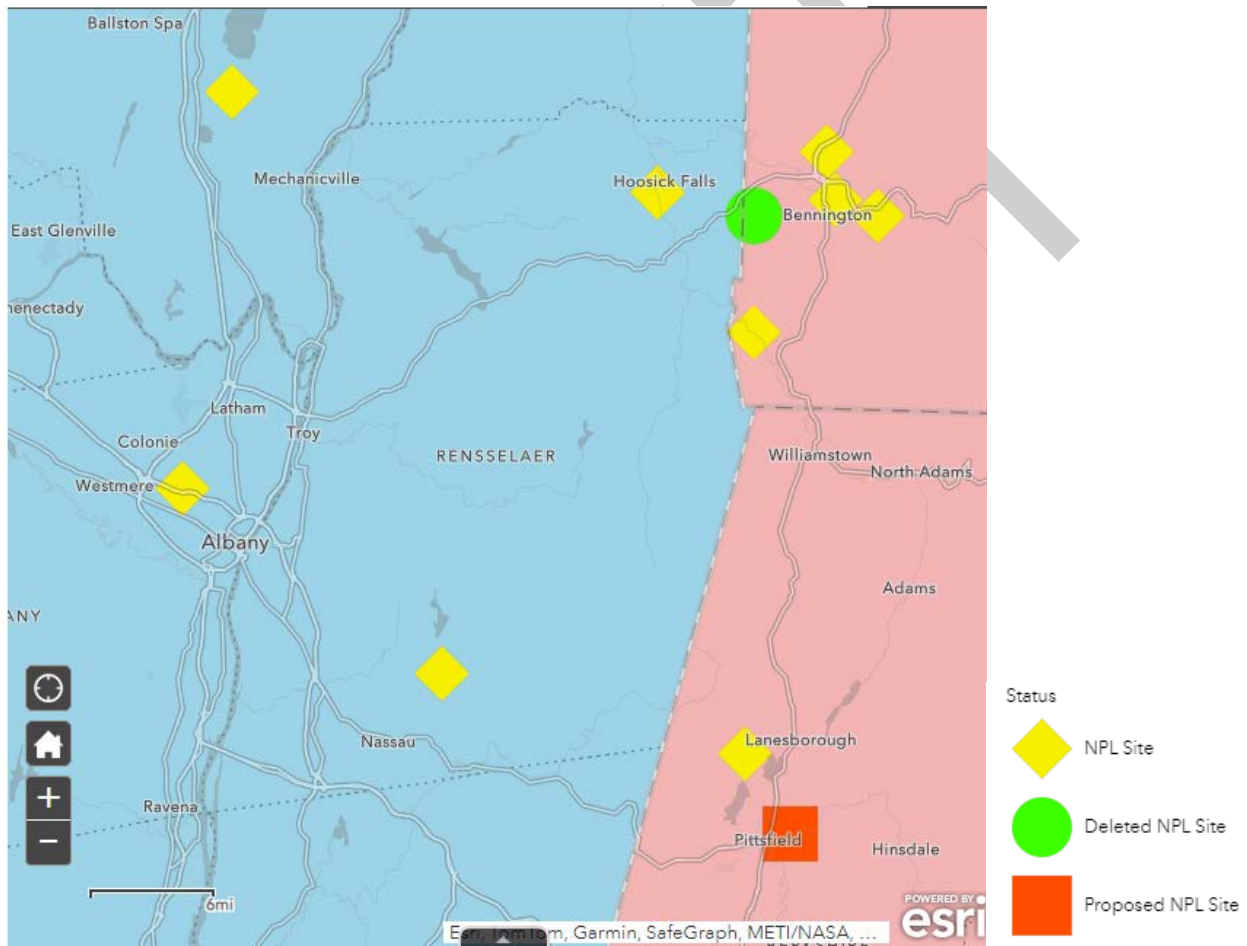


Figure 100: Superfund Sites, Rensselaer County¹⁰⁸

¹⁰⁷ News 10, "1 Inured after HAZMAT Situation in Rensselaer County." <https://www.news10.com/news/rensselaer-county/1-injured-after-hazmat-situation-in-rensselaer-county/>

¹⁰⁸ United States Environmental Protection Agency, "Search for Superfund Sites Where You Live." <https://www.epa.gov/superfund/search-superfund-sites-where-you-live>

Brownfields and Superfund sites are areas contaminated by hazardous substances and pollutants that can significantly impact the communities surrounding them. These sites can result from several factors, including previous industrial activities, improper waste disposal, and accidents.

The consequences can be devastating when a Brownfields or Superfund site affects a community. Contamination can affect residents' health, as exposure to hazardous substances can lead to a wide range of health problems, including respiratory issues, cancer, and neurological disorders.

Besides the health risks, a Brownfields or Superfund site can also harm the area's property values and economic development. Potential buyers and businesses may hesitate to invest in a contaminated area, and the stigma associated with the site can make attracting new residents and businesses difficult.

Furthermore, the cleanup and remediation of these areas can be a complex and costly process, often requiring the involvement of multiple government agencies and private organizations. This can strain the community's resources and may take years, if not decades, to complete.

The classifications by the New York Department of Environmental Conservation (DEC) for Registry sites and inactive hazardous waste disposal sites are as follows.¹⁰⁹

- **Code 1** – Contamination constitutes a significant threat to public health and the environment, and the significant threat is causing or presenting an imminent danger of causing irreversible or irreparable damage to the environment.
- **Code 2** – The disposal of hazardous waste has been confirmed, and the presence of such hazardous waste or its components or breakdown products represents a significant threat to public health or the environment, or hazardous waste disposal has not been confirmed, but the site has been listed on the Federal National Priorities List (NPL).
- **Code 3** – assigned to a site at which contamination does not at present and is not reasonably foreseeable to constitute a significant threat to public health or the environment.
- **Code 4** – assigned to a site that has been properly closed but requires continued site management consisting of operation, maintenance, and/or monitoring.
- **Code 5** – assigned to a site that has been properly closed and requires no further action.

Non-registry sites are being investigated and remediated in a Brownfields program or other environmental remediation program and are not listed in the Registry. Those classifications are as follows:

- **Code A (Active)** – assigned to a non-registry site in any remedial program where work is underway and incomplete.
- **Code C (Completed)** – used for sites where the department has determined that remediation has been satisfactorily completed under a remedial program, such as a State Superfund Program, Brownfields Cleanup Program, Environmental Restoration Program, Voluntary Cleanup Program, or

¹⁰⁹ Department of Environmental Conservation, "Site Classifications." <https://dec.ny.gov/environmental-protection/site-cleanup/database-search/site-classifications>

Resource Conservation and Recovery Act of 1976 (RCRA) Corrective Action Program. State Superfund (Registry) sites must have completed all active operation, maintenance, or monitoring requirements before being delisted and made a Class C.

- **Code P** (Potential) – used for sites where preliminary information indicates that a site might have contamination which makes it eligible for consideration for placement on the Registry of Inactive Hazardous Waste Disposal Sites (commonly referred to as the list of State Superfund Sites).
- **Code PR** (Potential RCRA corrective action) – This classification code is used for sites that are, or have been, subject to RCRA requirements.
- **Code: N** (No further action at this time) – used when the investigation and evaluation of a Class P site results in a determination that contamination at the site does not warrant placing the site on the Registry, it is being addressed under a Brownfields program, or it was in a Brownfields program— Brownfield Cleanup Program (BCP), the Environmental Restoration Program (ERP) or the Voluntary Cleanup Program (VCP)—or other non-Registry program. Remediation was not completed, and the site did not otherwise qualify for listing on the Registry. In addition, a site may be identified simply as the location(s) where a drum(s) or other discrete waste was at one time present and subsequently removed by DEC or others, and based on the resulting conditions, no need for additional work was apparent; or an application to BCP, ERP, or VCP was submitted, and was then withdrawn or terminated before any actions were taken to investigate or remediate the site. Table 57 provides information on Brownfields and Superfund remediation sites in Rensselaer County.

Table 57: Brownfield and Superfund Site Remediation in Rensselaer County¹¹⁰

Site Code	Site Name	Program	Site Class	City/Town	Address
C442001	Old Troy Municipal Incinerator Site	BCP	N	Brunswick	East Side of Oakwood Avenue (N of Farrell Rd)
C442035	BASF Corporation "South 40"	BCP	C	Rensselaer	36 Riverside Avenue
C442041	Hudson Valley Paperboard	BCP	N	Castleton-On-Hudson	1900 River Road
C442043	Tim Bayly Property	BCP	C	Rensselaer	800 Broadway
C442043A	Tim Bayly Property – Off-Site	BCP	C	Rensselaer	800 Broadway
C442047	Taconic	BCP	N	Petersburgh	136 Coonbrook Road
C442058	Poestenkill Place Site	BCP	A	Troy	244-246 First Street

¹¹⁰ New York State Department of Environmental Conservation, "Environmental Site Remediation Database Search." [Environmental Site Remediation Database Search \(ny.gov\)](https://www.dec.ny.gov/ems/135497.html)

Site Code	Site Name	Program	Site Class	City/Town	Address
C442065	Former Barnet Mills	BCP	A	Rensselaer	20 Forbes Avenue
B00056	Rensselaer Riverfront Site	ERP	N	Rensselaer (c)	River Road
B00145	South River Street	ERP	N	Troy	South River Street
B00163	South Troy Industrial Park	ERP	C	Troy	East Industrial Parkway
B00176	East Greenbush Bus Garage	ERP	N	East Greenbush	112 Hayes Road
E442037	Scolite – Upper Hudson River and Estuary Center	ERP	C	Troy	2 Madison Street
442001	Old Troy Municipal Incinerator	HW	3	Brunswick	Route 40
442002	Alexander Schmigel Property	HW	C	Hoosick	Route 67
442003	Former City of Rensselaer Landfill	HW	C	Rensselaer	Partition Street
442004	BASF	HW	4	Rensselaer	36 Riverside Avenue
442005	Former Columbia Corporation	HW	2	Hoosick	11 Cottrell Road
442006	Dewey Loeffel	HW	2	Nassau	Mead Road
442007	Hoosick Falls Landfill	HW	2	Hoosick	Route 22
442008	Oak Materials River Road	HW	2	Hoosick Falls	River Road
442009	Sterling Drug Site 1	HW	4	Rensselaer	33 Riverside Avenue
442010	Sterling Drug Site 2	HW	4	East Greenbush	Route 9J and Riverside Avenue
442011	Sterling Drug Site 3	HW	2	East Greenbush	Riverside Avenue Extension
442012	Former John Simptson Property	HW	N	Grafton	1/2 mile North of the existing end of Agan Road
442013	Portec; Incorporated	HW	N	Troy	1 Burden Avenue
442015	Copeland Coating	HW	N	Nassau	Route 20

Site Code	Site Name	Program	Site Class	City/Town	Address
442016	East Greenbush Landfill	HW	N	East Greenbush	Ridge Road
442017	Sand Lake Landfill	HW	N	Sand Lake	Chamberlain Road
442018	Former Agway; Incorporated	HW	C	Eagle Bridge	Main Street
442019	Geier & Bluhm	HW	N	Troy	594 River Street
442020	Farrell Property	HW	C	East Nassau	Route 66
442021	Storonske Cooperage	HW	C	Schodack	2425 Kraft Road
442022	BASF Wyandotte Corporation	HW	4	Rensselaer	36 Riverside Avenue
442023	Schodack Landfill	HW	C	Schodack	Poyneer Road
442024	Roxy Cleaners	HW	4	North Greenbush	Main Avenue (Route 66 at Route 150)
442025	Northeast Truck Stop	HW	C	Schodack	999 Route 9
442026	Sterling Drug Site 4 – Route 9J	HW	N	East Greenbush	RT 9J
442027	BASF – Manufacturing Plant	HW	2	Rensselaer	36 Riverside Avenue
442028	Valley Falls Dry Cleaner	HW	4	Valley Falls	11 Lyon Street
442029	NM – Troy Water St. MGP	HW	A	Troy	Water Street
442029A	NM – Area 4 Water St. – Troy MGP	HW	4	Troy	1000 River Road
442029B	Chevron Former Asphalt Facility	HW	A	Troy	Water Street
442030	NM – Troy Smith Ave. MGP	HW	2	Troy	Smith Avenue
442031	Dujack Holding Corp. – Poestenkill Site	HW	C	Poestenkill	Route 355
442032	Troy Plaza	HW	N	Troy	120 Hoosick St.
442033	Newland Island	HW	2	Schaghticoke	Stillwater Bridge Road
442036	Poestenkill TCA Spill Site	HW	C	Poestenkill	Main Street (Rt. 355)

Site Code	Site Name	Program	Site Class	City/Town	Address
442040	Dynamic Systems; Inc.	HW	P	Poestenkill	323 State Route 355
442042	Rensselaer Wyck Target Range	HW	C	Rensselaer	10th Street
442044	Fashion Care Cleaning East Greenbush	HW	2	East Greenbush	595 Columbia Turnpike
442045	Former United One-Hour Dry Cleaners	HW	2	East Greenbush	170 Columbia Turnpike
442046	Saint-Gobain McCaffrey Street	HW	2	Hoosick Falls	14 McCaffrey Street
442047	Taconic	HW	2	Petersburgh	136 Coon Brook Road
442048	Saint-Gobain Liberty Street	HW	2	Hoosick Falls	1 Liberty Street
442049	Former Oak Materials John Street	HW	2	Hoosick Falls	3 Lyman Street
442050	Allied-Signal Laminate Systems – Mechanic Street	HW	N	Hoosick Falls	1 Mechanic Street
442052	Former Oak-Mitsui – First Street	HW	P	Hoosick Falls	80 First Street
442053	Former Dodge Machine Company – Church Street	HW	P	Hoosick Falls	90 Church Street
442054	Petersburgh Landfill	HW	P	Petersburgh	Jones Hollow Road
442055	78 Sheer Rd	HW	N	Sand Lake	78 Sheer Rd
442056	Hoosick Falls Range (new)	HW	P	Hoosick Falls	Areson Road
442057	NM – Rensselaer MGP	HW	A	Rensselaer	Washington St
442059	Interface Solutions	HW	P	Hoosick Falls	12 Davis Street
442064	Route 203	HW	2	Nassau	5225-5239 Route 203
442066	Crown Cleaners	HW	2	East Greenbush	627 and 627 (Rear) Columbia Turnpike

Site Code	Site Name	Program	Site Class	City/Town	Address
442067	Fallon Apartments	HW	P	Troy	Glen Avenue and Regatta Place
442014	Cherry Plain State Park	RCRA	C	Berlin	Cherry Plain State Park
442038	Ashland Distribution	RCRA	A	Rensselaer	South Street
442039	Domermuth Petroleum Equip & Maintenance Corp.	RCRA	C	Troy	Foot of Main Street
V00069	B&D Tire	VCP	C	Wynantskill	69 Main Avenue
V00296	Perry Warehouses	VCP	N	Troy	Main Street
V00297	Northeast Truck Stop	VCP	C	Schodack	999 Route 9
V00341	South Troy Industrial Park	VCP	C	Troy	Industrial Park Road
V00365	21 Adams Street	VCP	N	Troy	21 Adams Street
V00442	Former Sperry Warehouse	VCP	N	Troy	Main Street
V00464	BASF Corporation South 40 Parcel	VCP	N	Rensselaer	36 Riverside Avenue
V00482	NM – Troy Liberty St. MGP	VCP	C	Troy	Liberty St.
V00483	NM – Troy Jefferson St. Holder	VCP	A	Troy	115th Avenue
V00488	NM – Rensselaer MGP	VCP	N	Rensselaer	Washington St
V00521	BASF Corporation Closed Landfill	VCP	C	Rensselaer	36 Riverside Avenue
V00578	Steel Treaters Inc.	VCP	C	Troy	520 Campbell Avenue

Note: BCP = Brownfield Cleanup Program, ERP = Environmental Restoration Program, HW = Hazardous Waste RCRA = Resource Conservation and Recovery Act, VCP = Voluntary Cleanup Program.

Figure 101 shows the classes of HAZMAT identified in Table 58, which provides information on identified HAZMAT incidents in Rensselaer County since the last plan update in 2019.



Figure 101: Hazardous Materials Classes¹¹¹

Table 58: Hazardous Materials Incidents in Rensselaer County Identified by the U.S. Department of Transportation

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx Ground Package System, Inc. (FedEx)	Rensselaer	02/21/2024	Sodium hydroxide, solution	8	0	Ecolab
FedEx	Rensselaer	02/17/2024	Sodium hydroxide, solution	8	0	Ecolab
R&L Carriers Shared Services (R&L)	Troy	01/31/2021	Corrosive liquid, basic, inorganic, N.O.S.	8	0	Chemique Inc.
FedEx	Rensselaer	01/24/2024	Corrosive liquid, acidic, inorganic, N.O.S.	8	0	Zep Retail GDC
FedEx	Rensselaer	01/24/2024	Corrosive liquid, acidic, inorganic, N.O.S.	8	0	Grainger NEDC, Lehigh Hot

¹¹¹ Federal Motor Carrier Safety Administration, "Nine Classes of Hazardous Materials." https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/docs/Nine_Classes_of_Hazardous_Materials-4-2013_508CLN.pdf

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	01/10/2024	Sodium hydroxide, solid	8	0	HDS MA21
FedEx	Rensselaer	01/10/2024	Toluene	3	0	Fisher Scientific
FedEx	Rensselaer	01/10/2024	Diethyl ether or ethyl ether	3	0	Fisher Scientific
R&L	Troy	01/09/2024	Sodium Hydroxide, solution	8	0	Thermo Fisher Scientific
FedEx	Rensselaer	12/28/2023	Lithium-Ion batteries including lithium ion polymer batteries	9	0	Zep Retail GDC
FedEx	Rensselaer	12/06/2023	Corrosive liquid, basic, inorganic, N.O.S.	8	0	Morris Products Inc.
R&L	Troy	11/14/2023	Paint, including paint, lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	FMI Paint & Chemical, Inc.
FedEx	Rensselaer	11/2/2023	Diethyl ether or ethyl ether	3	0	Acro organics
FedEx	Rensselaer	10/17/2023	Ethanol or Ethyl alcohol or ethanol solutions or ethyl alcohol solutions	3	0	Fisher Scientific
FedEx	Rensselaer	10/17/2026	Methanol	3	0	Astral Diagnostics
FedEx	Rensselaer	10/9/2023	Corrosive liquid basic inorganic, N.O.S.	8	0	Morris Products
A. Duie Pyle Inc.	Castleton-On-Hudson	10/7/2023	Resin solution, flammable	3	0	Cardolite Corporation

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	10/32023	Corrosive liquid basic inorganic, N.O.S.	8	0	HDS NJ22
R&L	Troy	09/14/2023	Corrosive liquids, toxic, N.O.S.	8	0	Chemtreat, Inc.
FedEx	Rensselaer	09/13/2023	Corrosive liquids, N.O.S.	8	0	Webstaurants tore#876
A. Duie Pyle Inc.	Castleton-On-Hudson	08/22/2023	Adhesives, containing a flammable liquid	3	0	Upaco Adhesives, Inc.
FedEx	Rensselaer	08/18/2023	Hexanes	3	0	Midland Scientific
R&L	Troy	08/14/2023	Paint related material including paint thinning, drying, removing, or reducing compound	3	0	Akzo Coatings Inc.
R&L	Troy	08/14/2023	Paint-related material including paint thinning, drying, removing, or reducing compound	3	0	HIS Paint
FedEx	Rensselaer	08/02/2023	Isopropanol or isopropyl alcohol	3	0	VWR
FedEx	Rensselaer	07/28/2023	Acetonitrile	3	0	Honeywell/Burdick & Jackson
FedEx	Rensselaer	07/19/2023	Toluene	3	0	Aldrich Chemical Co. Inc.
FedEx	Rensselaer	06/19/2023	Corrosive liquid, acidic, organic, N.O.S.	8	0	Mohawk Labs PRP

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
A. Duie Pyle Inc.	Castleton-On-Hudson	06/09/2023	Ethanol solutions	3	0	Rochester Midland Corp.
FedEx	Rensselaer	05/26/2023	Corrosive liquid, acidic, inorganic, N.O.S.	8	0	Zep retail GDC
FedEx	Rensselaer	05/26/2023	Corrosive liquids N.O.S.	8	0	Johnston Paper
FedEx	Rensselaer	05/18/2023	Corrosive liquid, acidic, inorganic, N.O.S.	8	0	Zep Retail GDC
R&L	Troy	04/24/2023	Sodium hydroxide, solution	8	0	National Car Wash Solutions
FedEx	Rensselaer	04/06/2023	Sulfuric acid with not more than 51% acid	8	0	Aldon Corp
FedEx	Rensselaer	03/14/2023	Nitric Acid other than red fuming with more than 70 % nitric acid	8	0	Fisher Scientific
FedEx	Rensselaer	03/08/2023	Hydrochloric acid	8	0	Ecolab Inc.
A. Duie Pyle Inc.	Castleton-On-Hudson	02/10/2023	Resin solution, flammable	3	0	Ineos Composites US, LLC
FedEx	Rensselaer	01/26/2023	Hydrogen peroxide and peroxyacetic acid mixtures stabilized with acids, water and not more than 5% peroxyacetic acid	5.1	0	Medline/C47/ Perryville

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	01/25/2023	Hydrogen peroxide and peroxyacetic acid mixtures stabilized with acids, water and not more than 5% peroxyacetic acid	5.1	0	Medline/C47/ Perryville
A. Duie Pyle Inc.	Castleton-On-Hudson	12/28/2022	Corrosive liquids N.O.S.	8	0	Alpha Chemical Services, Inc.
FedEx	Rensselaer	12/24/2022	Sodium hydroxide solution	8	0	Ecolab
FedEx	Rensselaer	11/08/2022	Methanol	3	0	Statlab Medical Products
FedEx	Rensselaer	10/24/2022	Corrosive liquids N.O.S.	8	0	Clark Associates
FedEx	Rensselaer	10/22/2022	Corrosive liquid, acidic organic, N.O.S.	8	0	Grainger
A. Duie Pyle Inc.	Castleton-On-Hudson	10/7/2022	Corrosive liquids	8	0	Barclay Water Management
FedEx	Rensselaer	9/22/2022	Hypochlorite solution with more than 5 % but less than 16% available chlorine	8	0	Webstaurant Store #876
FedEx	Rensselaer	9/21/2022	Corrosive liquid, basic, inorganic, N.O.S.	8	0	Lehigh Hot
FedEx	Rensselaer	9/20/2022	Isopropanol or isopropyl alcohol	3	0	Astro Chemical Co Inc.

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	09/13/2022	Hypochlorite solutions with more than 5% but less than 16% available chlorine	8	0	Webstaurant Store
FedEx	Rensselaer	09/08/2022	Sodium hydroxide solution	8	0	Ecolab
FedEx	Rensselaer	09/07/2022	Corrosive liquids, N.O.S.	8	0	Clark Associates
FedEx	Rensselaer	09/06/2022	Hydrochloric acid	8	0	Ecolab
FedEx	Rensselaer	09/01/2022	Hypochlorite solutions with more than 5% but less than 16% available chlorine	8	0	Webstaurant Store#876
FedEx	Rensselaer	08/26/2022	Acetonitrile	3	0	Aldrich Chemical Co Inc.
FedEx	Rensselaer	08/12/2022	Corrosive liquids, basic, inorganic, N.O.S.	8	0	North American Research Corp.
FedEx	Rensselaer	08/10/2022	Corrosive liquids, N.O.S.	8	0	Clark Associates
FedEx	Rensselaer	08/04/2022	Alcohols, N.O.S.	3	0	Grainger NEDC Robbinsville
A. Duie Pyle Inc.	Castleton-On-Hudson	08/03/2022	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Gemini Coatings
FedEx	Rensselaer	07/27/2022	Corrosive liquids, N.O.S.	8	0	Clark Associates

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	0726/2022	Flammable solids, organic N.O.S.	4.1	0	Sigma-Aldrich Inc.-IPD
FedEx	Rensselaer	07/22/2022	Hypochlorite solutions with more than 5% but less than 16% available chlorine	8	0	Webstaurants tore#876
FedEx	Rensselaer	07/21/2022	Corrosive liquid, basic, inorganic, N.O.S.	8	0	Morris Products
Greenwood Motor Lines, Inc.	Troy	07/15/2022	Printing ink, flammable or printing ink-related material (including printing ink thinning or reducing compound) flammable	3	0	Flint Group
FedEx	Rensselaer	07/14/2022	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Eastern Chem-Lac LLC
FedEx	Rensselaer	07/08/2022	Ethanol or ethyl alcohol or ethanol solutions or ethyl alcohol solutions	3	0	Fisher Scientific

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	07/08/2022	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Atlantic Plywood
FedEx	Rensselaer	06/21/2022	Hydrochloric acid	8	0	Statlab
Greenwood Motor Lines Inc.	Troy	06/14/2022	Resin Solution, flammable	3	0	Polynt Composites USA Inc.
FedEx	Rensselaer	06/10/2022	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Atlantic Plywood
A. Duie Pyle Inc.	Castleton-On-Hudson	06/06/2022	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Continental products LTD
A. Duie Pyle Inc.	Castleton-On-Hudson	06/01/2022	Paint related material including paint, thinning, drying, removing, or reducing compound	3	0	PPG
A. Duie Pyle Inc.	Hoosick Falls	05/13/2022	Ethyl Acetate	3	0	Univar USA

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
A. Duie Pyle Inc.	Castleton-On-Hudson	05/11/2022	1-Methoxy-2-propanol	3	0	Univar USA
A. Duie Pyle Inc.	Castleton-On-Hudson	05/06/2022	Azodicarbonamide	4.1	0	High Polymer Labs Inc.
FedEx	Rensselaer	04/12/2022	Acetone	3	0	Fisher Scientific
FedEx	Rensselaer	03/14/2022	Hydrochloric acid	8	0	Ecolab
FedEx	Rensselaer	03/14/2022	Hydrochloric acid	8	0	Ecolab
FedEx	Rensselaer	02/22/2022	Paint related material, flammable, corrosive (including paint thinning or reducing compound)	3	0	Atlantic Plywood
FedEx	Rensselaer	02/18/2022	Sodium hydroxide, solution	8	0	Ecolab Inc.
FedEx	Rensselaer	02/07/2022	Methanol	3	0	DHL/Richard Allan Scientific
FedEx	Rensselaer	01/18/2022	Sodium hydroxide, solution	8	0	Ecolab
FedEx	Rensselaer	01/18/2022	Sodium hydroxide, solution	8	0	Ecolab
FedEx	Rensselaer	12/20/2021	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	IC&S Distributing

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	12/16/2021	Hydrogen peroxide aqueous solutions with not less than 20% but not more than 40 % hydrogen peroxide (stabilized as necessary)	5.1	0	Nanosonics 10156 Customer OB
FedEx	Rensselaer	12/07/2021	Gasoline includes gasoline mixed with ethyl alcohol with not more than 10% alcohol	3	0	Racing Fuels
FedEx	Rensselaer	12/04/2021	Gasoline includes gasoline mixed with ethyl alcohol with not more than 10% alcohol	3	0	Racing Fuels
FedEx	Rensselaer	11/22/2021	Ethanol solutions	3	0	Decon Laboratories
FedEx	Rensselaer	11/22/2021	Ethanol solutions	3	0	Decon Laboratories
Greenwood Motor Lines Inc.	Troy	11/01/2021	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	PPG Industries

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
Greenwood Motor Lines Inc.	Brunswick	10/19/2021	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	HIS Paint
Greenwood Motor Lines Inc.	Troy	10/06/2021	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	HIS Paint
Greenwood Motor Lines Inc.	Troy	09/29/2021	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	PPG Refinish Warehouse
FedEx	Rensselaer	08/31/2021	Hypochlorite Solutions	8	0	Clark Associates
Greenwood Motor Lines Inc.	Troy	08/30/2021	Sodium Hydroxide, solution	8	0	Chemtreat
FedEx	Rensselaer	08/15/2021	Sodium Hydroxide, solution	8	0	HDS NJ22
FedEx	Rensselaer	08/15/2021	Gasoline Includes gasoline mixed with ethyl alcohol, with not more than 10% alcohol	3	0	VP Racing Fuels

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	08/15/2021	Gasoline Includes gasoline mixed with ethyl alcohol, with not more than 10% alcohol	3	0	VP Racing Fuels
FedEx	Rensselaer	08/15/2021	Gasoline Includes gasoline mixed with ethyl alcohol, with not more than 10% alcohol	3	0	VP Racing Fuels
FedEx	Rensselaer	08/15/2021	Gasoline Includes gasoline mixed with ethyl alcohol, with not more than 10% alcohol	3	0	VP Racing Fuels
FedEx	Rensselaer	08/15/2021	Gasoline Includes gasoline mixed with ethyl alcohol, with not more than 10% alcohol	3	0	VP Racing Fuels
FedEx	Rensselaer	08/15/2021	Gasoline Includes gasoline mixed with ethyl alcohol, with not more than 10% alcohol	3	0	VP Racing Fuels
Greenwood Motor Lines Inc.	Troy	08/12/2021	Paint-related material, flammable, corrosive (including paint thinning or reducing compound)	3	0	Medco Tool

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
Greenwood Motor Lines Inc.	Troy	08/11/2021	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	PPG
FedEx	Rensselaer	07/08/2021	Corrosive liquid, basic inorganic, N.O.S.	8	0	Grainger NEDC Robbinsville
Greenwood Motor Lines Inc.	Troy	06/11/2021	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	HIS Paint
FedEx	Rensselaer	06/04/2021	Paint-related material, flammable, corrosive (including paint thinning or reducing compound)	3	0	Atlantic Plywood
Greenwood Motor Lines Inc.	Troy	06/01/2021	Corrosive liquid, basic, organic, N.O.S.	8	0	Elite Crete
FedEx	Rensselaer	05/25/2021	Nitric acid other than red fuming, with more than 70% nitric acid	8	0	Ecolab
FedEx	Rensselaer	05/06/2021	Extracts, flavoring, liquid	3	0	Robert Flavors
A. Duie Pyle Inc.	Castleton-On-Hudson	01/19/2021	Flammable liquids N.O.S	3	0	

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	12/08/2020	Tetrahydrofuran	3	0	Aldrich Chemical Co Inc.
FedEx	Rensselaer	10/30/2020	Isopropyl Alcohol	3	0	HISCO
FedEx	Rensselaer	10/30/2020	Sodium Hydroxide, solution	8	0	Niteo Products LLC
FedEx	Rensselaer	10/30/2020	Isopropyl Alcohol	3	0	HISCO
FedEx	Rensselaer	10/30/2020	Sodium Hydroxide solution	8	0	Niteo Products LLC
FedEx	Rensselaer	10/23/2020	Ethanol solutions	3	0	Ecolab
FedEx	Defreestville	10/23/2020	Ethanol Solutions	3	0	Ecolab
FedEx	Defreestville	10/10/2020	Isopropyl alcohol	3	0	Medisca Inc.
FedEx	Rensselaer	09/30/2020	Corrosive liquid, basic, inorganic, N.O.S.	8	0	Grainger
FedEx	Rensselaer	09/22/2020	Gasoline includes gasoline mixed with ethyl alcohol, with not more than 10% alcohol	3	0	VP Racing Fuels
FedEx	Rensselaer	09/22/2020	Hypochlorite solutions	8	0	Clark Associates
FedEx	Rensselaer	09/21/2020	Flammable liquids, corrosive, N.O.S.	3	0	Advanced Sterilization Product
FedEx	Rensselaer	08/31/2020	Alcohols N.O.S.	3	0	Agrochem Inc.

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	08/28/2020	Calcium hypochlorite, hydrated or calcium hypochlorite, hydrated mixtures with not less than 5.5% but not more than 16% water	5.1	0	In the Swim
FedEx	Rensselaer	08/10/2020	Corrosive Liquids N.O.S.	8	0	Zep Inc.
FedEx	Rensselaer	07/27/2020	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Randolph Products
FedEx	Rensselaer	06/08/2020	Alcohols N.O.S.	3	0	Agrochem Inc.
FedEx	Rensselaer	06/03/2020	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Atlantic Plywood
Greenwood Motor Lines	Brunswick	05/28/2020	Methyl ethyl ketone	3	0	Univar Solutions
A. Duie Pyle Inc.	Castleton-On-Hudson	05/15/2020	Paint-related material, flammable, corrosive (including paint thinning or reducing compound)	3	0	Sherwin Williams

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	05/14/2020	Corrosive liquid, acidic, inorganic N.O.S.	8	0	Zep Inc.
FedEx	Rensselaer	04/03/2020	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Atlantic Plywood
FedEx	Rensselaer	03/24/2020	Petroleum Products N.O.S.	3	0	CBG Biotech, Ltd.
FedEx	Rensselaer	01/22/2022 0	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Atlantic Plywood
FedEx	Rensselaer	01/14/2020	Isopropanol or Isopropyl alcohol	3	0	Humco Holding Group Inc.
FedEx	Rensselaer	12/18/2019	Ethyl alcohol	3	0	Decon Labs
FedEx	Rensselaer	12/18/2019	Ethyl alcohol	3	0	Decon Labs
FedEx	Rensselaer	11/25/2019	Petroleum Products	3	0	CBG Biotech
FedEx	Rensselaer	10/04/2019	Hydrochloric Acid	8	0	Statlab Medical Products
FedEx	Rensselaer	09/27/2019	Alcohols N.O.S.	3	0	Best Value Vacs
Langer Transport Corp.	Rensselaer	09/10/2019	Flammable liquids N.O.S.	3	0	BASF Corporation

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	08/03/2019	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Atlantic Plywood
FedEx	Defreestville	07/24/2019	Hypochlorite solutions with more than 5% but less than 16 % available chlorine	8	0	Webstaurant Store
FedEx	Rensselaer	07/17/2019	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Atlantic Plywood
FedEx	Rensselaer	07/17/2019	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Atlantic Plywood
FedEx	Rensselaer	07/11/2019	Hydrochloric acid	8	0	Statlab Medical Products

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	07/10/2019	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Atlantic Plywood
FedEx	Rensselaer	07/03/2019	Smokeless powder for small arms (100#'s or less)	4.1	0	Gemmer and Clemens
FedEx	Rensselaer	06/28/2019	Acetonitrile	8	0	Midland Scientific
FedEx	Rensselaer	06/26/2019	Nitric acid other than red fuming with more than 70% nitric acid	8	0	Ecolab
FedEx	Rensselaer	06/14/2019	Corrosive liquids N.O.S.	8	0	Webstaurant Store
FedEx	Rensselaer	05/23/2019	Petroleum Products N.O.S.	3	0	CBG Biotech
FedEx	Rensselaer	05/16/2019	Sodium Hydroxide solution	8	0	Ecolab
FedEx	Rensselaer	05/10/2019	Flammable liquids N.O.S.	3	0	Printers Service
FedEx	Defreestville	04/03/2019	Sodium hydroxide solution	8	0	Ecolab
FedEx	Rensselaer	03/22/2019	Sodium hydroxide solution	8	0	Ecolab
FedEx	Rensselaer	03/22/2019	Sodium hydroxide solution	8	0	Ecolab
FedEx	Rensselaer	03/22/2019	Sodium hydroxide solution	8	0	Ecolab

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
FedEx	Rensselaer	03/22/2019	Sodium hydroxide solution, Solid	8	0	Ecolab
FedEx	Rensselaer	02/18/2019	Ethanol or ethyl alcohol or ethanol solutions or ethyl alcohol solutions	3	0	Tesla Scientific
FedEx	Rensselaer	02/18/2019	Sodium Hydroxide solution	8	0	Fisher Scientific Company
FedEx	Defreestville	02/15/2019	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Atlantic Plywood
FedEx	Rensselaer	1/31/2019	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Atlantic Plywood
FedEx	Rensselaer	1/29/2019	Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base	3	0	Atlantic Plywood
FedEx	Rensselaer	01/14/2019	Flammable liquids, corrosive, N.O.S	3	0	Atlantic Plywood

Carrier	Incident City	Date	Commodity	Hazardous Class	Fatalities	Shipper
Vermont Railway Inc.	Hoosick Falls	01/09/2019	Liquefied Petroleum Gas	2.1	0	Markwest Utica EMG, LLC
Vermont Railway Inc.	Hoosick Falls	01/09/2019	Liquefied Petroleum Gas	2.1	0	Markwest Utica EMG, LLC
New Penn Motor Express LLC	Troy	01/04/2019	Environmentally Hazardous substances, liquid, N.O.S	9	0	Gilbert and James

PROBABILITY OF FUTURE EVENTS

Determining the probability of hazardous waste incidents in Rensselaer County is complex. The county is home to several chemical manufacturers and distributors, including specialty chemical producers, which produces specialty silicones and other chemicals, and Albany Molecular Research, which focuses on drug discovery and development. Other significant companies in the area include BASF, which produces a wide range of chemicals and polymers, and PeroxyChem, which specializes in hydrogen peroxide and peracetic acid. In addition, many smaller chemical companies and suppliers also operate in the region. However, it is concerning that there have been 170 DOT incidents since 2019. Unless the underlying causes are addressed, the probability of events will remain high.

CLIMATE CHANGE

Climate change can increase the frequency and severity of hazardous waste incidents. Extreme weather events, such as hurricanes, floods, and wildfires, can cause infrastructure damage, disrupt waste management systems, and lead to hazardous waste leakage into the environment. As the temperature rises, the chemical reactions that generate hazardous waste can worsen, and the volatility of some hazardous substances can increase. Furthermore, climate change can alter ecosystems, create new pathways for hazardous waste to enter the food chain, and affect human and animal health. Therefore, it is crucial to address climate change as part of a comprehensive strategy to prevent and respond to hazardous waste incidents and to safeguard public health and the environment.

Development Trends

VULNERABILITY ASSESSMENT

A community that has experienced 170 HAZMAT incidents over a 5-year period is highly vulnerable to the negative impacts of these incidents. Such incidents can pose significant health risks to community members, damage the environment, and disrupt normal life activities. Inadequate emergency response plans, insufficient resources, and weak enforcement of regulations can further compound the community's vulnerability.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Hazardous materials can cause severe and long-lasting environmental damage and devastate human health. They can contaminate air, water, and soil, seriously threatening humans, and the environment. Exposure to such materials can cause acute or chronic health effects, ranging from skin irritation to cancer.

Hazardous material releases can significantly impact infrastructure, resulting in extensive damage and potential losses. The release can directly affect infrastructure, such as roads, bridges, pipelines, and buildings, leading to structural damage or collapse. Corrosive or toxic substances can erode or weaken infrastructure components, compromising their integrity and stability. In the case of pipelines, a HAZMAT leak can cause pipeline failures, leading to environmental contamination and disrupting the transportation of resources. The cleanup and remediation efforts following a HAZMAT release also can impact infrastructure, as extensive decontamination measures may be required. In addition, the economic consequences of infrastructure damage can be substantial, including costs associated with repairs, reconstruction, and loss of functionality. Disruptions in transportation routes and utilities can hinder economic activities, affecting businesses, trade, and local economies.

Apart from human costs, HAZMAT can also have significant economic impacts. Cleanup and remediation efforts required to address a HAZMAT release can be extremely expensive and may take years or even decades to complete. Businesses and communities may also suffer reputational damage, as news of a HAZMAT release can cause widespread concern and alarm.

Overall, HAZMAT can cause significant harm, and it is vital to take steps to prevent their release and respond quickly and effectively in case of an incident. This requires ongoing investment in research, monitoring, and response capabilities, as well as strong regulations and enforcement to ensure that HAZMAT is managed safely and responsibly.

VULNERABLE POPULATIONS

There are populations that may be at higher risk in the event of HAZMAT incidents. These include people working in industries that handle or process HAZMAT, such as chemical plants and biotechnology plants. Communities living near these industries also may be at risk of exposure to harmful substances, such as chemicals and pollutants, which can cause respiratory problems, neurological issues, and other complications. Individuals who are more vulnerable to the health effects of exposure to HAZMAT include children, the elderly, and those with preexisting medical conditions. Emergency responders, such as firefighters and police officers, who respond to such incidents also are at risk of exposure.

Several factors determine the level of population involvement in HAZMAT incidents. They can include the type of HAZMAT involved, its quantity and concentration, the location and environment of the incident, weather conditions, and the response time and effectiveness of emergency services. Other factors include the availability of protective equipment, evacuation procedures, and the potential for secondary incidents or explosions.

COMMUNITY LIFELINES

Hazardous materials are assigned to all the community lifelines except Communications (see Figure 102). Law enforcement and emergency services may face difficulties in providing services after HAZMAT spills or exposures to those in nearby or rural areas, where staff are limited. Exposure to these materials can also contaminate crops, soil, and livestock for an unknown duration. Communities exposed to HAZMAT spills or exposures might have to evacuate and be unable to return. Health risks, including cancer and potential death, can occur when humans and animals are exposed to these toxic substances.



Figure 102: FEMA Community Lifelines

VULNERABILITY SCORE

Rensselaer County seems to have a strong capacity to recover and adapt in the face of disruptive events or disasters. This is suggested by its very high community resilience score, which indicates that the community has a robust infrastructure and resources in place that can help it withstand and recover from various types of shocks and stresses.

Moreover, the community's relatively low expected annual loss (EAL) suggests that it is less exposed to hazards and risks that could cause significant losses, such as natural disasters and economic downturns. This could be due to effective risk reduction and mitigation measures implemented in the community, such as building codes, emergency planning, and public awareness campaigns.

Finally, the community's relatively low social vulnerability indicates that it has a strong social fabric and is equipped to respond to the needs of its most vulnerable members during times of crisis. This could be attributed to factors, such as high social cohesion, effective social support networks, and access to resources and services that can help mitigate the impact of disasters.

Overall, the combination of these factors suggests that Rensselaer County is well prepared to face various challenges and disruptions and is likely to recover quickly in the face of adversity.

High Wind Hazard Profile

Wind, as defined by the American Meteorological Society, is air that is in constant motion relative to the surface of the Earth. Extreme winds are most commonly the result of tornadoes, hurricanes, tropical cyclones, extratropical cyclones (northeasters), destructive wind, and thunderstorms, but they can also occur in their absence as mere “windstorms.” High winds (straight-line winds) are not associated with rotation, like tornado winds. Damaging winds are often called “straight-line” winds to differentiate the damage they cause from tornado damage. The 2023 State Hazard Mitigation Plan (SHMP) indicates that when straight-line winds meet or exceed 58 miles per hour (mph), they are classified as severe by the National Weather Service (NWS). Extreme wind events might occur over large, widespread areas or in very limited, localized areas. They can occur suddenly without warning. They can occur at any time of the day or night at any location in Rensselaer County. Extreme winds pose a significant threat to lives, property, and vital utilities due to flying debris, such as rocks, lumber, fuel drums, sheet metal, and loose gear of any type that can be picked up by the wind and hurled with great force. Extreme winds also down trees and power lines, creating power outages across affected areas.

Location

Extreme wind events are experienced in every region of the United States. A useful tool for determining the location of the extreme wind hazard area in a jurisdiction is depicted in Figure 1. This map of design wind speeds was developed by the American Society of Civil Engineers. It divides the United States into four wind zones, geographically representing the frequency and magnitude of potential extreme wind events. The figure shows that Rensselaer County is in Zone II, with a design wind speed for shelters of 160 miles per hour, and that the region in which the county is located is also considered to be susceptible to hurricanes, which are the subject of a detailed profile later in this section.

Extent

Extreme wind can occur alone, such as during straight-line wind events and derechos, or it can accompany other natural hazards, including hurricanes and severe thunderstorms. Severe wind poses a threat to lives, property, and vital utilities, primarily due to the effects of flying debris or downed trees and power lines. Severe wind will typically cause the greatest damage to lighter structures, such as manufactured homes. Table 1 presents the Beaufort scale as one measure of the magnitude or severity of the wind hazard.

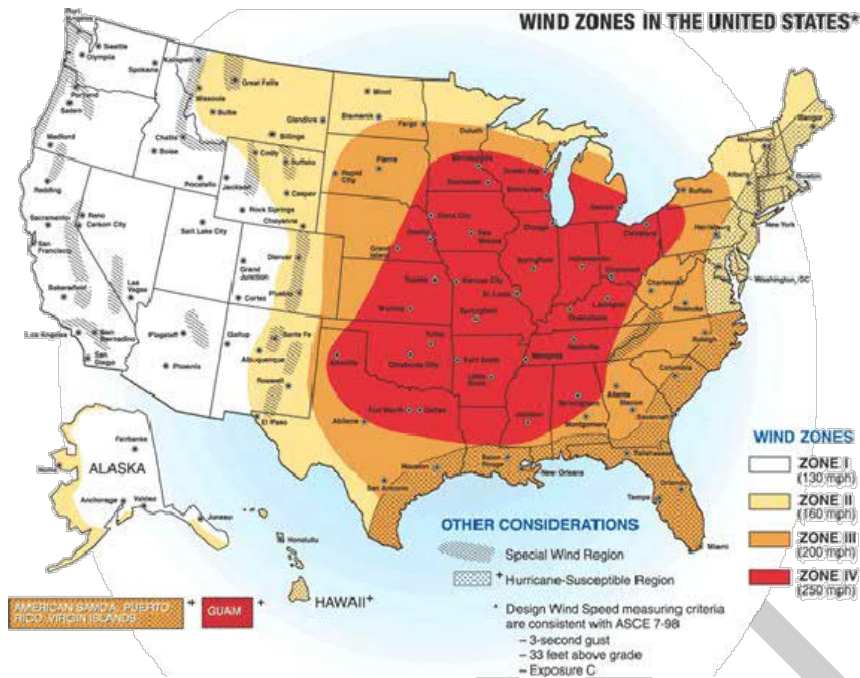


Figure 103: Map of Wind Zones in the United States

Table 59: The Beaufort Scale

Beaufort Number	Wind Speed (miles per hour)	Description	Wind Effects on Land
0	<1	Calm	Calm, smoke rises vertically.
1	1-3	Light Air	Wind motion visible in smoke.
2	4-7	Light Breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	Gentle Breeze	Leaves and smaller twigs in constant motion.
4	13-18	Moderate Breeze	Dust and loose paper are raised. Small branches begin to move.
5	19-24	Fresh Breeze	Small trees begin to sway.
6	25-31	Strong Breeze	Large branches are in motion. Whistling is heard in overhead wires. Umbrella use is difficult.
7	32-38	Near Gale	Whole trees in motion. Some difficulty experienced walking into the wind.
8	39-46	Gale	Twigs and small branches break from trees. Cars veer on roads.
9	47-54	Strong Gale	Larger branches break from trees. Light structural damage.
10	55-63	Storm	Trees broken and uprooted. Considerable structural damage.

Beaufort Number	Wind Speed (miles per hour)	Description	Wind Effects on Land
11	64–72	Violent Storm	Widespread damage to structures and vegetation.
12	>73	Hurricane	Considerable and widespread damage to structures and vegetation. Violence.

Previous Occurrences

Rensselaer County has experienced many types of damaging wind events. According to the NCEI Storm Events Database, more than 220 wind days and more than 500 discrete wind events occurred in Rensselaer County between 1996 and 2023 (including high wind, strong wind, and thunderstorm wind events, but excluding wind from tornados, which are addressed separately in this section). These incidents resulted in a reported total of 20 injuries, \$31,000 in crop damage, and more than \$2.3 million in property damage. Table 60 lists the damage from wind events between 2011 and 2023.

Table 60: Wind Events in Rensselaer County, 2011–2023

Event Type	Number of Events	Reported Deaths	Reported Injuries	Reported Property Damage	Reported Crop Damage
Strong Wind	63	0	0	\$68,000	\$9,000
Thunderstorm Wind	246	0	6	\$69,000	\$22,000
High Wind	24	0	0	\$2,000	\$0
Total:	333	0	6	\$139,000	\$31,000

Seventy wind days and 184 discrete wind events have been recorded since the last version of this plan was approved in 2018, causing \$27,000 in crop damage, and \$100,000 in property damage.

More notable damage-causing events (since 1996) includes the following:

- July 6, 1999:** Powerful thunderstorms brought down trees and power lines in many localities. A microburst was recorded in Rensselaer, bringing down a large number of trees, and roofs were peeled off homes. An even more destructive microburst with estimated winds of 100 mph brought thousands of trees down between Raymertown and Pittstown and tore roofs off storage buildings. Property damage of \$559,500 was reported.
- September 16, 1999:** Rensselaer County was included in the area covered by the disaster declaration following Tropical Storm Floyd; \$400,000 in damage was reported.
- June 25, 2000:** Thunderstorm winds blew down trees in Brunswick, Berlin, Tomhannock, and Grafton Lake. In Tomhannock, trees were uprooted near the reservoir, and two fell on houses. Wind gusts

were estimated to be 60–100 mph at Grafton State Park, which uprooted trees and damaged camps and year-round houses. Power lines also were downed. Damages of \$179,000 were reported.

- **September 11, 2002:** A large concentration of wind damage was recorded in southeastern Rensselaer County, where Route 20 near Nassau was closed when many trees toppled onto power lines. Damages of \$30,000 were reported.
- **November 13, 2003:** A portion of the roof of a convenience store was blown off in Melrose. Damage was estimated at \$30,000.
- **May 4, 2010:** Strong thunderstorm winds downed trees and wires in Snyder’s Corner, and several trees were downed on roads in the Luther section of East Greenbush. Shingles were sheared off the roof of a four-story building at the corner of River Street and First Street in Troy. Wires were downed in Schodack Center. Damages of \$55,000 were reported.
- **July 23, 2014:** Downed trees and wires were reported throughout the area due to thunderstorm winds.
- **June 30, 2017:** Numerous strong to severe thunderstorms occurred, especially across the Mohawk Valley, Saratoga Region, and Capital Region. They produced two EF-1 tornadoes in Fulton and Herkimer Counties and knocked down many trees and power lines across the region. There was a report of large hail in Saratoga County. One of the storms caused four injuries in Schodack, where a firework display tent collapsed at the Pilot truck stop on Route 9 (see Figure 104). At least 1,500 people lost power. In the Town of Nassau, Route 20 was closed between Bliss School House Road and Route 66 due to downed trees and wires. A tree and power lines were downed in Stephentown.



Figure 104: Personnel Respond in Schodack after a tent collapse, June 30, 2017 (Martin Miller/ Special to the Times Union)

- **February 26, 2019:** Gusts above 50 mph were common in the area, and several sites recorded gusts above 60 mph. Gusts as high as 69 mph occurred near Adams, MA, and East Springfield, NY. The 61 mph gust recorded at Albany International Airport was the strongest one observed during

meteorological winter since 1987. The strongest gusts occurred during the afternoon of February 25. There were numerous power outages and downed trees, and there was structural damage to barns and houses. In the City of Rensselaer, part of the roof blew off a concession stand at the Little League Field (Figure 105) and bricks were blown off the side of an auto parts store (Figure 106).



Figure 105: Damage to the Rensselaer Little League Field Concession Stand (CBS6 News)



Figure 106: Damage to an Auto Parts Store in the City of Rensselaer (CBS6 News)

- September 7, 2023:** A round of late summer thunderstorms overnight impacted several upstate New York communities. Intense thunderstorms at the end of a heatwave triggered power outages throughout the Hudson Valley, up through the Capital Region. The Rensselaer County Village of Hoosick Falls bore the brunt of the bad weather (see Figure 107). A state of emergency was called after the storms toppled power poles and downed trees. Mayor Rob Allen reported that while houses and vehicles suffered damage, no village residents reported serious injuries, and National Grid crews

have been working to restore service. The National Grid and the village’s Department of Public Works performed cleanup and restoration to 45,000 customers as a result of storm damage.



Figure 107: Damage in the Rensselaer County Village of Hoosick Falls (WAMC Northeast Public Radio photo)

PROBABILITY/IMPACTS OF CLIMATE TRENDS AND VARIATIONS

Extreme wind events have occurred frequently in Rensselaer County, and the probability of occurrences in the county is certain. The entire planning area is susceptible to a wide variety of recurring severe storms that cause extreme wind conditions. Based on historic occurrence data in the NCEI Storm Events database, Rensselaer County can expect about eight significant wind event days per year.

With regard to the impact of climate change on the probability of wind events, the 2023 SHMP concluded that:

- An understanding of the relationship between climate change and wind is still emerging.
- The impacts that climate change might have on wind location, frequency, and duration appear to be uncertain.
- The Intergovernmental Panel on Climate Change (IPCC) projects that surface winds will weaken over time in the region due to climate change.
- However, wind speeds have strengthened over the past decade, reversing a roughly 30-year stilling trend, making it unclear whether this is linked to climate change.
- As New York State continues to become more vulnerable to severe thunderstorms and tornadoes, it will continue to be impacted by high wind events.
- “Interest in non-convective high winds is growing due to their societal impact, gaps in the scientific understanding of the triggering mechanisms for these events, and possible future changes in their frequency and intensity caused by climate change.”

The data in Figure 108 suggest that at least 29% of properties in New York have at least some wind risk over the next 30 years from hurricanes, tornados, or severe storm winds. Rensselaer County’s risk level would be minimal to moderate based on the map legend. Figure 109 shows the risk rating for strong winds for municipalities in Rensselaer County, according to the NRI. This rating uses past events to establish the probability that a similar event will occur again.

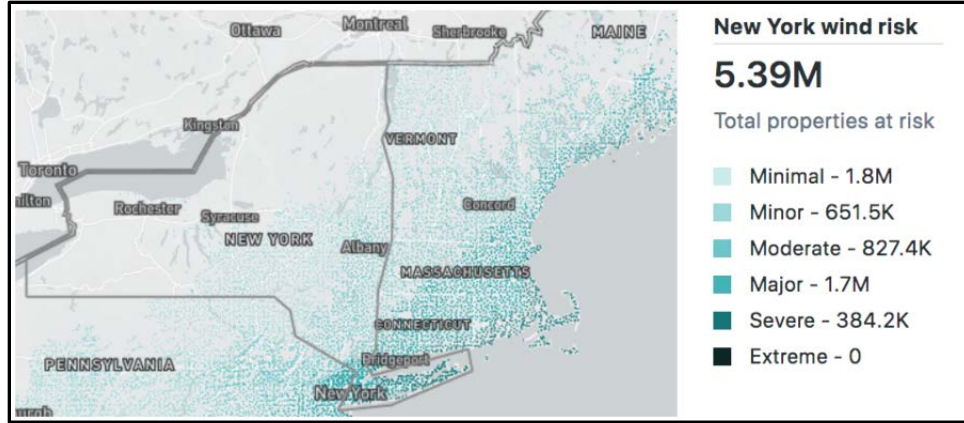


Figure 108: New York Wind Risk¹¹²

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¹¹² Source: [Mitigate NY](#)

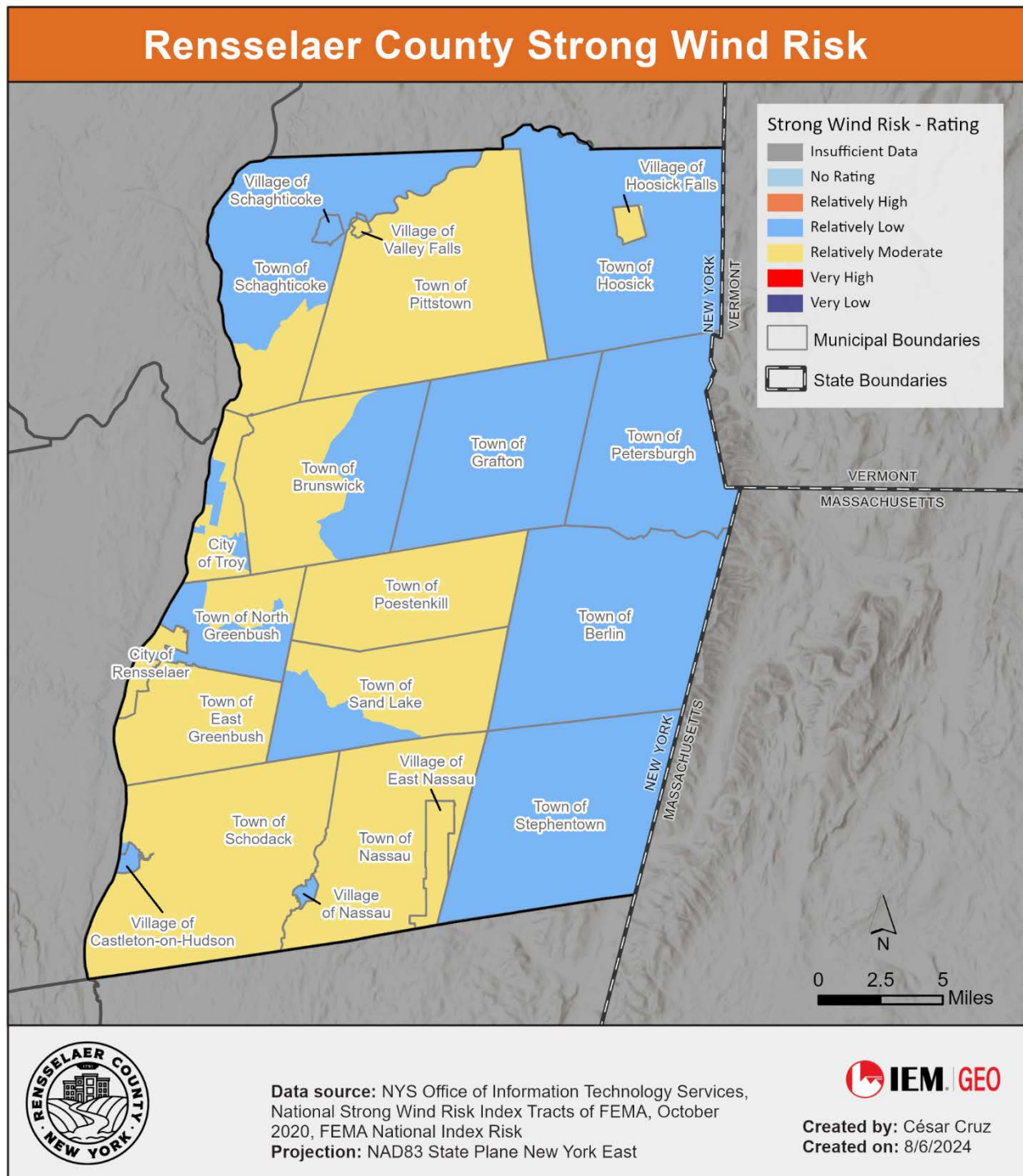


Figure 109: National Risk Index Strong Wind Risk Rating

VULNERABILITY ANALYSIS

To understand its vulnerability to natural hazards, a community must determine the assets that are exposed to or vulnerable to the hazard area. All of Rensselaer County has been identified as a hazard area

for wind. Therefore, all assets in the county (i.e., population, structures, critical facilities, and lifelines) are vulnerable.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Strong winds can have a broad range of potential impacts on buildings, infrastructure, people, and communities. Damage to buildings can include collapsed roofs and damage to equipment, doors and windows, and structural components. Impact damage from wind-borne debris during storms or other hazards can cause doors, windows, and walls to warp, crack, or shatter, compromising a building's envelope and allowing water, wind, and debris to enter. This can cause injuries from shattered glass and expose the building's interior to the elements.

Asphalt shingle roofs are susceptible to damage from strong winds, particularly if they are not properly installed or if the shingles are aged or worn. High winds can lift or tear off shingles, leaving the underlying structure exposed to further damage. Large debris or falling trees can cause partial or complete roof damage/failure, denting, or buckling.

Strong winds or flying debris can cause physical damage to HVAC equipment, such as bending and dislodging outdoor units, damaging ventilation systems, and puncturing ductwork. Contamination infiltration happens when dust and debris from windstorms infiltrate HVAC systems—clogging filters, impairing airflow, and reducing system efficiency. High winds can damage external plumbing fixtures and exposed pipes, which can cause water leaks, loss of water supply, and potential water damage in a building.

Infrastructure damage can occur from wind-blown debris and downed tree/tree limbs, and wind can down power lines and damage transformers, substations, and other equipment, causing power outages. Utility poles can be blown over, trees can fall on powerlines and power substations, and wind can cause power lines to swing into one another, resulting in a fault or a short circuit, interrupting power services.

Strong winds and flying debris can damage gas distribution facilities, pipelines, and equipment. High winds can damage or destroy terminals, hangars, runways, taxiways, and aprons at airports. Bridges may be closed when winds reach a sustained speed, leading to travel delays or the inability to travel at all if the bridge leads off an island. Wind loading happens when strong winds impose lateral forces on bridges, potentially leading to structural damage or collapse. Fallen trees and blown tree limbs or other debris can be blown onto roads, causing roads to be blocked. Fallen trees and flying debris can also damage communication infrastructure, including antennas, satellite dishes, and transmission lines, causing service interruptions.

Figure 110 shows the NRI rating for the Expected Annual Loss for Rensselaer County at \$553K from strong wind damage, a rating of relatively moderate, and a risk index score of 68.5. (Figure 110).

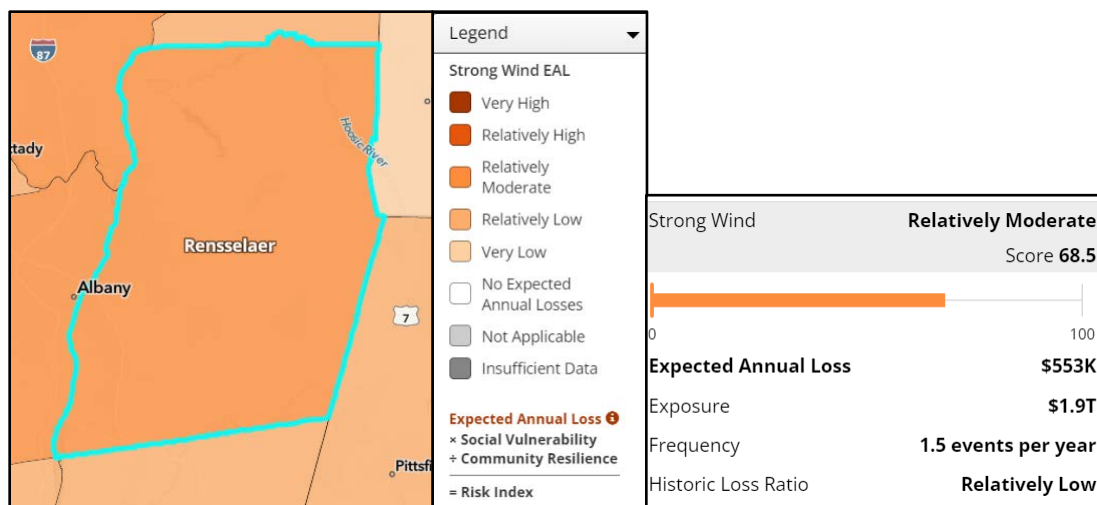


Figure 110: Expected Annual Loss from Strong Wind, Rensselaer County Score, Map and Legend¹¹³

VULNERABLE POPULATIONS

Social vulnerability is a broad concept that examines the differential impact of hazards on society based on existing socio-demographic conditions and community characteristics. The number of natural hazard events and disasters in the U.S. has been increasing, a trend that is expected to continue.

Windstorms can spread debris, smoke, and dust. These airborne pollutants can have a negative impact on people’s health, but especially those with respiratory health conditions, such as asthma, chronic obstructive pulmonary disease (COPD), and lung cancer. The 2023 SHMP states that wind hazard loss associated with damage to the population is estimated to be highest across New York City and the lower Hudson Valley.

IMPACT ON COUNTY ASSETS

The extensive built infrastructure in the Northeast is increasingly challenged by hazard- and climate-related impacts. As a result of early settlement patterns, the region has some of the oldest buildings and facilities in the United States. These structures—as well as the energy, transportation, water, and sanitation systems that make up the regional built environment—were not built to withstand the new conditions and extreme weather events projected to occur over the next century. Disruption of services that depend on these systems can have a negative impact on public health and safety, with the potential for significant repercussions in the county’s economy.

COMMUNITY LIFELINES

Community lifelines include lifeline utility systems (including drinking water, wastewater, energy resources, and communications infrastructure), emergency and essential facilities (including police, fire, ambulatory,

¹¹³ FEMA, National Risk Index, Rensselaer County Strong Wind Expected Annual Loss Score, Map and Legend.” [National Risk Index \(fema.gov\)](https://www.fema.gov/national-risk-index)

and emergency operations facilities), hospitals and medical centers, schools, elderly care facilities, child care facilities, and religious service facilities. Community facilities are the buildings, land, equipment, and activities provided on the public’s behalf by government and/or private organizations. These facilities are important components of the quality of life of a municipality. Critical facilities are necessities for the health, safety, well-being, and stability of communities. Critical infrastructure systems are essential for life safety and economic viability and include transportation, power, communications, and water and wastewater systems. FEMA Community Lifelines are a critical component of emergency management in the United States. These lifelines are designed to address the essential needs of a community during and after a disaster. There are eight lifelines, each with its own focus and purpose (Figure 111).



Figure 111: Community Lifelines¹¹⁴

VULNERABILITY SCORE

In Rensselaer County, strong winds are not particularly common, and while their potential consequences are high, they have not historically caused significant damage. The NRI includes data on the expected annual losses to individual natural hazards, historical loss, and overall risk at the county and census tract levels. Figure 112 shows the NRI rating for Rensselaer County for strong wind risk as relatively moderate, with a risk score of 62. (Figure 112).

¹¹⁴ Source: <https://www.fema.gov/sites/default/files/2020-05/CommunityLifelinesToolkit2.0v2.pdf>

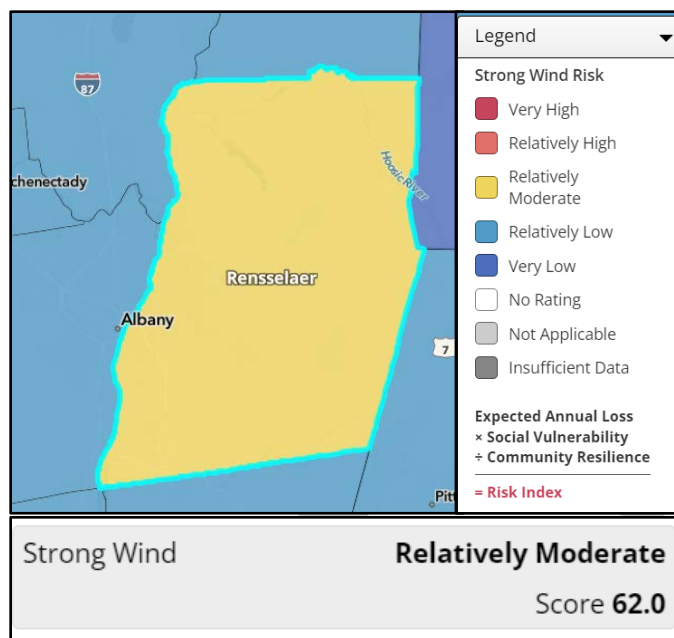


Figure 112: FEMA NRI Rensselaer County Strong Wind Score, Map and Legend¹¹⁵

Hurricane/Tropical Storm Hazard Profile

Hazard Definition

A hurricane is a severe tropical cyclone with winds that have reached a constant speed of 74 miles per hour or more. Hurricane winds blow in a large spiral around a relative calm center known as the "eye." The eye is generally 20 to 30 miles wide, and the system can extend outward from the eye as far as 400 miles. In the Northern Hemisphere, hurricane winds circulate counterclockwise around the eye. These storms are usually short in duration but are extremely powerful and cause damage due to significant storm surges and high winds. Storm systems with wind speeds between 39 and 73 miles per hour are classified as a tropical storm. In the Atlantic basin, hurricanes and tropical storms are most likely to occur between June 1st and November 30th, with the peak number of events typically occurring between mid-August and late October.






Hurricanes and tropical storms are particular types of events. The hazards associated with a hurricane or tropical storm event are high winds, flooding (including storm surge), coastal erosion, and wave action. Each of the unique hazards associated with hurricane and tropical storm events are specifically discussed elsewhere in the plan, as applicable to Rensselaer County.

The magnitude or severity of hurricanes is categorized by the Saffir–Simpson scale. The Saffir–Simpson Scale is a five-category wind speed/storm surge classification scale used to classify Atlantic hurricane

¹¹⁵FEMA, "National Risk Index Rensselaer County Strong Wind Score, Map and Legend." [National Risk Index \(fema.gov\)](https://www.fema.gov/national-risk-index)

intensities. The scale is used to give an estimate of the potential property damage and flooding that can be expected. The Saffir–Simpson values range from Category 1 to Category 5, as shown in Table 1. Wind speed is the determining factor in the scale, as storm surge values are highly dependent on the slope of the continental shelf in the landfall region.

Table 61: The Saffir–Simpson Hurricane Scale¹¹⁶

Category	Wind Speed	Storm Surge (Above Normal Sea Level)	Expected Damage	Photo Example
1	74–96 mph	4–5 feet	Minimal: Damage is done primarily to shrubbery and trees. Unanchored mobile homes are damaged and some signs are damaged, but no real damage is done to structures.	
2	96–110 mph	6–8 feet	Moderate: Some trees are toppled, some roof coverings are damaged, and major damage is done to mobile homes.	
3	111–130 mph	9–12 feet	Extensive: Large trees are toppled, some structural damage is done to roofs, mobile homes are destroyed, and structural damage is done to small homes and utility buildings.	
4	131–155 mph	13–18 feet	Extreme: Extensive damage is done to roofs, windows, and doors; roof systems on small buildings completely fail; some curtain walls fail.	
5	Greater than 155 mph	Greater than 18 feet	Catastrophic: Roof damage is considerable and widespread; window and door damage is severe, there are extensive glass failures, and entire buildings could fail.	

For tropical storms (not represented on the Saffir–Simpson Hurricane scale), winds are between 39 and 73 miles per hour and typical effects include breakage of twigs and branches off trees, toppling of shallow-rooted trees, and some damage to signboards and windows.

The magnitude or severity of hurricane and tropical storm events will increase under the following conditions:

- The storm category increases
- The diameter of the storm system increases

¹¹⁶ Source: FEMA’s How-To #2, page 2-23

- The system's forward speed decreases
- Rainfall amounts increase
- The number of people, structures, and infrastructure in the affected areas increases

For the sake of clarity, it should also be noted that, for communities with mapped erosion, surge, or wave action zones, the magnitude or severity will also increase with increasing degree of coastal erosion, surge and/or wave action. However, there are no mapped coastal erosion hazard areas or significant wave action hazard areas in Rensselaer County; the Hudson River is tidal up to Federal Dam at Troy.

Location

Hurricanes and tropical storms threaten the entire Atlantic and Gulf seaboard of the United States, and while coastal areas are most directly exposed to the brunt of landfalling storms their impact is often felt hundreds of miles inland. The 2023 SHMP indicates that high sustained winds, lightning strikes, massive rainfall, storm surge, flooding and resulting erosion, and tornadoes associated with hurricanes can all pose significant risks to New York City, Long Island, and in some cases, the Hudson Valley, the Catskills, and other parts of upstate. No single jurisdiction within Rensselaer County is more likely than any other to have the path of such a system traverse within its borders, although due to the distance of Rensselaer County from the coastline, most hurricanes that reach the New York State area are likely to become downgraded to tropical storms, tropical depressions, or extratropical systems as they move any distance inland.

Extent

Due to the size of hurricane and tropical storm systems, areas within Rensselaer County can still be affected even when the eye makes landfall outside of Rensselaer County. The entire planning area is potentially susceptible to a hurricane/tropical storm. The hazards associated with hurricane and tropical storm events have distinct hazard area locations, discussed in other sections of this report. For Rensselaer County, these include wind and flood hazards.

Previous Occurrences

Hurricanes and tropical storms have impacted Rensselaer County and its participating jurisdictions in the past and will continue to do so in the future. The county has an active history of hurricane and tropical storm events. Storms have been characterized by flooding and/or wind impacts, with occasional landslides due to excessive rainfall. According to NOAA's improved Historical Hurricane Tracks Tool v4.0, the tracks of three hurricanes (one Category 3 hurricane and two Category 1 hurricanes), eight tropical storms and five extratropical systems have passed within 65 miles of the Rensselaer County seat at Troy since 1863. The most proximate events to Rensselaer County during the last 100 years were an unnamed tropical storm which passed a few miles northwest of the county's northwestern corner in 1949, and the famously destructive New England Hurricane of 1938, which was still considered a Category 3 hurricane when it

passed approximately 10 to 12 miles to the east of Rensselaer County. In addition, the extratropical remains of Hurricane Gracie passed directly over central Rensselaer County in 1959. Figure 1 shows the track of each recorded historical storm in relation to the Rensselaer County search area. As can be seen in the figure, almost all hurricane and tropical storm tracks traverse in a northeasterly direction through the area. Table 2 provides the date of occurrence, storm name (if applicable), maximum wind speed and category of the storm based on the Saffir–Simpson Scale (as recorded within 65 miles of the Rensselaer County seat in the City of Troy). Please note that Hurricane Floyd and Superstorm Sandy do not appear in Figure 1 or Table 2 because their respective storm tracks passed further than 65 miles from Rensselaer County.

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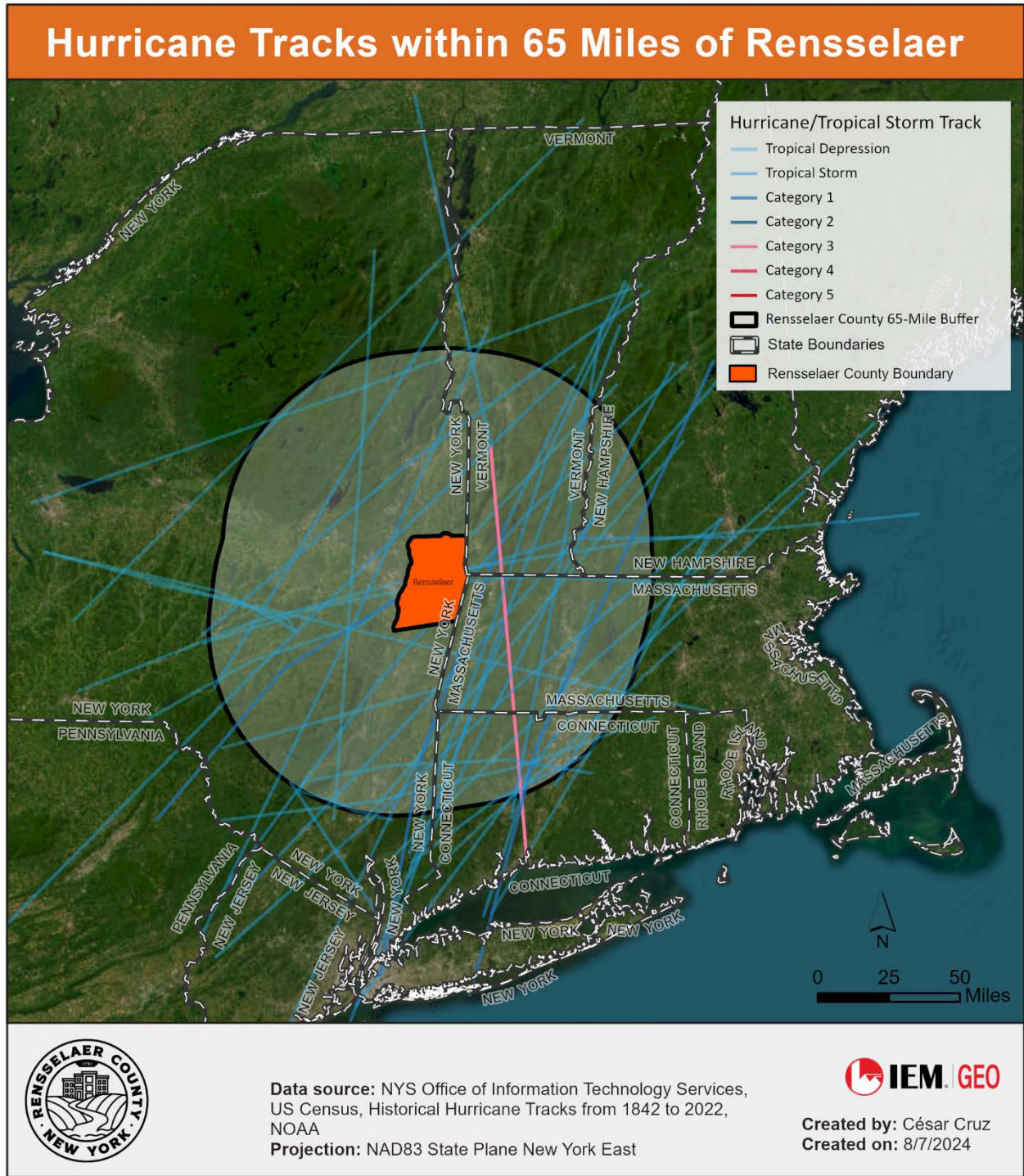


Figure 113: Hurricane/Tropical Storm Tracks within 65 Miles of Rensselaer County, 1863–2023¹¹⁷

¹¹⁷ NOAA 2018, "Hurricane/Tropical Storm Tracks within 65 Miles of Rensselaer County, 1863-2023."
<http://coast.noaa.gov/hurricanes/>

Table 62: Hurricane/Tropical Storm Tracks within 65 Miles of Rensselaer County, 1863–2023

Date of Occurrence	Storm Name	Storm Category
Sep 16, 1863 to Sep 19, 1863	Unnamed 1863	Tropical Storm
Oct 29, 1866 to Oct 30, 1866	Unnamed 1866	Extratropical Storm
Sep 12, 1876 to Sep 19, 1876	Unnamed 1876	Tropical Storm
Oct 18, 1878 to Oct 25, 1878	Unnamed 1878	Category 1 Hurricane
Aug 15, 1893 to Sep 02, 1893	Unnamed 1893	Tropical Storm
Aug 15, 1893 to Aug 26, 1893	Unnamed 1893	Category 1 Hurricane
Oct 26, 1899 to Nov 04, 1899	Unnamed 1899	Extratropical Storm
Sep 27, 1924 to Oct 01, 1924	Unnamed 1924	Extratropical Storm
Sep 19, 1929 to Oct 05, 1929	Unnamed 1929	Extratropical Storm
Sep 09, 1938 to Sep 23, 1938	Unnamed 1938	Category 3 Hurricane
Aug 23, 1949 to Sep 01, 1949	Unnamed 1949	Tropical Storm
Aug 18, 1952 to Sep 03, 1952	Able 1952	Tropical Storm
Sep 20, 1959 to Oct 02, 1959	Gracie 1959	Extratropical Storm
Aug 20, 1971 to Aug 29, 1971	Doria 1971	Tropical Storm
Aug 25, 1979 to Sep 08, 1979	David 1979	Tropical Storm
Aug 21, 2011 to Aug 30, 2011	Irene 2011	Tropical Storm
Aug 21, 2021 to Aug 24, 2021	Henri 2021	Tropical Storm

Rensselaer County has also been significantly impacted by hurricanes and tropical storms whose tracks passed at great distances from county borders. For example, the county received a FEMA Emergency Declaration after Hurricane Katrina in 2005 because of the influx of evacuees from states impacted by the storm, as opposed to direct storm impacts or damages from the hurricane itself in Rensselaer County. Similarly, Rensselaer County received an Emergency Declaration from FEMA after Hurricane Sandy in 2012, due largely to the tremendous need for support from responders outside of impacted areas to travel to hard-hit areas farther south in the storm's path and assist their colleagues during immediate post-disaster response.

Notable recent events impacting Rensselaer County include:

- September 16–17, 1999 - Floyd¹¹⁸:** The remnants of Hurricane Floyd moved up the eastern seaboard on September 16 and during the early hours on September 17. The storm brought both high winds and exceptionally heavy rainfall to eastern New York, which included a large swath of 3- to 6-inch amounts. Some areas received more than 1 foot of rain. Specific rainfall amounts included 6.12 inches at Albany International Airport, the highest ever officially recorded there from any given storm.

¹¹⁸ NOAA, 1999, "Hurricane Floyd, September 16, 1999." [Hurricanes in History \(noaa.gov\)](https://www.noaa.gov/hurricanes)

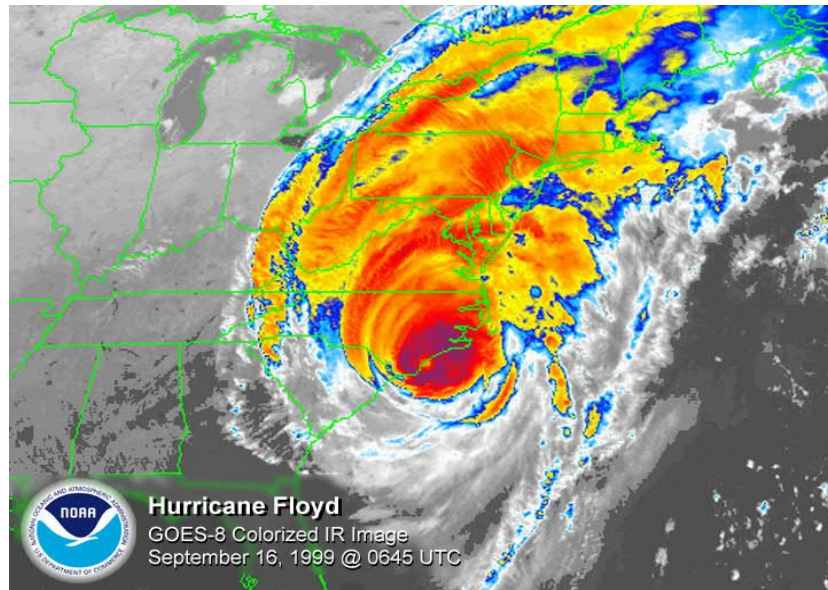


Figure 114: Hurricane Floyd September 16, 1999

Even higher amounts of rainfall included 8.15 inches in Delmar and 9 inches at Knox, both located in Albany County. 12.21 inches of rainfall were recorded in Cairo, Greene County, the most associated with the storm. The rain produced widespread flooding across the region, which proved very destructive and resulted in one fatality. The rains, combined with rain left over from Tropical Storm Dennis a week earlier, alleviated the 14-month drought across most of the region. Winds from the passage of Floyd gusted to 49 mph at Albany International Airport during the evening of September 16. Higher gusts estimated over 60 mph were common across the hill towns. The combination of the wind and very saturated ground produced widespread downing of trees and power lines across much of eastern New York. The rain and wind produced massive power outages across the region. As many as 80,000 people lost power in the Mid-Hudson Valley region; 54,000 in the Greater Capital District; and another 25,000 in the Lake George Saratoga region. Some individuals had to wait more than a week for power to be restored. The storm resulted in lost wages, closed schools throughout the region, and cancelled flights at Albany International Airport. Floyd resulted in the counties of Albany, Dutchess, Greene, and Rensselaer being declared "major disaster areas" by Governor Pataki.

- August 28, 2011 - Irene:** The remnants of Hurricane Irene brought heavy to extreme rainfall to the region, which resulted in catastrophic and flash flooding in some areas. In Rensselaer County, numerous road closures were also reported, with one bridge damaged, and 60 evacuations reported. In addition, major flooding occurred on the Hoosic River at Eagle Bridge and on the Hudson River at Troy. Numerous trees and power lines were reported down due to strong winds across Rensselaer County, resulting in power outages and road closures. In the Village of Castleton-On-Hudson, Route 150 at Route 9J was reported closed. In East Greenbush, a National Weather Service Cooperative Observer reported a measured wind gust of 41 mph. In the Town of Hoosick, a National Weather Service Cooperative Observer reported a measured wind gust of 39 mph in Buskirk. In the Town of Sand Lake, portions of Route 43 in West Sand Lake were reported closed due to flooding, including between Geiser Road and Mammoth Spring Road, and between Route 150 and Route 351. In the Village of Castleton-on-Hudson, Route 9J was closed due to flooding between Knickerbocker Road

and Brickyard Road. In the Town of Grafton, Route 2 was closed across Rensselaer County due to numerous reports of flooding and some wash outs. In Troy, A mudslide occurred on Route 2 (Brunswick Road) at Route 66 (Pawling Avenue) causing a house to collapse, two other houses were knocked from their foundations by about 8 feet, and a large tree fell and destroyed an automobile shop. A home was destroyed in Poestenkill on Franklin Street by flood waters from the Poesten Kill. Route 7 across Rensselaer County was closed due to numerous reports of flooding.

Major flooding occurred on the Hoosic River. The Eagle Bridge river gage located on the right bank 0.5 miles upstream from Case Brook, 1.2 miles downstream from Walloomsac River, and 1.2 miles southeast of Eagle Bridge exceeded its 11-foot flood stage at 1:31 p.m. EST August 28, its 13-foot moderate flood stage at 3:43 pm, and its 16-foot major flood stage at 6:31 pm. It crested at 19.24 feet at 12:30 a.m. August 29, and dropped below flood stage at 2:29 p.m. August 29. Route 103 in Buskirk was reported flooded approximately one mile south of Route 67. Route 136, Whiteview Road, in Wynantskill was closed at Brookside Avenue due to flooding. Route 22 in Petersburg was closed due to flooding and a washout between Smith Road and Church Hollow Road. Portions of Route 20 were reported closed due to flooding, including at Route 9 in the Town of Schodack, and between Lords Hill Road and Coldwater Tavern Road in Nassau. Wynantskill Creek was reported flowing out of its banks with water on Thais Road at the intersection of Springer Road. Water from the Poesten Kill destroyed a home on Franklin Street in Poestenkill. Route 66 in Wynantskill was reported closed due to flooding. The Troy River gage located about 1 mile north of Route 7 exceeded its 21.5-foot flood stage at 5:21 p.m. EST August 28, its 24-foot moderate flood stage at 2:06 a.m. August 29, and its 27-foot major flood stage at 2:30 pm; it crested at 27.05 feet at 3:15 p.m., and dropped below its flood stage at 12:37 p.m. August 30. The Albany River gage, located on the right bank 0.1 miles upstream from the bridge on U.S. Highways 9 and 20 in Albany, exceeded its 11-foot flood stage at 11:12 p.m. EST August 28, its 13-foot moderate flood stage at 6:50 a.m. August 29, and its 15-foot major flood stage 3:26 pm; it crested at 15.4 feet at 6:15 p.m. August 29, and dropped below flood stage at 6:44 a.m. August 30. The Rensselaer County Emergency Management Office requested voluntary evacuations for parts of the City of Troy due to flooding from the Hudson River for the neighborhoods between Ferry Street (Route 2) and the Menands Bridge (Route 378) from the Hudson River east to Fourth Street (Route 4) in South Troy and the area between 112th Street and 126th Street from the Hudson River to 5th Avenue in Lansingburgh (North Troy). Numerous homes and businesses were flooded in downtown Troy including Dinosaur Bar-B-Que. The Dunn Memorial Bridge eastbound ramp to Routes 9 and 20 was closed due to flooding from 10:45 a.m. August 29 to midday on August 30.

- October 29–30, 2012 - Sandy:** Rainfall in Rensselaer County was not excessively heavy and did not cause any flooding, thanks to dry antecedent conditions. Wind gusts of 40–60 mph were common from the afternoon of October 29 until the early morning hours of October 30. Wind gusts of 50 mph were recorded at the National Weather Service Forecast Office in nearby Albany. Trees and wires were reported down in Berlin due to high winds. In addition, the powerful storm caused a storm surge of water that moved up the Hudson River from the New York City area. In Rensselaer County, flooding occurred along the Hudson River, causing damage to homes and businesses located near the river. Brickyard Road in Castleton-on-Hudson was reported to be under water due to tidal flooding along the Hudson River.

- July 14, 2021 - Torrential Rainstorms:** Torrential rainstorms in Rensselaer County caused major damages totaling \$1.9 million to 18 homes and nine businesses, in addition to minor damages totaling \$2.3 million to 281 homes and 14 businesses. The storm also caused flooding that heavily damaged roads and bridges in central and southern portions of the county, requiring extensive repairs to damaged road systems, culverts, and streams.
- August 21–24, 2021 - Tropical Storm Henri:** The National Weather Service Doppler radar showed a broad region of steady rainfall associated with Tropical Depression Henri across northern New Jersey, south-central and southeastern New York, and east-central Pennsylvania. A narrower, convective band of heavier showers and thunderstorms was embedded within this rain shield, and extended meridionally from southeast of Syracuse, through Binghamton, to just west of Scranton. August 23, Radar continued to show a broad axis of light to moderate rainfall associated with Henri extending from the Mid-Atlantic Coast up through Long Island, western Connecticut and wrapping into southern New York.

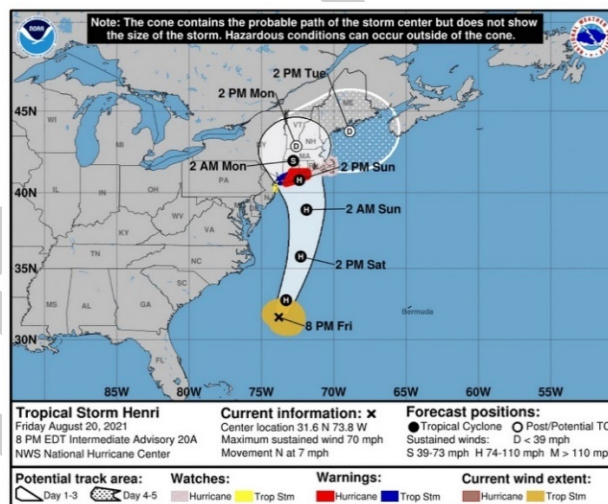


Figure 115: Tropical Storm Henri August 20, 2021¹¹⁹

NOAA’s NCEI Storm Events Database lists only one hurricane/tropical storm event day in Rensselaer County between 1996 and 2023 (Hurricane Irene in 2011). None of the event records included reports of deaths, injuries, property damage, or crop damage (see Table 3).

¹¹⁹ NOAA, 2021, “Tropical Storm Henri, August 20, 2021.” [Tropical Storm Henri 2021 path - Search Images \(bing.com\)](https://www.bing.com/images/search?q=Tropical+Storm+Henri+2021+path&imgcrsh=1)

Table 63: Hurricane/Tropical Storm Events, 1996–2023¹²⁰

Affected Location	Date(s)	Event Type	Reported Deaths	Reported Injuries	Reported Property Damage*	Reported Crop Damage
Rensselaer County	09/16/1999	Remnants of Hurricane Floyd	0	0	\$1,900,000	\$0
Rensselaer County	08/28/2011	Tropical Storm Irene	0	0	\$0	\$0
Rensselaer County	10/29/12–10/30/12	Remnants of Superstorm Sandy	0	0	\$0	\$0
Rensselaer County	08/21/21–8/24/2021	Tropical Storm Henri	0	0	\$0	\$0
Total			0	0	\$1,900,000	\$0

The FEMA web site (www.fema.gov/disasters) documents that Rensselaer County has received two major Emergency Declarations due to hurricane/tropical storm since the initial plan was prepared in 2011, as detailed in Table 64 as well as Figure 115 and Figure 116.

Table 64: FEMA Hurricane/Tropical Storm Declarations, 2011–2023¹²¹

Disaster/ Emergency Number	Declaration Type	Event	Incident Period	Eligible Assistance for Rensselaer County
DR#4020	Major Disaster Declaration	Hurricane	August 26–September 5, 2011	See Emergency Declaration map below for eligibility assistance for Rensselaer County (see Figure 115)
EM#3565	Emergency Declaration	Hurricane	August 21–24, 2021	See Emergency Declaration map below for eligibility assistance for Rensselaer County (see Figure 116)

¹²⁰ *Note: Extensive damages discussed qualitatively in NOAA’s event records as a result of Irene are not reported quantitatively by NOAA in their Storm Events Database under Reported Property Damage. Also: Floyd and Sandy were included in the NCEI database for their wind, flood, and surge damages.

¹²¹ FEMA, 2024, FEMA Hurricane/Tropical Storm Declarations.” [Declared Disasters | FEMA.gov](https://www.fema.gov/declared-disasters)

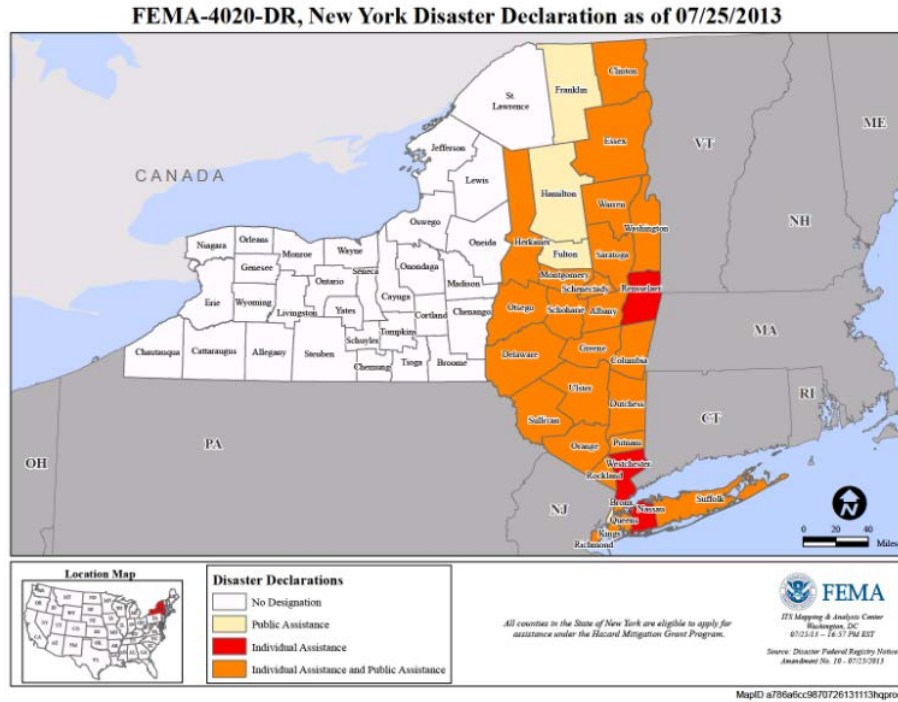


Figure 116: FEMA DR-4020, New York Disaster Declaration, July 25, 2013¹²²

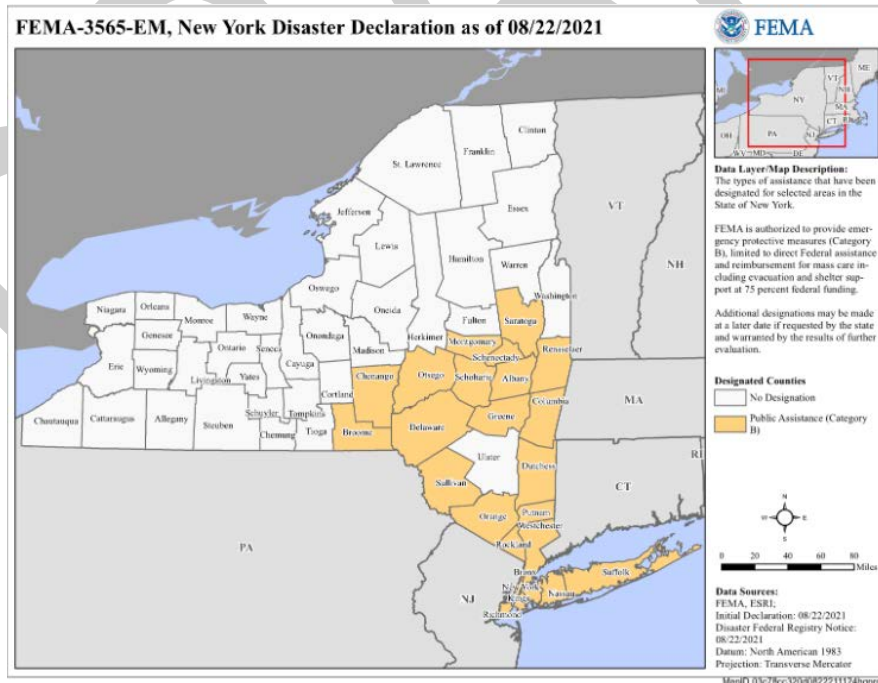


Figure 117: FEMA, EM-3565, New York Disaster Declaration, August 22, 2021¹²³

¹²² FEMA, 2024, "DR-4020, New York Disaster Declaration, July 25, 2013." [Designated Areas | FEMA.gov](https://www.fema.gov/designated-areas)

¹²³ FEMA, 2024, "EM-3565, New York Disaster Declaration, August 22, 2021." [Designated Areas | FEMA.gov](https://www.fema.gov/designated-areas)

Probability of Future Events

The probability of future hurricane and tropical storm events for Rensselaer County is high. According to NOAA statistical data, Rensselaer County is located in an area with an annual probability of a named storm between 6 and 12 percent (Figure 117). This empirical probability is fairly consistent with other scientific studies and observed historical data made available through various federal, state, and local sources. Occurrences are most likely during the official Atlantic hurricane season (the months of June through November). The peak of the Atlantic hurricane season is in early to mid-September and the average number of storms that reach hurricane intensity per year in this basin is six. The probability of storm occurrences will vary significantly based on the return interval for different categories of magnitude. The probability of less intense storms (lower return periods) is higher than more intense storms (higher return periods).

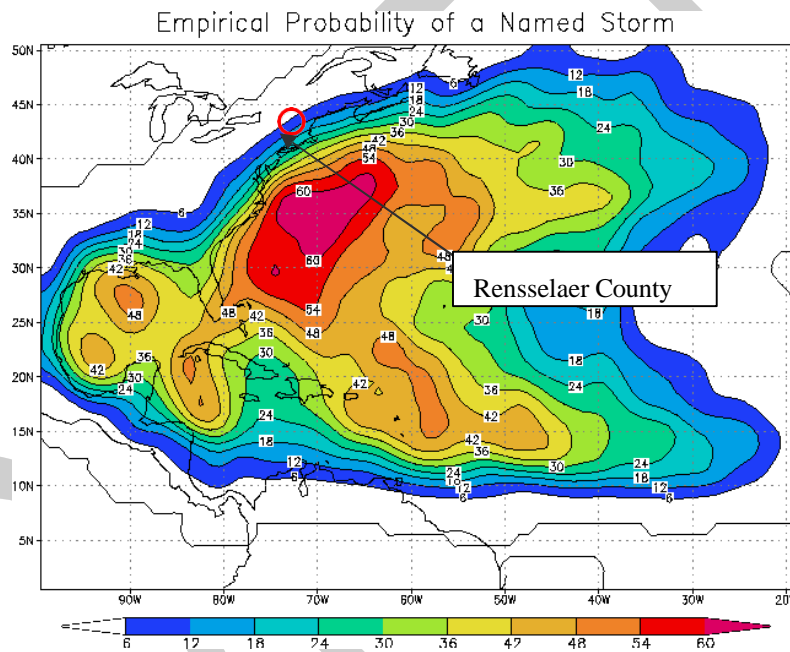


Figure 118: Probability of Named Storm¹²⁴

Impacts of Climate Trends and Variations

The 2023 SHMP states that climate change will make hurricanes intensify more rapidly, cause heavier rainfall, and result in more severe storm surges. Hurricane intensity decay is also predicted to continue slowing. Models suggest that although hurricane frequency will decrease, the proportion of Category 4 and 5 hurricanes will increase. However, this finding has mixed to low certainty. Some studies have suggested that as the world warms, a greater percentage of tropical storms in the Atlantic will form closer to the coast than they have in the past, and that as a result, more will make landfall, particularly along the East Coast. A more granular study reported similar findings and also asserted that tropical cyclones may

¹²⁴ 2019 Rensselaer County HMP, NOAA, "Probability of Named Storm."

travel closer to Boston and Norfolk than to New York City. Still, there is not yet a scientific consensus on this finding and most papers on the potential climate-induced geographic shifts in tropical cyclones include significant caveats and low-confidence findings. While the precise results of studies vary, the potential threat of strengthening hurricanes and tropical storms as a hazard to Rensselaer County cannot be ignored.

Because hurricanes gain intensity from ocean moisture, their intensity typically lessens, or decays, as they move inland. However, studies have shown that the decay in intensity has lessened proportionally with increase sea surface temperatures, meaning that more of hurricanes' destructive power is being preserved as they move farther inland, compared to historic levels. Hurricanes have also slowed over land, causing more rainfall, wind damage, and other impacts. Furthermore, data gathered since 1979 indicates that there are more pre-season hurricanes forming each year.

Storm effects are expected to increase due to climate change, and the following types of impacts may be anticipated in Rensselaer County as a result: inundation of low-lying areas; increased frequency and extent of storm-related flooding; impacts to human populations (property losses, more frequent flood damage, more frequent flooding of roadways and urban centers, risks to people as the population of flood-prone areas increases); more buildings and infrastructure exposed; greater losses to currently exposed buildings and infrastructure as water levels increase; impacts on gravity flow stormwater systems; and impacts on non-coastal areas.

The impacts of climate change can affect all parts of a community, including: transportation infrastructure (ports, marinas, airports, roads, bridges, railways); public infrastructure (stormwater and wastewater management systems, drinking water supply and distribution systems, power utility systems, communications systems); public facilities (e.g., police, fire, ambulance, hospitals, schools, daycare centers, adult living facilities, historic landmarks, government buildings, libraries, parks); and economic viability—particularly for communities where tourism tends to drive local economies, as is the case in some of Rensselaer County's communities. Climate change also could lead to a potential loss of assets that support tourism.

Vulnerability Analysis

EXPOSURE

To understand its vulnerability to natural hazards, a community must determine the assets that are exposed or vulnerable in the hazard area. All of Rensselaer County has been identified as a hazard area for hurricanes and tropical storms. Therefore, all assets in the county (i.e., population, structures, critical facilities, and community lifelines) are vulnerable.

FEMA defines *vulnerability* as "susceptibility to physical injury, harm, damage, or economic loss." The 2023 SHMP presents both quantitative and qualitative information about the physical, social, ecological, and economic risks associated with natural hazards as a foundation upon which state decision-makers and communities alike can build and conduct true vulnerability assessments.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Hurricanes and tropical storms are capable of producing catastrophic impacts. Depending on the nature of the event, many injuries and/or deaths could result, a large percentage of property in the affected area could be damaged or destroyed, and critical facilities could be completely shut down for 30 days or more. The Rensselaer County Emergency Preparedness Assessment (CEPA) characterizes hurricanes and tropical storms as a moderate hazard, with low likelihood and very high potential consequences. Impacts of hurricanes and tropical storms are associated with damages as a result of flooding (riverine and storm surge traversing up the Hudson River) and high winds.

It is possible for the entire county to be impacted by hurricanes and tropical storms, albeit in different ways. For example, wind impacts may be widespread across the county, whereas more localized riverine flooding would be expected in riverine flood zones, causing more severe types of structure damages in areas along the Hudson River susceptible to storm surge. Roads and bridges across the county would be susceptible to overtopping and damage from floodwaters. Impacts to the general public include evacuation and sheltering needs, as well as emergency response for those who shelter in place or are injured during the event. All property types can be impacted; roads, bridges, schools, hospitals and other types of critical facilities are susceptible to wind and water damage. Secondary impacts would be associated with flying debris. Transportation, communications, and governmental services may be severely impacted. Impacts would be exacerbated when coincident with high tides or during prolonged types of events that extend across several tidal cycles.

Hurricanes and tropical storms are complex combinations of discrete component hazards occurring simultaneously. Hurricanes and tropical storms include high winds 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 who have been impacted by the events. Significant damage can also be inflicted by trees, branches, and other objects that fall on power lines, buildings, roads, vehicles, and people. Damages during these events result from the cumulative impacts of a wide range of hazards including flooding, storm surge, and high winds.

No two hurricanes or tropical storms are identical. Even hurricanes of the same category can bring wildly different impacts depending on whether they occur during a time of high tide or low tide. For example, variations in inland wind affects and precipitation amounts can vary widely. Hurricanes and tropical storms often impact large areas and cross-jurisdictional boundaries. All existing and future buildings, facilities, and populations are considered to be exposed to potential damage from severe storms. Because hurricanes and tropical storms can lead to damage from additional hazards, such as flooding, coastal erosion, high winds, and precipitation, it is challenging to estimate the potential losses from all of these hazards.

A probabilistic scenario was created using Hazus to assess Rensselaer County's vulnerability to hurricane winds. Default Hazus wind speed data and damage functions and methodology were used to determine the potential estimated losses for 100- and 500-year scenarios.

An estimated 161,130 people in 66,000 households reside in the study region. The region contains more than 55,000 buildings, with a total replacement value (excluding contents) of \$27,213,000. Of these buildings, 91 percent are residential housing.

HAZUS 100-YEAR HURRICANE SCENARIO

The total economic loss predicted for this hurricane scenario is \$18.8 million dollars, which is 0.07 percent of the total replacement value of buildings in the analysis region. Direct building losses are the estimated costs to repair or replace the damage caused to a building, contents, and inventory by a flood. These losses total \$18.76 million, which exceeds 99 percent of the total losses for the scenario. Residences make up more than 94 percent of the total losses, which equal \$17,608,000. Of these, \$10,349 are business interruption losses associated with the inability to operate a business because of hurricane wind damage. This includes relocation costs, income and wage losses, and loss of rental income from people displaced from their homes. Hazus also estimates that 55,427 tons of debris will be generated by these structural damages. Approximately 17 truckloads will be required to remove the debris generated. Table 65 shows estimated potential losses as compared to structure Replacement Cost Value (RCV). Table 66 shows estimated potential impacts to critical facilities.

Because the damage to residences in this scenario were mostly minor, Hazus predicted that no individuals would be displaced or seek temporary shelter in this scenario.

Table 65: Estimate Critical Facility Impacts from Hurricane Winds: 100-Year Scenario

Facility Type	Count	At Least Moderate Damage	Loss of Functionality (Days)
Emergency Operations Center	1	0	0
Fire Stations	55	0	0
Hospitals	26	0	0
Police Stations	17	0	0
Schools	66	0	0

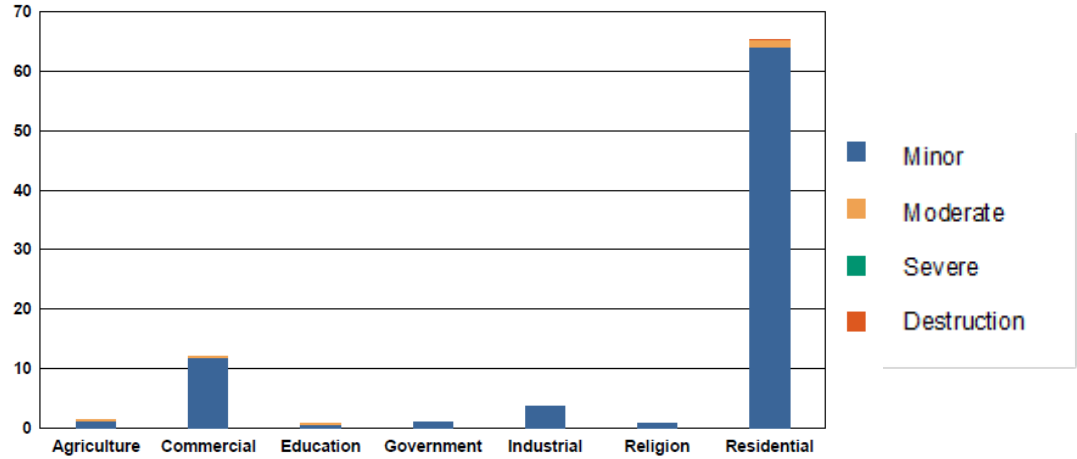


Figure 119: Expected Building Damage by Occupancy from 100-Year Hurricane

Occupancy	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	486	99.72	1	0.25	0	0.03	0	0.00	0	0.00
Commercial	2,950	99.59	12	0.40	0	0.01	0	0.00	0	0.00
Education	69	99.05	1	0.91	0	0.03	0	0.00	0	0.00
Government	190	99.47	1	0.52	0	0.01	0	0.00	0	0.00
Industrial	822	99.56	4	0.43	0	0.00	0	0.00	0	0.00
Religion	216	99.63	1	0.36	0	0.01	0	0.00	0	0.00
Residential	50,890	99.87	64	0.13	1	0.00	0	0.00	0	0.00
Total	55,623		83		2		0		0	

Figure 120: Building Damage by Occupancy from 100-Year Hurricane

Table 66: Hazus Loss Estimates for 100-Year Hurricane Winds

Jurisdiction	Building Loss	Contents Loss	Inventory Loss	Relocation Cost	Income Loss	Rental Income Loss	Wage Loss	Total Loss
City of Rensselaer	\$301,870	\$152,918	\$0	\$250	\$0	\$0	\$0	\$455,038
City of Troy	\$1,570,804	\$497,932	\$0	\$4,330	\$0	\$0	\$0	\$2,073,066
Town of Berlin	\$476,966	\$234,184	\$0	\$613	\$0	\$0	\$0	\$711,763
Town of Brunswick	\$1,155,448	\$567,393	\$0	\$656	\$0	\$0	\$0	\$1,723,498
Town of East Greenbush	\$875,103	\$167,039	\$0	\$486	\$0	\$0	\$0	\$1,042,628
Town of Grafton	\$386,365	\$240,935	\$0	\$111	\$0	\$0	\$0	\$627,411
Town of Hoosick	\$457,122	\$195,143	\$0	\$656	\$0	\$0	\$0	\$652,922
Town of Nassau	\$573,736	\$310,566	\$0	\$68	\$0	\$0	\$0	\$884,369
Town of North Greenbush	\$1,024,340	\$516,222	\$0	\$467	\$0	\$0	\$0	\$1,541,029
Town of Petersburg	\$352,885	\$184,698	\$0	\$148	\$0	\$0	\$0	\$537,731
Town of Pittstown	\$568,135	\$282,717	\$0	\$184	\$0	\$0	\$0	\$851,037
Town of Poestenkill	\$663,988	\$366,296	\$0	\$368	\$0	\$0	\$0	\$1,030,651
Town of Sand Lake	\$1,054,430	\$649,749	\$0	\$527	\$0	\$0	\$0	\$1,704,706
Town of Schaghticoke	\$493,072	\$285,332	\$0	\$124	\$0	\$0	\$0	\$778,528

Jurisdiction	Building Loss	Contents Loss	Inventory Loss	Relocation Cost	Income Loss	Rental Income Loss	Wage Loss	Total Loss
Town of Schodack	\$1,258,741	\$705,686	\$0	\$593	\$0	\$0	\$0	\$1,965,020
Town of Stephentown	\$860,526	\$426,784	\$0	\$284	\$0	\$0	\$0	\$1,287,593
Village of Castleton-on-Hudson	\$89,947	\$44,726	\$0	\$72	\$0	\$0	\$0	\$134,744
Village of East Nassau	\$108,158	\$58,545	\$0	\$12	\$0	\$0	\$0	\$166,716
Village of Hoosick Falls	\$297,603	\$141,627	\$0	\$285	\$0	\$0	\$0	\$439,515
Village of Nassau	\$54,761	\$142	\$0	\$88	\$0	\$0	\$0	\$54,991
Village of Schaghticoke	\$34,681	\$17,737	\$0	\$14	\$0	\$0	\$0	\$52,432
Village of Valley Falls	\$38,695	\$19,295	\$0	\$13	\$0	\$0	\$0	\$58,003
Total	\$12,697,376	\$6,065,667	\$0	\$10,349	\$0	\$0	\$0	\$18,773,392

Hazus 500-Year Hurricane Scenario

Hazus predicts that about 76 buildings will be at least moderately damaged in this scenario. The total economic loss estimated for this hurricane scenario is \$119.6 million dollars, which is 0.44 percent of the total replacement value of buildings in the analysis region. Building related losses are broken into two categories in Hazus. Direct building losses are the estimated costs to repair or replace the damage caused to a building, contents, and inventory by a flood. These losses total \$120 million, which exceeds 92 percent of the total losses for the scenario. Residences make up more than 85 percent of the total losses, which total \$98,657,060. Eight percent (\$9,055,897) of total losses are due to business interruption losses associated with the inability to operate a business because of hurricane wind damage. This includes relocation costs, income and wage losses, and loss of rental income from people displaced from their homes. Hazus also estimates that 180,404 tons of debris will be generated by these structural damages. Approximately 204 truckloads will be required to remove the debris generated.

Because the damage to residences in this scenario were mostly minor, Hazus predicts that only two households would be displaced and that no individuals would seek temporary public shelter in this scenario.

Table 67: Estimated Impacts to Critical Facilities from Hurricane Winds 500-Year

Facility Type	Count	At Least Moderate Damage	Loss of functionality (Days)
Emergency Operations Center	1	0	0
Fire Stations	55	0	0
Hospitals	26	0	0
Police Stations	17	0	0
Schools	66	0	0

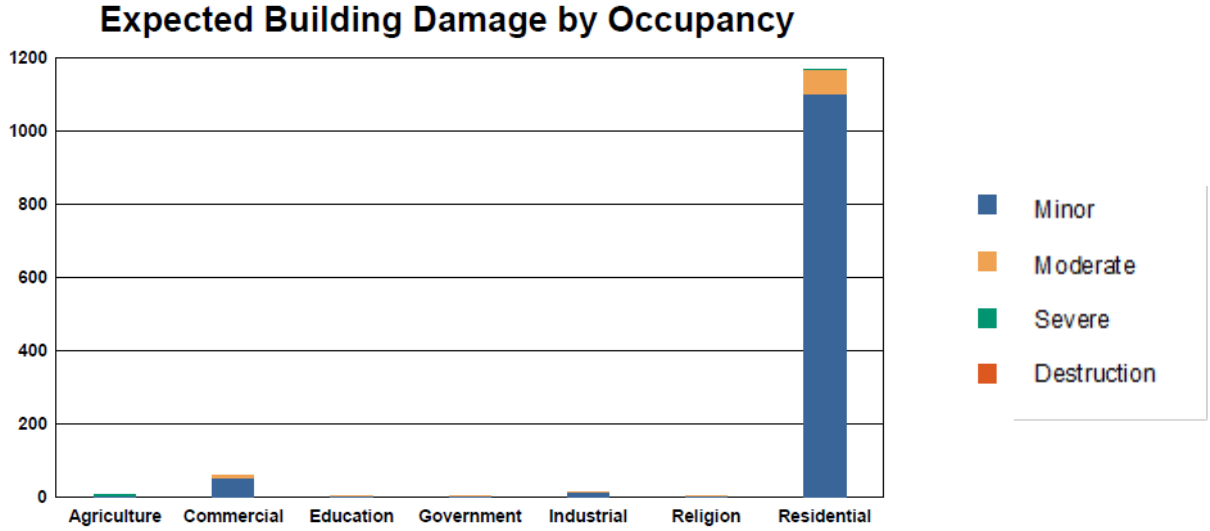


Figure 121: Expected Building Damage by Occupancy from 500-Year Hurricane

Occupancy	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	482	98.99	4	0.84	1	0.13	0	0.04	0	0.00
Commercial	2,903	98.00	53	1.78	6	0.21	0	0.00	0	0.00
Education	66	94.18	3	4.36	1	1.47	0	0.00	0	0.00
Government	187	97.68	4	2.06	0	0.26	0	0.00	0	0.00
Industrial	811	98.22	14	1.68	1	0.10	0	0.00	0	0.00
Religion	214	98.41	3	1.47	0	0.11	0	0.01	0	0.00
Residential	49,786	97.71	1,104	2.17	65	0.13	1	0.00	0	0.00
Total	54,448		1,184		74		1		0	

Figure 122: Building Damage by Occupancy from 500-Year Hurricane

Table 68: Hazus Loss Estimates for 500-Year Hurricane Winds

Jurisdiction	Building Loss	Contents Loss	Inventory Loss	Relocation Cost	Income Loss	Rental Income Loss	Wage Loss	Total Loss
City of Rensselaer	\$2,848,827	\$1,033,134	\$12	\$73,386	\$6,035	\$38,864	\$14,173	\$4,014,433
City of Troy	\$19,630,372	\$5,770,417	\$862	\$1,771,895	\$1,362,409	\$427,923	\$3,209,232	\$32,173,111
Town of Berlin	\$1,046,162	\$545,396	\$0	\$4,829	\$0	\$473	\$0	\$1,596,860
Town of Brunswick	\$8,804,285	\$3,480,638	\$9,389	\$216,559	\$20,328	\$79,791	\$47,738	\$12,658,728
Town of East Greenbush	\$6,743,095	\$1,053,050	\$60	\$208,857	\$13,565	\$84,229	\$31,857	\$8,134,714
Town of Grafton	\$1,216,007	\$721,253	\$75	\$3,412	\$237	\$505	\$556	\$1,942,044
Town of Hoosick	\$771,531	\$296,991	\$0	\$2,725	\$0	\$255	\$0	\$1,071,503
Town of Nassau	\$2,664,669	\$1,279,399	\$1,112	\$55,175	\$24	\$21,999	\$57	\$4,022,436
Town of North Greenbush	\$8,955,259	\$3,278,222	\$895	\$230,013	\$15,166	\$80,605	\$37,228	\$12,597,387
Town of Petersburg	\$463,003	\$239,201	\$0	\$193	\$0	\$0	\$0	\$702,397
Town of Pittstown	\$2,064,644	\$900,783	\$135	\$75,890	\$165	\$30,924	\$357	\$3,072,897
Town of Poestenkill	\$3,603,021	\$1,725,853	\$2,654	\$93,351	\$15,533	\$26,623	\$36,487	\$5,503,521
Town of Sand Lake	\$6,943,780	\$3,210,967	\$2,569	\$149,386	\$13,790	\$51,004	\$32,385	\$10,403,881





Jurisdiction	Building Loss	Contents Loss	Inventory Loss	Relocation Cost	Income Loss	Rental Income Loss	Wage Loss	Total Loss
Town of Schaghticoke	\$3,945,476	\$1,691,522	\$1,053	\$106,354	\$8,606	\$37,569	\$20,221	\$5,810,800
Town of Schodack	\$6,593,149	\$2,900,255	\$12	\$90,459	\$187	\$40,374	\$438	\$9,624,874
Town of Stephentown	\$2,281,535	\$1,122,343	\$685	\$54,573	\$0	\$27,006	\$0	\$3,486,143
Village of Castleton-on-Hudson	\$387,897	\$165,946	\$0	\$5,041	\$3,440	\$189	\$8,079	\$570,593
Village of East Nassau	\$501,426	\$240,939	\$210	\$10,375	\$0	\$4,136	\$0	\$757,086
Village of Hoosick Falls	\$351,746	\$153,935	\$0	\$410	\$0	\$1	\$0	\$506,092
Village of Nassau	\$344,710	\$8,449	\$0	\$15,287	\$2,069	\$7,704	\$4,858	\$383,076
Village of Schaghticoke	\$265,849	\$103,071	\$144	\$8,228	\$1,000	\$2,770	\$2,349	\$383,412
Village of Valley Falls	\$152,914	\$65,544	\$19	\$5,485	\$94	\$2,186	\$219	\$226,462
Total	\$80,579,356	\$29,987,308	\$19,888	\$3,181,882	\$1,462,648	\$965,131	\$3,446,235	\$119,642,450

ADDITIONAL IMPACTS

The Hazus hurricane model analysis focused on wind damages. The wind model does not provide impact estimates to transportation and utility systems. However, it can be inferred that high winds associated with hurricanes have the potential to damage power lines and other utility infrastructure. Disruption to power lines and facilities can have cascading impacts that prevent normal operation of other infrastructure services. High winds generate debris from damaged structures or trees, which can disrupt transportation functionality by blocking roads or railway lines and prohibiting air travel. The model also did not include flooding related to heavy rain associated with hurricanes. Additional damage to infrastructure or critical facilities may be associated with hurricane-induced flooding.

Table 69 describes the damage that could be expected for each category of hurricane. Damage during hurricanes might also result from spawned tornadoes as well as storm surge and inland flooding associated with heavy rainfall that usually accompanies these storms.

Table 69: Hurricane/Tropical Storm Damage Category

Storm Category	Damage Level	Description of Damages	Photo Example
1	Minimal	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery and trees. Also, some coastal flooding and minor pier damage may occur.	
2	Moderate	Some roofing material, door and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings might break their moorings.	
3	Extensive	Some structural damage to small residences and utility buildings, with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain may be flooded well inland.	
4	Extreme	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.	


Storm Category	Damage Level	Description of Damages	Photo Example
5	Catastrophic	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be necessary.	

Figure 119 illustrates the National Risk Index rating. The Expected Annual Loss for Rensselaer County is \$2.1 million from hurricane, and the risk score is 73.3 percent.

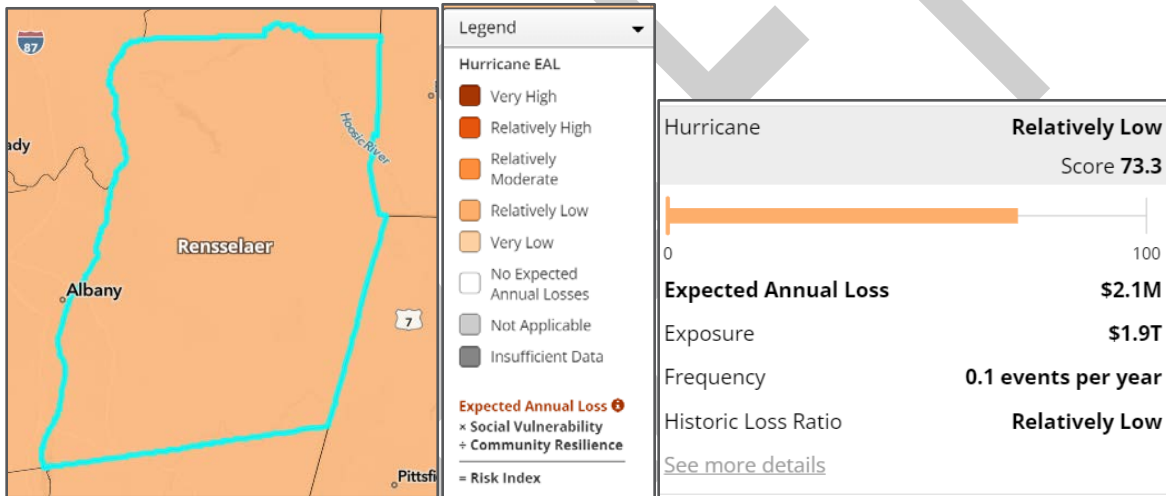


Figure 123: Rensselaer County Hurricane/Tropical Storm Expected Annual Loss, Score, Map, Legend¹²⁵

Vulnerable Populations

Flooding caused by hurricanes and tropical storms can damage or destroy infrastructure, homes, and businesses. High winds can cause trees to fall, resulting in property damage, downed power lines, and power outages. Because of the danger of wind, emergency managers plan on having evacuations complete and personnel sheltered before the onset of tropical storm-force winds, rather than waiting for hurricane-force winds. People’s homes and businesses can be damaged or destroyed by flooding (riverine or other) and high winds. All of these hazards can pose serious risks to lives and livelihoods in New York State. The power outages can disrupt electrical services, putting life-dependent medical devices at risk.

¹²⁵ FEMA, National Risk Index, “Rensselaer County Hurricane/Tropical Storm Expected Annual Loss Score, Map and Legend.” [Map | National Risk Index \(fema.gov\)](https://www.fema.gov/national-risk-index)

Other damages include risk of injury or drowning due to severe flooding, food shortages, and loss of shelter and income.

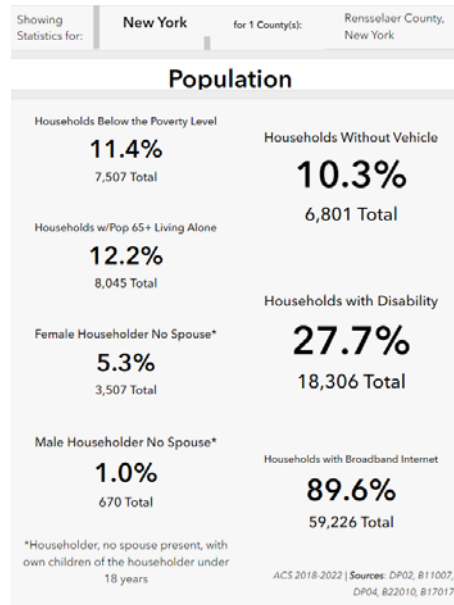


Figure 124: Rensselaer County Vulnerable Population Demographics¹²⁶

¹²⁶ US Census 2022 Community Resilience Estimates, "Rensselaer County Vulnerable Population Demographics." [CRE for Equity \(arcgis.com\)](https://arcgis.com)



Figure 125: Lone house survives Hurricane Ike. It is reported that this house was rebuilt to withstand a Category 5 hurricane after it was destroyed previously by Hurricane Rita in 2005.¹²⁷

From 2013 to 2022, 442 deaths have been directly related to tropical systems, and of those, 56.8 percent (251 deaths) were due to inland flooding.¹²⁸ Most of these fatalities occur because people underestimate the power of moving water and purposely walk or drive into flooding conditions.

¹²⁷ NOAA, 2020, "Lone House Survives Cat 5 Hurricane Ike." [Hurricane Damage Potential | National Oceanic and Atmospheric Administration \(noaa.gov\)](https://www.noaa.gov/hurricane-damage-potential)

¹²⁸ NOAA, 2024, [Cyclone Hazards & Safety | National Oceanic and Atmospheric Administration \(noaa.gov\)](https://www.noaa.gov/cyclone-hazards-safety)

Causes of direct fatalities from Atlantic tropical cyclones 1963-2012

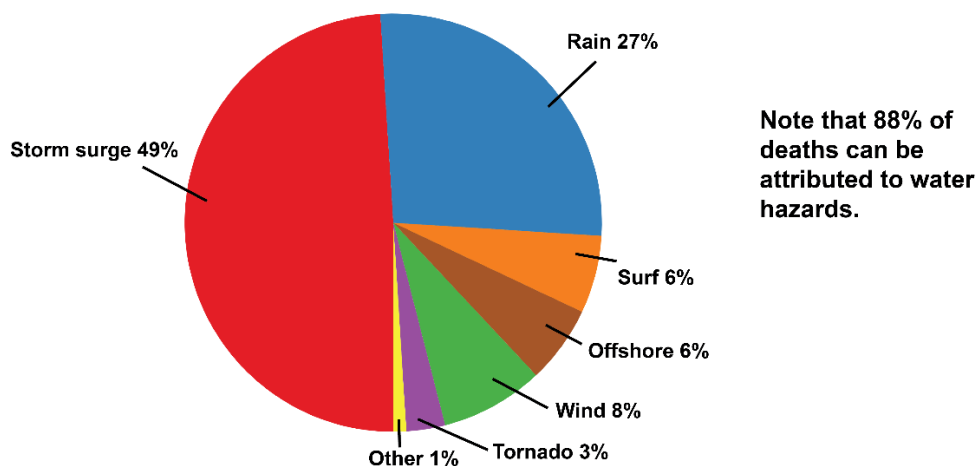


Chart adapted from *Fatalities in the United States from Atlantic Tropical Cyclones: New Data and Interpretation* by Edward N. Rappaport, 2014.

Figure 126: Cause of Tropical Cyclone Fatalities, 1963–2012¹²⁹

Impact on County Assets

The extensive built infrastructure in the Northeast is increasingly challenged by hazard- and climate-related impacts. As a result of early settlement patterns, the Northeast has some of the oldest buildings and facilities in the United States. These structures—as well as energy, transportation, water, and sanitation systems that make up the regional built environment—were not built to withstand the new conditions and extreme weather events projected to occur over the next century. Disruption of services that depend on these systems could have a negative impact on public health and safety as well as significant repercussions for the county’s economy. Table 70 lists the critical facilities potentially exposed to hurricane/tropical storm damage.

Table 70: Critical Facilities Potentially Exposed to Hurricane/Tropical Storm Damage

Municipality	Facility Type	Facility Name	Location/Address
East Greenbush, Town of	School	Red Mill School	225 McCullough Place
East Nassau, Village of	Fire Station	Tsatsawassa Protective Fire Company	9 Firehouse Lane
East Nassau, Village of	Fire Station	Hoags Corners Fire Company	7237 NY 66

¹²⁹ NOAA, 2020, Chart adapted from *Fatalities in the United States from Atlantic Tropical Cyclones: New Data and Interpretation* by Edward N. Rappaport, 2014. [Hurricanes | National Oceanic and Atmospheric Administration \(noaa.gov\)](https://www.noaa.gov)

Municipality	Facility Type	Facility Name	Location/Address
Grafton, Town of	Communications Tower	Airtouch Paging	East End of Snyder Road
Grafton, Town of	Communications Tower	Hudson Valley Communications	Davitt Lake Road
Grafton, Town of	Communications Tower	New York, State Of	Dickenson Hill
Grafton, Town of	Communications Tower	Rensselaer, County Of	2.25 miles east of South Road
Grafton, Town of	Police	Rensselaer County Sheriff	45 Richmond Street
Hoosick, Town of	Church	First Baptist Church of Hoosick	648 South Street (County Route 95)
Hoosick, Town of	School	Hoosick Falls Central School	21187 State Route 22
North Greenbush, Town of	Communications Tower	New York, State Of	0.8 miles west-southwest of US Route 4 junction with Jordan Road Route 2
North Greenbush, Town of	Communications Tower*	RPI, Advanced Mas Partners, Town of Colonie	WRPI Tower Glenmore Road
North Greenbush, Town of	School	Woodland Hill Montessori School	100 Montessori Way
Pittstown, Town of	Communications Tower	Albany Telephone Company Cellular One, Mobilemedia	Near Leloup Road (aka Crandall Road)
Pittstown, Town of	Church	Pittstown United Methodist Church	45 Old Route 7
Poestenkill, Town of	Communications Tower	Aat Paging Corporation li	Davitt Pond Road
Poestenkill, Town of	Communications Tower	Albany Telephone Company	High Meadow Road
Rensselaer, City of	School	Rensselaer Junior/Senior High School	25 Van Rensselaer Drive
Sand Lake, Town of	Communications Tower	Albany Telephone Company	2 Chamberlain Road
Sand Lake, Town of	Fire Station	Taborton Fire Company	861 Taborton Road
Sand Lake, Town of	Police	Rensselaer County Sheriff	145 Gettle Road

Municipality	Facility Type	Facility Name	Location/Address
Sand Lake, Town of	School	Averill Park High School	146 Gettle Road #2
Sand Lake, Town of	Church	Salem United Methodist Church	349 Shaver Road
Schodack, Town of	Communications Tower	Albany Telephone Company	Route 20
Schodack, Town of	Communications Tower	Albany Telephone Company Cellular One	"Sand Lake" 0.22 miles north of New York Route 151
Schodack, Town of	Communications Tower	Cellco Partnership	0.25 miles east of intersection of US 9 and I-90
Schodack, Town of	Communications Tower	Rensselaer, County of	0.4 miles from Schodack Town Hall on dirt road
Schodack, Town of	Communications Tower		2,000 feet east of Junction Highway 9, Highway 20
Schodack, Town of	Natural Gas	Compressor Station 254	East of Route 66
Schodack, Town of	Church	House of Praise Church	1688 Route 9
Stephentown, Town of	Communications Tower	AT&T Corp	Fire Tower Road
Stephentown, Town of	Communications Tower	Cellco Partnership	Fire Tower Road
Stephentown, Town of	Communications Tower	Cellco Partnership, Dba Verizon Wireless	Fire Tower Road
Stephentown, Town of	Communications Tower	New York, State of	Seven Hills

Community Lifelines

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Community Lifelines are essential for the well-being of any community. They provide support and assistance to individuals who require help, especially during times of crisis. FEMA Community Lifelines are a critical component of emergency management in the United States. These Community Lifelines are designed to address the essential needs of a community during and after a disaster. There are eight Community Lifelines, each with its own focus and purpose (Figure 127).



Figure 127: Community Lifelines¹³⁰

Community lifelines include lifeline utility systems (including drinking water, wastewater, energy resources, and communications infrastructure), emergency and essential facilities (including police, fire, ambulatory, and emergency operations facilities), hospitals and medical centers, schools, elderly care facilities, childcare facilities, and religious service facilities. Community facilities are the buildings, land, equipment and activities provided on the public’s behalf by government and/or private organizations. These facilities are important components to the quality of life of a municipality. Critical Facilities are necessities for the health, safety, wellbeing, and stability of communities. Critical infrastructure systems, which are essential for safety and economic viability, include transportation, power, communication, and water and wastewater systems.

Vulnerability Score

Based on the National Risk Index (NRI), Rensselaer County has a relatively low-risk index with a risk index score of **74.2** for Hurricane/Tropical storm, which is lower than the national average percentile.

Table 71: Risk Factor-Hurricane/Tropical Storm

Hurricane/ Tropical Storm	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Low	Very High	Low	\$2.1M	Moderate

¹³⁰ FEMA, “Community Lifelines Toolkit 2.0.” <https://www.fema.gov/sites/default/files/2020-05/CommunityLifelinesToolkit2.0v2.pdf>

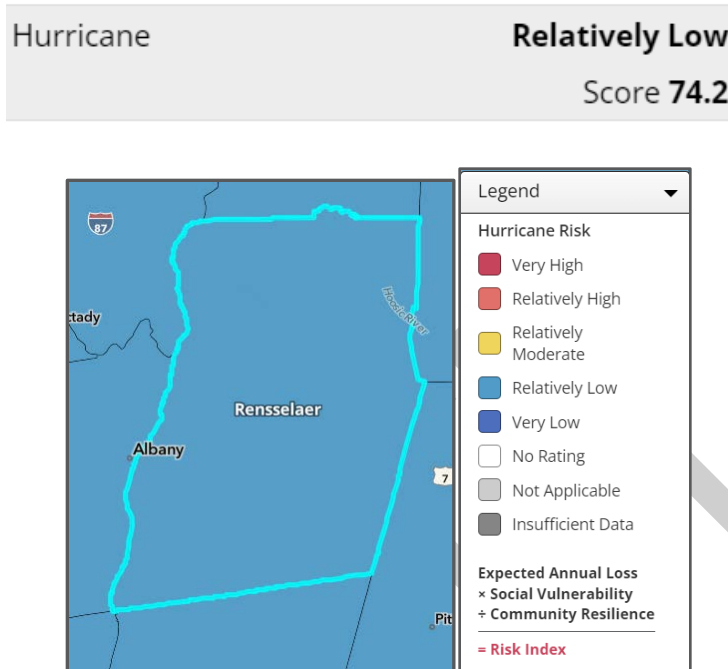


Figure 128: National Risk Index Rensselaer County Hurricane/Tropical Storm Score, Map and Legend¹³¹

Landslide Hazard Profile

Hazard Description

The 2023 SHMP defines the term “landslide” as the movement of rock, debris, or earth down a slope. Slope failure occurs when the force of gravity pulling the slope downward exceeds the strength of the earth materials that compose the slope to hold it in place. In addition to the force of gravity, other contributing factors to landslides include rainfall and/or rapid snowmelt, earthquakes, volcanic activity, changes in groundwater, and human-induced modifications to existing slopes.

Landslides can occur wherever very weak or fractured materials rest on moderate to steep slopes (typically, a slope steep enough to make walking difficult).

The 2023 SHMP cites the following key factors affecting the risk of landslide occurrence:

¹³¹ FEMA, NRI, “National Risk Index Rensselaer County Hurricane/Tropical Storm Score, Map and Legend.” [Map | National Risk Index \(fema.gov\)](https://www.fema.gov/national-risk-index)

- **Slope.** Slopes are more likely to fail when they are greater than or equal to 10 degrees, as are slopes where the height from the top of the slope to its toe is greater than 40 feet. Minor landslides called “slumps” can occur with very minor slopes.
- **Vegetative Cover.** Slopes with little or no vegetative cover are more prone to landslides than more vegetated slopes.
- **Soil Water Content.** Slopes are more likely to fail when soil water content is high.

Landslides can be triggered by natural events or by humans. Natural events include erosion, decreases in vegetative cover due to natural causes and/or seasonal changes, and ground shaking from earthquakes. Human-caused triggers include altering the slope gradient, increasing the soil water content, and removal of vegetative cover.

Location

The 2023 SHMP indicates that, in general, New York State’s soil is not prone to landslides. Locations that are, such as the Hudson and Mohawk River, were formerly occupied by glacial lakes during the last Ice Age (see Figure 129). As glaciers retreated, thick deposits of fine-grained sediments were deposited at the bottom of these former lakes (see Figure 130).

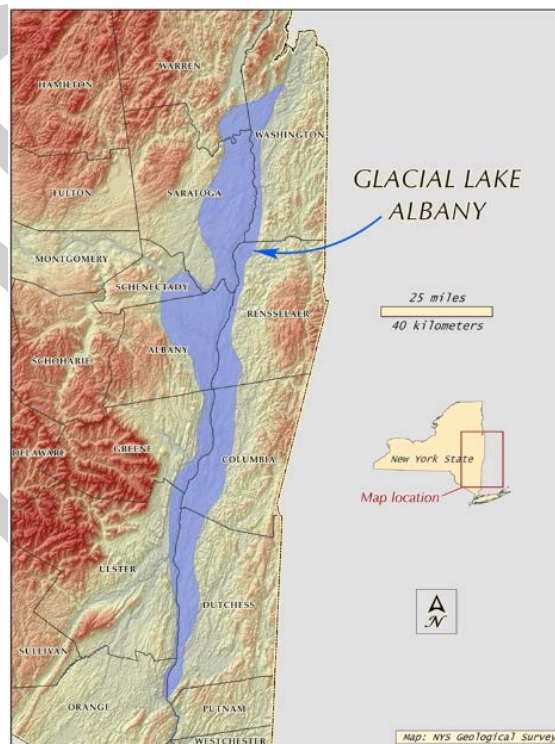


Figure 129: Hudson and Mohawk River Valley Glacial Lakes Map¹³²

¹³² NYSHMP, 2023, “Hudson and Mohawk River Valley Glacial Lakes Map.” [Mitigate NY](#)

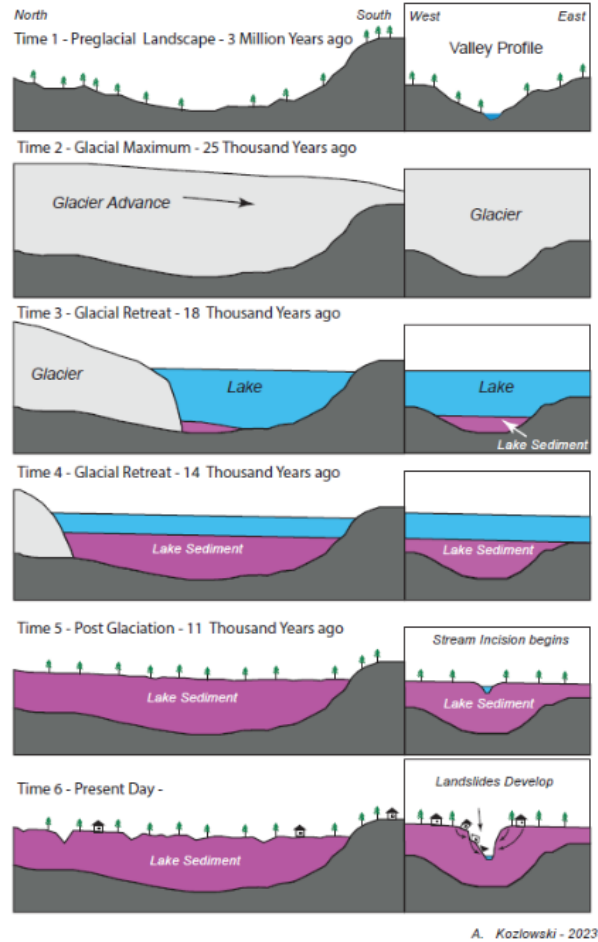


Figure 130: New York State Glacier Landslide Risk History¹³³

Once the glaciers fully retreated, new streams developed on top of the lake sediments and began to erode and incise the fine-grained sediments. For the last 11,000 years, stream erosion and incision has continued over the lake in equilibrium with a stable climate. Erosion and incision along stream corridors dug steep slopes in many locations across New York. Steep slopes carved into fine-grained glacial lake sediments are prone to slope failure and landslides.

Areas commonly considered safe from the threat of landslides include areas that have not experienced landslides in the past, areas of minimal slope, and areas set back from the tops of slopes. Conversely, areas commonly considered more prone to landslides tend to be those where landslides have occurred in the past, bases of steep slopes or drainage channels, and developed hillsides where leach field septic systems are used. In general, landslides are most likely to occur along major river and lake valleys that were once occupied by glacial lakes resulting in glacial lake deposits (glacial lake clays) and are usually associated with steeper slopes.

¹³³ NYSHMP, 2023, "New York State Glacier Landslide Risk History." [Mitigate NY](#)

Figure 131 was prepared by the Rensselaer County Department of Economic Development and Planning on December 30, 2010. It shows the U.S. Department of Agriculture Natural Resource Conservation Service Soils Map for Rensselaer County and highlights soil types with likely, moderate, and high slump/slide potential.

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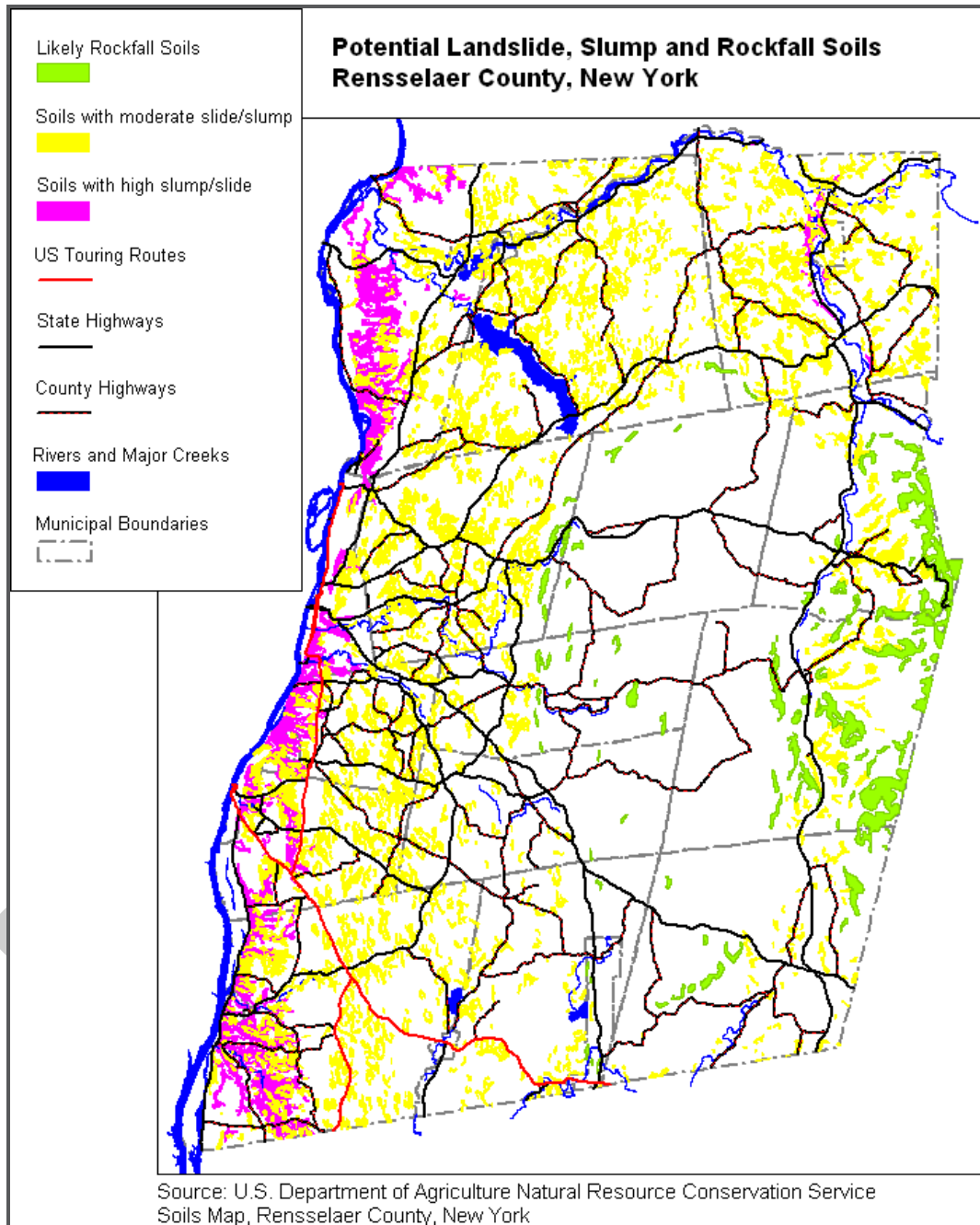


Figure 131: Potential Landslide, Slump and Rockfalls Soil, Rensselaer County Soils Map¹³⁴

¹³⁴ 2019 Rensselaer County HMP, U.S. Department of Agriculture Natural Resource Conservation Service, "Potential Landslide, Slump and Rockfalls Soil, Rensselaer County Soils Map."

Extent

U.S. Geological Survey (USGS) landslide susceptibility mapping uses three basic classifications to communicate the risk, in conjunction with three further classifications to communicate the combinations of susceptibility and incidence:

- High Incidence (more than 15 percent of the area involved)
- Moderate Incidence (1.5 to 15 percent of the area involved)
- Low Incidence (less than 1.5 percent of the area involved)
- High Susceptibility/Moderate Incidence
- High Susceptibility/Low Incidence
- Moderate Susceptibility/Low Incidence

USGS landslide susceptibility mapping for Rensselaer County presented in Figure 4 shows that the area with the highest identified risk of landslides is the western side of Rensselaer County. This is an area mapped as High Incidence that lies generally within 2 to 5 miles of the Hudson River. Another portion of the county along its eastern boundary is identified as High Susceptibility/Moderate Incidence. The remainder of the county is mapped as Low Incidence, although the majority of individual landslide incidents in the county for which records are available have been recorded in this zone. Of the six categories of incidence and susceptibility listed above, only these three have been identified in Rensselaer County. It should be noted that this mapping represents the overall risk of landslides; occasionally, areas more vulnerable to landslides may exist within low-risk or low-incidence areas due to local topographical conditions.

The municipalities most likely to experience landslide events are those immediately adjacent to the Hudson River: the Cities of Troy and Rensselaer; the Towns of Schaghticoke, North Greenbush, East Greenbush and Schodack and the Villages of Schaghticoke and Castleton-on Hudson.

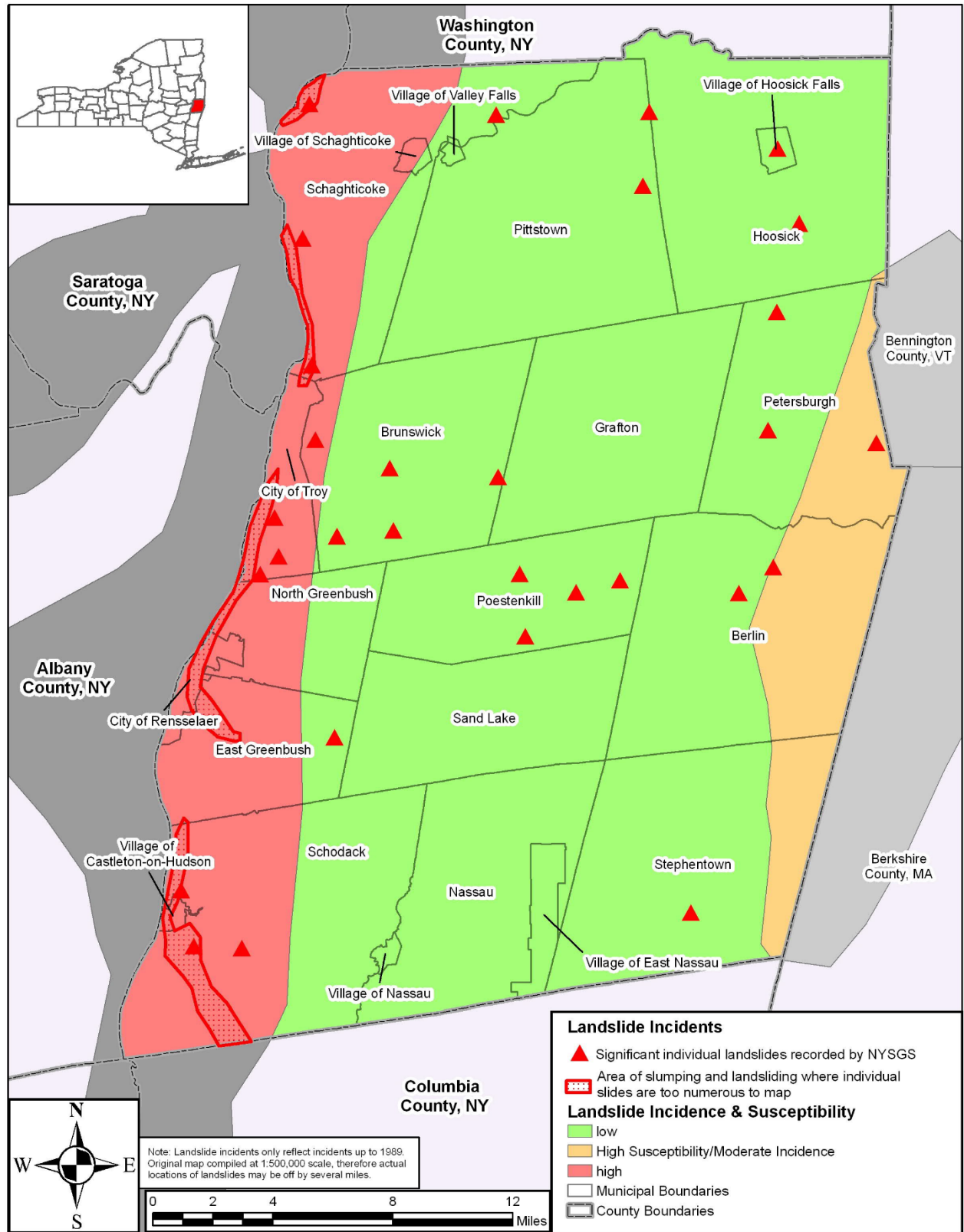


Figure 132: Landslide Incidents and Susceptibility in Rensselaer County¹³⁵

The severity of a landslide depends in large part on the degree of development in the area in which it occurs and the geographic area of the slide itself. Generally speaking, landslides can result in devastating consequences, but only in very localized areas. A landslide occurring in an undeveloped area would be less severe because lives and property would not be affected; the only impacts would be to land, vegetation, and possibly some wildlife. By contrast, a landslide occurring in a developed area could have devastating effects, ranging from structure and infrastructure damage to injury and/or loss of life. Structures or infrastructure built on susceptible land would likely collapse as their footings slide downhill, while those below the land failure would likely be crushed. Landslides in the area of roadways could fall and damage or destroy vehicles and force other drivers to have accidents.

Table 72 tabulates the area of land in each incidence/susceptibility category for each municipality in Rensselaer County, as presented graphically in Figure 132.

Table 72: Land in Areas Susceptible to Landslides in Rensselaer County

Municipality	Total Acres	High Incidence		High Susceptibility/ Moderate Incidence	
		Area (Acres)	Percent	Area (Acres)	Percent
Berlin, Town of	38,227	0	0%	15,774	41%
Brunswick, Town of	28,284	2,189	8%	0	0%
Castleton-on-Hudson, Village of	531	531	100%	0	0%
East Greenbush, Town of	15,672	12,208	78%	0	0%
East Nassau, Village of	3,029	0	0%	0	0%
Grafton, Town of	29,711	0	0%	0	0%
Hoosick Falls, Village of	950	0	0%	64	7%
Hoosick, Town of	39,361	0	0%	0	0%
Nassau, Town of	25,558	0	0%	0	0%
Nassau, Village of	442	0	0%	0	0%
North Greenbush, Town of	12,079	6,026	50%	0	0%
Petersburgh, Town of	26,683	0	0%	8,916	33%
Pittstown, Town of	41,256	0	0%	0	0%
Poestenkill, Town of	20,727	0	0%	0	0%
Rensselaer, City of	2,191	2,191	100%	0	0%
Sand Lake, Town of	23,088	0	0%	0	0%
Schaghticoke, Town of	32,545	22,281	68%	0	0%
Schaghticoke, Village of	640	474	74%	0	0%

¹³⁵ 2019 Rensselaer County HMP/USGS, "Landslide Incidents and Susceptibility in Rensselaer County."

Municipality	Total Acres	High Incidence		High Susceptibility/ Moderate Incidence	
		Area (Acres)	Percent	Area (Acres)	Percent
Schodack, Town of	40,217	23,084	57%	0	0%
Stephentown, Town of	37,263	0	0%	6,931	19%
Troy, City of	7,066	6,972	99%	0	0%
Valley Falls, Village of	308	0	0%	0	0%
Rensselaer County Total:	425,825	75,970	18%	31,685	7%

Previous Occurrences

The FEMA website (www.fema.gov/disasters) documents that New York State has received no major disaster declaration due to landslide. The SHMP 2023 provides data on six non-declared landslide events from 1996 to 2023 in the state with a combined loss for each event of \$501,000 (see Figure 133). Additionally, the New York State Museum Geological Survey estimates that approximately 100–400 landslides occur annually in New York State.

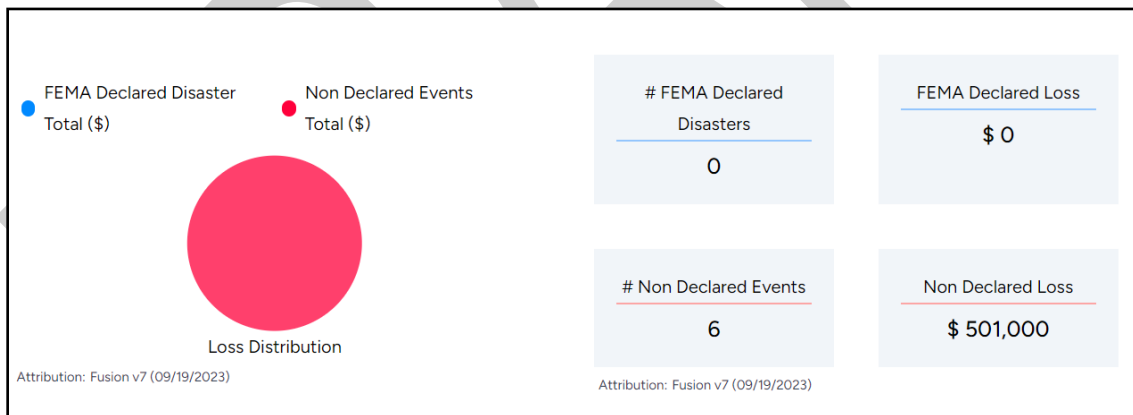


Figure 133: FEMA Declared and Undeclared Disaster Landslide Events¹³⁶

The 2023 SHMP provides a statewide map of landslide events from 1996 through 2023 for which damages exceeded \$500,000 (Figure 134).

¹³⁶ NYSHMP, 2023, "FEMA Declared and Undeclared Disaster Landslide Events." [Mitigate NY](#)

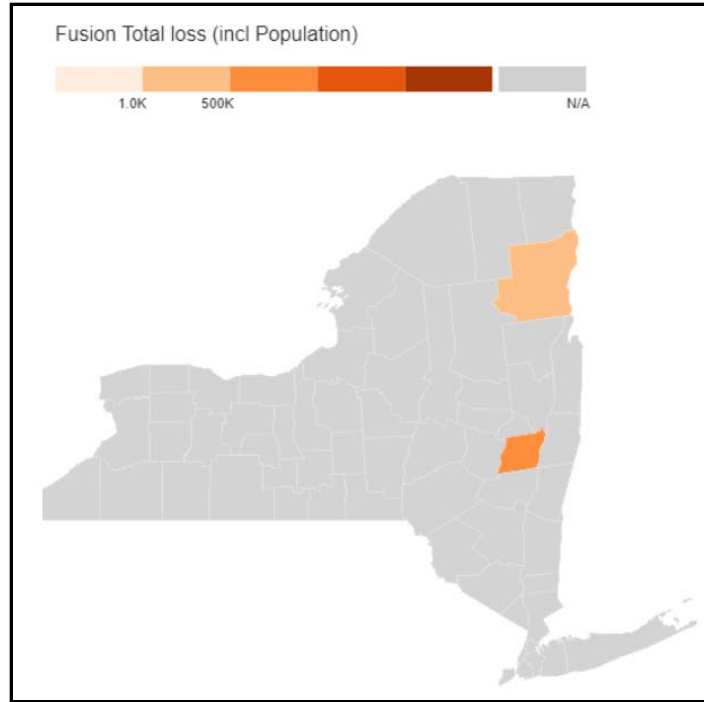


Figure 134: Statewide Map of Landslide Events, 1996–2023¹³⁷

Figure 135 sums total loss by the month in which damage occurred in the state from 1996 to 2022. Understanding the seasonality of damaging historic hazard events can help anticipate and plan for future events.

¹³⁷ NYSHMP, 2023, Attribution: [Fusion Events v7 \(09/29/2023\)](#) "Statewide Map of Landslide Events, 1996–2023." [Mitigate.NY](#)

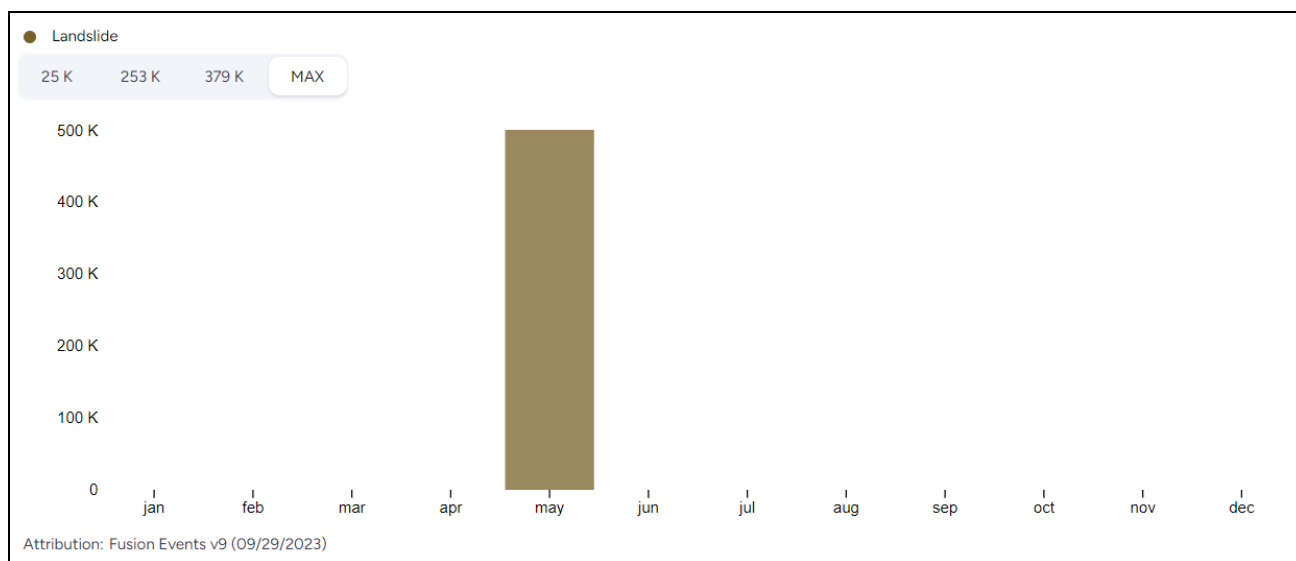


Figure 135: Landslide Events By Month¹³⁸

The “Landslide Inventory Map of New York,” produced by the New York State Geological Survey (NYSGS) in cooperation with the USGS, plots the location of 30 landslide events in Rensselaer County between 1837 and 1989, as well as several areas in the High Incidence risk zone near the Hudson River where individual slides are too numerous to map. Data sheets obtained from the NYSGS also record the dollar damages caused by many of these events, with average losses of approximately \$25,000 per event (1980 dollars). The details available for landslides in Rensselaer County recorded by NYSGS are presented in Table 73.

Table 73: Landslide Events Recorded by NYSGS in Rensselaer County 1837–1989

Date	Municipality Affected	Description	Damage Estimate
1837	City of Troy	Corner of Washington/Fourth Streets: Large landslide destroyed three houses and two stables, five people killed	Not recorded
1843	City of Troy	Nine residential structures and several other buildings destroyed by large landslide, 17 people killed	Not recorded
1854	City of Troy	Construction site of St Peter's College destroyed by landslide	Not recorded
1930s	City of Troy	Landslide destroyed three buildings on RPI campus	Not recorded
1950s	City of Troy	Proudfit Laboratory building south of Sage Avenue damaged by landslide, subsequently removed	Not recorded
1951	City of Troy	Main approach road to RPI damaged by landslide	Not recorded

¹³⁸ NYSHMP, 2023, Attribution: [Fusion Events v7 \(09/29/2023\)](#), “Landslide Events by Month.” [Mitigate NY](#)

Date	Municipality Affected	Description	Damage Estimate
1970	City of Troy	Thompson Street, Troy: Housing development on top of slope, slide destroyed one housing unit and damaged city road	Not recorded
1981	City of Troy	Stanton Street: Major slide in sand/clay destroyed foundations of several housing units under construction	Not recorded
1983	City of Troy	Major debris flow on steep slope (100 feet high) into Poesten Kill. Top of Congress Street behind old Wooltex factory. Significant part of construction site lost, creek blocked	Not recorded
pre-1985	Town of Stephentown	Soil slump caused by undercutting stream, affects highway (County Route 26)	\$35,000
pre-1985	Town of Schodack	Soil slump, portion of highway undercut by stream (County Route 4 at South Schodack)	\$20,000
pre-1985	Town of Schodack	Soil slump caused by undercutting stream, affects highway (County Route 4 near Castleton-on-Hudson)	\$25,000
pre-1985	Town of Schodack	Soil slump caused by undercutting stream, affects highway (County Route 8 at Stony Point)	\$20,000
pre-1985	Town of East Greenbush	Soil slump caused by undercutting stream, affects highway (County Route 53 at Best)	\$25,000
pre-1985	Town of Poestenkill	Failure of Cut slope near County Route 40, East Poestenkill	\$5,000
pre-1985	Town of Poestenkill	Soil slump caused by undercutting stream, affects highway (County Route 79)	\$20,000
pre-1985	Town of Brunswick	Failure of Cut slope on County Route 139 at Eagle Mills	\$10,000
pre-1985	Town of Brunswick	Soil slump caused by undercutting stream, affects highway (County Route 79 at Cropseyville)	\$30,000
pre-1985	Town of Brunswick	Soil slump caused by undercutting stream, encroaching on highway (County Route 134 at Eagle Mills)	\$120,000
pre-1985	City of Troy	Oakwood Avenue: housing development "lost"	Not recorded
pre-1985	Town of Schaghticoke	Soil slump caused by undercutting stream, affects highway (County Route 121 at Speigletown)	\$20,000
pre-1985	Town of Schaghticoke	Soil slump caused by undercutting stream, affects highway (County Route 121 west of Melrose)	\$15,000
pre-1985	Town of Schaghticoke	Soil slump caused by undercutting stream, affects highway (County Route 125)	\$15,000
pre-1985	Town of Schaghticoke	Soil slump caused by undercutting stream, affects highway (County Route 114)	\$20,000

Date	Municipality Affected	Description	Damage Estimate
pre-1985	Town of Hoosick	Failure of cut slope on County Route 103, southwest of Eagle Bridge	\$10,000
pre-1985	Town of Pittstown	Failure of cut slope on County Route 109, west of West Hoosick	\$10,000
pre-1985	Town of Hoosick	Soil slump in clay undercut by stream affecting State Route 7	Not recorded
pre-1985	Town of Petersburg	Soil slump caused by undercutting stream, affects highway (County Route 98 at North Petersburg)	\$20,000
pre-1985	Town of Petersburg	Soil slump caused by undercutting stream, affects highway (County Route 94)	\$30,000
pre-1985	Town of Berlin	Soil slump caused by undercutting stream, affects highway (County Route 38)	\$20,000
pre-1985	City of Troy	South end of Troy in the vicinity of Menands Bridge: 12 homes reported lost in two separate slides	Not recorded
1986	City of Troy	Many slides in Lake Albany clays in Prospect Park/RPI area	\$1,000,000
1986	City of Troy	South end of Troy in the vicinity of Menands Bridge: group of slides in Lake Albany clays	Not recorded
1987	City of Troy	Southwest corner of RPI campus, slumping of corner of new parking lot	\$10,000
1987	City of Troy	Between Lexington Avenue and Spring Avenue: one home destroyed by slide, portions of Lexington Avenue closed	\$50,000
1987	City of Troy	Hawthorne Street overlooking Spring Avenue: slide on steep slope did not impact buildings but one house later condemned as a result	\$115,000

In addition to events recorded by NYSGS up to 1989, general research has uncovered several additional landslide incidents:

- **Date Unspecified:** A Core Planning Group Member reported during the last plan update that in the early 1970s NYS Route 2 in the Town of Brunswick slumped in the Poestenkill, requiring the road to be closed and major work to be done, which is still visible to this day.
- **March 2008:** A landslide occurred in Troy south of Thomson Street near Delaware Avenue. No details of the impacts were available. A photo of the slide indicates that some damage did result.
- **February 25–26, 2010:** The NYSHMP 2019 indicates that a mudslide was reported off Main Street in Castleton-on-Hudson on February 25, 2010, affecting access to a home. The mudslide was the result of heavy rainfall and snowmelt. On February 26, 2010, a landslide occurred behind the Castleton Volunteer Fire Department, forcing the evacuation of the firehouse and its equipment and burying a basketball court located behind the firehouse on Green Street. Heavy rains weakened the hillside and for a time it was feared that signs indicated a more severe impending landslide. The firehouse and its

equipment were evacuated. At a subsequent meeting between the Village and the Rensselaer County Soil and Water Conservation Service (RCSWCS), the Village indicates that they were advised by RCSWCS that the best approach for moving forward would be to allow the material to remain intact at the base of the slope, and to fence in the area. Local regulations exist in the Village to protect against slumping, sliding, and erosion regarding activities that can be taken on slopes with inclines exceeding 25 percent where HUE (250e) soils are present. More formal mitigation activities for this particular site were not recommended.

- August 28, 2011:** A mudslide occurred on Route 2 (Brunswick Road) at Route 66 (Pawling Avenue), causing a house to collapse. Two other houses were knocked from their foundations by about 8 feet, and an automobile shop was destroyed and displaced by about 75 feet. Newspaper articles from that day report minor injuries (cuts and scrapes) for impacted residents, and precautionary evacuations of dozens of residents along Brunswick Road and Highland Street.

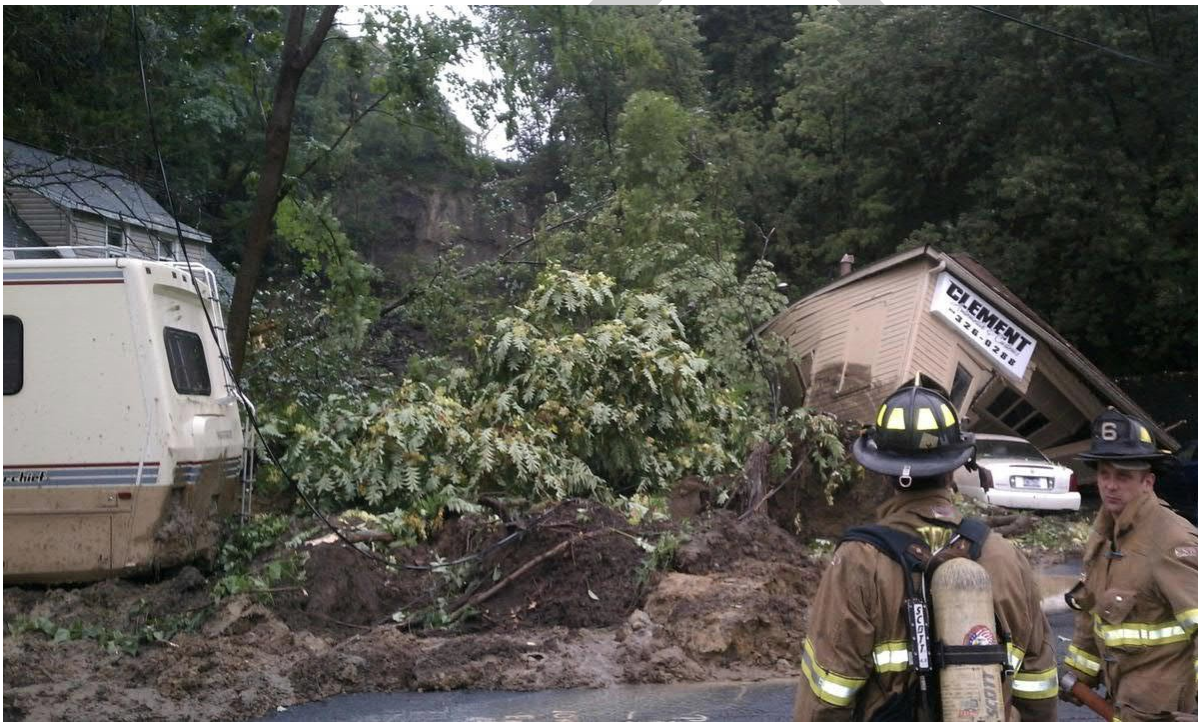


Figure 136: Garage Destroyed on Brunswick Road in Troy after Landslide, August 28, 2011 (Photo Courtesy of The Troy Record)

- Date Unspecified – late April 2019:** Since the last plan update, a Core Planning Group Member from the Town of Brunswick identified the residence located at 528 McChesney Avenue Extension as being at risk from landslide. The Town communicated the problem to the Rensselaer County Bureau of Public Safety. The property is located on a cliff high above a bend in the Poesten Kill; over time, the water has eroded the base of the slope, causing the land to slide toward the creek. In April 2019, another large portion of the ground eroded away and fell, leaving only feet before the property. Slope failure behind the residence due to erosion at the base of the slope from the Poesten Kill also poses a potential future risk to McChesney Avenue Extension, a county road. RCBPS coordinated with NRCS.



Figure 137: 528 McChesney Ave. Ext., April 2019 (Photo Courtesy of Google Earth)

Probability of Future Events

Although it is certainly possible for landslides to occur within Rensselaer County, it is difficult to reach a reliable estimation of the frequency of future occurrences due to the lack of readily available data regarding historic occurrences. The overall probability of future occurrence is assumed to be low for much of the central portion of the county, as shown in Figure 138, which indicates the National Risk Index (NRI) rating for landslide risk in Rensselaer County. However, there are significant areas (comprising, in essence, the municipalities adjacent to the Hudson River) where landslides have historically been comparatively frequent. The available records suggest that landslides have been occurring at a rate of at least one every five years or so in the county overall, with an assumed higher rate in the areas identified as of High Incidence" and "Areas of slumping and landsliding where individual slides are too numerous to map" by USGS and NYSGS. Therefore, the future probability can be considered possible.

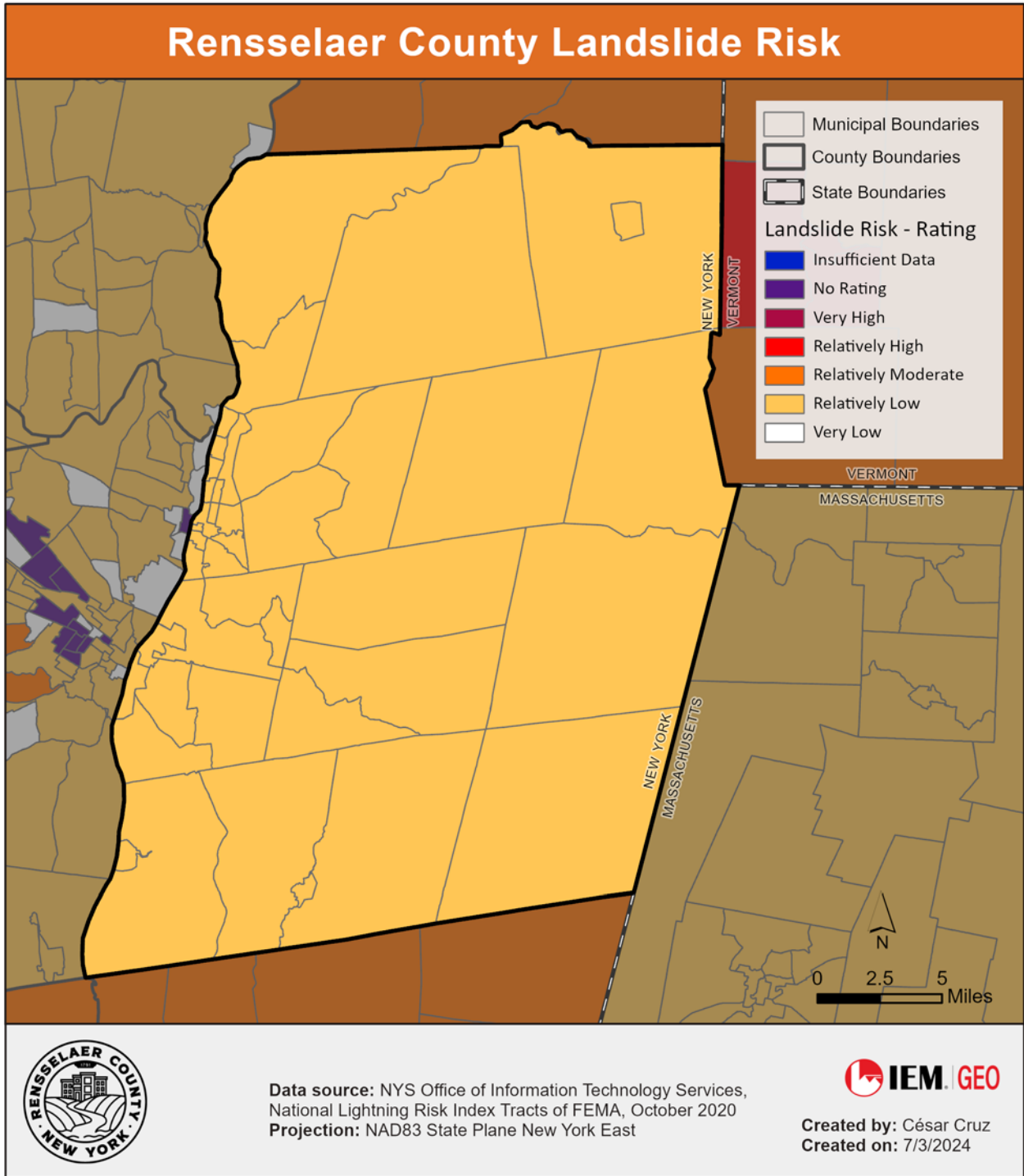


Figure 138: Rensselaer County Landslide Risk

Impacts of Climate Trends and Variations

Although no research has shown a direct link between climate change and current or historic landslide events in New York State, landslides may be impacted by climate change in the future. The underlying

conditions and causes of landslides, such as bedrock stability and heavy rain events, are influenced by climate-related trends like temperature increases, sea level rise, and extreme precipitation events.

The 2023 SHMP concludes the following with regard to climate change:

- Unseasonably warm days leading to rapid snowmelt or extreme precipitation events can make the ground overly saturated, creating unstable environment on steep slopes, which can cause landslides.
- Warming trends and increasingly frequent and intense extreme precipitation events will only continue to become more common due to climate change.
- Continuing climate change will alter the existing equilibrium between landscape development and climate that New York has experienced since the end of the last Ice Age.
- Increased precipitation amounts and more frequent extreme precipitation events will lead to the development of a new equilibrium, which will likely increase incidents of landslide events.
- The location of climate-influenced landslide events remains difficult to model; however, modern detailed geological mapping at the quadrangle or county scale over a LiDAR terrain base map may provide the best predictive tool to identify areas susceptible to future landslide hazards.

Vulnerability Analysis

Landslides are a common occurrence in some of Rensselaer County's most landslide-prone communities. Most events have tended to affect local roadways. Municipal adoption of steep slope ordinances has had a beneficial effect in hazard mitigation for the primary affected communities.

Estimated Impact and Potential Losses

Landslides often occur with little or no warning and pose significant risks to the natural environment, human safety, property, infrastructure, utilities, and transportation, with impacts causing injuries or fatalities. Potential impacts of landslides include environmental disturbance, property and infrastructure damage, and injuries or fatalities. Landslide impacts are typically limited to those areas immediately surrounding the slope failure. The structural integrity of buildings in the affected area can be compromised, or the entire building can be destroyed. Roadways and drainage systems in affected areas can be damaged or destroyed as well. Because landslides occur without warning, injuries and loss of life are also possible in affected areas. Any damage resulting from a landslide would most likely be localized. It is difficult to estimate potential losses in a landslide event. Given the lack of detailed historical loss data on significant landslide occurrences in Rensselaer County, it is assumed that although one major event may result in significant losses, annualizing losses over a long period of time would most likely yield a negligible annualized loss estimate for all jurisdictions exposed to this hazard. Although damages associated with any single event could be significant at the particular location of the event, it is estimated that damages are most likely negligible when evaluated on an average annual basis. NOAA's NCEI Storm Events Database records zero landslides in Rensselaer from 1996 to the present. Known historic

occurrences since 1996 include at least five landslides (two in Troy, two in Castleton-on-Hudson, and one in Brunswick); however, dollar damages are not available for these events.

In Rensselaer County, the expected annual loss (EAL) value for landslide is \$122,000, with a rating of relatively moderate expected annual losses, and an NRI score of 85.4 (Figure 139).

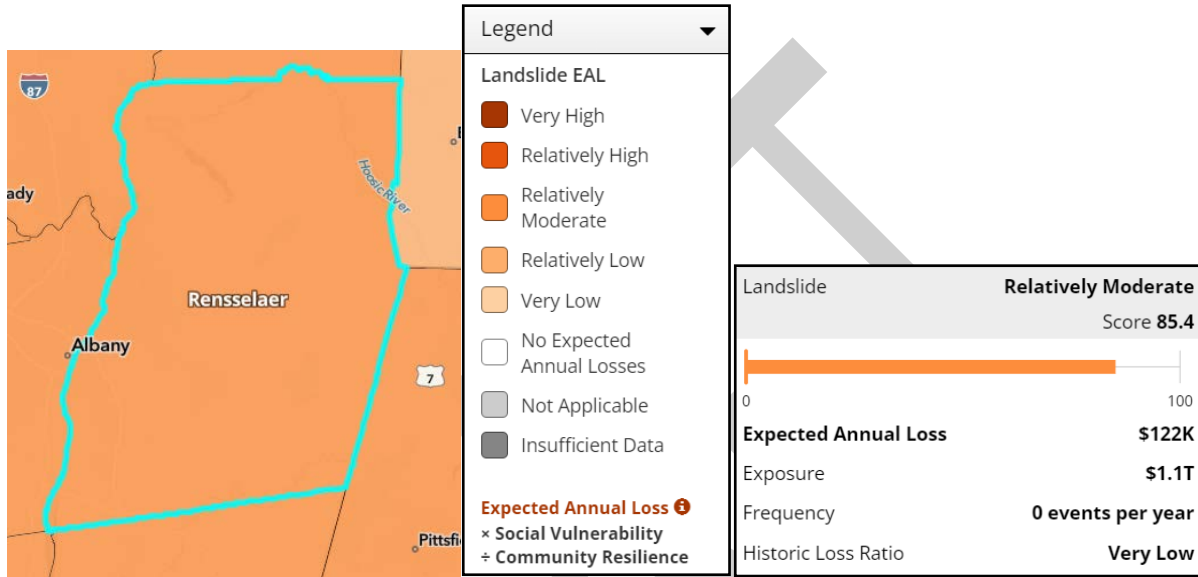


Figure 139: Expected Annual Loss – Rensselaer County¹³⁹

Vulnerable Populations

Landslide can pose a devastating risk to people in the affected area. Homes affected by a landslide may become uninhabitable. If a road or rail line is in the path of destruction, then local transportation may be impacted, potentially complicating efforts to move people to a safe zone and/or to obtain vital supplies such as food and water.

Impact on County Assets

Historically, most damage caused by landslide has occurred sporadically in eastern New York. Damages to the built environment, such as downed power lines or damaged structures, are estimated to be highest throughout the North Country, Capital Region, and Mohawk Valley.

Community Lifelines

Community Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. They are essential for the well-being of any community, providing

¹³⁹ FEMA, National Risk Index, "Rensselaer County Landslide Expected Annual Loss Score, Map and Legend." [Map | National Risk Index \(fema.gov\)](https://www.fema.gov/national-risk-index)

support and assistance to individuals who require help, especially during times of crisis. FEMA Community Lifelines are a critical component of emergency management in the United States that are designed to address the essential needs of a community during and after a disaster. There are eight Community Lifelines, each with its own focus and purpose (see Figure 140).



Figure 140: Community Lifelines¹⁴⁰

Community lifelines include lifeline utility systems (including drinking water, wastewater, energy resources, and communications infrastructure), emergency and essential facilities (including police, fire, ambulatory, and emergency operations facilities), hospitals and medical centers, schools, elderly care facilities, childcare facilities, and religious service facilities. Community facilities are the buildings, land, equipment and activities provided on the public’s behalf by government and/or private organizations. These facilities are important components of a municipality’s quality of life. Critical facilities are necessities for the health, safety, wellbeing, and stability of communities. Critical infrastructure systems are essential for life safety and economic viability and include transportation, power, communication, and water and wastewater systems.

Rensselaer County’s diverse spectrum of infrastructure encompasses transportation networks, energy grids, communication systems, water supply, and more. Each component plays a pivotal role in shaping socioeconomic dynamics, providing essential services and sustaining Rensselaer County’s vibrant culture and economy. Assessing, fortifying and adapting the county’s critical infrastructure is imperative to safeguarding residents, preserving economic vitality, and paving the way for a more resilient future.

Vulnerability Score

The NRI includes data on the expected annual losses to individual natural hazards, historical loss, and overall risk at a county and Census tract level. Based on the NRI, Rensselaer County has a relatively

¹⁴⁰ FEMA, “Community Lifelines Toolkit 2.0.” <https://www.fema.gov/sites/default/files/2020-05/CommunityLifelinesToolkit2.0v2.pdf>

moderate index with a risk index score of **80.9** for landslide, which is lower than the average national percentile. The following table provides an overview of each category for Rensselaer County.

Table 74: Risk Factor – Landslide

Landslide	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Moderate	High	Moderate	\$0	Low

Landslide **Relatively Moderate**
Score **80.9**

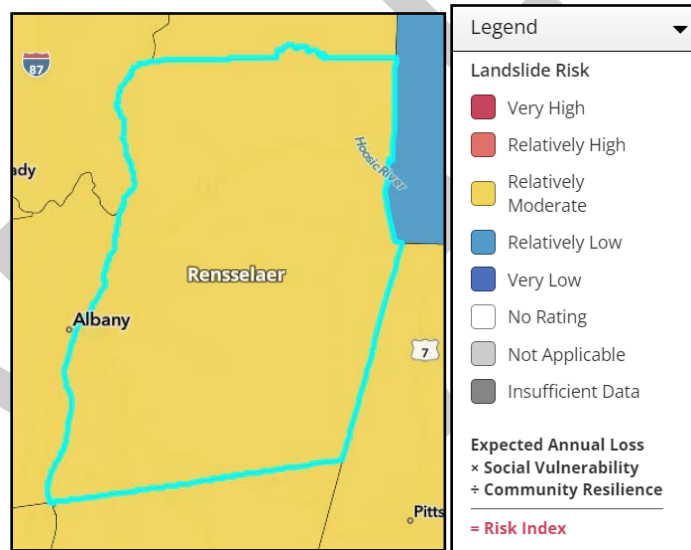


Figure 141: National Risk Index¹⁴¹

Lightning Hazard Profile

Hazard Description

Lightning is brief electrical discharge between a cloud and the ground or from cloud to cloud. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes, but the surrounding air cools following the bolt. This rapid heating and cooling of the

¹⁴¹ FEMA, NRI, "National Risk Index Rensselaer County Landslide Score, Map and Legend" [Map | National Risk Index \(fema.gov\)](https://www.fema.gov)

surrounding air causes thunder. The 2023 State Hazard Mitigation Plan (SHMP) lists four different types of lightning:

- **Cloud-to-sky lightning** is a discharge jumping from a cloud into the surrounding sky.
- **Intra-cloud lightning** is the most common. Intra-cloud lightning occurs when oppositely charged centers within the same cloud ignite and cause a bright flash (Figure 143).
- **Inter-cloud lightning** occurs between oppositely charged areas of different clouds.
- **Cloud-to-ground lightning** is the most dangerous to people, and therefore, the most researched. It occurs when the negative charge of the bottom of a cloud travels to the positively charged ground below (Figure 142).



Figure 142: Cloud-to-Ground Flash (The Most Damaging and Deadly Type)



Figure 143: Intra-Cloud Lightning



Figure 144: Cloud-to-Air Flash Lightning

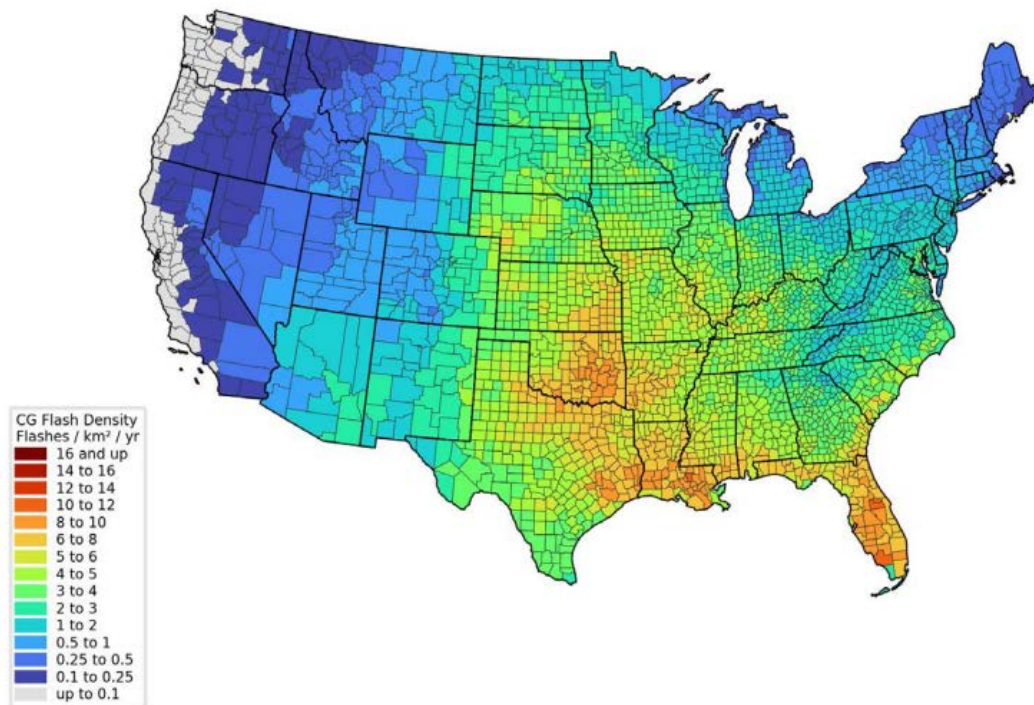
Location

Lightning is a common hazard and lightning strikes can occur anywhere within New York State. Lightning-related fatality risk is a function of population density and flash density, so although lightning is not as common in New York State as in other parts of the United States, the high population density means that lightning-related fatality risk is still substantial in parts of the state. Rensselaer County is located in a region of the country that is susceptible to lightning strikes, though not as susceptible as southeastern states. Figure 145 shows Cloud-to-Ground Lightning Incidence in the Continental United States for the years 1997 to 2010 based upon data provided by Vaisala's National Lightning Detection Network® (NLDN®). This shows that two to three cloud-to-ground lightning incidences are generally observed per square kilometer¹⁴² per year in Rensselaer County.

All areas of Rensselaer County are equally susceptible to lightning strike. While lightning occurs randomly anywhere and anytime, the most common location for lightning fatalities and injuries to people is in open areas such as parks, beaches, golf courses, and other recreational areas. Rensselaer County remains susceptible to lightning deaths and injuries due to the large number of people who engage in outdoor activities.

¹⁴² One square kilometer equals about 0.386 square miles or just over 247 acres.

Cloud-to-ground flash density 2015–2020 per county



VAISALA

2021 ANNUAL LIGHTNING REPORT

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Figure 145: National Lightning Detection Network Cloud to Ground Flash Density, 2015–2020¹⁴³

Extent

The 2023 SHMP presents NOAA’s Lightning Activity Level (LAL) as a parameter measuring the magnitude or severity of the lightning hazard at any given time. The LAL is an assigned numeric value ranging from 1 to 6 indicating the relative amount of lightning activity based on cloud and storm development and number of lightning strikes per 15-minute interval (see Figure 146).

¹⁴³ VAISALA, 2024, “National Lightning Detection Network Cloud to Ground Flash Density, 2010–2019.” [National Lightning Detection Network \(NLDN\) | Vaisala](#)

Lightning Activity Level (LAL)	
Is a scale which describes lightning activity. Values are labeled 1-6:	
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five minute period.
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5 minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced Lightning is frequent, 11 to 15 cloud to ground strikes in a 5 minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a 5 minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.

Figure 146: Lightning Activity Level (LAL)¹⁴⁴

Previous Occurrences

NOAA’s National Centers for Environmental Information (NCEI) Storm Events Database records four lightning events in Rensselaer County between January 2010 and December 2023, causing \$67,000 in property damages and one reported injury.

Table 75: Lightning Events, 1996–2023¹⁴⁵

Affected Area	Date	Event Type	Reported Deaths	Reported Injuries	Reported Property Damage	Reported Crop Damage
Pittstown	8/16/1996	Lightning	0	0	\$25,000	\$0

¹⁴⁴ 2023 NYSHMP, “Lightning Activity Level.” Mitigate NY

¹⁴⁵ NOAA NCEI Database, “Lightning Events, 1996–2023.” [Storm Events Database - Search Page | National Centers for Environmental Information \(noaa.gov\)](https://www.ncei.noaa.gov/stormevents/database-search)

Affected Area	Date	Event Type	Reported Deaths	Reported Injuries	Reported Property Damage	Reported Crop Damage
Rensselaer	7/6/1999	Lightning	0	0	\$10,000	\$0
Town of Hoosick	5/13/2000	Lightning	0	0	\$70,000	\$0
Town of Schaghticoke	7/4/2001	Lightning	0	1	\$25,000	\$0
Brunswick	6/5/2002	Lightning	0	0	\$50,000	\$0
Castleton-on-Hudson	8/2/2002	Lightning	0	1	\$0	\$0
Brunswick	7/1/2004	Lightning	0	2	\$1,000	\$0
North Greenbush	7/8/2004	Lightning	0	7	\$0	\$0
Town of Schaghticoke	8/18/2009	Lightning	0	0	\$5,000	\$0
Troy	5/30/2016	Lightning	0	0	\$50,000	\$0
Town of East Greenbush	07/28/2019	Lightning	0	1	\$1,000	\$0
Castleton-on-Hudson	08/21/2019	Lightning	0	0	\$1,000	\$0
Town of Hoosick	06/30/2020	Lightning	0	0	\$15,000	\$0
Total:			0	11	\$253,000	\$0

Notable occurrence details are provided below:

- August 16, 1996:** Lightning burned a single-story barn to the ground in Pittstown. Tools and recreational vehicles were lost in the fire. Damages were estimated at \$25,000.
- July 6, 1999:** Lightning struck several buildings in the City of Rensselaer, causing damage estimated at \$10,000 in **total**.
- July 6, 1999:** Lightning struck a home in Hoosick, which resulted in much of the house being gutted by fire. Damages were estimated at \$70,000.
- July 4, 2001:** Lightning struck a house in Schaghticoke, producing minor damage (estimated at \$25,000) and at least one injury.
- June 5, 2002:** Lightning struck a barn in Brunswick, causing significant damage (estimated at \$50,000) to the structure.

- **July 1, 2004:** Lightning struck a place of business in Brunswick. Two minor injuries occurred: one due to smoke inhalation, and another due to a firefighter falling off a ladder. Damages were estimated at \$1,000.
- **July 8, 2004:** Seven people sent to hospital with injuries when lightning struck a softball field in Wynantskill in the Town of North Greenbush.
- **July 8, 2004:** A house was struck by lightning in the town of Schaghticoke. Damages were estimated at \$5,000.
- **July 2010:** A direct strike to the Rensselaer County Bureau of Public Safety building damaged in July 2010 damaged equipment and required temporary operations out of the BPS trailer for several days.
- **Date Unspecified:** Core Planning Group members also reported at the time of the initial plan's development that the Town Hall telephone system in the Town of Grafton had recently been destroyed by a lightning strike.
- **May 30, 2016:** Lightning struck a home on Lindsey Drive in Brunswick. The lightning struck the chimney and traveled down through the walls to the basement, where it started a fire. The home was reported to have significant damage (approximately \$50,000 in damage was reported in the NCEI database).

DETAILED DESCRIPTION OF LIGHTNING EVENTS BETWEEN 2010 AND 2023:

TROY, MAY 2016

A warm and humid air mass was in place over eastern New York on Memorial Day (May 30). With a cold front approaching from the west, lines of thunderstorms developed during the late afternoon and early evening hours and moved eastward across the region. One of these thunderstorms strengthened enough to become severe, producing damaging winds as it crossed across the greater Capital Region. Some trees and wires were downed due to these gusty winds. The threat of thunderstorms ended later in the evening hours as the cold front crossed the area from west to east. Lightning struck a home on Lindsey Drive in Brunswick. The lightning struck the chimney and traveled down through the walls to the basement, where it started a fire. The home was reported to have significant damage.

CASTLETON-ON-HUDSON, AUGUST 2019

Multiple severe weather hazards occurred during the afternoon and evening hours of Wednesday, August 21, 2019, due to a strong upper-level shortwave moving into a humid and unstable airmass. This setup resulted in multiple severe thunderstorms, flooding, and two confirmed tornadoes with damage across much of the region. Over 10,000 people lost power, and the Washington County Fair closed for the day. Lightning hit a tree resulting in downed wires trapping a person in a car.

WALLOOMSAC, JUNE 2020

Showers and thunderstorms developed in response to an upper-level low situated over the region. A few of these storms became severe with a few reports of downed trees and a report of a destroyed barn due to lightning. A barn on Cottrell Road was destroyed by a fire caused by a lightning strike.¹⁴⁶

Probability of Future Events

Lightning is a common occurrence in New York State, and there is a high probability that it will happen in the future. According to NOAA, Rensselaer County is located in an area that experiences an average of one to two lightning flashes per square kilometer (three to five lightning flashes per square mile per year). This means that there could be around 2,000 to 3,300 strikes per year across the 22 jurisdictions in the planning area. Given the frequency of lightning strikes, it is expected that they will continue to pose a threat to life and property, as well as to communication equipment throughout the county.

The graph (Figure 147) below sums total loss by the month in which damage occurred from 1996 to 2022. Understanding the seasonality of damaging historic hazard events can help anticipate and plan for future events. Figure 148 shows the National Risk Index rating of lightning for Rensselaer County.

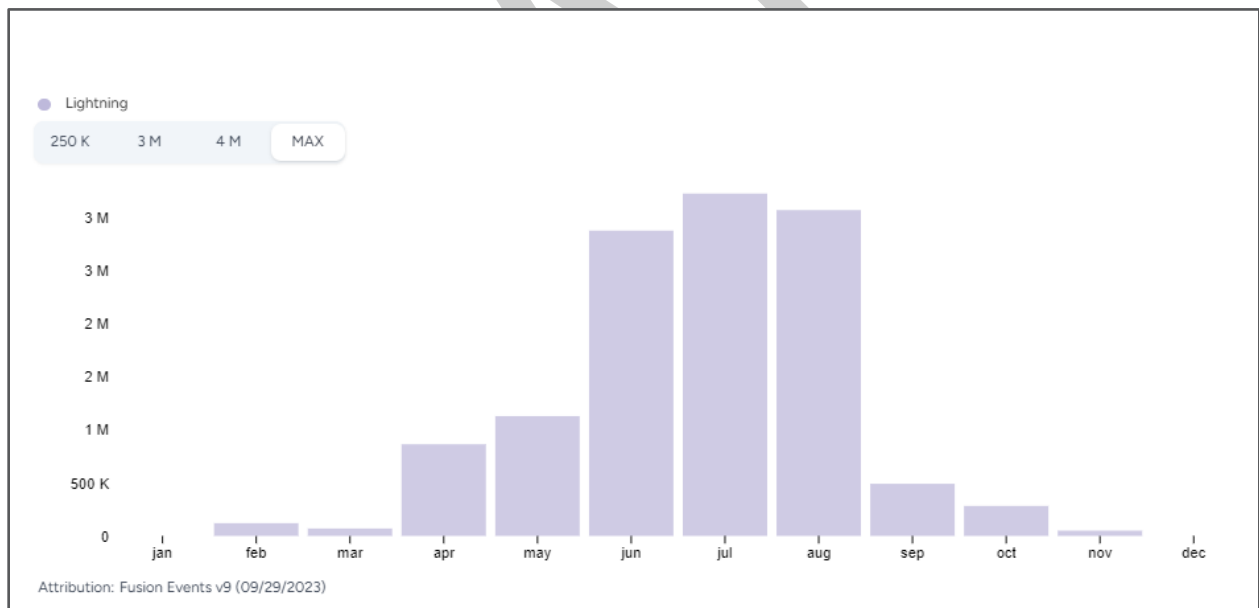


Figure 147: New York State Events by Month¹⁴⁷

¹⁴⁶ NOAA NCEI Database, [Storm Events Database - Search Page | National Centers for Environmental Information \(noaa.gov\)](https://www.ncei.noaa.gov/stormevents)

¹⁴⁷ [2023 NYSHMP, "New York State Events by Month." Mitigate NY](#)

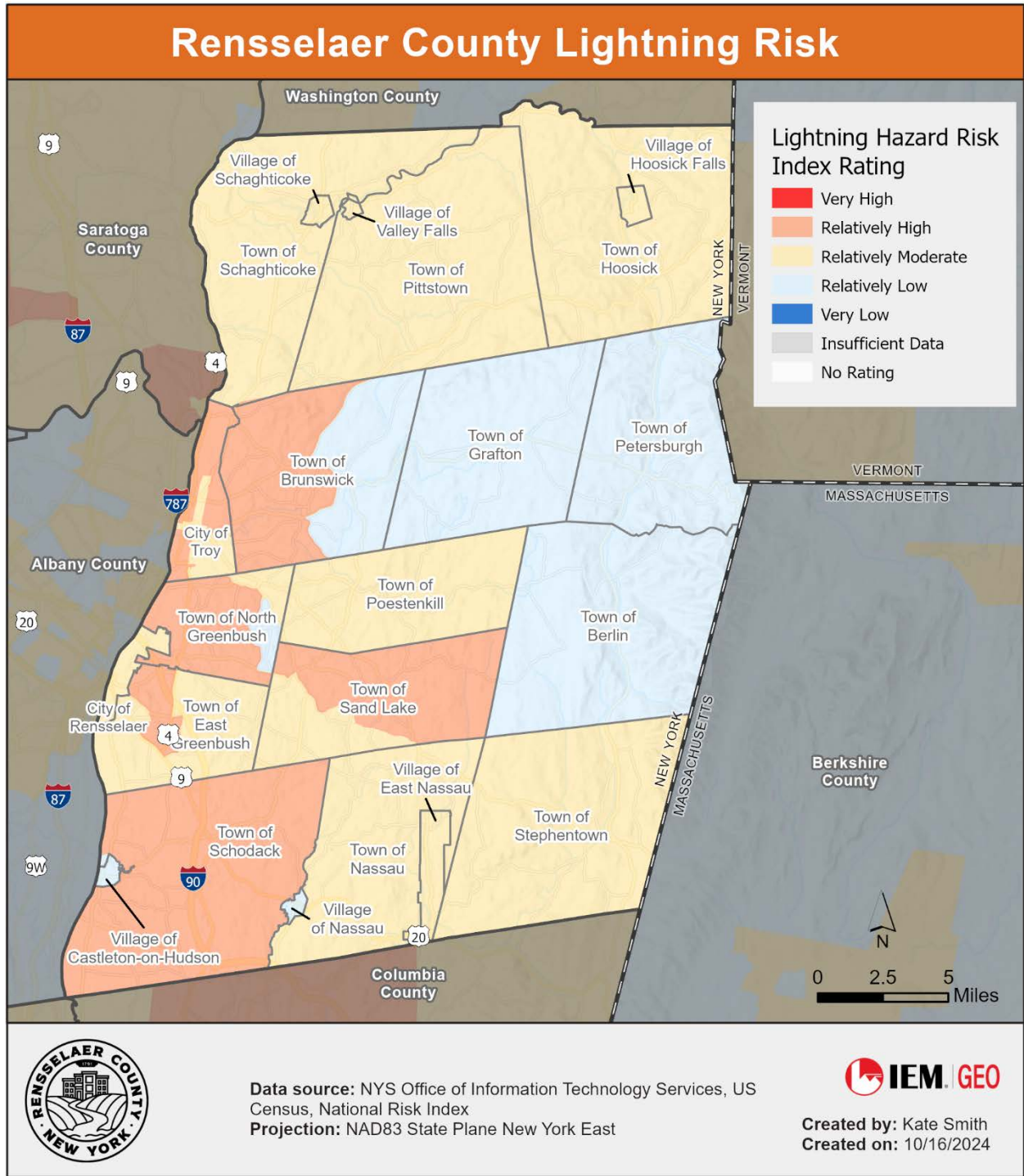


Figure 148: National Risk Index Rating for Lightning

IMPACTS OF CLIMATE TRENDS AND VARIATIONS

The 2023 SHMP purports research on how climate change may affect lightning is limited. One model projected the number of lightning strikes in the United States will increase 12 percent for every degree

increase of global average air temperatures. A more recent study in Europe projected that the impact of climate change on lightning would be location-specific, with some areas experiencing more lightning strikes and some experiencing fewer, largely based on latitude. While projections of changes to intensity and duration remain limited, one study suggested that long-continuing-current lightning flashes—intense lightning flashes that are longer in duration and more likely to spark fires than other types of lightning—may become more common, though not significantly so in the Northeast. Ultimately, while specific impacts to lightning remain uncertain, lightning occurs more frequently in warmer temperatures, so it may be reasonable to see some level of increased lightning occurrence with projected climate change.

As of early 2023, there is no clear change in lightning frequency or intensity in the United States, while there have been an increasing number of lightning-caused fires in the West. This is largely due to dry conditions, rather than a change in the frequency or intensity of lightning itself. However, climate change is expected to increase the frequency and intensity of thunderstorms, which can present an associated increase in the probability of lightning occurring.

Vulnerability Analysis

EXPOSURE

It is important to note that the lightning hazard area in Rensselaer County covers the entirety of the county and is consistent throughout all jurisdictions. As such, any future development plans for this area would follow the same trends county-wide. Although there may be an increase in the number of new structures exposed to lightning in the future, all municipalities are required to comply with the New York State Building Code and any applicable local regulations, which provide a certain level of protection against the most common lightning events.

ESTIMATED IMPACT AND POTENTIAL LOSSES

In Rensselaer County, lightning's impacts are typically minor, causing very few injuries and only minor property damage. Shutdowns of critical facilities, if any, are usually temporary. Historical impacts in the area include direct health impacts on individuals struck by lightning, structure damages from fires caused by lightning, and impacts on emergency communications facilities. While lightning occurs frequently in Rensselaer County, damaging events are relatively few and limited in scope. Building codes requiring buildings to be grounded work to decrease damages. People outdoors are particularly vulnerable during a lightning event. Lightning most typically happens within 10 miles of a thunderstorm.

Lightning events have the potential to pose a significant risk to people and can create dangerous and difficult situations for public health and safety officials. Impacts to the planning area can include the following:

- Individuals exposed to the storm can be directly struck, posing significant health risks and potential death.

- Structures can be damaged or crushed by falling trees damaged by lightning, which can result in physical harm to the occupants.
- Lightning strikes can result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage often results in an increase in structure fires and carbon monoxide poisoning as individuals attempt to cook or heat their homes with alternate, unsafe cooking or heating devices, such as grills.
- Lightning strikes can be associated with structure fires and wildfires, creating additional risk to residents and first responders.
- Emergency operations and services may be significantly impacted due to power outages and/or loss of communications.
- City or county departments may be damaged, delaying response and recovery efforts for the entire community.
- Economic disruption due to power outages and fires negatively impacts the programs and services provided by the community due to short- and long-term loss in revenue.
- Some businesses not directly damaged by lightning events may be negatively impacted while utilities are being restored, further slowing economic recovery.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.

The economic and financial impacts of lightning on the area will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the county, communities, local businesses, and citizens will also contribute to the overall economic and financial conditions in the aftermath of any lightning event.

The hazard index score for lightning in Rensselaer County is relatively high at **89.4**, which reflects the expected annual loss value and community risk factor, including the adjustment factor used to calculate the risk value. And the estimated annual loss value (EAL) is **\$559K**.

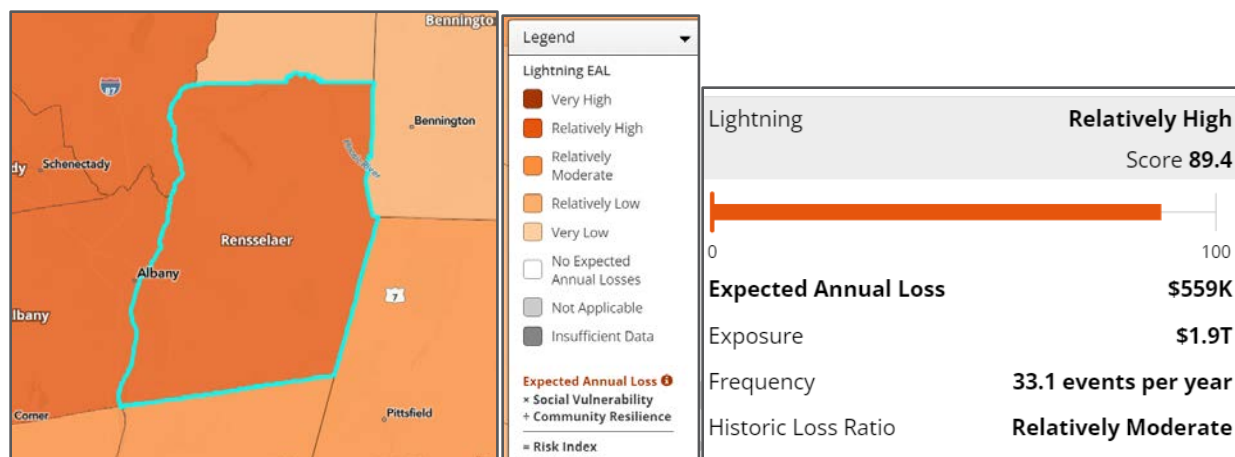


Figure 149: Expected Annual Loss-Rensselaer County¹⁴⁸

VULNERABLE POPULATIONS

According to FEMA, an average of 300 people are injured and 80 people are killed in the United States each year by lightning. Direct lightning strikes also have the ability to cause significant damage to buildings, critical facilities, and infrastructure. Lightning is also responsible for igniting wildfires that can result in widespread damages to property before firefighters have the ability to contain and suppress the resultant fire.

The most vulnerable people are those who are active outdoors, whether it is participating in outdoor activities or working outdoors, particularly farmers and ranchers. Like other locations in the United States, Rensselaer County remains susceptible to lightning deaths and injuries due to the large number of people who engage in outdoor activities. All areas of Rensselaer County are equally susceptible to lightning strikes. While lightning occurs randomly anywhere and anytime, the most common location for lightning fatalities and injuries to people is in open areas such as parks, beaches, golf courses, and other recreational areas. Other vulnerable populations include those who rely on electrically powered medical equipment, whereby the electrical outages caused by lightning are generally short-lived. Critical facilities, such as hospitals and care facilities, are sometimes equipped with backup generators that can provide electricity during outages.

IMPACT ON COUNTY ASSETS

Lightning strikes in the United States cause an average of 55 fatalities and hundreds of injuries each year. Lightning can strike communication equipment like radio towers, cell towers, antennae, satellite dishes, and electrical transformers, affecting emergency response and communication. In addition, lightning

¹⁴⁸ FEMA, National Risk Index, "Rensselaer County Lightning Expected Annual Loss Score, Map and Legend." [Map | National Risk Index \(fema.gov\)](https://www.fema.gov/national-risk-index)

strikes can cause significant damage to buildings, critical facilities, and infrastructure, as they can ignite a fire or vegetation, which can lead to a wildfire.

COMMUNITY LIFELINES

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Community lifelines are essential for the well-being of any community. They provide support and assistance to individuals who require help, especially during times of crisis. FEMA Community Lifelines are a critical component of emergency management in the United States. These lifelines are designed to address the essential needs of a community during and after a disaster. There are eight lifelines, each with its own focus and purpose (Figure 150).



Figure 150: Community Lifelines¹⁴⁹

Depending on the duration and severity of an electrical storm, all community lifelines—safety and security; health and medical; communications; hazardous materials; food, hydration, shelter; energy (power and fuel); water systems; and transportation—can be affected. Compared to the severity and duration of other types of hazards, the effects of lightning strikes on community lifelines are relatively short-lived. Community facilities are the buildings, land, equipment and activities provided on the public’s behalf by government and/or private organizations. These facilities are important components to the quality of life of a municipality. Critical facilities are necessities for the health, safety, well-being, and stability of communities. Critical infrastructure systems are essential for life safety and economic viability and include transportation, power, communication, and water and wastewater systems.

VULNERABILITY SCORE

In Rensselaer County, lightning is not particularly common and, while its potential consequences are high, it has not historically caused significant damages. The National Risk Index (NRI) includes data on the

¹⁴⁹ FEMA, NRI, “National Risk Index Rensselaer County Lightning Score, Map and Legend” [Map | National Risk Index \(fema.gov\)](https://www.fema.gov)

expected annual losses to individual natural hazards, historical loss, and overall risk at a county and Census tract level. The following table provides an overview of each category at the county level.

Table 76: National Risk Index–Lightning

Lightning	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Relatively Moderate	High	Low	\$559K	Low

Figure 11 illustrates the National Risk Index rating for Rensselaer County as relatively moderate and an index score of 87.9.

DRAFT

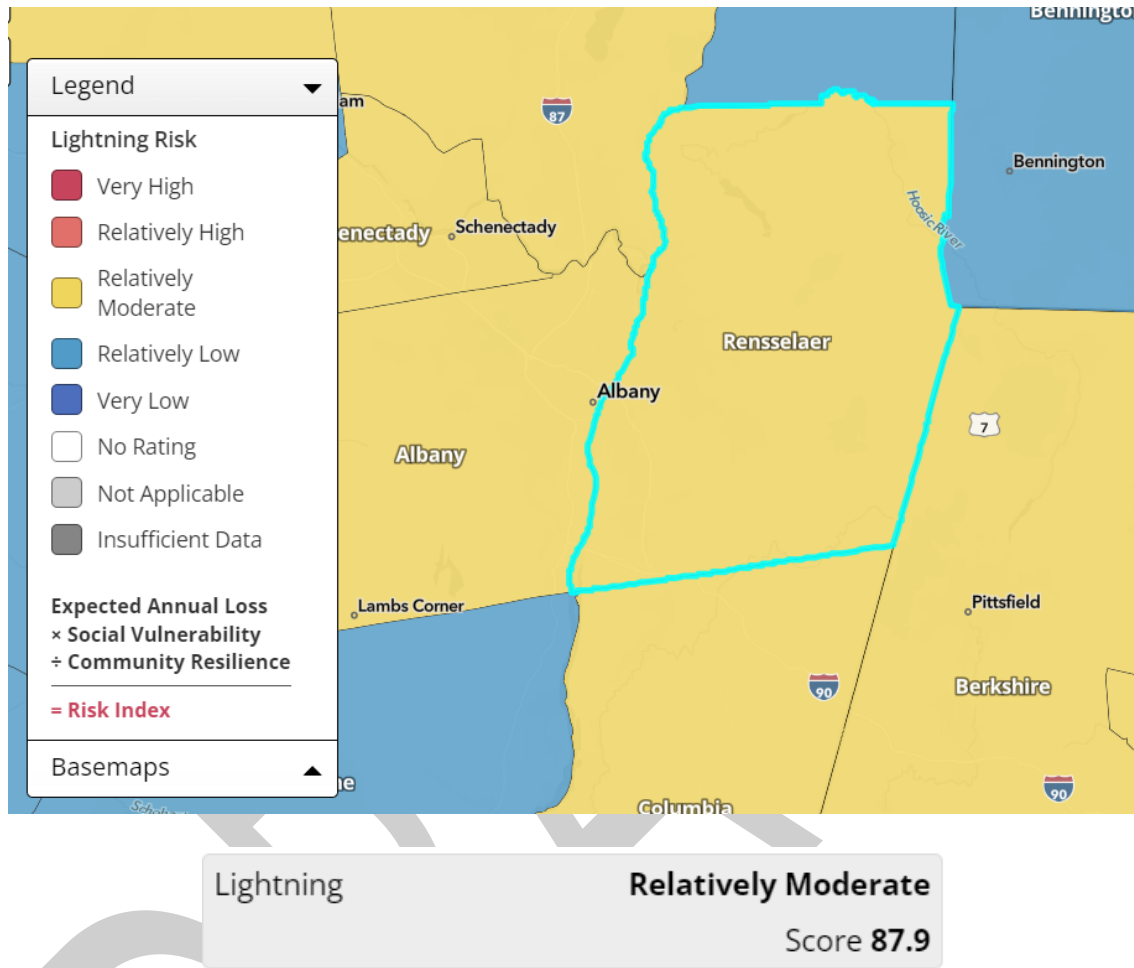


Figure 151: Rensselaer County NRI Lightning Risk Map¹⁵⁰ *

Terrorism Hazard Profile

FEMA defines terrorism in the United States as "the use of force or violence against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion, or ransom."¹⁵¹

This definition encompasses various violent acts, including those committed by individuals, groups, or governments, intended to instill fear and achieve political or ideological goals. Terrorists use threats to create fear, spread propaganda, and gain attention. The following are list of the types of terrorism:

- **International terrorism** is when violent criminal acts are committed by individuals and/or groups inspired by or associated with designated foreign terrorist organizations or nations (state-sponsored). Activities transcend national boundaries or are sponsored by international groups.

¹⁵⁰ FEMA, NRI, "National Risk Index Rensselaer County Lightning Score, Map and Legend" [Map | National Risk Index \(fema.gov\)](#)

¹⁵¹ FEMA, "Terrorism." <https://www.fema.gov/pdf/areyouready/terrorism.pdf>

- **Domestic terrorism** is committed by homegrown groups with no ties or connections outside the United States. These groups are generally motivated by political, racial, ethnic, economic, health, and other grievances.
- **Transnational terrorism** involves actions in which victims, perpetrators, and sites of violence represent different states and nationalities, such as the current war between Israel and Palestine.¹⁵²
- **Civil unrest** is a term that encompasses limited political violence (such as acts of terrorism, individual assassinations, etc.), sporadic violent collective action (such as riots), or nonviolent and mildly violent collective action (such as protests, demonstrations, etc.), all of which tend to take place in times of peace.¹⁵³
- **Agroterrorism** is intended to disrupt or damage a country's agriculture, especially using a biological agent against crops or livestock.
- **Cyberterrorism** is any premeditated, politically motivated attack against information systems, programs, and data that threatens violence or results in violence.¹⁵⁴

Acts of terrorism include threats of terrorism, assassinations, kidnappings, hijackings, bomb scares and bombings, cyber-attacks, and the use of chemical, biological, nuclear, and radiological weapons.¹⁵⁵ The following is a brief overview of some of the potential terroristic methods:

- **Explosive devices** have been used frequently by terrorists and are one of their more common weapons. Highly portable, they can be transported using vehicles and humans. Information on the construction of these types of devices is readily available. Explosive devices are also easily detonated from remote locations or by suicide bombers. Common explosives include the substances listed below:¹⁵⁶
 - Triacetone triperoxide (TATP) is an improvised primary explosive that can be synthesized using easily acquired precursors. It appears as a white, crystalline solid and is highly unstable and sensitive, requiring safety precautions during handling, preparation, and storage.
 - Ammonium nitrate (AN) is an oxidizer known for its availability and cheap material cost and is often mixed with common fuels, such as fuel oil (ANFO). It has been used extensively in the main charge of improvised weapons worldwide. ANFO is a secondary or tertiary explosive and is the most common commercial explosive, requiring few specialized skills or machinery to mix.

¹⁵² United States Institute of Peace, "Rethinking Transnational Terrorism."

https://www.usip.org/sites/default/files/2020-02/pw_158-rethinking_transnational_terrorism_an_integrated_approach.pdf

¹⁵³ United Nations Office for Disaster Risk Reduction, "Civil Unrest." <https://www.undrr.org/understanding-disaster-risk/terminology/hips/so0003>

¹⁵⁴ TechTarget Network, "Cyberterrorism."

<https://www.techtarget.com/searchsecurity/definition/cyberterrorism#:~:text=Cyberterrorism%20is%20usually%20defined%20as,viole%20or%20results%20in%20viole>

¹⁵⁵ Ibid.

¹⁵⁶ Office of the Director of National Intelligence, "Methods & Tactics." <https://www.dni.gov/nctc/methods.html>

- Trinitrotoluene (TNT) is one of the most used explosives for military and industrial purposes. TNT's insensitivity to shock and friction reduces the risk of accidental detonation. It appears as a yellow solid but turns dark brown if removed from the packaging and exposed to sunlight. It is commonly mixed with other explosives materials in commercial boosters and military munitions or used as a main charge.
 - Hexamethylene triperoxide diamine (HMTD) is an improvised primary explosive prepared with widely available precursors. It appears as a white crystalline solid and is highly sensitive to friction, impact, and electrostatic discharge. HMTD can degrade quickly if improperly synthesized or stored.
 - Urea nitrate (UN) is a high explosive formed as odorless crystals that are colorless to off-white, although additives and/or metal from a mixing container may alter the compound's appearance. UN is used as a secondary explosive or main charge.
 - Composition 4 (C-4) is a common insensitive military explosive combining Research Department eXplosive (RDX) with a plastic binder. C-4 appears as an off-white solid consistent with that of modeling clay.
- **Biological threats** are organisms or toxins that can kill or incapacitate people, livestock, and crops. The three basic groups of biological agents are bacteria, viruses, and toxins. Most biological agents are difficult to grow and maintain. Biological agents can be dispersed through aerosols, infecting animals that carry diseases to humans or contaminating food or water supplies. Two common biological threats include botulinum toxin and smallpox.
- **Chemical threats** are poisonous vapors, aerosols, liquids, and solids that harm people, animals, or plants. They can be released by bombs or sprayed from aircraft, boats, or vehicles. They can be used as liquids to create a hazard to people and the environment. Common chemical agents include the following:¹⁵⁷
 - **Sarin** is an extremely toxic substance solely used as a nerve agent. Nerve agents are the most lethal and rapidly acting chemical warfare agents known to date. The United Nations categorizes it as a weapon of mass destruction under UN Resolution 687, and its production and stockpiling have been banned by the Chemical Weapons Convention of 1993. Sarin can be stored as two separate ingredients that can then be mixed immediately before use, making it safer for the terrorist to use.
 - **VX** is a highly toxic chemical nerve agent that paralyzes the nervous system. It is more dangerous and longer lasting than related nerve agents such as tabun and sarin, which have short-term effects and dissipate quickly. VX is toxic when it enters the body through the skin and toxic when inhaled. It is an odorless and tasteless oily liquid that appears amber in color and evaporates very slowly, like motor oil.
 - **Ricin** is a highly toxic substance found in castor beans. It can be fatal if inhaled, ingested, or injected. Ricin can be a powder, a mist, or a pellet, or it can be dissolved in water or weak acid.

¹⁵⁷ Ibid.

Castor beans are used worldwide to produce castor oil, and ricin is a byproduct of this process. Ricin can penetrate the cells of a person's body and interfere with protein synthesis, causing significant damage to several organs in severe cases. The symptoms of ricin poisoning depend on the method of exposure and the amount received. Although there is treatment available, long-term organ damage is likely for survivors. Death from ricin poisoning can occur within 36 to 72 hours of exposure, depending on the method of exposure (inhalation, ingestion, or injection) and the amount received.

- **Nuclear blasts** are explosions with intense light and heat, a damaging pressure wave, and widespread radioactive material that can contaminate the air, water, and ground surfaces for miles around.
- **Radiological dispersion**, often referred to as a "dirty bomb," combines a conventional explosive device with radioactive material. It is designed to scatter dangerous and sub-lethal amounts of radioactive material over a general area. The device kills or harms through the traditional explosive's initial impact and by emitting radiation and contamination. A radiological dispersion device can contaminate buildings and the surrounding area and put individuals at risk of exposure to radiation from the radioactive substance. People might get contaminated externally (on their skin) or internally through inhalation, ingestion, or wounds.

Location

The New York State Department of Homeland Security and Emergency Services suggests jurisdictions should work with schools, religious institutions, civic organizations, healthcare facilities, courts, government buildings, mass gathering sites, and other key locations to understand what target hardening and other security measures are in place, as these types of locations could be targets of domestic terrorism, hate crimes, or other acts of targeted violence.¹⁵⁸ Rensselaer County has several highly regarded universities and research institutions, including the Rensselaer Polytechnic Institute (RPI), Russell Sage College, Hudson Valley Community College, Emma Willard School, and the Troy City School District. These institutions attract students, researchers, and faculty worldwide, making them potentially vulnerable to terrorist attacks or attempts to obtain sensitive research information. In addition, the county is home to several critical infrastructure facilities, such as power plants and water treatment plants that could be targeted by terrorists seeking to cause widespread damage.

Extent

Several factors can influence the extent of terrorism in Rensselaer County, New York. The type and frequency of terrorist attacks can have a significant impact. For instance, a single terrorist attack, even if it is minor, can have a long-lasting impact on a rural community, especially if it targets a critical

¹⁵⁸ New York State Department of Homeland Security and Emergency Services, August 2022, "Understanding Target Hardening and Security Measures", https://www.dhSES.ny.gov/system/files/documents/2022/08/county-domestic-terrorism-plan-guidance_0.pdf.

infrastructure or natural resource. In contrast, a community that experiences frequent but less severe attacks may develop a high level of resilience and be better prepared to handle such incidents.

Previous Occurrences

CYBER TERRORISM ATTACK

May 7, 2021- FBI and State Police cyber squads investigated a malware attack that paralyzed Rensselaer Polytechnic Institute's (RPI) computer systems for several weeks. The situation developed during RPI's final exam period and resulted in the university temporarily canceling final exams. The cyberattack disrupted nearly all of the engineering and research school's operation, which led to the use of alternative lines of communication with RPI's internet, email, instant communications and telephone services disabled. The school temporarily suspended access to the network, advised employees not to log into the system to avoid any infection of non-university computers, as it worked with law enforcement and cyber security experts to determine the extent of the trespass. RPI did not report how or if the attack may have impacted the \$104 million in research contracts carried out by RPI professors and scientists. RPI affiliates have contracts with research offices of the U.S. Army, Navy, Air Force and Defense Advanced Research Projects Agency, the Defense Department's research arm.¹⁵⁹

Probability of Future Events

The New York State Department of Homeland Security and Emergency Services states jurisdictions should review the current threat environment to determine the potential organizations, groups, and/or types of individuals that could pose a domestic terrorism threat, or that exist within the Jurisdiction, and could pose a threat to others. The Federal Bureau of Investigation (FBI) and the Department of Homeland Security (DHS) continue to assess that racially or ethnically motivated violent extremists (REMVEs), primarily white supremacist organizations, will likely continue to be the most lethal domestic terrorism threat to the United States. However, domestic violent extremists may be inspired by several different ideologies, such as anti-government violent extremism, abortion-related violent extremism, incel violent extremism, and environmental and animal rights violent extremism. In addition, threats from homegrown violent extremists, those primarily inspired by al-Qa'ida and the Islamic State's global jihadist ideology, persist.¹⁶⁰

According to the Department of Homeland Security, there were 231 domestic terrorism incidents nationwide between 2010 and 2021. Of these, about 35% (the largest category) were classified as racially- or ethnically-motivated. These attacks were also the most lethal. For example, in July 2016, a racially-motivated individual killed five police officers in Dallas. More recently, in May 2022, a racially-motivated

¹⁵⁹ Government Technology, Cybersecurity, May 12, 2021, Kenneth C. Crow II Times Union, [FBI Leads Probe as Cyber Attack Cripples University Computers \(govtech.com\)](https://www.timesunion.com/news/story/fbi-leads-probe-as-cyber-attack-cripples-university-computers-2021-05-12/)

¹⁶⁰ New York State Department of Homeland Security and Emergency Services, August 2022, "Review the Current Threat Environment", https://www.dhses.ny.gov/system/files/documents/2022/08/county-domestic-terrorism-plan-guidance_0.pdf

individual shot and killed 10 people in Buffalo, New York. Anti-government or anti-authority motivated violent extremism was the second largest category of incidents, and resulted in 15 deaths over the same time period. There were also domestic terrorism incidents linked to animal rights extremists and abortion-related violent extremists, among other motivations. Animal rights-related incidents did not result in any deaths during this time period; incidents related to abortion-related violent extremists led to 3 deaths.¹⁶¹

Domestic Terrorism-Related Incidents by Category, from 2010 through 2021

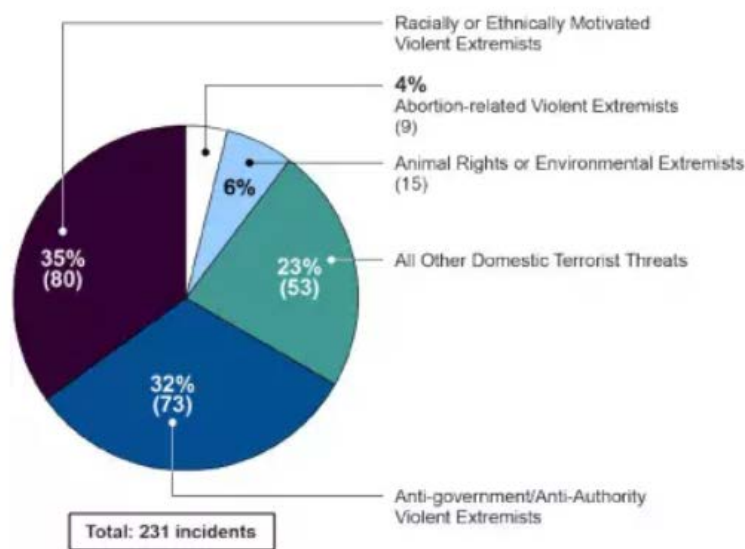


Figure 152: Domestic Terrorism-Related Incidents by Category, from 2010 through 2021¹⁶²

Vulnerability Assessment

Rensselaer County hosts numerous critical infrastructure sites, including power plants, telecommunication networks, and transportation hubs. These facilities are crucial to the county's daily operations and the functioning of the wider region. These facilities could be targeted, causing significant harm and disruption to the county's economy and residents.¹⁶³ Power plants in Rensselaer County provide electricity to the region, making them a high-value target for terrorists. Disrupting power supplies could cause widespread panic and chaos, hindering the county's response to other emergencies. The county's telecommunication networks may be at risk. Terrorists could target these networks to disrupt communications, making it difficult for emergency services to communicate and coordinate their response. This could lead to confusion and delays in responding to any terrorist activity. Transportation hubs, such as airports and

¹⁶¹ United States Government Accountability Office, May 2, 2023, <https://www.gao.gov/blog/rising-threat-domestic-terrorism-u.s.-and-federal-efforts-combat-it>

¹⁶² Ibid.

¹⁶³ Department of Homeland Security, "The National Strategy for the Physical Protection of Critical Infrastructures and Key Assets." https://www.dhs.gov/xlibrary/assets/Physical_Strategy.pdf

train stations, are also critical infrastructure sites terrorists could target. Disrupting these sites could cause significant economic damage to the county and the wider region.

In addition, Rensselaer County is located nine miles from Albany, New York, the capitol of New York State and the county seat of and most populous city in Albany County. As the location of the New York State capitol and the legislature, the city of Albany and its surrounding counties, like Rensselaer County, could be potential targets for terrorism.

Estimates and Impact and Potential Losses

Terrorism can have a significant impact on rural communities, such as Rensselaer County, in various ways. Apart from physical harm, injury, and death, terrorism can cause economic damage if local businesses and industries are disrupted or destroyed. The fear and anxiety caused by terrorism can also cause people to leave the area, leading to a decline in population and social cohesion. Since rural communities may have limited access to resources and support services, recovering from the effects of terrorism can be more challenging. Overall, terrorism's effects on rural communities can be far-reaching and devastating.

Vulnerable Populations

Terrorism is a global threat that can strike anybody, irrespective of their race, religion, ethnicity, or nationality. Anti-Semitism is a serious issue that affects many communities, and it puts Jewish students at risk of facing discrimination, harassment, or even violence. The Hebrew Academy of the Capital District is in Albany, New York. Although Albany is generally safe, it is close to Rensselaer County, which witnessed an increase in extremist activity in 2023, with 20 anti-Semitic incidents in Albany. Troy also recorded 5 anti-Semitic incidents in 2023, making it a potential target for terrorism. This is a significant concern for the students, staff, their families, and the wider community. Jewish citizens may be more susceptible to incidents of anti-Semitism.

Moreover, marginalized communities, including refugees, immigrants, and religious minorities, may face an increased likelihood of being targeted by domestic terrorism. These groups may be more vulnerable because they may lack social and economic resources and have limited access to security and protection. Terrorist groups often exploit these vulnerabilities to carry out attacks, which may result in greater harm to marginalized communities.

It is important to note that terrorism can have a profound impact on both the direct victims and the wider society. It can create fear, disrupt social and economic activities, and erode community trust.

Community Lifelines

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Community lifelines are essential for the well-being of any community. They provide support and assistance to individuals who require help, especially during times of crisis. FEMA Community Lifelines are a critical component of emergency management in the United States. These

lifelines are designed to address the essential needs of a community during and after a disaster. There are eight lifelines, each with its own focus and purpose (see Figure 153 below).



Figure 153: FEMA Community Lifelines

During a terrorist event, all lifelines such as Safety and Security; Food, Hydration, Shelter; Health and Medical; Energy; Communications; Transportation; Water Systems; and Hazardous Materials are all at risk. Explosives, radiological devices, and nuclear bombs can cause substantial damage to structures and infrastructures, blocking evacuation routes and making it tough for emergency services, law enforcement, medical aid, and essential items like food and water to be available. Biological and chemical assaults can also destroy crops, poison livestock, and contaminate soil, making food production challenging for years. Power outages may occur due to explosives, disrupted communication, and fuel supply. Therefore, protecting citizens and critical assets from these worst-case scenarios in the United States is crucial.

Development Trends

There are no indications of any changes in development that would influence the level of vulnerability of the county to terrorism.

Tornado Hazard Profile

The 2023 New York State Hazard Mitigation Plan defines tornadoes as violently rotating columns of air extending from the base of a thunderstorm cloud to the ground and often (but not always) visible as a funnel cloud. Tornado wind speeds can range from as low as 40 miles per hour (mph) to as high as 318 mph. Tornadoes often accompany thunderstorms and hurricanes. They can occur at any time of the year but are more prevalent during the spring and summer months.

Geographic Extent

Rensselaer County is located in an area that is susceptible to tornadoes, though their occurrence is not nearly as frequent or intense as it is in other regions of the country. Of the roughly four tornadoes that touch down in New York State each year, approximately 80 percent tend to be of low magnitude (from

EF0 to EF2) and typically impact only relatively small areas. Figure 154 shows tornado activity in the United States based on the number of recorded tornadoes per 1,000 square miles. All of Rensselaer County is uniformly exposed.

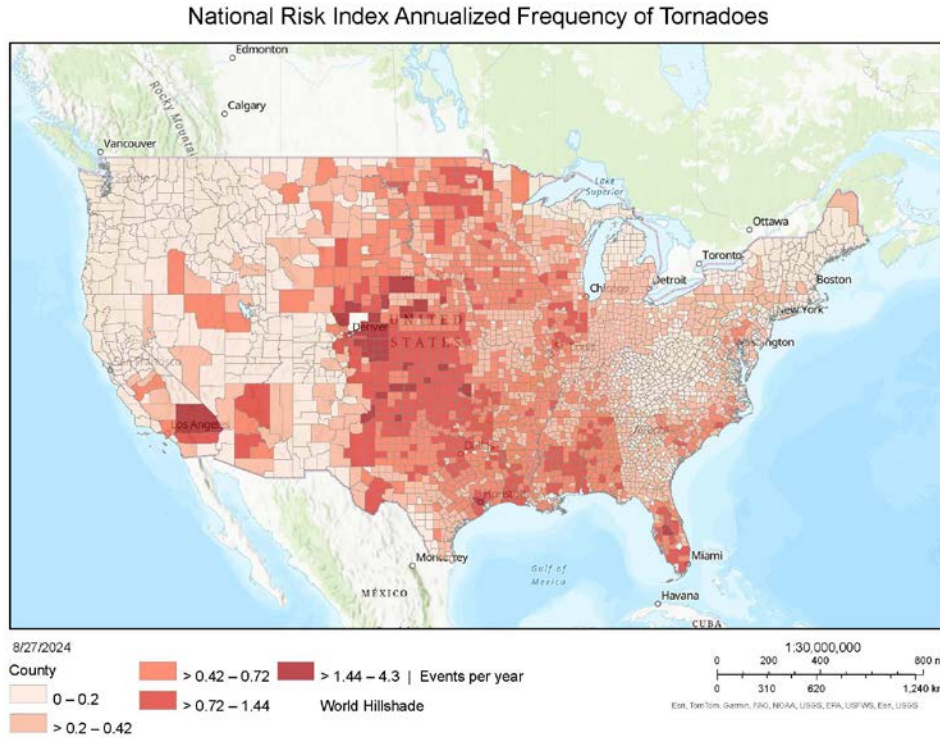








Figure 154: National Risk Index Annualized Frequency of Tornadoes¹⁶⁴

The magnitude or severity of a tornado is dependent upon wind speed and is categorized by the Enhanced Fujita Scale, presented in Table 77. Tornadoes are typically considered to be “significant” for EF2 or EF3 on the Fujita Scale and “violent” for EF4 and EF5. Table 77 shows the Enhanced Fujita Scale for tornadoes, which was developed to measure tornado strength and associated damages. The tornadoes associated with tropical cyclones are most frequent in September and October, when the incidence of tropical storm systems is greatest. This type of tornado usually occurs around the perimeter of the storm and most often to the right and ahead of the storm path or the storm center as it comes ashore. These tornadoes commonly occur as part of large outbreaks and generally move in an easterly direction.

¹⁶⁴ Source: Federal Emergency Management Agency: National Risk Index

Table 77: Enhanced Fujita Scale for Tornadoes¹⁶⁵

Storm Category	Damage Level	3 Second Gust (mph)	Description of Damages	Photo Example
EF0	Light	65–85	Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.	
EF1	Moderate	86–110	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.	
EF2	Significant	111–135	Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; high-rise windows broken and blown in; light-object missiles generated.	
EF3	Severe	136–165	Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.	
EF4	Devastating	166–200	Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown, and large missiles generated.	
EF5	Incredible	200+	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; steel reinforced concrete structures badly damaged.	

Previous Occurrences

National Oceanic Atmospheric Administration’s (NOAA) National Centers for Environmental Information (NCEI) Storm Events Database records three tornadoes in Rensselaer County between 1996 and 2023,

¹⁶⁵ Source: National Oceanic and Atmospheric Administration; Federal Emergency Management Agency

causing \$10,270,000 in property damages. Details of damages given for these events are as follows (Table 78). Notable occurrence details are also provided below after the table.

Table 78: Tornado Events, 1996–2023

Affected Location	Date	Event Type	Reported Deaths	Reported Injuries	Reported Property Damage	Reported Crop Damage
Town of Schaghticoke, Village of Schaghticoke, Village of Valley Falls, Town of Pittstown	5/31/1998	F2 Tornado	0	0	\$10,000,000	\$200,000
Town of Schodack	5/31/1998	F2 Tornado	0	0	\$175,000	\$0
Village of Nassau	7/21/2003	F1 Tornado	0	0	\$50,000	\$0
Schaghticoke Airport	08/29/2020	EF1 Tornado	0	0	\$45,000	\$30,000
Total:			0	0	\$10,270,000	\$230,000

MAY 31, 1998

During the morning hours of May 31, several lines of severe thunderstorms formed ahead of an approaching cold front. This resulted in two tornadoes that caused damage in Rensselaer County. The first tornado touched down west of Mechanicville in Saratoga County and intensified to F3 before crossing the Hudson River into the Town of Schaghticoke in Rensselaer County and decreasing to an F2.



Figure 155: Tornado Damage at Wiley Brothers Lumber and Hardware Store, Route 40, Schaghticoke, 1998

The tornado tracked across the Town of Schaghticoke and just brushed the Village of Schaghticoke to the north. Czub Grain Farm on Verbeck Avenue was heavily damaged. It then followed the Hoosic River as it crossed the Village of Valley Falls. Soon thereafter, the track became discontinuous and the intensity decreased to an F1. In the Town of Hoosick, the path became continuous again and increased to an F2. Several farms suffered extensive damage including Lukeland Dairy Farm where a 60-ton silo and a barn were leveled.

The tornado then tracked from extreme northeast Rensselaer County to Bennington County in southern Vermont, where it quickly decreased to an F1 after crossing the border. A second tornado generated by the same weather system tracked across southern Rensselaer County. This tornado first touched down on Palmer Road about 2 miles east of Interstate 90 in the Town of Schodack. The tornado moved due east and passed just south of North Schodack then tracked east northeast to Millers Corners on the south shore of Burden Lake.

The damage path continued in this direction to Pike Pond before it dissipated at Alps Mountain. This tornado destroyed three barns, damaged several homes, and produced extensive tree damage along its path. Overall, approximately 50 to 60 homes and businesses were damaged or destroyed, and substantial damages to treed/forested areas were incurred. Power was not restored to parts of this region for three to four days. Approximately 70 injuries occurred with this tornado, but no one was killed.

This event resulted in the declaration of disaster DR-1222, under which Rensselaer and neighboring counties were eligible for funding under the FEMA Public Assistance Grant Program.

JULY 21, 2003

A combination of an unstable air mass and strong wind shear aloft produced the largest tornado outbreak since May 31, 1998. This storm spawned a long-lived significant tornado that initially touched down in southeastern Greene County and produced a discontinuous path of 17 miles in Greene County, 12.2 miles in northwestern Columbia County, and 4.8 miles in southern Rensselaer County. The tornado left a swathe of destruction including hundreds, if not thousands of trees uprooted and snapped away, along with many power and telephone wires. Many roads in each of these counties were impassable due to debris.

In Rensselaer County, the tornado touched down as an F1 near the Village of Nassau near Route 20. The average width of the tornado was between 75 and 100 yards and a discontinuous path length of more than 4 miles. Homes and a garage were severely damaged, but no injuries were reported. The roof on the Agway was blown off and a gazebo landed across the state highway in a pile of splintered wood. The National Weather Service (NWS) Survey team noted that the tornado had multiple vortices in this area, and additional straight-line damage was also noted in the same town. The last touchdowns were in the Town of Schaghticoke with an F1 rating.

DATE UNKNOWN

During the plan update in 2011, Core Planning Group members also recalled a tornado of unknown magnitude at an unknown date that affected the Park Avenue/McClellan Drive area of the Village of Nassau.

AUGUST 29, 2020

Thunderstorms developed over portions of eastern New York during the afternoon of August 29. A couple of these storms produced hail up to ping pong ball size. They later spawned two EF1 tornadoes in the towns of Stillwater and Schaghticoke, with damage to a couple of residences and a high school. An EF0 tornado briefly touched down in southwestern Warren County. Sporadic wind damage was noted elsewhere.

An EF1 tornado with maximum winds of 110 mph occurred in the town of Schaghticoke, NY, during the evening of August 29. Significant damage was done to the roof of a house on Verbeck Avenue, and a shed in the backyard of the house was destroyed. Several large trees were uprooted near the house. Farther to the southeast, several trees were downed near a cemetery near the intersection of Routes 40 and 67. Structural damage was also done to the roof of Hoosic Valley Junior Senior High School and elementary school in this area. The tornado continued into Valley Falls, where sporadic tree damage was noted.

The following map (Figure 156) shows the paths of past tornadoes that have occurred in Rensselaer County. The data comes from NOAA NCEI storm events database, 1955–2022.

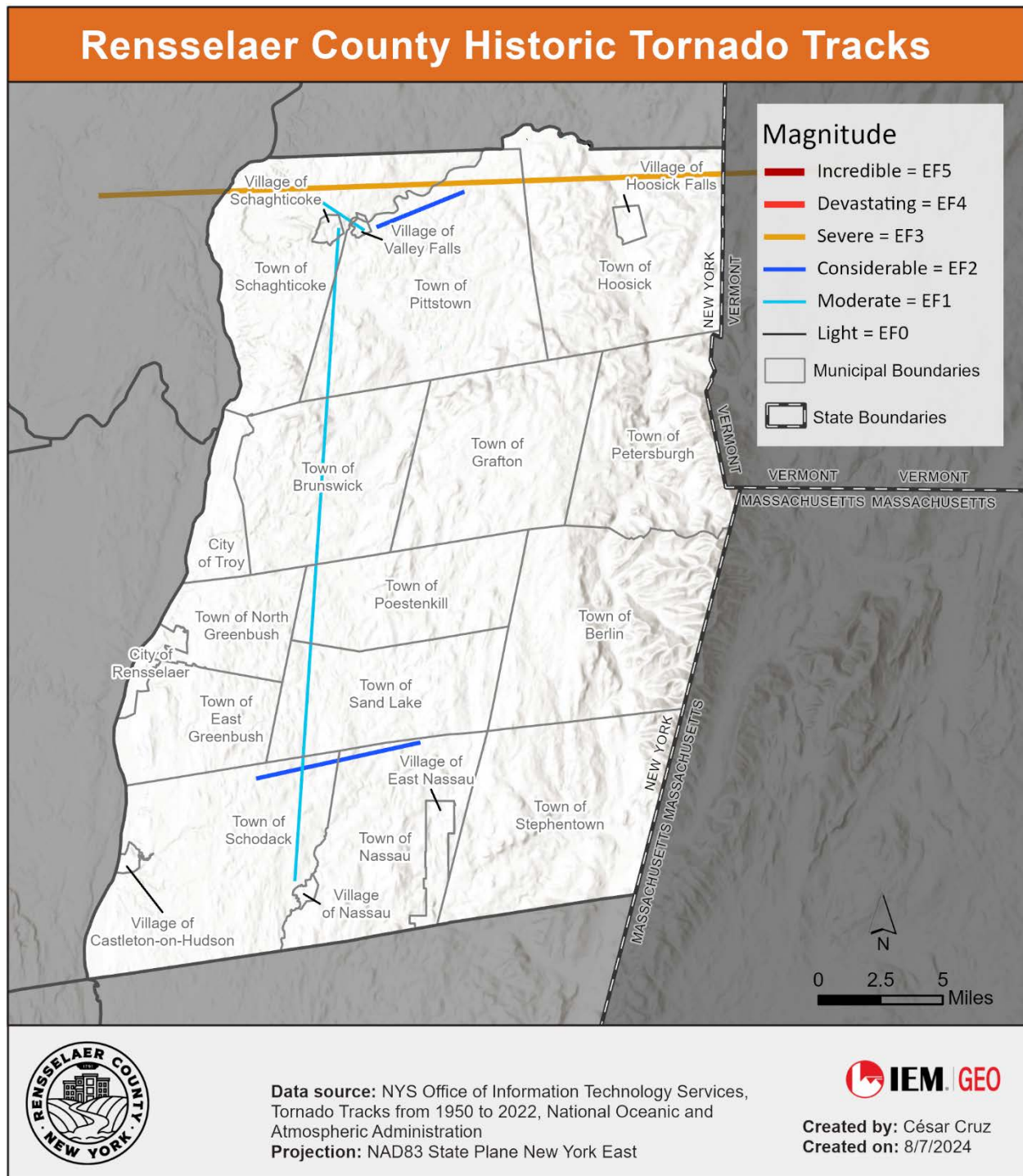


Figure 156: Historic Tornado Paths in Rensselaer County

Probability/Climate Trends and Variables

It is likely that Rensselaer County will continue to experience weak to moderate tornadoes, though their frequency of occurrence will be fairly low. Historical storm data made available through NOAA’s NCEI

indicate that Rensselaer County is in an area that tends to experience less than one tornado event per year (three events in 22 years, resulting in an estimated annual number of 0.1 events per year). In New York, tornadoes are more likely to occur during the months of March through August and tend to form in the late afternoon and early evening.

With regard to climate change impacts on probability of tornadoes, the 2023 SHMP concludes the following:

- The connection between climate change and tornadoes is unclear.
- Because tornadoes are short-term events, lack reliable historical data, and have localized nature that is difficult to integrate into climate models, projecting the effects of climate change on them is difficult.
- A recent study used models to project that supercells-thunderstorms, which most tornadoes are produced from, will become more frequent and intense, more common in the late winter and early spring, may be more likely to produce tornadoes, and somewhat more common in New York.
- Researchers hypothesize that, because of this, tornadoes would become increasingly frequent and intense.
- Changes in tornado duration due to climate change, if any, remain uncertain.

Vulnerability Analysis

EXPOSURE

To understand its vulnerability to natural hazards, a community must determine the assets that are exposed or vulnerable in the hazard area. All of Rensselaer County has been identified as a hazard area for tornadoes. Therefore, all assets in the county (i.e., population, structures, critical facilities, and lifelines) are vulnerable.

ESTIMATED IMPACT AND POTENTIAL LOSSES

High-wind velocity and wind-blown debris, along with lightning or hail, result in the damage caused by tornadoes. Destruction caused by tornadoes depends on the size, intensity, and duration of the storm. Tornadoes cause the greatest damage to structures that are light, such as residential homes and mobile homes, and tend to remain localized during impact.

Impacts are related to the strength of the storm. Weaker tornadoes cause minor impacts, such as loss of roof shingles, damage to rain gutters and siding, and broken tree branches. Stronger storms can tear off roofs, break windows, overturn vehicles, strip bark off of trees, and/or completely uproot trees. Extremely strong tornadoes can cause catastrophic impacts—with homes completely blown away or leveled and steel-reinforced buildings damaged beyond repair.

Communities impacted by tornadoes can be affected for long periods of time. Fatalities can occur. Residents can be displaced from their homes for long periods of time, and sometimes may have to

relocate outside of the community depending on the extent of the damage. When public and/or critical facilities schools are damaged or destroyed, community impacts are long-term and substantial. Functional downtime of government operations and services (i.e., the type that would occur if schools, municipal buildings, and emergency services buildings are affected) can be significant and long term. The local economy of tornado-impacted communities can be affected as well, impacting businesses, employment, employees, and incomes. Farms can be destroyed. Impacts tend to be more extensive and longer in duration as the strength of the tornado increases, for tornadoes of longer width or duration on the ground (impacting the area affected), and in areas with greater development (more people and property exposed).

Figure 157 illustrates the National Risk Index rating the Expected Annual Loss for Rensselaer County at \$3M from tornado, with a rating of relatively moderate expected annual losses, and a risk score of 79.1.(Figure 157).

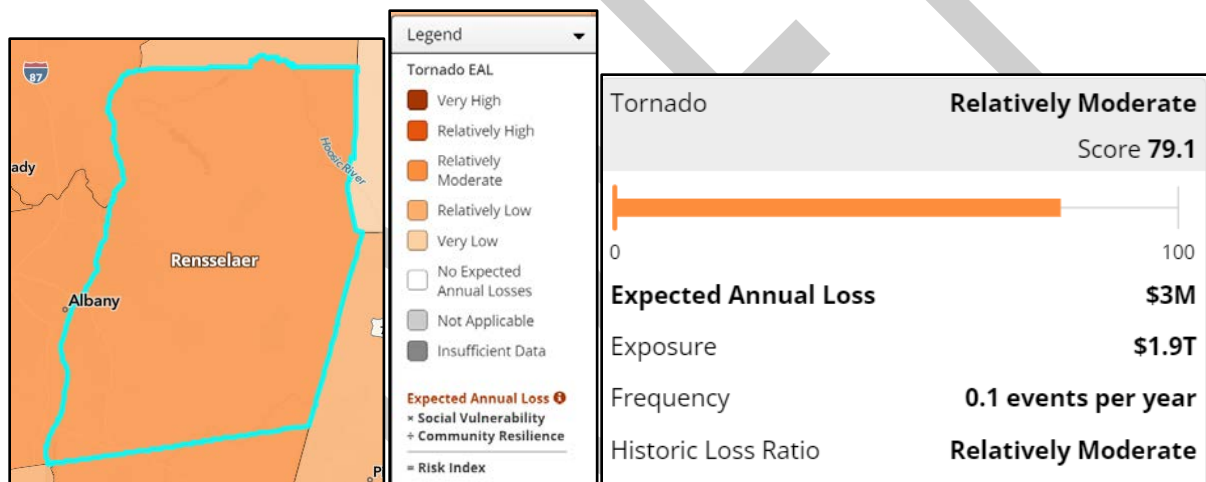


Figure 157: FEMA National Risk Index Rensselaer County Expected Annual Loss, Score, Map and Legend¹⁶⁶

VULNERABLE POPULATIONS

FEMA defines vulnerability as susceptibility to physical injury, harm, damage, or economic loss. The 2023 SHMP presents both quantitative and qualitative information about the physical, social, ecological, and economic risks associated with natural hazards as a foundation upon which state decision makers and communities alike can build and conduct true vulnerability assessments. Figure 158 and Figure 159 below provides social and economic demographics for Rensselaer County.

Tornadoes can strike quickly with little or no warning, giving those in impacted areas barely enough time to take shelter. Because of the unpredictable nature of tornadoes and severe storms, it is normal for

¹⁶⁶ FEMA, National Risk Index, Rensselaer County Tornado Expected Annual Loss Score, Map and Legend."", [Map | National Risk Index \(fema.gov\)](https://www.fema.gov/national-risk-index)

people to experience emotional distress. Feelings such as overwhelming anxiety, trouble sleeping, and other depression-like symptoms are common responses to these types of disasters.

The 2023 SHMP states tornadoes can rip crops and vegetation from the ground, affecting food supplies. If pipelines with wastewater or chemicals are destroyed or water treatment facilities are damaged, water sources (groundwater, river, lake, etc.) could be contaminated. This can lead to a water shortage, resulting in widespread sickness and dehydration.

A tornado can cause anywhere from minor damages to complete destruction of a community. If a significant portion of a community is severely damaged or destroyed, residents may be displaced temporarily or permanently, and they may need to relocate to other areas in order to find housing, jobs, schools, and essential services while their community is being rebuilt. Impacted businesses may permanently close, threatening the supply of goods and services and local revenue sources.

Due to the unpredictable nature of tornadoes, damage to the built environment can be extensive and widespread. Any unsecured items in the path of a tornado are at risk of becoming flying debris, further increasing the probability of damage to any infrastructure within the vicinity. This flying debris may cause damage to vehicles, buildings, and other aspects of the built environment. Specific damage may include roof destruction, shattered windows, ripped siding, downed power lines, ripped pavement, destroyed wastewater treatment plants, and more. Tornadoes in rural areas may cause some damage and destruction to buildings, but likely not as much as in urban areas, where buildings are in close proximity. If one building is damaged, it is possible the debris can be picked up by the wind and thrown into other buildings nearby, causing damage even if the tornado does not directly strike the other building.

Residential, commercial, industrial, transportation, and other infrastructure and power lines are susceptible to damage. The ability to respond promptly to clear debris, restore power, and begin building repairs is essential for recovery from this type of event. If a large number of residential structures were to be directly hit by a tornado, a shelter for displaced residents would likely need to be activated for an extended period of time.

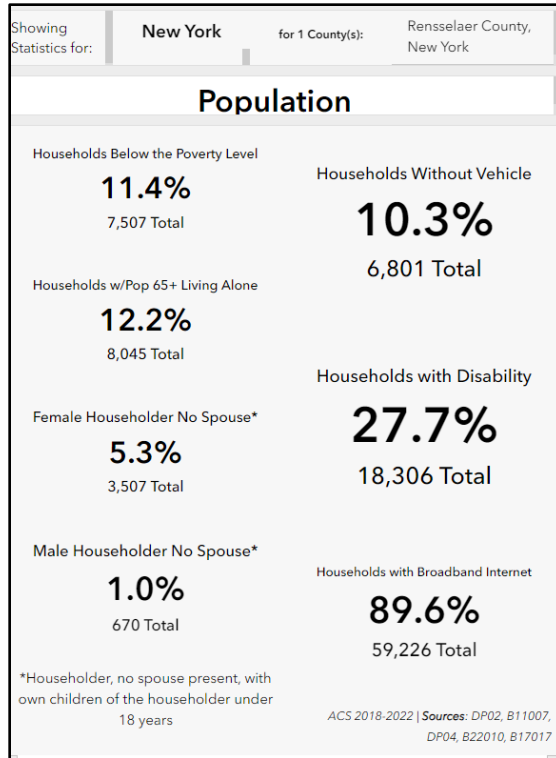


Figure 158: Rensselaer County Population Demographics by Households¹⁶⁷

¹⁶⁷ Source: [CRE for Equity \(arcgis.com\)](https://arcgis.com)

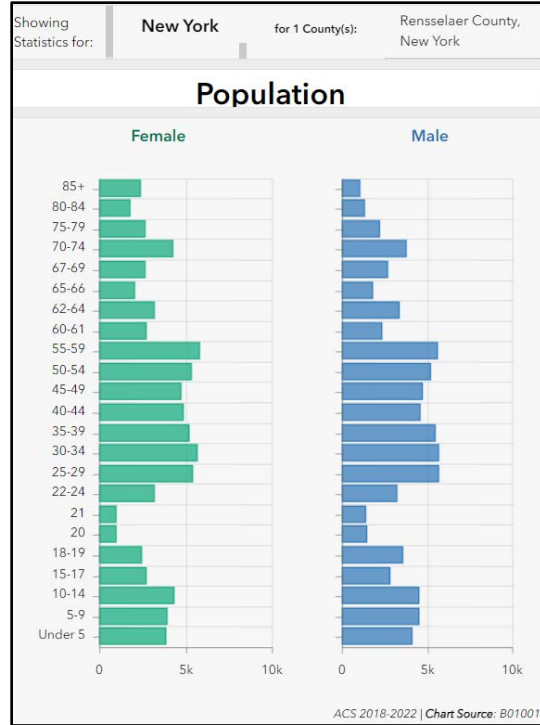


Figure 159: Rensselaer County Population Demographics by Gender and Age¹⁶⁸

IMPACT ON COUNTY ASSETS

Damage to the built environment such as downed power lines or damaged structures is estimated to be highest across the Hudson Valley and the Catskill Mountain regions. Tornadoes generally cause the greatest damage to structures of light construction (e.g., residential dwellings and vulnerable manufactured homes). Structural vulnerability is related to building construction type and age. For example, wood-frame structures are more susceptible to high winds while steel and concrete are more resistant. Even when a building remains structurally sound, broken glass from windows can cause injuries both inside and outside the building and damage building contents. Failures of windows and doors greatly increase storm damage. Because wind entering the building changes the pressure differential between the building’s interior and exterior, additional windows will break. If wind-driven rain and water reach the interior of a structure, materials can be damaged or ruined. Partially completed buildings are also vulnerable if their components are not fully connected, or structural features intended to withstand strong winds are incomplete.

COMMUNITY LIFELINES

Community facilities are the buildings, land, equipment and activities provided on the public’s behalf by government and/or private organizations. These facilities are important components to the quality of life of a municipality. Critical facilities are necessities for the health, safety, well-being, and stability of

¹⁶⁸ Source: [CRE for Equity \(arcgis.com\)](https://arcgis.com)

communities. Critical infrastructure systems are essential for life safety and economic viability and include transportation, power, communication, and water and wastewater systems.

Rensselaer County maintains the following buildings and physical plant facilities—all of which can be identified as community facilities vulnerable to tornado damage—Rensselaer County Ned Pattison Government Center, the Agriculture/Life/Science Building, Troy Senior Center, Hoosick Falls Regional Center, Family and County Court Complex. In addition, in the event of a tornado event, those municipalities', such as the City of Troy, with electrical power lines on the National Power Grid and/or New York State Electric and Gas are likely to be damaged and cause extended power outages. Downed telecommunication towers would result in loss of communications systems throughout the county. Road debris due to impact of tornadoes (i.e., downed trees, powerlines, other structural debris) could block roads and limit access of emergency responders.

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Community lifelines are essential for the well-being of any community. They provide support and assistance to individuals who require help, especially during times of crisis. FEMA Community Lifelines are a critical component of emergency management in the United States. These lifelines are designed to address the essential needs of a community during and after a disaster. There are eight lifelines, each with its own focus and purpose (Figure 160).



Figure 160: Community Lifelines¹⁶⁹

VULNERABILITY SCORE

In Rensselaer County, tornadoes are not particularly common and, while their potential consequences are high, they have not historically caused significant damages. The National Risk Index (NRI) includes data on the expected annual losses to individual natural hazards, historical loss, and overall risk at a county and

¹⁶⁹ FEMA, Community Lifelines Toolkit 2.0, <https://www.fema.gov/sites/default/files/2020-05/CommunityLifelinesToolkit2.0v2.pdf>

Census tract level. Based on the National Risk Index (NRI), Rensselaer County has relatively moderate rating for the risk index and a score of **74.6** for tornado, which is relatively moderate in comparison to the national percentile (Figure 161).

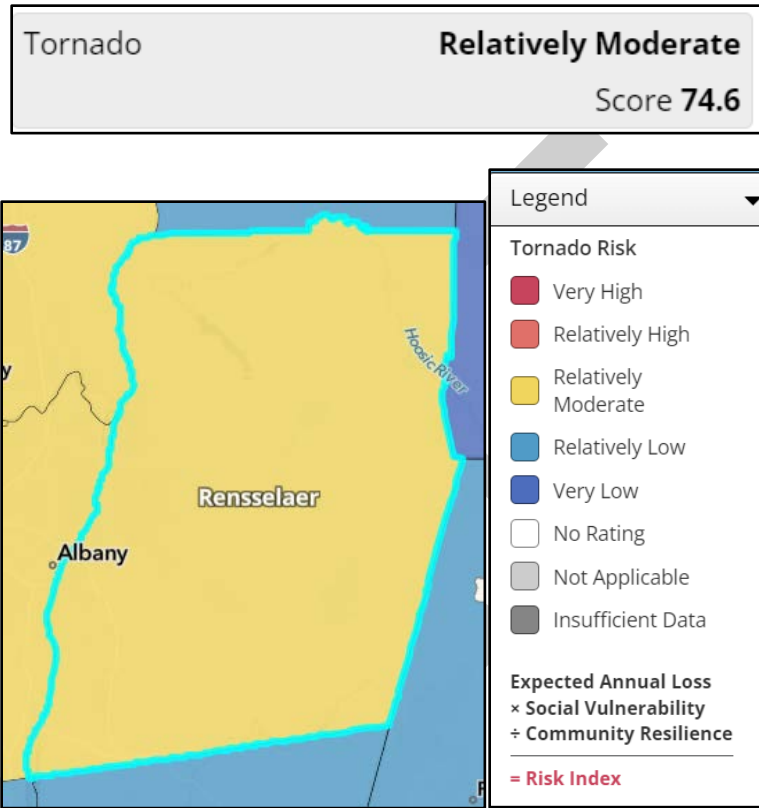


Figure 161: FEMA National Risk Index Rensselaer County Tornado Score, Map and Legend¹⁷⁰

Utility/Infrastructure Failure Hazard Profile

Utility/infrastructure failure occurs when critical systems, facilities, or networks that provide essential services to society experience a partial or complete breakdown. Such failures can have severe consequences, such as economic losses, public safety risks, and disruptions to daily life. Below is a brief overview of some potential infrastructure incidents.

Structural failure occurs when the physical integrity of infrastructure such as bridges, buildings, or dams is compromised, leading to collapse or significant damage. Structural failure can result from poor design, construction flaws, material degradation, or natural hazards.

Utility failure occurs when systems such as power grids, water supply networks, and communication systems experience failures due to equipment malfunctions, natural disasters, cyberattacks, or inadequate

¹⁷⁰ FEMA, "National Risk Index Rensselaer County Tornado Score, Map and Legend", [Map | National Risk Index \(fema.gov\)](https://www.fema.gov)

maintenance. Utility failures can lead to power outages, water shortages, loss of communication, and disruptions to various sectors.

Transportation failure occurs when roads, railways, airports, or ports suffer from failures that impede mobility and logistics. This includes road or bridge collapses, train derailments, airport closures, and disruptions to maritime operations. Severe weather, accidents, or inadequate maintenance can contribute to transportation failures.

Information technology failure occurs from hardware or software malfunction, cyberattacks, network outages, or data breaches. These failures can disrupt communication, business operations, financial systems, and essential services dependent on technology.

Natural disasters, aging infrastructure, insufficient maintenance, and human error/accidents contribute to infrastructure failure risk. Events like earthquakes, droughts, floods, storms, and extreme temperatures can overwhelm infrastructure systems, causing failures due to structural damage, power outages, and communication disruptions. Infrastructure that was built decades ago is now in need of repair, retrofitting, or replacement. This aging infrastructure may be more vulnerable to failures due to wear and tear, corrosion, and outdated design standards. Inadequate or deferred maintenance can weaken infrastructure over time, making it more prone to failure. Budget constraints, lack of prioritization, or inadequate inspection and repair practices can deteriorate infrastructure conditions. Infrastructure failures can result from human errors during the design, construction, operation, or maintenance phases. Accidents, including vehicle collisions or construction mishaps, can also cause infrastructure failures.

LOCATION

Infrastructure failure can happen anywhere, for any of many reasons, including natural disasters, aging infrastructure, insufficient maintenance, and human error/accidents. However, some areas may be more prone to infrastructure failure than others, depending on the type of infrastructure, local weather patterns, and other factors. For example, areas prone to earthquakes may experience more infrastructure failures due to seismic activity. Similarly, coastal regions are more susceptible to infrastructure failures caused by hurricanes, floods, and storms. Additionally, in areas with high population density, the consequences of infrastructure failure can be more significant due to the number of people and businesses impacted. Ultimately, it is essential to understand that infrastructure failure can happen anywhere and to take proactive steps to ensure that infrastructure is well maintained and updated to minimize the risk of failure.

EXTENT

It is difficult to predict the full impact of an infrastructure failure in Rensselaer County without knowing the type and scale of the failure. Rensselaer County has made significant investments in its infrastructure over the years, which may help reduce damage to the community's infrastructure in the event of a failure. The county boasts a well-developed network of roads, highways, bridges, and other transportation facilities that facilitate the movement of people and goods throughout the region. The county's infrastructure has profoundly impacted the community, making it easier for residents to access essential services like healthcare, education, and employment opportunities.

Rensselaer County continues to invest in its infrastructure, and several projects are slated for future construction, as shown in Figure 162.

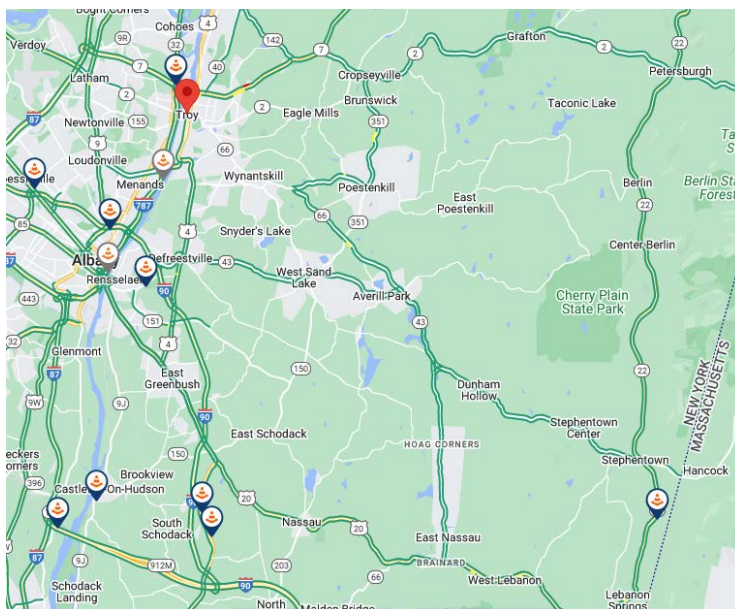


Figure 162: Slated Rensselaer Road Construction Projects¹⁷¹

When utility and infrastructure failures occur in a community, the effects can be far-reaching and significant. Infrastructure failures can have a wide range of negative impacts, such as power outages, water shortages, transportation disruptions, and damage to buildings and other structures. For example, if the water supply is disrupted, it can lead to a lack of sanitation and potentially harmful health consequences. If there is a power outage, it can disrupt communication systems, transportation, and access to medical care.

Utility and infrastructure failures can also have economic impacts on a community. Businesses may have to close or operate at reduced capacity, leading to financial losses for business owners and their employees. Additionally, the cost of repair and recovery efforts can be significant, straining the resources of the community and local government.

Furthermore, the psychological impact of utility and infrastructure failures should not be overlooked. People may feel a sense of helplessness and vulnerability when basic needs are not being met, which can lead to anxiety, stress, and other mental health issues.

PREVIOUS OCCURRENCES

March 24, 2024, an ice storm knocked out power to 217,000 people affected by the ice and snowstorm that hit the eastern region of New York. The storm caused significant damage to the power infrastructure, with up to half an inch of ice accumulating on power lines and trees and more than 20 inches of snow in

¹⁷¹ New York Department of Transportation, "Projects in Your Neighborhood." <https://511ny.org/#route>

some areas. The extensive damage was widespread, with fallen trees and debris creating access challenges for the company’s crews.¹⁷²

On December 19, 2023, Rensselaer County experienced flooding due to the overflow of rivers and creeks. The excessive water caused the drains to fail, flooding homes and banks. Furthermore, the situation worsened as one of the roads washed out due to a creek overflowing, leading to transportation disruptions.¹⁷³

Unstable power grids can be a major problem for any community, and Rensselaer County is no exception. When power grids become unstable, the result can be power outages that cause significant inconvenience and even danger to people’s lives.

Various factors, such as natural disasters, equipment failure, and human error, can cause power outages. Power outages can significantly impact people’s daily lives and the local economy in a county like Rensselaer, which is home to many residents and businesses.

For instance, if power outages occur frequently, businesses may suffer losses due to damaged equipment and lost sales. At the same time, residents may face difficulties completing daily tasks such as cooking, cleaning, and even caring for their health. Power outages can also impact emergency services like hospitals, fire departments, and police stations, putting people’s lives at risk.

Figure 163 displays the instability of the power grid in Rensselaer County over a 15-day period.

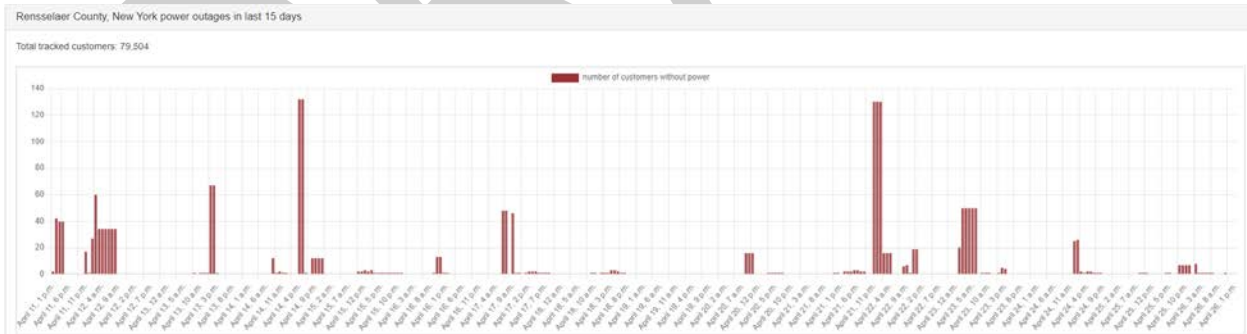


Figure 163: Power Outages in the Last 15 Days, Rensselaer County¹⁷⁴

¹⁷² Spectrum News 1, “National Grid Restores Power to Most After Weekend Ice, Snow.” <https://spectrumlocalnews.com/nys/capital-region/news/2024/03/24/weekend-winter-storm-leaves-thousands-without-power-in-capital-region>

¹⁷³ News 10, “Rensselaer County Continues Cleanup After Flood Damage.” <https://www.news10.com/news/rensselaer-county-continues-cleanup-after-flood-damage/>

¹⁷⁴ USA Today, “OFF THE GRID: Rensselaer County, New York Power Outage Tracker.” <https://data.usatoday.com/national-power-outage-map-tracker/area/rensselaer-county-ny/36083/>

PROBABILITY OF FUTURE EVENTS

Local authorities in Rensselaer County are increasingly concerned about potential infrastructure issues in the future. The area's roads, bridges, and water supply systems have been used for decades, and many have already exceeded their expected lifespan. This aging infrastructure increases the risk of failures that would cause disruptions in daily life and threaten public safety. The concerns are compounded by the effects of climate change and natural hazards, making it essential to address the issue before it worsens.

Rensselaer County is susceptible to various natural disasters, including thunderstorms, heavy snowfall, and earthquakes, although the possibility of a significant earthquake is low. Flooding can cause severe damage to the infrastructure systems, which is becoming more severe due to climate change. Climate change is leading to more frequent and intense weather events, further accelerating the deterioration of the infrastructure systems.

Local authorities must prioritize infrastructure maintenance and upgrades to tackle the challenges. They should focus on incorporating climate resiliency measures by investing in new infrastructure systems that can withstand the effects of climate change, such as extreme weather events. Regular inspections, monitoring, and maintenance are essential to ensure that existing infrastructure systems function as intended.

In conclusion, the probability of future infrastructure issues in Rensselaer County due to aging infrastructure, climate change, and natural hazards is moderate. However, with proper planning and investment in the infrastructure systems, local authorities can mitigate these risks and ensure the safety and well-being of the community.

CLIMATE CHANGE

Climate change significantly impacts infrastructure such as bridges, roads, and water systems. Rising temperatures, changing precipitation patterns, and more frequent extreme weather events contribute to the degradation of these essential structures.

One of the most visible impacts of climate change on infrastructure is the damage caused by extreme weather events. These events can cause significant damage to bridges and roads, washing out roadways and undermining bridge foundations. Additionally, rising sea levels can increase erosion, storm surge, flooding, and damage to infrastructure along the Hudson River.

Another significant impact of climate change on infrastructure is through changes in temperature patterns. Higher temperatures can cause roads and bridges to expand and contract, leading to cracks and structural damage. Similarly, changes in precipitation patterns can lead to soil erosion and instability, which can damage infrastructure foundations and support structures.

Water systems are also particularly vulnerable to the impacts of climate change. Rising temperatures and changing precipitation patterns can lead to droughts and water shortages, which can strain water systems and decrease water quality. Additionally, more frequent and severe storms can overwhelm water treatment facilities, increasing pollution and the risk of waterborne diseases.

Overall, climate change's impacts on infrastructure are significant and far-reaching. Addressing these challenges will require significant infrastructure resilience and adaptation investments to ensure that essential systems function effectively in a changing climate.

Vulnerability Assessment

Rensselaer County is vulnerable to utility and infrastructure failures, which can significantly impact the residents and local economy. Power outages due to equipment failures or extreme weather conditions can disrupt the functioning of the county's hospitals, schools, and other critical facilities.

Additionally, human error or equipment failure can cause accidents that damage critical infrastructure. Cybersecurity threats like hacking or malware attacks can also disrupt utilities and communication systems. Additionally, improper disposal of hazardous materials can lead to contamination of water sources and soil, which can have long-term impacts on public health and the environment.

To mitigate these risks, Rensselaer County officials must invest in maintaining and upgrading critical infrastructure like water treatment plants, power grids, and communication networks. They should also work with the local chemical/pharmaceutical industry to ensure that proper safety protocols are in place to prevent accidents and minimize the impact of any incidents.

ESTIMATES IMPACT AND POTENTIAL LOSSES

Infrastructure failures can devastate communities, causing significant harm to human life as well as economic losses. The extent of damage and the type of incident can vary, leading to different estimated impacts. For instance, injuries or loss of life can be catastrophic in the case of a bridge collapse. The economic impact can also be substantial, including repair costs, loss of productivity, and disruption of supply chains.

Besides the immediate impact on human life and the economy, infrastructure failures can have long-term consequences for communities. Damage to essential systems such as water and sanitation infrastructure can lead to health risks, including spreading water-borne diseases. The loss of power or communication networks can also hinder emergency response efforts and make it challenging for communities to recover from the incident.

The potential losses to a community in the case of infrastructure failure can be staggering. In addition to the loss of life and economic resources, infrastructure incidents can damage public confidence in the reliability and safety of essential systems. This can lead to a decline in investment and economic activity, particularly in areas where infrastructure is aging or inadequate.

VULNERABLE POPULATIONS

Infrastructure failures can have serious consequences, including loss of life, injuries, and damage to public confidence in the reliability and safety of essential systems. When bridges collapse, buildings give way, or transportation incidents occur, victims and their families may suffer immense grief and suffering. Injured

individuals may need medical treatment and rehabilitation and may experience long-term physical or psychological effects.

In addition to the human toll, infrastructure failures can disrupt daily routines and activities. They can cause transportation delays, canceled trips, and difficulties commuting to work, school, or other important engagements. They can also disrupt access to essential services such as clean water, electricity, healthcare facilities, and communication networks, compromising people's health, safety, and quality of life.

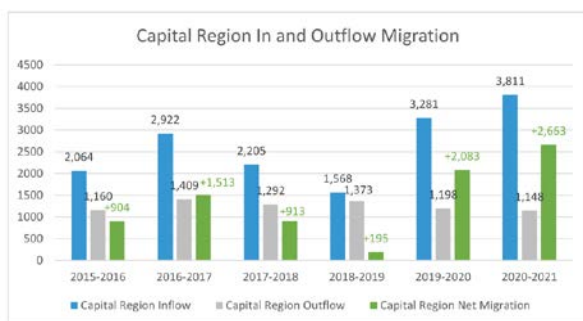
Certain populations are more vulnerable to the impacts of infrastructure incidents. Those living in areas with aging or inadequate infrastructure may experience disruptions in essential services such as water, electricity, transportation, or communication systems. Disadvantaged communities, such as low-income neighborhoods and marginalized groups, often face greater vulnerability to infrastructure incidents. These communities may have limited access to well-maintained infrastructure, such as roads, bridges, and public transportation systems, thus increasing their risk exposure.

Rural communities are also susceptible to the impacts of infrastructure incidents. Remote or isolated areas may have limited infrastructure and resources, making them more vulnerable to disruptions in transportation, healthcare services, or emergency response. The geographic challenges faced by rural communities can hamper their ability to recover from infrastructure incidents and access necessary support.

People with disabilities or limited mobility face heightened vulnerability. Inaccessible infrastructure, such as a lack of ramps, elevators, or accommodations for visual or hearing impairments, can hinder their ability to evacuate, access emergency services, or receive timely information during incidents.

DEVELOPMENT TRENDS

Infrastructure failures can have significant impacts on development trends. When critical infrastructure—such as power grids, water systems, or transportation networks—fails, these services' diminished reliability and availability can harm economic growth, public health and safety, and quality of life. In addition, infrastructure failures can lead to supply chain disruptions, decreasing the availability of goods and services' and increasing consumer costs. As a result, infrastructure failures can discourage investment and development in affected areas and lead to population migration away from affected regions. This does not appear to be the case for Rensselaer County, as indicated in the Figure 164, which displays an inflow of migration to the area.



Net migration in 2020-21 from NYC to the Capital Region is as followed:
 Albany County: +1,151
 Rensselaer County: +306
 Saratoga County: +451
 Schenectady County: +755
 Capital Region: +2,263
 The total migration out of the Capital Region was 1,148 to NYC in 2020-21.

Figure 164: Migration in the Capital Region 2015–2021¹⁷⁵

The largest net gain in the region over the past six years was recorded in 2020–2021, with 2,663 people. Albany County had the highest share of this gain at 43 percent, followed by Schenectady, Saratoga, and Rensselaer counties.

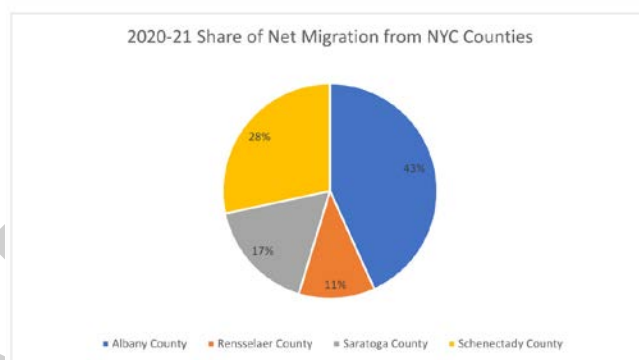


Figure 165: Migration Inflow by County¹⁷⁶

Population growth can have a significant impact on the development trends in Rensselaer County. As the population increases, there is a higher demand for housing, infrastructure, and services like healthcare, education, and transportation. This can lead to increased development in these areas as well as the construction of new businesses and commercial properties to meet the needs of the growing population. Furthermore, population growth can have a positive impact on the local economy because it means a larger workforce and increased consumer demand for goods and services. However, it can also pose challenges such as increased traffic congestion, resource strain, and potential environmental impacts.

Table 79 shows the projected populations for Rensselaer County and its jurisdictions over a 30-year period, along with the expected increase or decrease in population. The formula used to calculate population percentages is as follows:

¹⁷⁵ Capital District Regional Planning Commission, “2020-2021 Data Shows Another Jump in Net Migration from NYC Counties.” <https://cdrpc.org/a-look-at-the-2020-21-migration-data>

¹⁷⁶ Ibid

((New Population - Old Population) / Old Population) x 100%

Table 79: Estimated Population Projections, Rensselaer County 2020–2050¹⁷⁷

Jurisdiction	2020 Estimated Growth	2030 Estimated Population	2040 Estimated Population	2050 Estimated Population	Estimated Percentage Growth/Decline 2020–2050
Rensselaer County	161,744	163,685	164,643	164,943	2.0
City of Rensselaer	9,531	9,603	9,533	9,513	-0.2
Troy	50,098	50,065	50,032	50,002	-0.2
Berlin	1,893	1,904	1,883	1,826	-3.5
Brunswick	12,143	12,308	12,449	12,571	3.5
East Greenbush	16,896	17,244	17,542	17,801	5.4
Grafton	2,159	2,182	2,202	2,219	2.8
Hoosick	6,979	7,024	7,061	6,939	-0.6
North Greenbush	12,532	12,908	13,140	13,221	5.5
Petersburgh	1,556	1,582	1,587	1,567	0.7
Pittstown	5,827	5,918	5,913	5,642	-3.2
Poestenkill	4,771	5,006	5,071	5,094	6.8
Sand Lake	8,794	9,043	9,199	9,342	6.2
Schaghticoke	7,803	7,909	7,992	8,062	3.3
Schodack	12,960	13,099	13,173	13,314	2.7
Stephentown	2,978	3,040	3,093	3,139	5.4
Village of Castleton-on-Hudson	1,469	1,467	1,464	1,461	-0.5
Village of East Nassau	602	613	624	632	5.0
Village of Hoosick Falls	3,497	3,493	3,489	3,411	-2.5
Village of Nassau	4,824	4,850	4,773	4,691	-2.8
Village of Schaghticoke	584	580	570	560	-4.1

¹⁷⁷ Capital Regional Planning Commission, “Community Fact Sheets.” <https://cdrpc.org/data/cfs>

Jurisdiction	2020 Estimated Growth	2030 Estimated Population	2040 Estimated Population	2050 Estimated Population	Estimated Percentage Growth/Decline 2020–2050
Village of Valley Falls	458	466	465	453	-1.1

It is difficult to forecast which parts of Rensselaer County will be most affected by population growth, because it is expected to be evenly distributed across the county. However, regions with high growth potential, such as Poestenkill, East Greenbush, and Sand Lake, may have a more significant impact. Furthermore, areas near major transportation routes or with easy access to amenities such as healthcare, education, and shopping may also experience increased growth and development. Finally, the influence of population growth is influenced by various factors, such as economic conditions, infrastructure investment, and local policy decisions.

As the population of Rensselaer County grows, it is likely that agricultural areas will be affected by pressure to convert agricultural land into other uses, such as housing, infrastructure, and services. Unfortunately, this could result in the loss of valuable farmland and negatively impact the local food supply. However, it is important to keep in mind that agriculture is a vital industry, and local leaders and stakeholders may take measures to protect and preserve agricultural land in the county.

As the demand for locally grown food increases, farmers may have opportunities to expand their operations and meet the needs of the county's growing population. The impact of population growth on Rensselaer County's agricultural areas will depend on various factors, including land use policies, economic conditions, and community priorities. Figure 166 displays current land use in Rensselaer County.

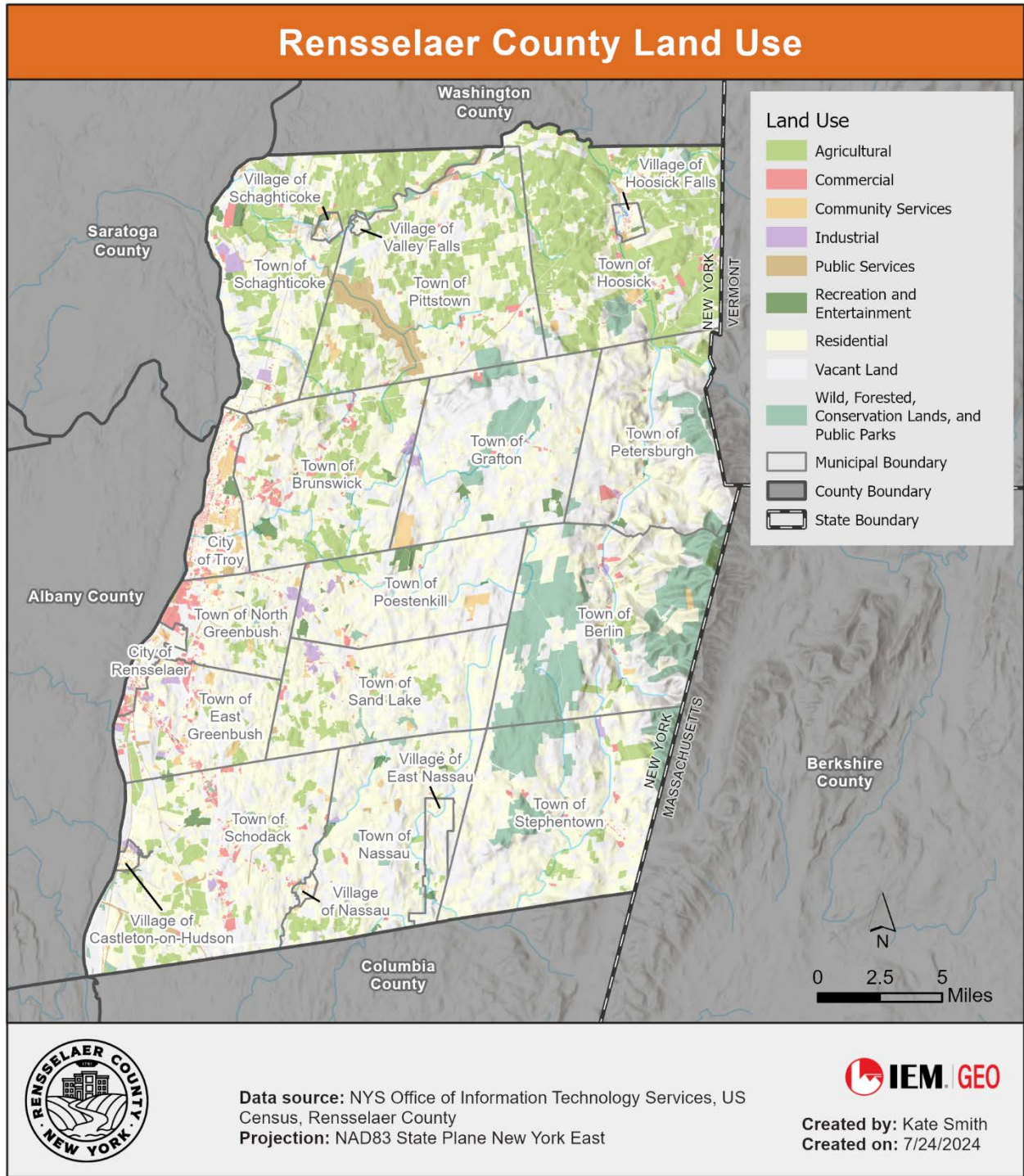


Figure 166: Land Use Map

Due to population growth, building permit issuances have been increasing in the Capital Region since 2019. Between 2021 and 2022, they increased by 10.64 percent, a slightly slowed pace from the 39.3 percent increase between 2020 and 2021, as shown in Figure 167.

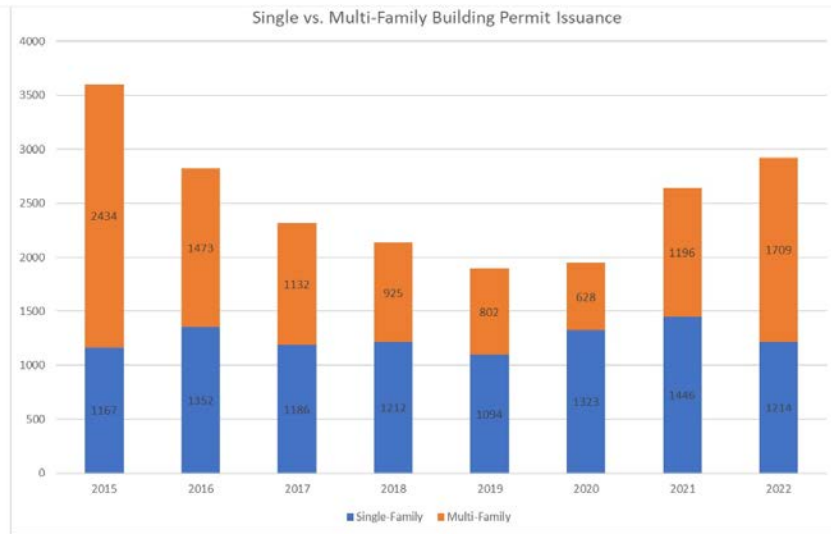


Figure 167: Capital Region Housing Permits¹⁷⁸

In 2022, 2,563 building permits were issued in the region. Saratoga County issued the most permits (49 percent), followed by Albany County (38 percent), Rensselaer County (7 percent), and Schenectady County (6 percent). Saratoga County's share decreased by 8 percent from 2021, while Schenectady County's share dropped more significantly by 11 percent. Most permits were for multi-family units, except in Rensselaer County, where 71 percent were for single-family units.

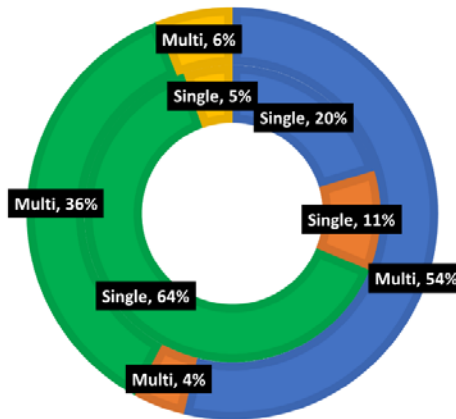


Figure 168: Share of Building Permits by County in the Capital Region¹⁷⁹

There have been no significant utility or infrastructure failure events since the previous plan, and the development vulnerability is unchanged, indicating continued positive development trends for the county.

¹⁷⁸ Capital District Regional Planning Commission, "Building Permit Update 2022." <https://cdrpc.org/building-permit-update-2022>

¹⁷⁹ Ibid

COMMUNITY LIFELINES

Ensuring the safety and security of residents is crucial when it comes to Infrastructure Incidents. Access to necessities such as food, hydration, shelter, healthcare, medical services, energy, communication, transportation, water systems, and safety from hazardous materials is affected by structural failures like bridges, buildings, and dams or transportation disruptions like roads, railways, airports, or ports. These disruptions can hinder emergency services, transportation of goods and services, and transportation routes for residents, ultimately resulting in reduced access to medical and food sources that may create health and food insecurities. When utility failures occur, power grids, water supply networks, and communication systems may be disrupted, causing communication problems, unsafe drinking water, and improper removal of wastewater and human waste. This may lead to the spread of diseases and illnesses.



Figure 169: FEMA Community Lifelines

VULNERABILITY SCORE

Failures in utility and infrastructure systems can cause significant disruptions to daily life and economic activities. According to the plan update, Rensselaer County is at moderate risk of being impacted by such events. However, the vulnerability score has not yet been calculated. This hazard is a cascading and new addition to the plan update. The vulnerability score will be determined once more data has been collected.

Wildfire and Wildfire Smoke Hazard Profile

Hazard Description

A wildfire is an uncontrolled fire burning in an area of vegetative fuels such as grasslands, brush, or woodlands. Wildfires can occur in areas essentially void of development, or in areas where development intermingles with these natural areas, known as the “wildland–urban interface” (WUI). Many wildfires occur in locations that abound in dense forests, grasslands, and shrubs. Heavier fuels with high continuity, steep slopes, high temperatures, low humidity, low rainfall, and high winds all work to increase wildfire risk.

Wildfires can occur at any time of the year, but they will usually occur during warmer and drier months. Wildfires are most commonly caused by people (e.g., arson, debris burns, and carelessness). Lightning is the next most common cause of wildfires. As reported by the Wildland Fire Assessment System (WFAS), whether a wildfire will result from a lightning strike depends largely on the duration of the current and the kind of fuel the lightning hits. Wildfire spread after ignition usually depends primarily on fuel moisture.

The 2023 SHMP states that wildfires include those commonly referred to as “forest fires,” “brush fires,” “grass fires,” “range fires,” or “ground fires.” The term “wildfire” typically excludes agricultural fires, which are intentional fires to manage croplands. Another category of wildland fire is so-called beneficial fires, which are intentionally set or intentionally allowed to burn for cultural, ecosystem, or public-safety purposes. Common types of beneficial fire include cultural fire, which can be part of indigenous cultural practices, as well as prescribed burns, which are conducted in a controlled manner to simulate the fires an ecosystem has evolved to require or to remove dangerous fuel loads near communities.

LOCATION

Areas that are typically considered to be safe from wildfires include highly urbanized, developed areas not contiguous with vast areas of wild lands. Areas typically considered to be prone to wildfires include large tracts of wild lands containing heavier fuels with high continuity, at steeper slopes—particularly those that are far away from firefighting apparatus that would suppress the spread of wildfires once reported. Figure 170 shows the areas of Rensselaer County that are considered to be susceptible to wildfires (including the following land cover types: deciduous, evergreen, and mixed forest, shrub land, and grassland). In the figure, at-risk parcels with improved property present are colored red; at-risk parcels with no improved property present are colored orange; cultivated agricultural land and pastureland areas that are not generally considered to be at significant risk from wildfire are colored light gray; and urban/developed parcels are colored dark gray. This allows a general determination to be made regarding those areas at risk from wildfire in which there is a higher likelihood that such fires could also pose a threat to lives and structures, in addition to susceptible areas where improved property is present (colored red) that have a direct interface with the wildfire hazard. Figure 170 was included in the Rensselaer County 2020 Hazard Mitigation Plan. Due to limitations in finding the source of this data to evaluate for updates, this map and associated acreage values in Table 80 are included again in the 2024 update.

Wildfires are a significant hazard in Rensselaer County, particularly in the forested areas of the county. Many of the areas at risk from wildfires are also popular with hikers and campers. Several locally important transportation routes, such as State Routes 2, 7, and 43, pass through potentially vulnerable areas, leaving them vulnerable to closure during forest fire due to smoke conditions. Areas in Rensselaer County where the magnitude and severity of the wildfire hazard are the greatest tend to exhibit the lowest population densities in the county; as a result, the exposure of people living and working in the areas of highest hazard risk is often relatively low.

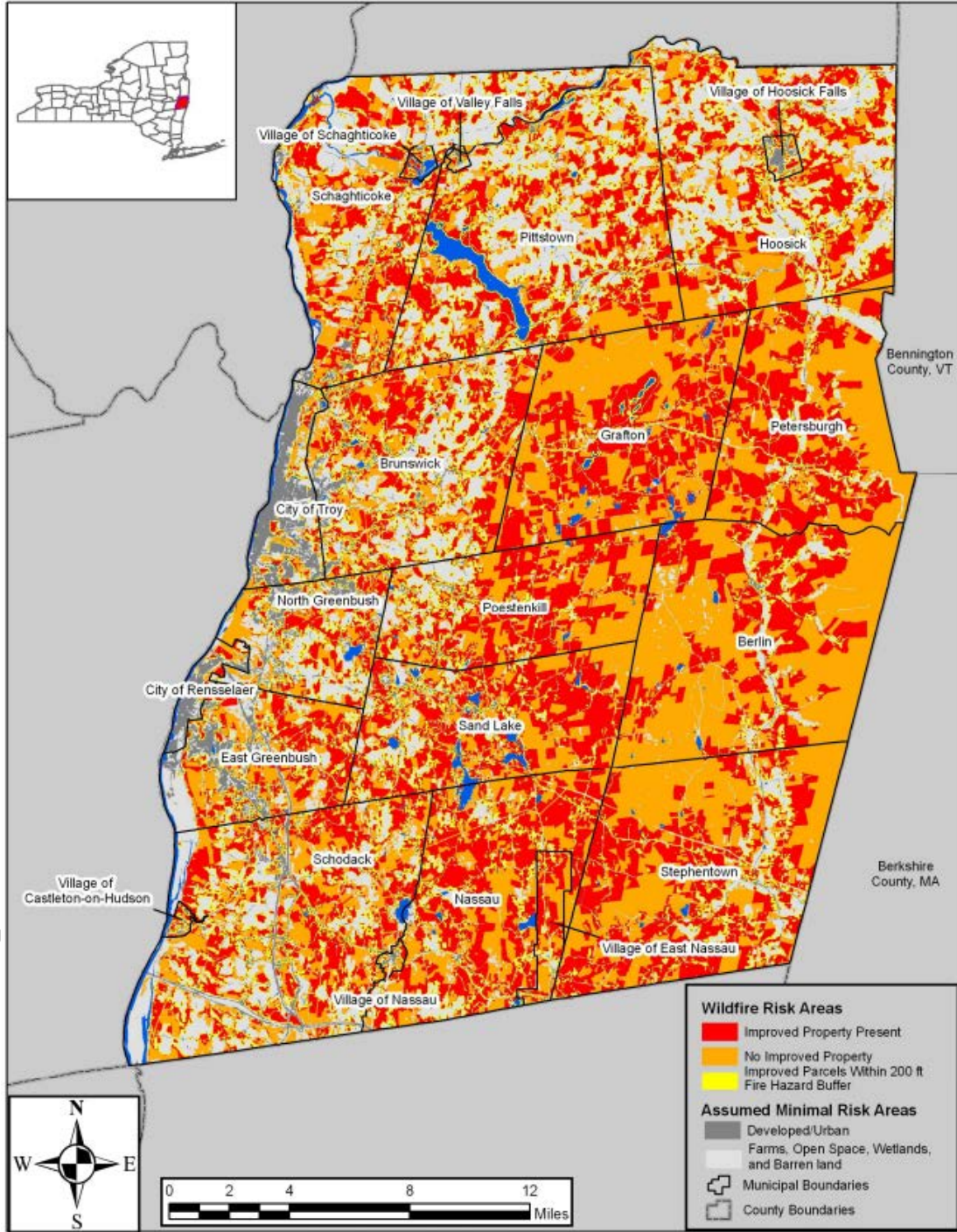


Figure 170: Wildfire Risk Areas in Rensselaer County

The 2023 SHMP asserts that there is no universal scale for comparing wildfires; however, direct measurement is calculated by acreage burned. Additionally, the Northeast-Midwest Wildfire Risk Explorer tool allows users to develop maps showing potential wildfire risk levels and burn probability in New York. This tool can help identify areas in need of more wildfire mitigation and prevention support. Figure 171

illustrates the 2018 Wildland Fire Protection Areas; it indicates that Rensselaer County is in Fire District 4-4 and under Statutory Authorities ECL 9-1109 and 6 NYCRR 191.1.

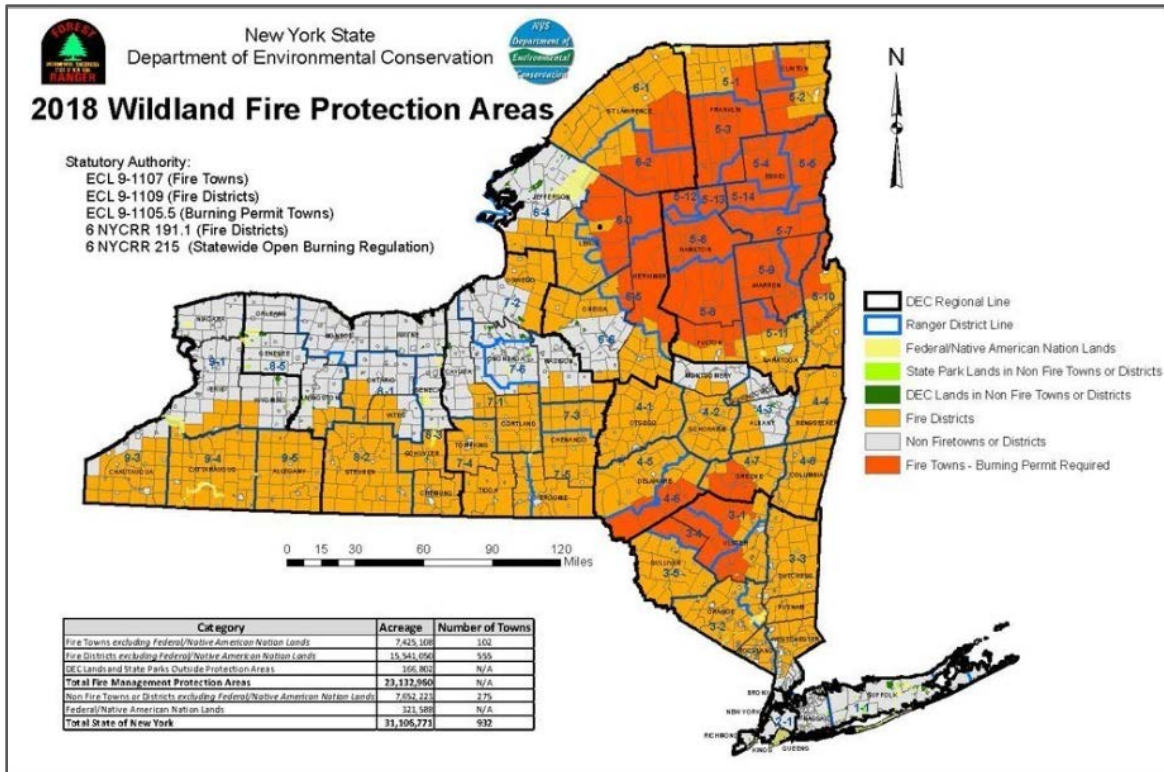


Figure 171: New York Wildland Fire Protection Areas¹⁸⁰

New York State Department of Environmental Conservation Wildfire Predictive Services has created the New York State Fire Danger Rating Area (FDRA), which divides New York into 10 regions according to wildfire potential. The FDRAs are grouped 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 FDRAs are further categorized into six color-coded categories: Extreme (red), Very High (orange), High (yellow), Moderate (blue), Low (green), and Red Flag Warning. The Red Flag warning is used for short-term, temporary warning. 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 Map is updated daily on NYS Department of Environmental Conservation for the public to view.

EXTENT

The wildfire risk for the individual municipalities within Rensselaer County has been quantified by measuring the length of the WUI and the total value of improved property located in the areas considered to be vulnerable to wildfires; these estimations are presented in Table 80. The WUI measurements were

¹⁸⁰ Source: [Mitigate NY](#)

estimated incorporating a 200-foot buffer extending from the wildfire risk areas into the developed areas, thereby accounting for the likelihood that structures in the developed area are at risk of combustion even if they are not immediately adjacent to sources of fuel for wildfires.

Including the buffer applied to wildfire risk areas, 81 percent of the county’s land area is in some way vulnerable to wildfire, with more than 50 percent of the land area vulnerable in all municipalities except for the Cities of Troy and Rensselaer.

In terms of the WUI, the Town of Schodack is the municipality most vulnerable to wildfires, with an interface more than 70 miles in length. The Towns of Brunswick and Sand Lake each have interfaces of more than 40 miles. Several municipalities in the more forested parts of the county have interfaces of less than 10 miles. Although this may appear low, it is explained by assuming that in such areas, developed land/improved property tends to lie within the expansive areas vulnerable to wildfire rather than adjacent to them.

Table 80 tabulates the area of land in each incidence/susceptibility category for each municipality in Rensselaer County, as presented graphically in Figure 170.

Table 80: Land in Wildfire Risk Zones

Municipality	Wildland–Urban Interface (Miles)	Wildfire Risk Zones with No Improved Property (Acres)	Wildfire Risk Zones with Improved Property (Acres)	Total Municipal Area (Acres)
Berlin, Town of	6.1	24,319	12,255	38,227
Brunswick, Town of	43.8	7,330	13,914	28,284
Castleton-on-Hudson, Village of	4.6	43	312	531
East Greenbush, Town of	38.8	4,507	6,344	15,672
East Nassau, Village of	2.5	1,261	1,563	3,029
Grafton, Town of	4.2	15,041	13,560	29,711
Hoosick Falls, Village of	8.4	152	378	950
Hoosick, Town of	19.1	9,557	18,845	39,361
Nassau, Town of	11.0	8,388	14,611	25,558
Nassau, Village of	3.6	103	219	442
North Greenbush, Town of	33.1	3,401	4,494	12,079
Petersburgh, Town of	6.1	12,553	12,424	26,683
Pittstown, Town of	24.7	9,310	20,537	41,256
Poestenkill, Town of	26.5	7,978	10,700	20,727

Municipality	Wildland–Urban Interface (Miles)	Wildfire Risk Zones with No Improved Property (Acres)	Wildfire Risk Zones with Improved Property (Acres)	Total Municipal Area (Acres)
Rensselaer, City of	2.7	368	320	2,191
Sand Lake, Town of	41.3	7,261	13,223	23,088
Schaghticoke, Town of	37.3	7,440	14,461	32,545
Schaghticoke, Village of	4.1	110	256	640
Schodack, Town of	71.0	11,926	17,207	40,217
Stephentown, Town of	10.6	17,248	17,377	37,263
Troy, City of	14.8	1,048	1,228	7,066
Valley Falls, Village of	1.6	100	98	308
County Totals:	415.8	149,447	194,326	425,825

PREVIOUS OCCURRENCES

The NOAA’s NCEI Storm Events Database records two wildfire episodes in Rensselaer County between 1996 and 2023 causing approximately \$2,000 in total property damages. One of the events was a wildfire located in Rensselaer County; the other episode involved smoke from a wildfire burning in Quebec. No episodes have been reported since the last version of the plan was adopted in 2011. Details of damages for these events are summarized by event type in Table 81.

Table 81: Wildfire Events, 1996–2023

Affected Area	Date	Event Type	Reported Deaths	Reported Injuries	Reported Property Damage	Reported Crop Damage
Town of Schaghticoke	04/19/2001	Wildfire	0	0	\$2,000	\$0
Countywide	07/05/2002	Smoke from a wildfire burning in Quebec	0	0	\$0	\$0
Total:			0	0	\$2,000	\$0

April 1962

A larger brush fire burned in an unspecified location, causing damages estimated at approximately \$8,000. No other information is available (Source: SHELDUS).

April 19, 2001

Very dry and breezy conditions allowed a small fire to erupt briefly out of control on the afternoon of April 19 in the Town of Schaghticoke. The fire scorched a 3-acre section of the Swallow Farm cornfield, located on Route 67. The blaze was extinguished in about an hour and luckily resulted in no injuries or building damage (Source: NOAA NCEI).

July 5, 2002

Smoke from a wildfire burning in northern Quebec was transported south across eastern New York. Advisories were issued warning people with respiratory problems to remain indoors and advising all people to curb outside activity (Source: NOAA NCEI).

Date Unknown, 2007

A large brush fire occurred in the Town of Berlin. No additional information is available (Source: Rensselaer County Department of Economic Development and Planning, 2010).

PROBABILITY OF FUTURE EVENTS

Wildfires are relatively uncommon in New York State, and wildfire risk in the county is among the lowest nationwide.¹⁸¹ However, as seen all over the world, the impacts of climate change—extreme heat and extreme drought—are creating the perfect conditions for increased wildfire probability. It is currently difficult to predict with precision, but the likelihood of more wildfires will continue to increase.

The 2023 SHMP defines the WUI as an area where human development meets or mixes with undeveloped wildland. In these areas, wildfires pose a particular risk to humans. The WUI typically has at least 1 housing unit per 40 acres and is split into the more-populated “interface” zone and lower-populated “intermix” zones. Interface zones generally have a clear demarcation between human development and wildlands, whereas wildlands are intertwined with development in intermix zones. Wildfires are of particular concern in the WUI because they bring humans—the primary cause of wildfire ignition in the United States, and our primary concern for public safety—into greater contact with flammable wildlands. The WUI grows nationwide by approximately 2 million acres each year as communities continue to expand, often due to the pressures of high housing costs in more densely populated areas. Recent WUI maps show that almost every county in New York State has both interface and intermix zones.

Wildfire probability depends on local weather conditions; the level of outdoor activities such as camping, debris burning, and construction; and the degree of public cooperation with fire prevention measures. Wildfire events are expected to remain at least an occasional occurrence in Rensselaer County, and

¹⁸¹ [Mitigate NY](#)

although there is insufficient readily available data that could be used to calculate actual probabilities, it is certain that wildfires will continue to occur in the county. The likelihood of increased future development (particularly residential) could result in an increase in the length of the WUI, an increase in the improved value of property within wildfire hazard zones, and a greater risk of property damage and danger to the public in future years. However, most wildfires in the county are contained and extinguished fairly quickly; events causing major property damage or life/safety threats are much less likely to occur.

Open Burning in New York. NYSDEC's web site indicates that open burning is the greatest cause of wildfires in New York State. Open burning is prohibited in New York State, with some exceptions—such as small campfires, small cooking fires, and ceremonial/celebratory bonfires—although these cannot be left unattended and must be fully extinguished. In towns with total populations below 20,000, it is permitted to burn tree limbs with attached leaves, as well as brush less than 6 inches in diameter and 8 feet in length. Burning large piles of brush collected from local residents at town or county transfer sites is prohibited. Burning leaves is also prohibited. Open burning to control invasive plant or insect species is allowed on a case-by-case basis. Fires on agricultural lands must be located on contiguous agricultural land larger than 5 acres, and the materials must be capable of being fully burned within 24 hours. The State's burn ban is in effect from March 16 through May 14. When followed, the burn ban and open burn restrictions work to reduce the likelihood of wildfires. More information can be found on the NYSDEC web site at <https://www.dec.ny.gov/chemical/58519.html>.

Figure 172 shows the respective wildfire risks of municipalities in Rensselaer County. The data of the map comes from the FEMA National Risk Index (NRI), which uses past events to establish the probability that a similar event can occur again. According to the NRI, Rensselaer County's risk for wildfire is low.

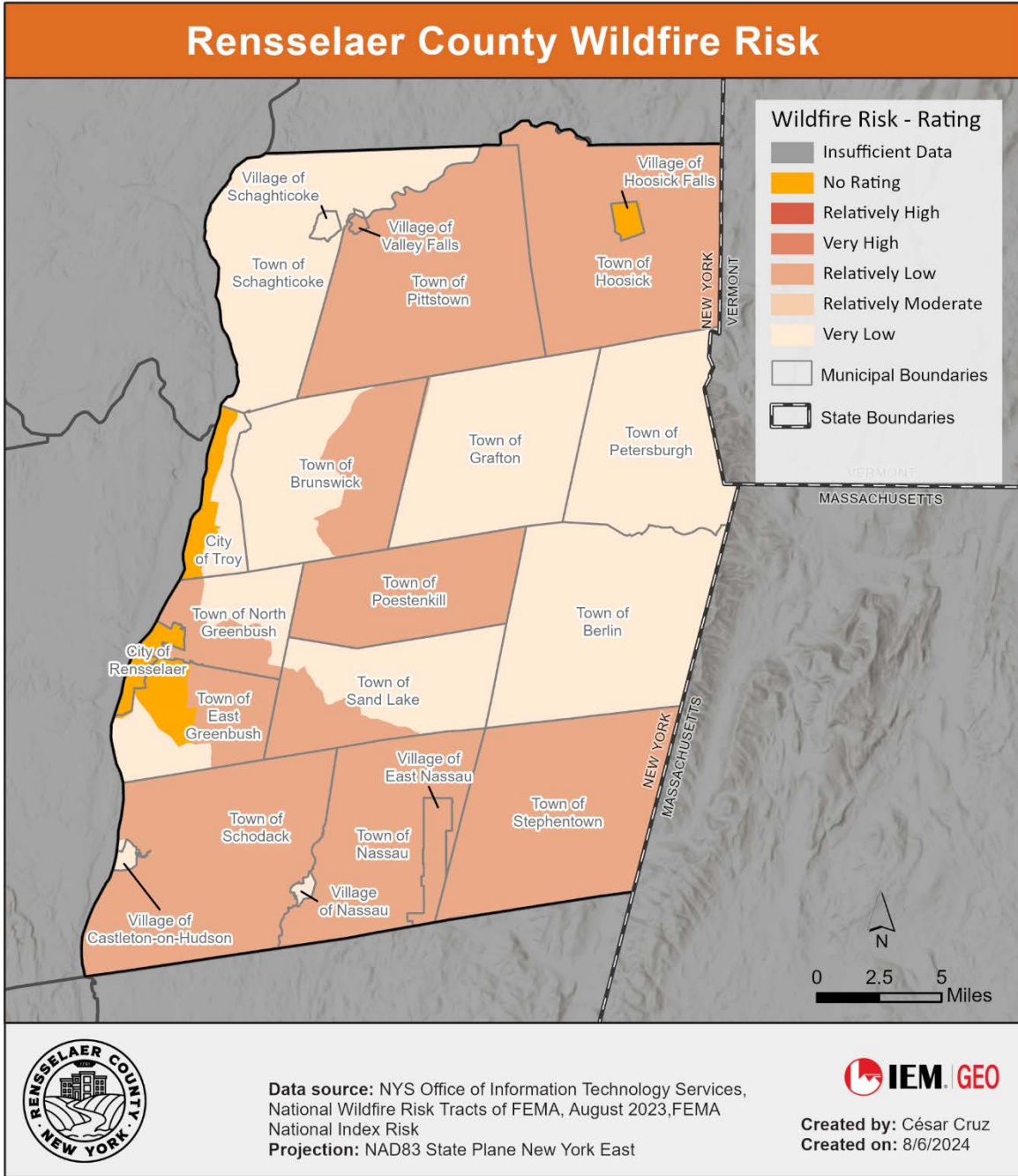


Figure 172: Rensselaer County Wildfire Risk – NRI

The Wildfire Risk to Communities tool helps communities understand wildfire risk. Figure 173 shows the wildfire likelihood for Rensselaer County, which is the probability of a wildfire burning in any given year based on modeled fire behavior that includes weather, topography, ignitions, and other factors contributing to the probability of a fire occurring. It is not predictive of, nor does it reflect, current fire danger conditions. Wildfire likelihood in Rensselaer County is low.

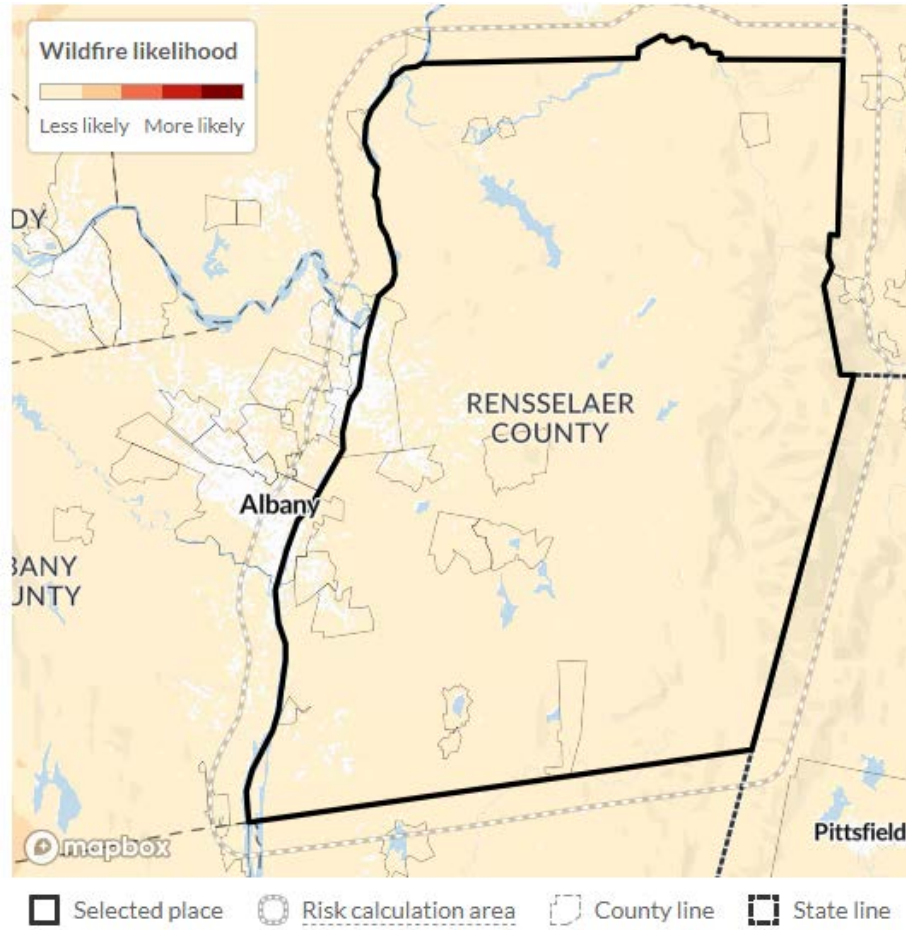


Figure 173: Rensselaer County Wildfire Likelihood¹⁸²

Risk to homes, shown in Figure 174, measures the relative impact of wildfire on residential structures. This considers wildfire risk in places with existing homes in addition to places where new construction may be proposed. On average, Rensselaer County homes are at greater risk to wildfire than homes in 57 percent of all counties in New York.¹⁸³

¹⁸² US Forest Service, Wildfire Risk to Communities. "Wildfire Likelihood." <https://wildfirerisk.org/explore/wildfire-likelihood/36/36083/>

¹⁸³ US Forest Service, Wildfire Risk to Communities, "Risk to Homes." <https://wildfirerisk.org/explore/risk-to-homes/36/36083/>

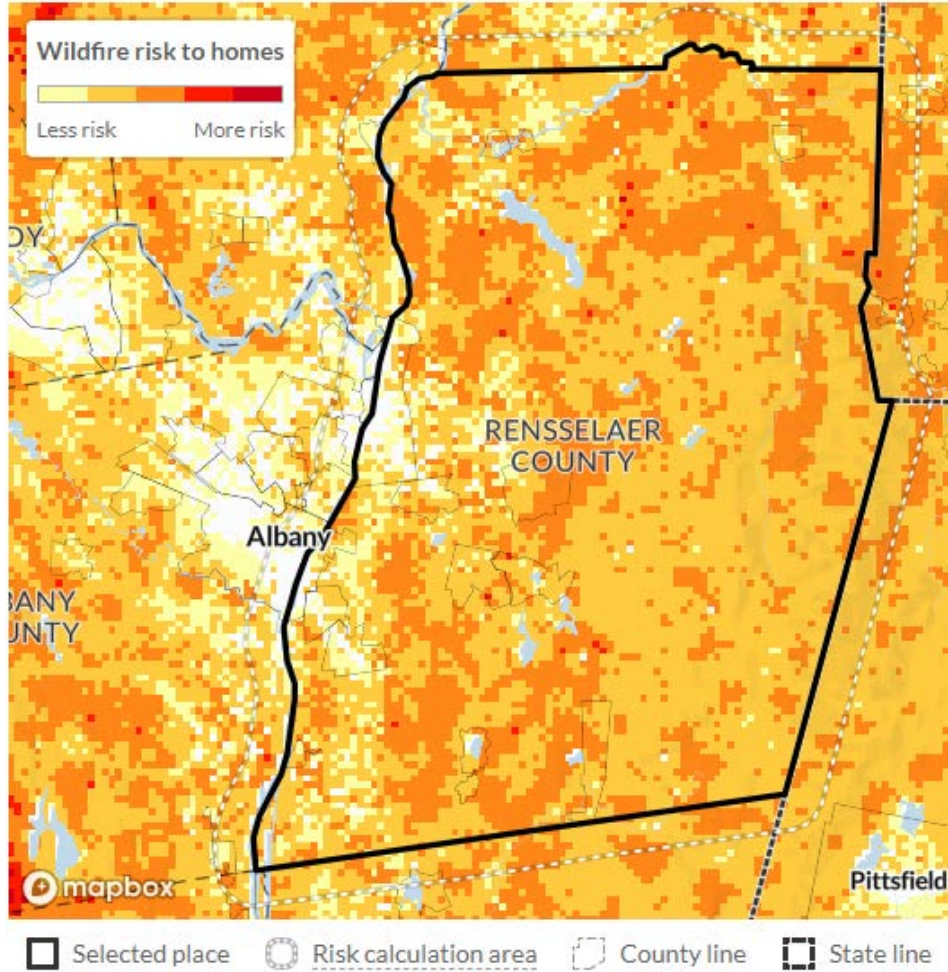


Figure 174: Rensselaer County Wildfire Risk to Homes

IMPACTS OF CLIMATE TRENDS AND VARIATIONS

A wildfire event poses a potentially significant risk to public health and safety, particularly when conditions such as low humidity, ample fuel loads, and strong winds are present. The impacts associated with a wildfire are not limited to the direct damages. Although wildfires are often a natural phenomenon and part of the normal cycle of the natural environment, they can result in significant deforestation, wildlife death, and water and air pollution. Environmental damage caused by a wildfire event may take decades—or longer—to be fully restored.

Climatic conditions such as severe freezes and drought can significantly increase the intensity of wildfires because these conditions kill vegetation, creating a prime fuel source for wildfires. The intensity and rate at which wildfires spread are directly related to wind speed, temperature, and relative humidity.

The 2023 SHMP reports that wildfires are directly impacted by climate change. Climate change will lead to warmer temperatures and drought conditions, which create an environment ripe for fires, particularly in the western United States. Information on the impacts of climate change on wildfire frequency, intensity,

duration, and location in New York State is currently limited. Generally, it is not expected that climate change will make wildfires a significant hazard of concern in New York.

Wildfire occurrence is projected to increase in New York, but baseline occurrence levels are so low that this increase is not expected to have a meaningful effect. Impacts on the duration and intensity of wildfire in New York are currently unclear, although wildfire season may begin and reach its peak earlier in the year.

Vulnerability Assessment

EXPOSURE

Land and Improved Property. To understand its vulnerability to natural hazards, a community must determine the assets that are exposed or vulnerable in the hazard area. For the purposes of this report, hazard areas were considered to be wholly inside, or within a 200-foot buffer of, high hazard areas. About 80 percent of Rensselaer County’s land area has characteristics which would be conducive to wildfires, and about 22 percent of the structure replacement cost value lies within these areas.

Table 82: Land and Improved Property Potentially Exposed to Wildfires

Municipality	Municipal Land Area (acres)	Land in Wildfire Hazard Areas (acres)	Municipal Structure Replacement Cost Value (\$)	Municipal Structure Replacement Cost Value in Wildfire Hazard Areas
Berlin, Town of	38,227	36,574	\$446,676,000	\$243,652,932
Brunswick, Town of	28,284	21,244	\$2,342,127,000	\$588,609,008
Castleton-on-Hudson, Village of	531	355	\$271,600,000	\$63,812,075
East Greenbush, Town of	15,672	10,851	\$3,659,758,000	\$732,801,341
East Nassau, Village of	3,029	2,824	\$94,148,000	\$47,235,329
Grafton, Town of	29,711	28,601	\$458,781,000	\$340,045,542
Hoosick Falls, Village of	950	530	\$583,380,000	\$205,873,106
Hoosick, Town of	39,361	28,402	\$745,594,000	\$68,258,380
Nassau, Town of	25,558	22,999	\$571,880,000	\$302,106,699
Nassau, Village of	442	322	\$173,160,000	\$26,065,615
North Greenbush, Town of	12,079	7,895	\$2,801,151,000	\$599,492,739

Municipality	Municipal Land Area (acres)	Land in Wildfire Hazard Areas (acres)	Municipal Structure Replacement Cost Value (\$)	Municipal Structure Replacement Cost Value in Wildfire Hazard Areas
Petersburgh, Town of	26,683	24,977	\$333,098,000	\$194,865,456
Pittstown, Town of	41,256	29,847	\$737,726,000	\$276,729,925
Poestenkill, Town of	20,727	18,678	\$945,815,000	\$464,367,208
Rensselaer, City of	2,191	688	\$1,588,138,000	\$258,237,821
Sand Lake, Town of	23,088	20,484	\$1,782,955,000	\$846,946,748
Schaghticoke, Town of	32,545	21,901	\$1,379,356,000	\$454,247,033
Schaghticoke, Village of	640	366	\$129,380,000	\$37,264,933
Schodack, Town of	40,217	29,133	\$2,486,786,000	\$865,773,330
Stephentown, Town of	37,263	34,625	\$509,235,000	\$283,287,545
Troy, City of	7,066	2,276	\$11,211,809,000	\$403,148,667
Valley Falls, Village of	308	198	\$81,394,000	\$14,635,887
Rensselaer County Total	425,825	343,773	\$33,333,947,000	\$7,187,150,179

Figure 175 is a map illustrating areas that are directly and indirectly exposed to wildfire, as well as the areas that are not exposed. Figure 176 shows the percentage of exposure for Rensselaer County compared to the rest of New York State.

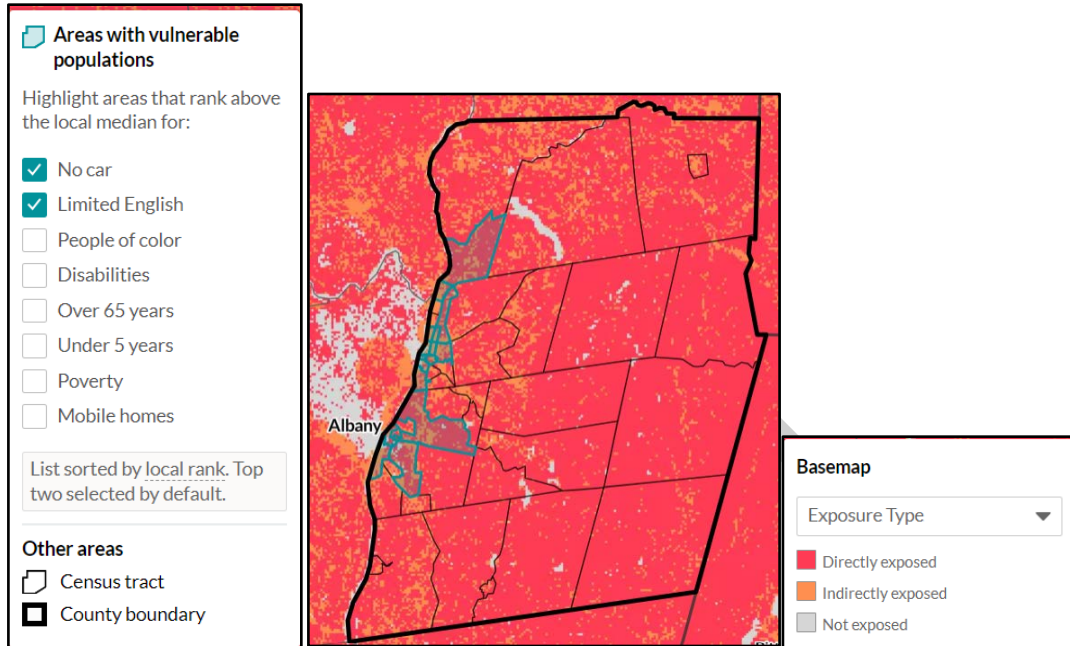


Figure 175: Rensselaer County Exposure to Wildfire¹⁸⁴

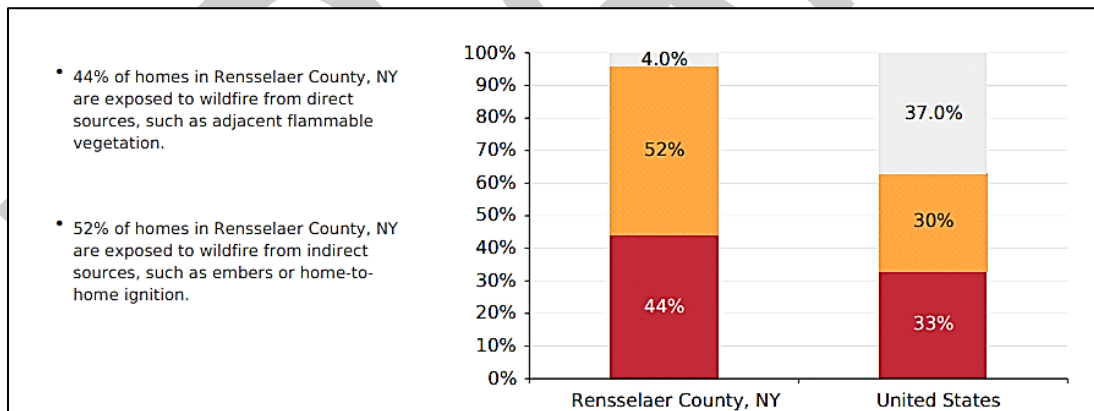


Figure 176: Rensselaer County Exposure Compared to Rest of New York, and to the U.S.¹⁸⁵

ESTIMATED IMPACT AND POTENTIAL LOSSES

Wildfires have the potential to destroy large portions of a community. Loss of life and injuries are possible for people living, working, or traveling through an impacted area. Firefighters are at risk while trying to contain and control the blaze. Beyond the loss of vegetation that wildfires leave in their wake, structures in the WUI can be severely damaged or destroyed. Large wildfires may lead to significant increases in stormwater runoff, mudslides, and landslides that can cause downstream flooding. Depending on the

¹⁸⁴ Source: [Wildfire Risk to Communities](#)

¹⁸⁵ Ibid

scale of the impacted area, as well as the type and numbers of buildings and infrastructure impacted, local economies and the social fabric of communities may suffer secondary effects following the event.

Standard loss estimation methodologies are not currently available for estimating wildfire damages, and very little historical data regarding events and associated losses was available to quantify here. For the purpose of this analysis, at this time we have determined that annual losses are unquantifiable. Although damages associated with any single event could be significant at the particular location of the event, it is estimated that damages are most likely negligible when evaluated on an average annual basis. Given the lack of detailed historical loss data on significant wildfire occurrences resulting in large-scale structural losses in Rensselaer County, it is assumed that although one major event may result in significant losses, annualizing structural losses over a long period of time would most likely yield a negligible annualized loss estimate in each jurisdiction exposed to this hazard.

In Rensselaer County, the expected annual loss (EAL) value for wildfire is very low at **\$28,000** per year.

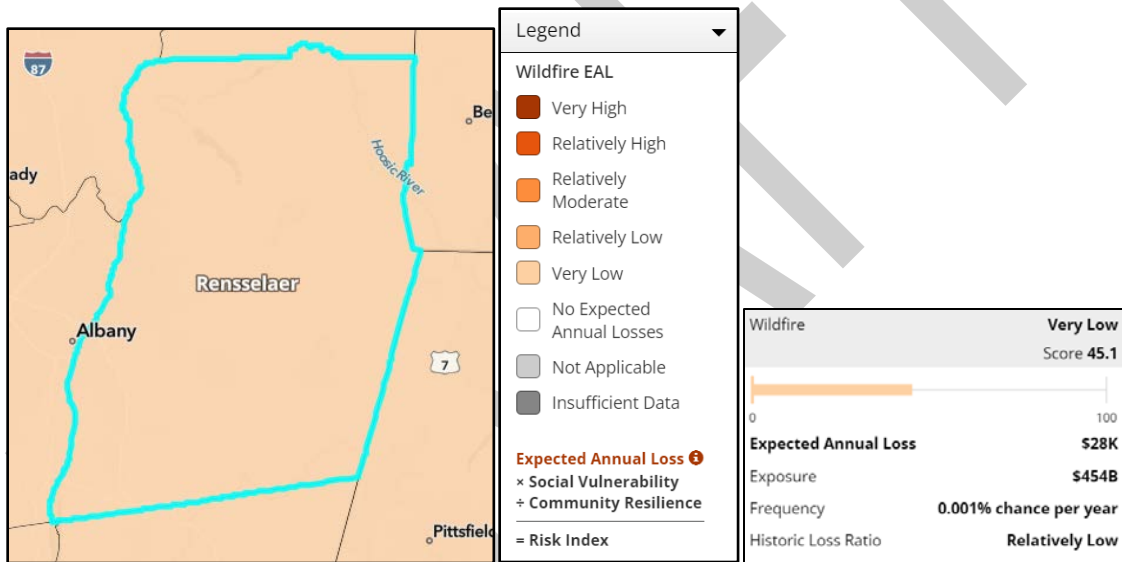


Figure 177: Expected Annual Loss – National Risk Index¹⁸⁶

VULNERABLE POPULATIONS

Social and economic factors can adversely affect how some people prepare for, respond to, and recover from wildfire. Vulnerable populations may lack access to resources, experience cultural and institutional barriers, have limited mobility, or have medical conditions exacerbated by stress or smoke.

People over age 65 and people who are disabled can be more susceptible to air pollution and particulates associated with wildfire smoke. Furthermore, race and ethnicity are strongly correlated with disparities in health and access to aid and resources. Language barriers can make it difficult to follow directions during an evacuation or to access support after a disaster. Wildfires disproportionately impact people with low

¹⁸⁶ Source: [Map | National Risk Index \(fema.gov\)](https://www.fema.gov)

incomes due to factors such as inadequate housing and diminished ability to evacuate or relocate. Additionally, the growing population of homeless, whether temporary or long-term, is particularly vulnerable to wildfire smoke when living directly outdoors or in make-shift structures.

Diminished air quality is an environmental impact that can result from a wildfire event and pose a potential health risk. The smoke plumes from wildfires can contain inhalable carcinogenic matter. Fine particles of invisible soot and ash that are too small for the respiratory system to filter can cause immediate and possibly long-term health effects. The elderly or individuals with compromised respiratory systems may be more vulnerable to the effects of diminished air quality after a wildfire event. Figure 178 provides vulnerable population demographics for Rensselaer County.

Vulnerable populations		
All areas in Rensselaer County		
Indicator	Number	Percent
Families in poverty	2,770 ±377	7% ±1%
People with disabilities	22,159 ±1,151	14.1% ±0.8%
People over 65 years	27,048 ±1,169	17% ±0.8%
People under 5 years	8,226 ±695	5.2% ±0.4%
People of color	27,869 ±3,682	17.5% ±2.3%
Black	9,976 ±965	6.3% ±0.6%
Native American	200 ±160	0.1% ±0.1%
Hispanic	8,182 ±1,059	5.1% ±0.7%
Difficulty with English	1,418 ±520	0.9% ±0.3%
Households with no car	6,257 ±573	9.6% ±0.9%
Mobile homes	1,754 ±294	2.7% ±0.6%

Figure 178: Vulnerable Populations¹⁸⁷

Potentially vulnerable populations may experience difficulty preparing for and responding to wildfire. Figure 179 illustrates areas with high vulnerable populations in Rensselaer County where wildfire is likely, as well as where people have no access to a vehicle and limited English proficiency.

¹⁸⁷ Source: [Wildfire Risk to Communities](#)

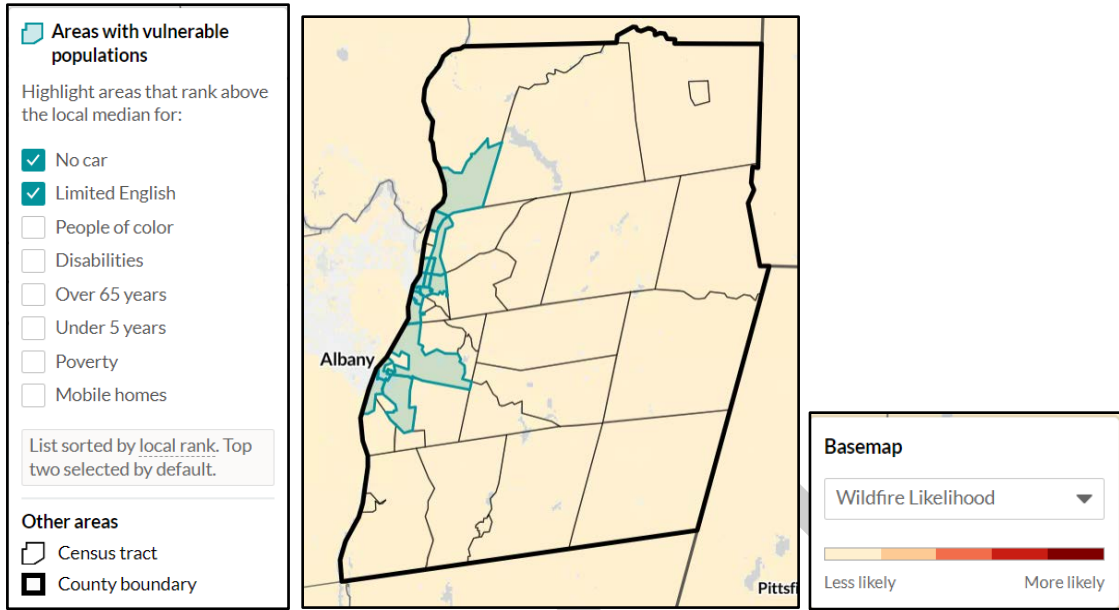


Figure 179: Vulnerable Populations At Risk From Wildfire

IMPACT ON COUNTY ASSETS

While potential severity of impact from wildfire for the Rensselaer County Planning Area, including all participating jurisdictions, is considered “Minor” for structural damages, meaning that critical facilities and services would be completely shut down for more than 1 week, and more than 10 percent of property would be destroyed or have major damage—indicating a substantial potential impact.

Table 83 contains a list of the critical facilities located Rensselaer County in the WUI located wholly within, or within a 200-foot buffer of, high hazard areas for wildfire and that are more susceptible to wildfire in each participating jurisdiction.

Table 83: Critical Facilities Located in the WUI by Jurisdiction

Municipality	Facility Type	Facility Name	Location/Address
Berlin, Town of	Communications Tower	Albany Telephone Company	Goodermote Road
Berlin, Town of	Communications Tower	Albany Telephone Company Cellular One	"Berlin" Goodermote Road
Berlin, Town of	Communications Tower	New York, State Of	Capital Game Refuge
Berlin, Town of	School	Berlin Central Junior & Senior High School	17400 Route 22
Berlin, Town of	School	Berlin Elementary School	53 School Street
Brunswick, Town of	School	George Washington Elementary School	344 Menemsha Lane

Municipality	Facility Type	Facility Name	Location/Address
Brunswick, Town of	Communications Tower	Beeper Pple, NY State Police, Metrocall, Arch Communications, Freepage, Pni, Clear Chan	2 miles east of Bald Mountain
Brunswick, Town of	Communications Tower	Cellco Partnership, Dba Verizon Wireless	Bald Mountain Road
Brunswick, Town of	Communications Tower	New York Cellular Geographic Service Area, Inc.	Bald Mountain Road
Brunswick, Town of	Communications Tower	Niagara Mohawk Power Corporation	4 miles northeast of downtown Troy, NY
Brunswick, Town of	Communications Tower	Niagara Mohawk Power Corporation	Bald Mountain 1 mile north of State Highway 142
Brunswick, Town of	Fire Station	Eagle Mills Fire Co	627 Brunswick Road
East Greenbush , Town of	Communications Tower	Albany Telephone Company	Ridge Road
East Greenbush, Town of	School	Citizen Edmond Genet Elementary School	29 Englewood Avenue
East Greenbush, Town of	School	Howard L. Goff School	35 Gilligan Road
East Greenbush, Town of	School	Red Mill School	225 McCullough Place
East Nassau, Village of	Fire Station	Tsatsawassa Protective Fire Company	9 Firehouse Lane
East Nassau, Village of	Fire Station	Hoags Corners Fire Company	7237 NY 66
Grafton, Town of	Communications Tower	Airtouch Paging	East end of Snyder Road
Grafton, Town of	Communications Tower	Hudson Valley Communications	Davitt Lake Road
Grafton, Town of	Communications Tower	New York, State Of	Dickenson Hill
Grafton, Town of	Communications Tower	Rensselaer, County Of	South Road 2 Mi 1/4 Miles East of
Grafton, Town of	Police	Rensselaer County Sheriff	45 Richmond Street
Hoosick, Town of	Church	First Baptist Church of Hoosick	648 South Street (County Route 95)

Municipality	Facility Type	Facility Name	Location/Address
Hoosick, Town of	School	Hoosick Falls Central School	21187 State Route 22
North Greenbush, Town of	Communications Tower	New York, State Of	8/10 miles west-southwest of junction of US Route 4 and Jordan Road Route 2
North Greenbush, Town of	Communications Tower*	RPI, Advanced Mas Partners, Town of Colonie	WRPI Tower Glenmore Road
North Greenbush, Town of	School	Woodland Hill Montessori School	100 Montessori Way
Pittstown, Town of	Communications Tower	Albany Telephone Company Cellular One, Mobilemedia	Near Leloup Road (AKA Crandall Road)
Pittstown, Town of	Church	Pittstown United Methodist Church	45 Old Route 7
Poestenkill, Town of	Communications Tower	Aat Paging Corporation li	Davitt Pond Road
Poestenkill, Town of	Communications Tower	Albany Telephone Company	High Meadow Road
Rensselaer, City of	School	Rensselaer Junior/Senior High School	25 Van Rensselaer Drive
Sand Lake, Town of	Communications Tower	Albany Telephone Company	2 Chamberlain Road
Sand Lake, Town of	Fire Station	Taborton Fire Company	861 Taborton Road
Sand Lake, Town of	Police	Averill Park School District Office	145 Gettle Road
Sand Lake, Town of	School	Averill Park High School	146 Gettle Road #2
Sand Lake, Town of	Church	Salem United Methodist Church	349 Shaver Road
Schodack, Town of	Communications Tower	Albany Telephone Company	Route 20
Schodack, Town of	Communications Tower	Albany Telephone Company Cellular One	"Sand Lake" 0.22 miles north of New York Route 151
Schodack, Town of	Communications Tower	Cellco Partnership	0.25 miles east of US 9 and I-90 intersection
Schodack, Town of	Communications Tower	Rensselaer, County Of	0.4 miles from Schodack Town Hall on dirt road
Schodack, Town of	Communications Tower		2000 feet east of Highway 9 and Highway 20 junction

Municipality	Facility Type	Facility Name	Location/Address
Schodack, Town of	Natural Gas	Compressor Station 254	East of Route 66
Schodack, Town of	Church	House of Praise Church	1688 Route 9
Stephentown, Town of	Communications Tower	AT&T Corp	Fire Tower Road
Stephentown, Town of	Communications Tower	Cellco Partnership	Fire Tower Road
Stephentown, Town of	Communications Tower	Cellco Partnership, Dba Verizon Wireless	Fire Tower Road
Stephentown, Town of	Communications Tower	New York, State Of	Seven Hills

Table 84 is a list of historic and cultural resources of Rensselaer County located wholly within, or within a 200 feet buffer of, high hazard areas for wildfire.

Table 84: Historic/Cultural Resources Potentially Exposed to Wildfires

Municipality	Historic Structure/Landmark/District	Location/Address
Brunswick	Garfield School	NY 2 and Moonlawn Road
Brunswick	Morison Farmstead	3842 NY 2
East Greenbush	John Carner, Jr. House	1310 Best Road
East Greenbush	Craver Farmstead	115 Craver Road
Hoosick	Bennington Battlefield	NY 67, on VT state line
Hoosick	Breese-Reynolds House	601 South Street
Nassau	Henry Tunis Smith Farm	South of Nassau on NY 203
Nassau, Village of	Albany Avenue Historic District	Albany Avenue
Nassau, Village of	Church Street Historic District	Church Street
North Greenbush	Defreest Homestead	South of Troy at U.S. 4 and Jordan Road
North Greenbush	Sharpe Homestead and Cemetery	44 Laura Lane
Pittstown	Sherman Farm	35 Sherman Road
Rensselaer, City of	Beverwyck Manor	Washington Avenue
Sand Lake	Albert R. Fox House	2801 NY 43 and 66
Sand Lake	Sand Lake Baptist Church	2960 NY 43
Schodack	Albany Avenue Historic District	Albany Avenue

Municipality	Historic Structure/Landmark/District	Location/Address
Schodack	Blink Bonnie	1368 Sunset Road
Schodack	District School No. 3	1125 South Schodack Road
Schodack	Elmbrook Farm	2567 Brookview Road
Schodack	Muitzes Kill Historic District	An irregular pattern on both sides of Schodack Landing Road
Schodack	Schodack Landing Historic District	NY 9J
Schodack	Joachim Staats House and Gerrit Staats Ruin	North of Castleton-on-Hudson
Troy, City of	Gardner Earl Memorial Chapel and Crematorium	Oakwood Avenue
Troy, City of	Oakwood Cemetery	101st Street
Troy, City of	Poesten Kill Gorge Historic District	Poesten Kill between Spring Avenue and NY 2
Troy, City of	Emma Willard School	Pawling and Elmgrove Avenues

COMMUNITY LIFELINES

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Community lifelines are essential for the well-being of any community. They provide support and assistance to individuals who require help, especially during times of crisis. FEMA Community Lifelines are a critical component of emergency management in the United States. These lifelines are designed to address the essential needs of a community during and after a disaster. There are eight Community Lifelines, each with its own focus and purpose, as depicted in Figure 180.



Figure 180: Community Lifelines

Community Lifelines include lifeline utility systems (e.g., drinking water, wastewater, energy resources, communications infrastructure), emergency and essential facilities (e.g., police, fire, ambulatory,

emergency operations facilities), hospitals and medical centers, schools, elderly care facilities, childcare facilities, and religious service facilities. Community facilities are the buildings, land, equipment and activities provided on the public’s behalf by government and/or private organizations. These facilities are important components to the quality of life of a municipality. Critical facilities are necessities for the health, safety, well-being, and stability of communities. Critical infrastructure systems are essential for life safety and economic viability; they include transportation, power, communication, and water and wastewater systems.

Wildfires pose a direct risk to many parts of the built environment, including homes and infrastructure. Wildfires can damage power lines and infrastructure, particularly in regions with overhead power lines running through forested areas. They can similarly damage or destroy communication infrastructure, including cell towers and fiber optic cables, causing service disruptions and isolating communities.

VULNERABILITY SCORE

Based on the NRI, Rensselaer County has a very low-risk index, with a risk index score of **42.3** for wildfire, which is lower than the national percentile.

Table 85: Risk Factor – Wildfire¹⁸⁸

Wildfire	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Very Low	High	Very Low	\$55K	Low

Wildfire **Very Low**
Score **42.3**

¹⁸⁸ Source: [Map | National Risk Index \(fema.gov\)](https://www.fema.gov)

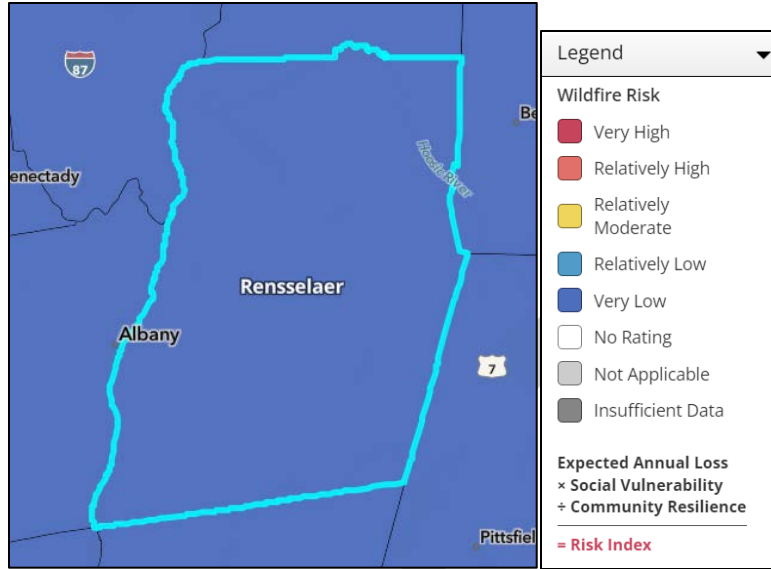


Figure 181: National Risk Index¹⁸⁹

Severe Winter Weather: Blizzard/Ice Storm/Heavy Snow Hazard Profile

Hazard Definition

A winter storm is a storm with significant snowfall, ice, and/or freezing rain. Just like any other storm at other times of the year, the right combination of ingredients is necessary for a winter storm to develop. Because winter storms are regular occurrences during the winter months in Rensselaer County, they are considered hazards only when they result in damage to specific structures and/or overwhelm local capabilities to handle disruptions to traffic, communications, and electrical power. Winter storms typically occur in New York State from late October until mid-April. Peak months for these events for Rensselaer County and its jurisdictions are December through March.

The 2023 SHMP states that severe winter weather storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. The severity of a winter storm depends on temperature, wind speed, type of precipitation (e.g., snow, sleet, freezing rain), accumulation rate, and length of the storm—which can last a few hours or several days. Winter storms, including blizzards and Nor'easters, can bring extreme cold, freezing rain, snow, ice and high winds.

A blizzard is a severe and potentially dangerous snowstorm characterized by several specific weather conditions and criteria. Although heavy snowfall is a prominent feature of a blizzard, it is the combination of factors that distinguish blizzards from regular snowstorms. Blizzards typically involve intense and

¹⁸⁹ Source: [Map | National Risk Index \(fema.gov\)](https://www.fema.gov)

sustained snowfall that can significantly reduce visibility and create deep snow accumulations. They are characterized by strong, sustained winds of at least 35 miles per hour or greater. These high winds can blow the falling and accumulated snow, reducing visibility to near zero in some cases. To be classified as a blizzard, these conditions must persist for an extended period of three (3) hours or longer.

Three basic ingredients are necessary to make a winter storm:

- **Cold air:** Below-freezing temperatures in the clouds and near the ground are necessary to make snow and/or ice.
- **Lift:** Something to raise the moist air to the clouds and cause precipitation. An example of lift is warm air colliding with cold air and being forced to rise over the cold dome. The boundary between the warm and cold air masses is called a "front." Another example of lift is air flowing up a mountainside.
- **Moisture:** To form clouds and precipitation. Air blowing across a body of water, such as a large lake or the ocean, is an excellent source of moisture.

Table 86: Types of Winter Storms

Type	Definition
Blizzard	A storm that contains large amounts of snow OR blowing snow, with winds in excess of 35 mph and visibilities of less than ¼ mile for an extended period of time (at least 3 hours). The wind factor is what distinguishes a blizzard from a snowstorm.
Snowstorm	A storm that is generally considered less severe than a blizzard due to the lack of high winds and low visibility; however, they can still be dangerous, especially when driving or walking on slick surfaces.
Ice Storm	A storm that results in the accumulation of at least ¼ inch of ice on exposed surfaces. They create hazardous driving and walking conditions. Tree branches and powerlines can easily snap under the weight of the ice.

LOCATION

ICE STORM

All of Rensselaer County is susceptible to, and can be affected by, ice storms; the ice storm hazard area is county-wide. Figure 182 (on the following page) illustrates the average number of hours per year with freezing rain in the U.S. According to the figure, Rensselaer County experiences between about 18 and 21 hours per year, based on data from 1932 to 2001 (MRCC, 2017), the most updated data as of this plan update. Rensselaer County has one of the highest annual average number of hours of freezing rain nationwide.

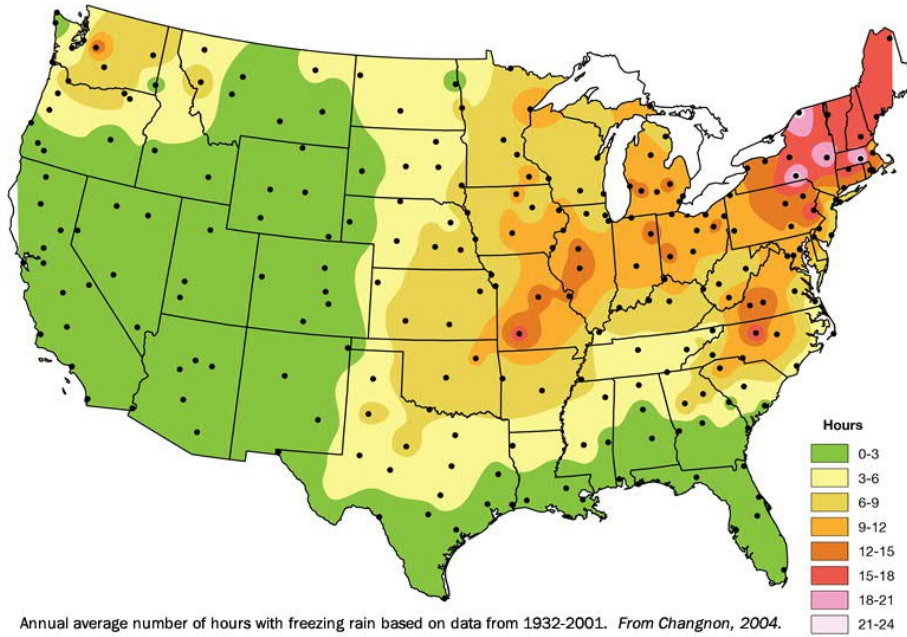


Figure 182: Annual Average Number of Hours with Freezing Rain¹⁹⁰

SNOWSTORM

All of Rensselaer County is susceptible to, and can be affected by, snowstorms; the snowstorm hazard area is county-wide. For the years 1981 to 2010, Rensselaer County's average annual snowfall ranged from between about 50 and 75 inches per year in northeastern areas, to between 25 and 50 inches per year in southwestern areas (see Figure 183 on the following page). Rensselaer County is accustomed to severe winter weather conditions and is prepared for the potential disruptions they might cause, although intense ice storms and snowstorms can still overwhelm local capabilities from time to time. The 2014 SHMP reports that, on average, New York State receives more snowfall than other states in the U.S., with average annual snowfall of about 65 inches.

¹⁹⁰ Rensselaer County is located in an area with an average number of 18 to 21 hours of freezing rain each year. https://mrcc.purdue.edu/living_wx/icestorms/

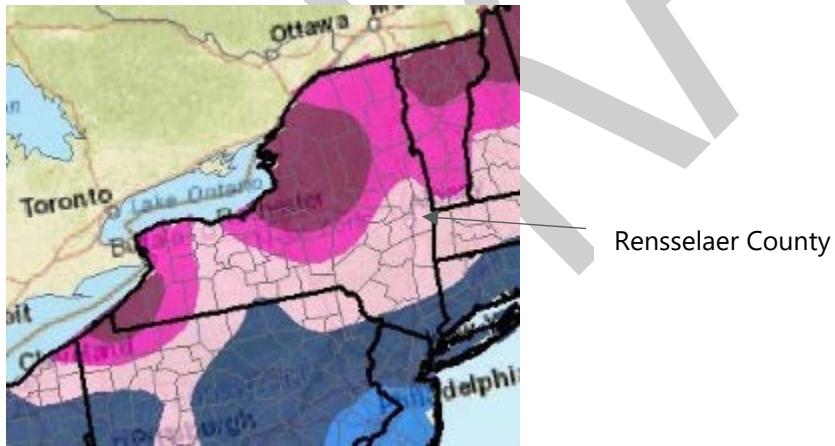
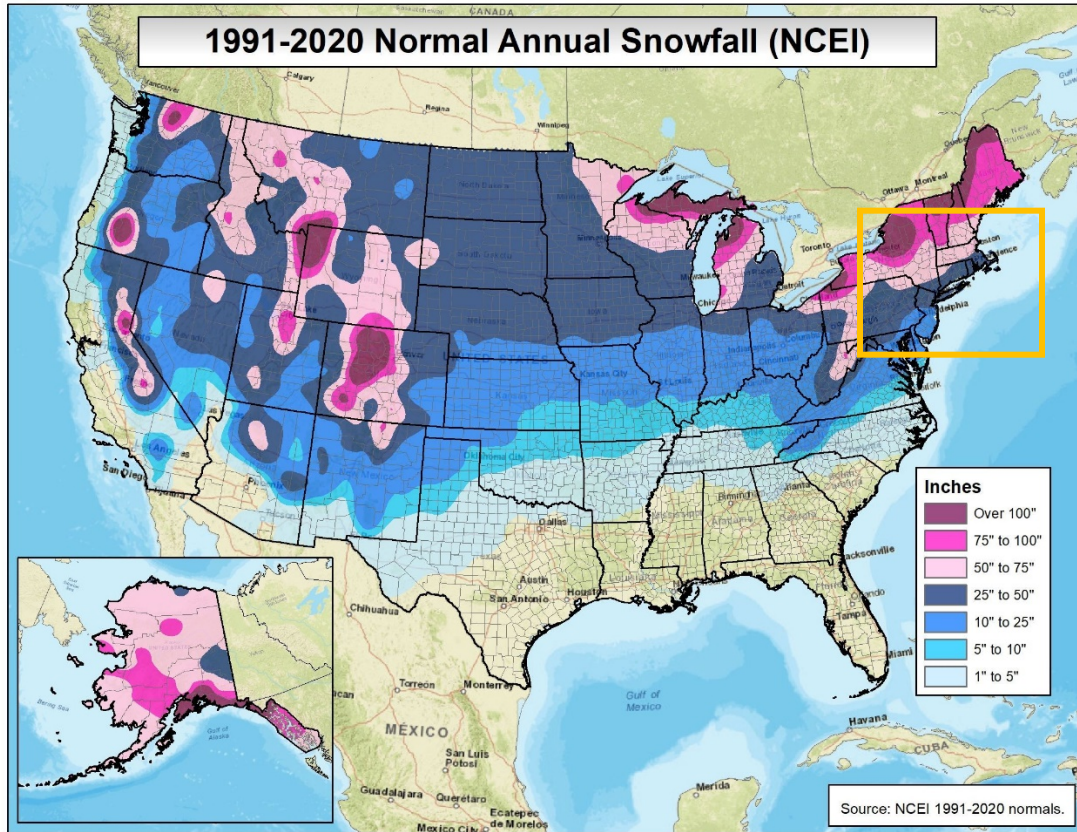


Figure 183: U.S. Annual Normal Snowfall (NCEI)¹⁹¹

EXTENT

ICE STORM

¹⁹¹ University of Nebraska – Lincoln. Lincoln Weather and Climate. "U.S. Annual Normal Snowfall in Inches." <https://lincolnweather.unl.edu/us-annual-normal-snowfall>

The severity of the effects of ice storms increases as the amount and rate of precipitation increase. In addition, storms with a low forward velocity are in an area for a longer duration and become more severe in their effects. Storms that are in full force during the morning or evening rush hours tend to have their effects magnified because more people are out on the roadways and directly exposed.

The Sperry–Piltz Ice Accumulation Index (SPIA) is used as a measure of the magnitude of ice storms. The SPIA uses a scale between 0 and 5 to range storms by damage and impact (see Table 87).

Table 87: Sperry–Piltz Ice Accumulation Index (SPIA)

Scale	Damage and Impact Descriptions
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews; few outages
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulations.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting one to five days
4	Prolonged and widespread utility interruptions with extensive damage to main distribution feeder lines and some high voltage transmission lines/structures. Outages lasting five to ten days
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed

SNOWSTORM

Like that of ice storms, the severity of the effects of snowstorms increases as the amount and rate of precipitation increase. In addition, storms with a low forward velocity persist in the same area for a longer duration and become more severe in their effects. Storms that are in full force during the morning or evening rush hours tend to have their effects magnified because more people are out on the roadways and directly exposed.

The magnitude of a severe winter storm NOAA’s National Climatic Data Center (NCDC) is currently producing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two-thirds of the United States. The RSI ranks snowstorm impacts on a scale from 1 to 5. It is based on the spatial extent of the storm, the amount of snowfall, and the interaction of the extent and snowfall totals with population (based on the 2020 Census). The NCDC has analyzed and assigned RSI values to more than 500 storms that have occurred since 1900 (NOAA-NCDC 2023). Table 88 presents the five RSI ranking categories.

Table 88: NOAA Regional Snowfall Index

Category	Description	RSI Value
1	Notable	1–3
2	Significant	3–6
3	Major	6–10
4	Crippling	10–18
5	Extreme	18+

PREVIOUS OCCURRENCES

ICE STORM

NOAA’s NCEI Storm Events Database records three ice storms in Rensselaer County between 1996 and 2023. No deaths, injuries, property damages, or crop damages were identified in the database. Details are included in Table 89. No events have occurred since the last version of this plan was finalized in 2011.

Table 89: Historical Ice Storm Events in Rensselaer County

Affected Location	Date	Event Type	Reported Deaths	Reported Injuries	Reported Property Damage	Reported Crop Damage
Countywide	1/15/2007	Ice Storm	0	0	\$0	\$0
Western Zone	2/13/2008	Ice Storm	0	0	\$0	\$0
Countywide	12/11/2008	Ice Storm	0	0	\$0	\$0
Total:			0	0	\$0	\$0

In Rensselaer County, ice storms are considered normal and expected during the winter months. New York State has received two Disaster Declarations for severe ice storms; however, Rensselaer County was not part of the declared area during either event. Due to the higher elevation, the eastern part of the county experiences more ice storm events than the western part, as noted in 2024 ice storm that hit the western section. The December 2008 event, described below, is categorized as a FEMA Severe Winter Storm Disaster Declaration; however, we are discussing it here for its significant ice storm characteristics and impacts in Rensselaer County.

December 11–12, 2008

A significant wintry mix of snow, sleet, and freezing rain fell, beginning Thursday afternoon and ending midday Friday. Snow and sleet accumulations of 3 to 6 inches fell. In addition, freezing rain, with estimated accretions in excess of 0.5 inches, led to numerous downed tree limbs, trees and power lines. Total ice accretion from freezing rain ranged from around 0.5 inches, up to 1 inch across portions of the Capital District and the Berkshires. The ice storm resulted in widespread damage to trees as well as power

outages across eastern New York, where an estimated 220,000 utility customers lost power. Many schools and businesses were shut down for several days due to the loss of power and impassable roads from extensive fallen debris, resulting in significant economic and societal impacts. States of emergency were declared across large portions of eastern New York. The hardest hit areas were within the immediate Capital District, across Albany and extreme southern Saratoga Counties, as well as across the central and southern Taconics, from central Rensselaer County into Columbia County and northern Dutchess County. Bitterly cold temperatures followed in the wake of the storm Saturday and Sunday, compounding the power outages across the region. Numerous warming shelters were set up to assist those who were without power and heat. The storm resulted in the Declaration of Disaster DR-1827, under which Rensselaer County received more than \$600,000 in funding from the FEMA Public Assistance Grant Program.



Figure 184: Ice Storm, Troy, December 2008



Figure 185: Ice Storm, Troy, December 2008



Figure 186: Route 117, December 2008

SNOWSTORM

Rensselaer County has experienced numerous types of snowstorms in the past. According to NOAA’s NCEI Storm Events Database, 186 snowstorm days and 337 discrete snowstorm events and occurred in Rensselaer County between 1996 and 2023 (including blizzard, heavy snow, winter storm, and winter weather), causing more than \$740,100 in property damages. Details of damages for these events are summarized by event type in Table 90. Forty-eight storms occurred after the 2011 plan was prepared; no losses were reported for these recent events.

Table 90: Snowstorm Event Summary, 1996–2023

Event Type	Number of Events	Reported Deaths	Reported Injuries	Reported Property Damage	Reported Crop Damage
Blizzard	1	0	0	\$0	\$0
Heavy Snow	27	0	0	\$227	\$0
Lake Effect Snow	0	0	0	\$0	\$0
Winter Storm	59	0	0	\$33,414	\$0
Winter Weather	69	0	0	\$0	\$0
Total:		0	0	0	\$0

Like ice storms, severe winter snowstorms are considered normal and expected in Rensselaer County during the winter months. The FEMA web site (www.fema.gov/disasters) documents that New York State, has been declared following 20 snowstorms since 1953. Rensselaer County has been declared during three snow disasters and two snow emergencies, as detailed in Table 91. No disasters or emergencies have been declared by FEMA since the initial plan was prepared in 2019.

Table 91: FEMA Snow Declarations Affecting Rensselaer County

Disaster/ Emergency #	Declaration Type	Event	Incident Period	Eligible Assistance for Rensselaer County
DR-801	Major Disaster Declaration	Severe Winter Storm	October 4, 1987	Public Assistance
DR-1083	Major Disaster Declaration	Blizzard	January 6-12, 1996	Public Assistance
EM-3173	Emergency Declaration	Snowstorm	December 25, 2002 to January 4, 2003	Public Assistance
DR-1827	Major Disaster Declaration	Severe Winter Storm	December 11-31, 2008	Public Assistance
EM-3299	Emergency Declaration	Severe Winter Storm	December 11-31, 2008	Public Assistance

A sampling of more notable, damage-causing events includes the following:

October 4, 1987

At the time the earliest winter storm formally recorded for Albany, this unusual snowstorm covered the Capital Region with 6 to 12 inches of very heavy, wet snow. Although not unusual in terms of its snow depth, this storm caused tremendous damage as the weight of its heavy, wet snow fell on trees in full leaf, downing limbs and power lines and leaving many areas without power for several days. The storm resulted in Declaration of Disaster DR-801.

March 12–13, 1993

What has sometimes been termed the “Storm of the Century” or the “Great Blizzard of 1993” was a massive storm that, at its peak, stretched from Canada to Central America. Its impacts were felt up and down the U.S. East Coast, where hurricane-force winds and upwards of a foot of snow combined with storm surge and scattered tornados. Total U.S. damages from this storm were estimated at \$6.6 billion. In nearby Albany, 27 inches of snow were reported. Impacts in Rensselaer County noted by Core Planning Group members included heavy snow accumulations, high winds, tree damage, power outages, limited road passage, and various parking restraints. The storm resulted in Federal Emergency Declaration EM-3107 (although Rensselaer County was not declared).

December 31, 1994

A mixture of snow and freezing rain occurred across much of eastern New York, creating treacherous traveling conditions on New Year’s Eve. In the Capital District area alone, hundreds of accidents occurred as roadways became ice-covered. The icy conditions forced the closure of several major highways and caused several fatal accidents.

January 12, 1996

Heavy snow fell across much of eastern New York except for the central Mohawk Valley Region. Specific snowfall totals included 12 inches in Troy in Rensselaer County. The storm resulted in Declaration of Disaster DR-1083 under which Rensselaer County became eligible for funding under the FEMA Public Assistance Grant Program.

March 31, 1997

Heavy snow fell over eastern New York from the Mohawk Valley southward. Snowfall amounts were highly elevation-dependent. Snowfall exceeded 2 feet in many mountain locations. Specific snowfall totals included 15 inches at the Albany Airport and 11 inches at Poestenkill in Rensselaer County. The wet snow brought down many trees and power lines, causing widespread power outages and many road closures, and many areas remained without power for several days. In the Capital District, 50,000 customers lost power. Damages of \$500,000 were reported in Rensselaer County.

December 6–8, 2003

A band of heavy snow, with rates up to 3 inches per hour, settled over the Taconics for a while on Saturday afternoon into the evening hours. The storm lasted about 30 hours. By the time the low pressure had moved to the east, a general swath of 1 to 2 feet of snow had fallen across the region. Unusually high amounts fell east of Albany in Rensselaer County with 32 inches noted at Averill Park and up to 39 inches at West Sand Lake. The storm caused numerous flight cancellations at Albany International Airport. Many localities declared snow emergencies. There were numerous vehicular accidents, but most were minor.

December 25, 2003 and January 4, 2004

Back-to-back severe snowstorms blanketed much of New York State. This resulted in FEMA Emergency Declaration EM-3173. The declaration allowed state and local governments, and certain private non-profit organizations in the counties to apply for federal assistance to fund 75 percent of the total eligible costs of equipment, contracts, and personnel overtime related to emergency services in dealing with the snow. The State of New York was responsible for 12.5 percent of the eligible costs and applicants funded the remaining 12.5 percent. Federal assistance provided to Rensselaer County and its municipalities as a result of this declaration totaled nearly \$800,000. CPG members recalled heavy snow accumulations, high winds, tree damage, power outages, limited road passage, and various parking restraints as a result of these events.

January 1–3, 2010

A powerful storm brought widespread snowfall to east central New York along with blustery conditions, resulting in blowing and drifting of the snow. Snowfall totals were generally 6 to 16 inches, with up to 2 feet across portions of Washington County and eastern Rensselaer County.

December 26–27, 2012

Snow, heavy at times, fell across much of eastern New York. This was combined with a mix of sleet and freezing rain across the mid-Hudson Valley and Taconic Region. Most areas in the immediate Capital

District reported between 6 and 11 inches of snow. This storm resulted in very slow travel during the holiday season, especially on the evening of the 26th and morning on the 27th.

March 2 and 7, 2018

On March 2nd, heavy wet snow blanketed higher elevations. Winds gusted 35 to 50 mph in some areas. On March 7th, 8 to 12 inches of snow accumulated across much of the Capital District, eastern Catskills, and Lake George-Saratoga Region. The heavy snowfall resulted in the closure of Interstates 84 and 88 and the New York State Thruway to high-profile vehicles. This event was the second major winter storm in less than a week.

January 19–20, 2019

One of the worst storms of the 2018–2019 winter season occurred, when, between January 19th and January 20th, Rensselaer County communities received between 8 and 18 inches of snow (8 inches in the Town of Berlin; 18 inches in Speigletown). County snowfall totals were generally higher in western areas.



Figure 187: Valley Falls, January 20, 2019¹⁹²

March 22–24, 2024

An early spring storm left more than 80,000 utility customers without power in the Capital Region. Smacked by a blend of snow and ice, Albany and Rensselaer counties were among the hardest hit areas, accounting for 81 percent of all National Grid customers left in the dark for several hours. Troy Mayor Carmella Mantello, Rensselaer County Executive Steve McLaughlin and Albany County Executive Dan McCoy issued Emergency Declarations on Saturday to allow crews to clean up fallen trees and help restore power to the hardest-hit areas in the region.

¹⁹² Source: Photo courtesy of Spectrum Local News (Korrine Jasmine)



Figure 188: A look at a downed tree in Troy. A powerful early Spring storm rocked the Capital Region, dumping 6 to 10 inches of snow and up to 0.5 inches of ice in Albany and Rensselaer counties.¹⁹³

Table 92 lists storm data between **01/01/1998 and 11/30/2023** for blizzards, heavy snow, and ice storms as reported in the NOAA NCEI database:¹⁹⁴

Table 92: NOAA NCEI Rensselaer County Winter Storm Events 1998–2023

Hazard Type	Location	Date	No. of Deaths	Additional Information/Highlights
Heavy Snow	West. Rensselaer East. Rensselaer	10/29/2000	0	This snowfall amount was enough to establish a new record for that date, and the fourth snowiest October ever recorded at Albany.
Heavy Snow	East. Rensselaer	10/22/2002	0	Albany officially reported 0.5 inches of snowfall, which established a record snowfall for the date, and was the most snow recorded in October since 1987. No significant problems were reported to the National Weather Service as a result of this storm.
Heavy Snow	West. Rensselaer East. Rensselaer	03/01/2005	0	Not available
Heavy Snow	West. Rensselaer East. Rensselaer	03/08/2005	0	Not available

¹⁹³ The Record, 2024, Several Rensselaer County officials issue emergency declarations after Saturday’s winter weather conditions – Troy Record

¹⁹⁴ NCEI, 2023, Storm Events Database - Search Results | National Centers for Environmental Information (noaa.gov)

Hazard Type	Location	Date	No. of Deaths	Additional Information/Highlights
Blizzard	West. Rensselaer East. Rensselaer	03/14– 16/2007	0	There was a widespread extreme public impact, with many roads severely impacted and schools closed for two days. A state of emergency was issued for all New York counties, and tractor-trailers were banned on most area interstates. Numerous counties issued travel bans on county roads. Much of the train service across the region was canceled, and all flights were grounded at Albany International Airport.
Ice Storm	West. Rensselaer East. Rensselaer	01/15/2007	0	Significant icing occurred from the freezing rain during Monday, leading to widespread power outages from downed trees and tree limbs, and from power transformers which shorted out. This ice storm had a significant impact on travel and economy across the region. Estimates of 85,000 customers were affected by power outages at the height of the ice storm Monday afternoon and evening.
Heavy Snow	West. Rensselaer East. Rensselaer	02/13– 14/2007	0	Snowfall amounts ranged from 1 to 3 feet across the hardest-hit areas of New York State, which included the Schoharie Valley, western Mohawk Valley, and southern Adirondacks. As much as 40 to 42 inches of snow fell in portions of western Montgomery County and southern Herkimer County. Snowfall amounts ranged from 6 to 9 inches within the Schoharie Valley and the Capital Region, with 6 to 11 inches across the eastern Catskills and the mid-Hudson Valley region. The heavy snowfall created treacherous travel conditions for the Thursday evening commute, leaving some roads impassable, and also resulted in the early dismissals of numerous schools and businesses.

Hazard Type	Location	Date	No. of Deaths	Additional Information/Highlights
Heavy Snow	West. Rensselaer East. Rensselaer	03/16– 17/2007	0	This storm brought widespread snowfall amounts of 10 to 20 inches across eastern New York, with some amounts of near two feet across the eastern Catskill region, as well as within a band extending across southern Columbia, and northern Dutchess counties of New York. This storm had significant adverse impacts to travel and commerce across the region from Friday afternoon into early Saturday morning. Travel was treacherous for the Friday evening commute, with numerous accidents reported.
Heavy Snow	West. Rensselaer East. Rensselaer	12/13/2007	0	Snowfall amounts ranged from 6 to 9 inches within the Schoharie Valley and the Capital Region, with 6 to 11 inches across the eastern Catskills and the mid-Hudson Valley region. The heavy snowfall created treacherous travel conditions for the Thursday evening commute, leaving some roads impassable, and also resulted in the early dismissals of numerous schools and businesses.
Heavy Snow	West. Rensselaer East. Rensselaer	12/30– 31/2007	0	Total snowfall accumulations ranged from 8 to 10 inches, with 10 inches reported in Grafton, and 9 inches in East Nassau. The heavy snow led to hazardous driving conditions during the Monday morning commute and caused numerous businesses to close or delay opening on Monday morning. Most schools were already closed due to the Holiday break.
Ice Storm	West. Rensselaer	02/13/2008	0	The ice accretion led to downed tree limbs, trees, and power lines across the hardest-hit regions, as well as scattered power outages. A significant wintry mix led to numerous school closings and treacherous travel conditions Wednesday morning.

Hazard Type	Location	Date	No. of Deaths	Additional Information/Highlights
				Dozens of accidents were reported during the Wednesday morning commute due to ice-covered roadways.
Ice Storm	West. Rensselaer East. Rensselaer	12/11– 12/2008	0	The ice storm resulted in widespread damage to trees and resultant power outages across eastern New York, where an estimated 220,000 utility customers lost power. Many schools and businesses were shut down for several days due to the loss of power and impassable roads from extensive fallen debris, resulting in significant economic and societal impacts. States of Emergency were declared across large portions of eastern New York. Approximately 30 to 40 roads were closed across the county due to debris from fallen tree limbs and wires.
Heavy Snow	West. Rensselaer East. Rensselaer	12/19– 20/2008	0	Snowfall totals generally ranged from 6 to 12 inches across eastern New York, including the southeast Catskills and mid-Hudson Valley, extending north into the Capital District and across the Lake George Saratoga region into the southern Adirondacks. However, locally higher amounts of up to 16 inches fell across portions of northern Warren County. This heavy snowfall closed numerous schools and businesses Friday through Saturday and led to treacherous travel conditions across much of eastern New York State.
Heavy Snow	West. Rensselaer	12/31/2008	0	A swath of moderate to locally heavy snow fell across the western and central Mohawk Valley, and the immediate Capital District, where snowfall amounts ranged from 6 to 11 inches. Farther south and east, snowfall amounts were less, mainly 3 to 6 inches. Even lighter amounts fell across northern Herkimer and

Hazard Type	Location	Date	No. of Deaths	Additional Information/Highlights
				Hamilton counties, where amounts generally ranged from 1 to 4 inches. The most intense snow coincided with the Wednesday morning commute, creating treacherous travel conditions as snowfall rates reached 1 to 2 inches per hour from the Capital region into the western Mohawk Valley. Numerous businesses had either delayed openings or were closed. Most schools were already off due to the Holiday break.
Heavy Snow	East. Rensselaer	01/10/2009	0	Snowfall amounts generally ranged from 4 to 8 inches, although locally higher amounts of between 8 and 11 inches fell across portions of the Capital Region, the eastern Catskills, the Schoharie Valley and Helderbergs.
Heavy Snow	East. Rensselaer	12/09/2009	0	The snow was heavy at times with snowfall rates of 1 to 2 inches per hour in some locations. Snowfall totals ranged from around 5 inches up to 12 inches.
Heavy Snow	East. Rensselaer	01/01–03/2010	0	There was widespread snowfall in east-central New York along with blustery conditions, resulting in blowing and drifting of the snow. Snowfall totals in these areas were generally 6 to 16 inches, with up to 2 feet across portions of Washington County and eastern Rensselaer County.
Heavy Snow	West. Rensselaer East. Rensselaer	02/23/2010	0	Generally, 1 to 2 feet of snow accumulated across much of east central New York, with the highest amounts at altitudes of 1500 feet or higher. The heavy wet snow resulted in widespread power outages across east central New York, including impacts to six major Central Hudson Gas and Electric transmission lines. Numerous trains were delayed and or canceled on Amtrak between Albany–

Hazard Type	Location	Date	No. of Deaths	Additional Information/Highlights
				Rensselaer and Poughkeepsie due to power outages.
Heavy Snow	West. Rensselaer East. Rensselaer	01/01/2014	0	Generally, 1 to 2 feet of snow accumulated across much of east central New York with the highest amounts above 1500 feet. The heavy wet snow resulted in widespread power outages across east-central New York, including impacts to six of Central Hudson Gas and Electric’s major transmission lines. Numerous trains were delayed and or canceled. There were many flights canceled at the Albany International Airport. Many cities declared Snow Emergencies.
Heavy Snow	West. Rensselaer East. Rensselaer	02/05/2014	0	Snow fell at rates more than 1 to 2 inches per hour, allowing for a messy commute during the morning hours, especially for areas from the Capital Region on southward. An additional heavy band of snowfall developed across mainly the northern and western parts of the region during the afternoon, with snowfall once again falling at rates of 1 inch per hour. By the time the snow tapered off in the evening hours, the entire region received a widespread 6 to 12 inches, with a few spots nearing 15 inches.
Heavy Snow	West. Rensselaer	02/13– 14/2014	0	Between 1 and 2 feet of snow fell across much of the Lake George Saratoga Region, Capital Region, Schoharie Valley, eastern Catskills, Taconics, and mid-Hudson Valley. Somewhat lower amounts of 4 to 10 inches fell across the Adirondacks and western Mohawk Valley. Very strong winds, gusting as high as 40 mph, occurred as the storm pulled away. This led to significant blowing and drifting of the snowfall. Many towns and cities had difficulty with snow removal, as much of the snowfall also

Hazard Type	Location	Date	No. of Deaths	Additional Information/Highlights
				<p>remained from a recent early February snowstorm as well. The weight of snow caused a few roof collapses across the region. A large tree branch broke due to the weight of the snow in Schoharie County, causing 700 power customers to lose power. As a result of the storm, Governor Andrew M. Cuomo declared a State of Emergency for the mid-Hudson as well as the following counties: Albany, Fulton, Montgomery, Rensselaer, Saratoga, Schenectady, Schoharie, Washington, and Warren across east-central New York. Restrictions were put on travel, including the banning of all tractor trailer trucks on Interstate 84 in Dutchess County and all tandem trailers on the New York State Thruway.</p>
Heavy Snow	West. Rensselaer East. Rensselaer	02/02/2015	0	<p>Most areas received 8 to 16 inches of snowfall with the highest totals in the Albany County Hilltown, Mohawk Valley, Taconics, and eastern Catskills.</p>
Heavy Snow	West. Rensselaer East. Rensselaer	02/07– 10/2015	0	<p>Three days of snowfall impacted all of eastern New York between February 7th and 9th. By the time all of the snow ended, amounts ranged between 5 and 17 inches across the area, with the heaviest amounts in the Sacandaga area of the southern Adirondacks and Schoharie County.</p>
Heavy Snow	East. Rensselaer	11/20– 21/2016	0	<p>The very cold air moving behind the storm allowed for lake-effect snow to occur across the western Adirondacks, western Mohawk Valley and Schoharie County. Although valley areas saw only a few inches of snowfall, high terrain areas saw upwards of 10 inches, with some localized totals near 2 feet within the highest terrain of the northern Taconics in eastern Rensselaer County.</p>

Hazard Type	Location	Date	No. of Deaths	Additional Information/Highlights
				<p>This heavy snowfall, accompanied by gusty winds, caused some power outages across the higher terrain. Media reported statewide outages totaled at 52,000 customers by Monday afternoon, with many of these located across the northern and central Taconics.</p>
Heavy Snow	West. Rensselaer East. Rensselaer	02/09/2017	0	<p>This system became a full-fledged Nor'easter as it emerged offshore and tracked just off the tip of Long Island. Storm total snowfall of 8 to 18 inches was observed from the wee hours through the early afternoon hours of February 9. The snowfall was very intense for a time around sunrise, with Albany International Airport reporting 4 inches in one hour. Toward the end of the event, a localized band of moderate to heavy snow formed over western portions of the Capital District, further enhancing snowfall totals.</p>
Heavy Snow	East. Rensselaer	01/04/2018	0	<p>A heavy band of snow impacted portions of the Taconics from the late morning through the afternoon hours of January 4, resulting in snowfall rates up to 3 inches per hour and total snowfall amounts mainly in the range of 7 to 15 inches. To the west of the heavy snow band across the Hudson, Mohawk, and Schoharie Valleys, a widespread 3 to 7 inches of snowfall occurred. Gusty northerly winds occurred with this system as well, with gusts of 30–45 mph recorded. The winds and falling snow contributed to reduced visibility and blowing and drifting of snow.</p>

Hazard Type	Location	Date	No. of Deaths	Additional Information/Highlights
Heavy Snow	West. Rensselaer East. Rensselaer	12/01– 03/2019	0	Storm total snowfall amounts were heaviest in the central Mohawk Valley, Helderbergs, northeastern Catskills, and the Capital District, where totals of 18 to 28 inches were common. The 22.6 recorded at Albany International Airport made this the eighth largest snowstorm on record, the fourth largest December storm, and the largest since the March 1993 Superstorm. It snowed for 39 hours and 14 minutes consecutively. Many schools were closed for two consecutive days, and numerous flights were delayed or cancelled. The governor declared a state of emergency for several of the hard-hit counties and deployed the National Guard to assist in cleanup efforts.
Heavy Snow	West. Rensselaer East. Rensselaer	12/16/2020	1 indirect	Bands of heavy snow occurred with snowfall rates of 1 to 2 inches per hour reported at times. An exceptionally strong band of snow sat over areas just north and west of Albany for several hours, producing snowfall rates of 3 to 6 inches per hour. Areas within this heavy band included Schoharie, Schenectady, Saratoga, southeast Warren and Washington counties, extending into southern Vermont. Here, snowfall totals ranged from 24 to around 40 inches. Snowfall amounts of 12 to 24 inches were common elsewhere, aside from northern portions of Herkimer and Hamilton counties, which were on the outer periphery of the storm, as snowfall amounts trended downward to between 2 and 6 inches there. The Albany International Airport received 22.9 inches of snow, which marked it as the eighth biggest snowstorm on record and the fourth biggest in the month of December, just surpassing the December 1–3, 2019,

Hazard Type	Location	Date	No. of Deaths	Additional Information/Highlights
				snowstorm. New York Governor Andrew Cuomo declared a State of Emergency for 18 counties in New York including Albany, Columbia, Dutchess, Greene, Montgomery, Rensselaer, Saratoga, Schenectady, Schoharie, Ulster and Washington. Key impacts: transportation delays, traffic accidents, flight cancellations, school closures, one indirect fatality.

Table 93 lists FEMA Declarations for Severe Winter Storm/Snowstorm with Rensselaer as a Designated County from 1998 to 2023:

Table 93: Federal Declared Emergencies and Disasters for Winter Storms

Incident Period	Type: EM or DR
12/25/2002 to 01/04/2003	New York Snowstorm (EM-3173-NY) declared on 02/25/2003
12/11/2008 to 12/31/2008	New York Severe Winter Storm (EM-3299-NY) declared on 12/18/2008
12/11/2008 to 12/31/2008	New York Severe Winter Storm (DR-1827-NY) declared on 3/4/2009
12/26/2010 to 12/27/2010	New York Severe Winter Storm (DR-1957-NY) declared on 02/18/2011
03/14/2017 to 03/15/2017	New York Severe Winter Storm (DR-4322-NY) declared on 07/12/2017

PROBABILITY OF FUTURE EVENTS AND CLIMATE CHANGE

ICE STORM

Ice storms have occurred regularly in Rensselaer County. Based on occurrences reported in NOAA’s NCEI Storm Events Database (1996–2018), Rensselaer County has about a 0.04 percent daily probability of an ice storm episode, or about 0.1 ice storms per year. New York State’s relatively high latitude supports freezing temperatures from late October or mid-November through mid-April.

The 2023 SHMP purports that climate change does not appear to have had an impact on ice storms in New York as of 2023. There is limited evidence on the potential for climate change to affect the frequency and intensity of ice storms. In the Great Lakes, reduced ice cover and warmer water temperatures caused by climate change may increase the amount and extent of lake-effect ice storms.

Figure 189 shows the risk that every municipality in Rensselaer County will have to be affected by a significant Ice Storm. The data of the map comes from the FEMA National Risk Index (NRI), which uses past events to establish the probability that a similar event can occur again.

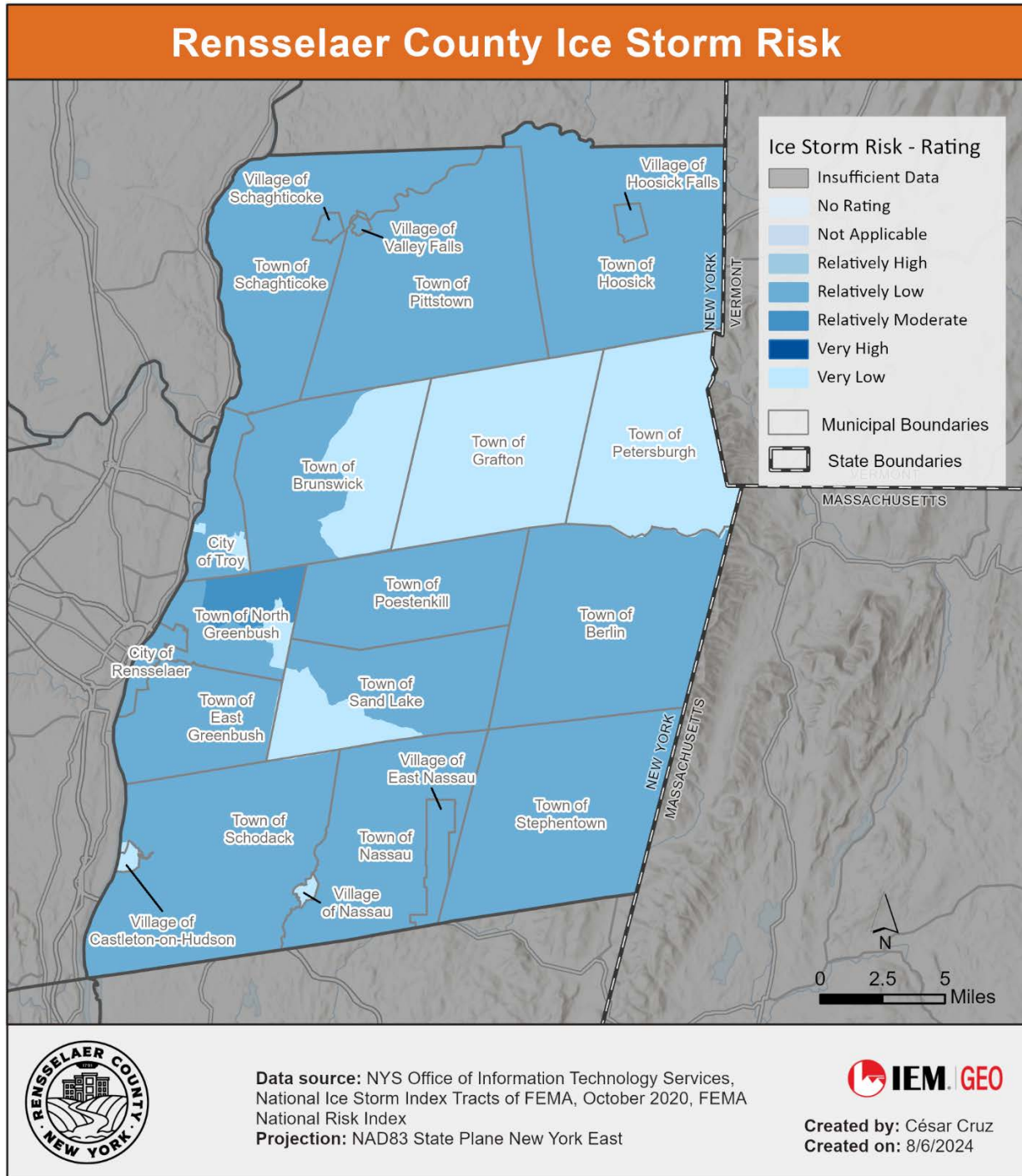


Figure 189: Ice Storm Risk Rating – National Risk Index

SNOWSTORM

Snowstorms have a history of very frequent occurrence in Rensselaer County. Based on occurrences reported in NOAA's NCEI Storm Events Database (1996–2018), Rensselaer County has about a 1.83 percent daily probability of a snowstorm episode, or about 6.7 winter storms per year. New York State's relatively high latitude supports freezing temperatures from late October or mid-November through mid-April.

The 2023 SHMP makes the following statement related to snowstorms in New York State and climate change:

- In the Northeast, although snow events may become less common and snowstorms (including lake-effect snowstorms) may increase in frequency relative to historical levels.
- However, this trend may not hold toward the end of the century as warming continues to increase.
- One study suggests that, although snowstorms will likely become less common due to atmospheric warming, when temperatures are cold enough, they will produce more snow than before.
- Climate-linked changes to snowstorm duration are unclear at this time.
- The relative increase in extreme snowstorm events over the past decades has been linked to climate change.

In the distribution of storm events as shown in Figure 9, blizzards constitute **37 percent**, and snowstorm events **36 percent** (for a total of **73 percent**), of all storm occurrences in Rensselaer County. Even though Rensselaer County has fewer severe winter storm events than many of the other counties in New York, it is particularly vulnerable to snowstorms and blizzards when compared to other types of storm events.¹⁹⁵ That said, the severity of future winter storms bringing potentially heavier snowstorms, coupled with rapidly fluctuating temperatures, can lead to above-average flooding due to more rapid melting of snow and ice, as is currently predicted with ongoing climate change.

¹⁹⁵ Source: [Rensselaer County New York natural disaster risk assessment on Augurisk](#)

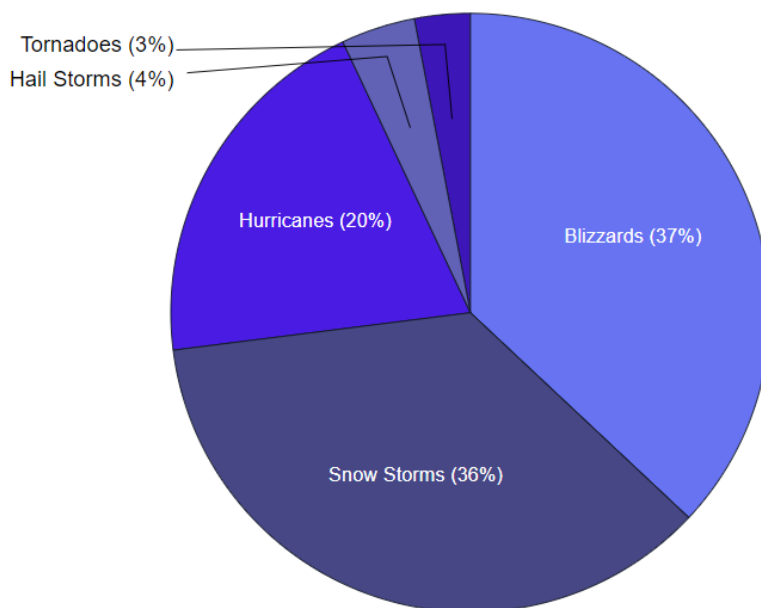


Figure 190: Distribution of Storm Events in Rensselaer County

Vulnerability Assessment

EXPOSURE

To understand its vulnerability to natural hazards, a community must determine the assets that are exposed or vulnerable in the hazard area. All of Rensselaer County has been identified as a hazard area for winter storms (ice storms and snowstorms). Therefore, all assets in the county (i.e., population, structures, critical facilities, and lifelines) are vulnerable.

IMPACT ON COUNTY ASSETS

All county assets are exposed to the impact of winter storms, particularly when such storms lead to power outages, which affect all aspects of daily life.

In summary, to understand its vulnerability to natural hazards, a community must determine the assets that are exposed or vulnerable in the hazard area. All of Rensselaer County has been identified as a hazard area for winter storms, including ice storms, blizzards, and heavy snowstorms. Therefore, all assets in the county—population, animals (livestock), structures (including roads), critical facilities, and public transportation—are vulnerable.

ESTIMATED IMPACT AND POTENTIAL LOSSES

Ice storms and snowstorms are of significant concern to Rensselaer County because of their direct and indirect impacts, which include delays, accidents, health problems, cascading effects such as utility failure,

and stress on community resources. Heavy snow can immobilize a region and paralyze a city by 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. The cost of removing snow and repairing damage 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 communications 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.

Figure 191 illustrates the NRI rating the expected annual loss (EAL) for Rensselaer County at \$538,000 from ice storm, with a rating of relatively high EALs and a risk score of 89.7.

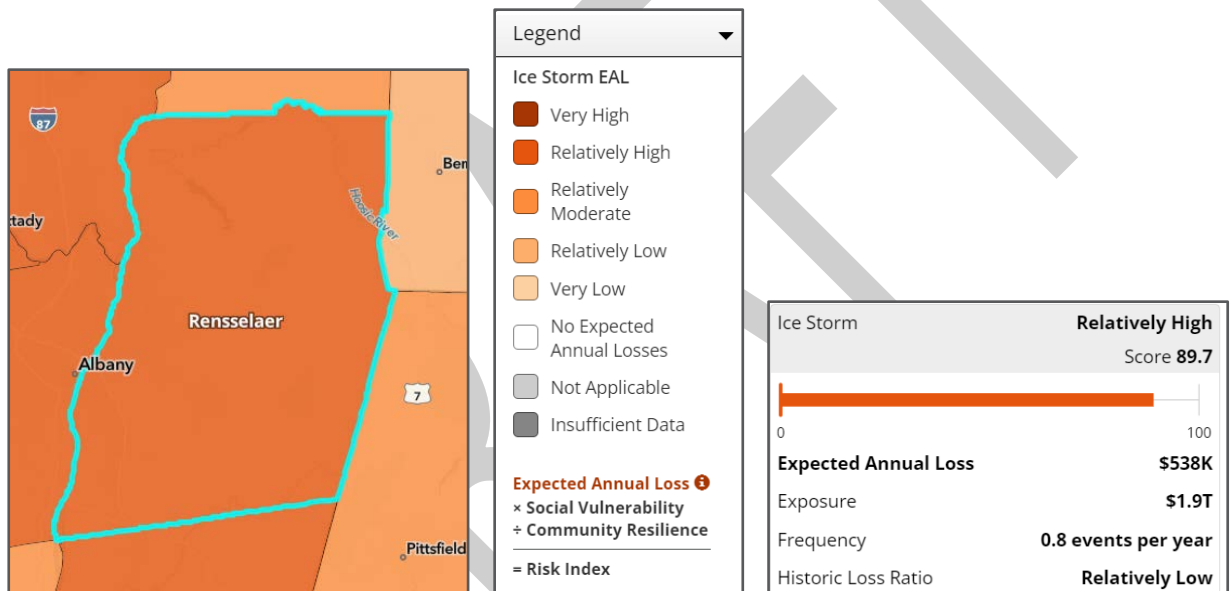


Figure 191: Ice Storm - Expected Annual Loss, Rensselaer County¹⁹⁶

Figure 192 illustrates the NRI rating the EAL for Rensselaer County at \$35,000 from ice storm, with a rating of relatively low EAL and a risk score of 43.0.

¹⁹⁶ Source: [Map | National Risk Index \(fema.gov\)](https://www.fema.gov)

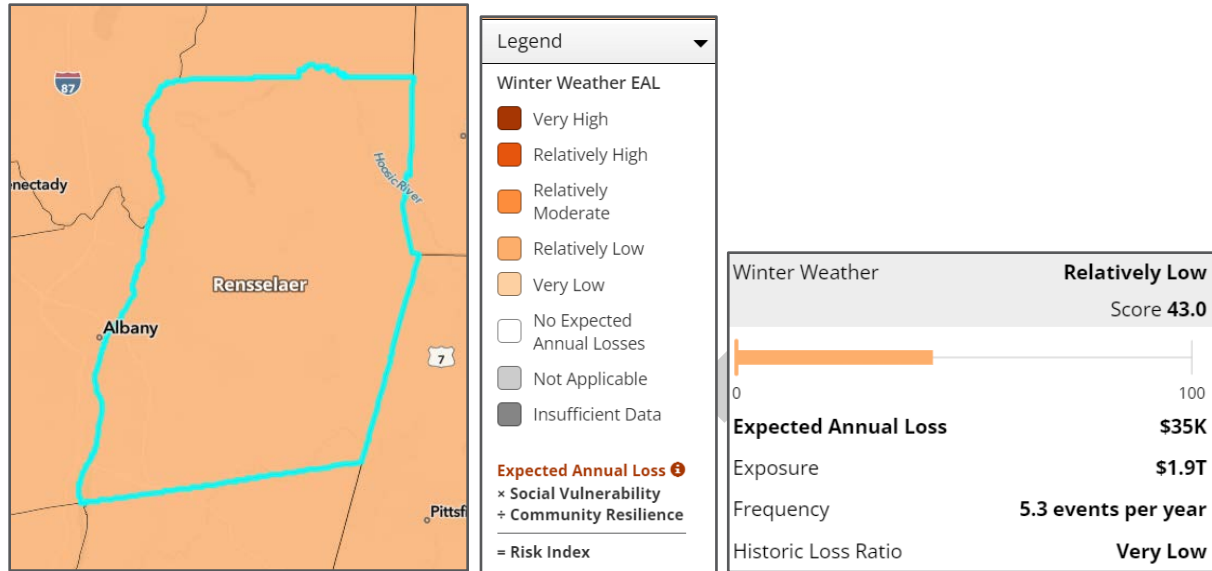


Figure 192: Snowstorm - Expected Annual Loss, Rensselaer County¹⁹⁷

VULNERABLE POPULATIONS

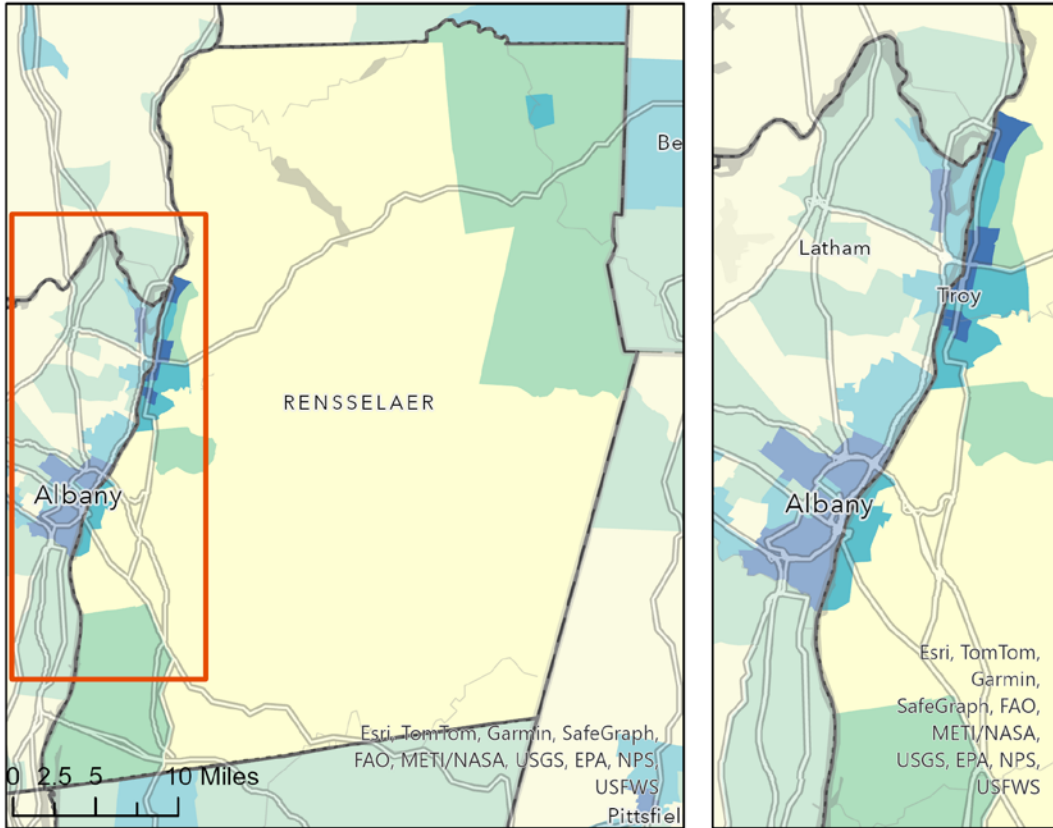
Vulnerable populations are those who face difficulties in accessing and using the standard resources provided during disaster preparedness, planning, response, and recovery. Vulnerable populations include individuals of different ages, classes, races, linguistic backgrounds, and economic statuses, among other social, cultural, and psychological factors. The relevance of each factor may vary depending on the nature of the emergency.

Severe winter weather increases the likelihood of car accidents, hypothermia, frostbite, carbon monoxide poisoning, and heart attacks due to overexertion.¹⁹⁸ These storms, which can sometimes last several days, can bring extreme cold, freezing rain, snow, ice, and high winds, including blizzards. The aftermath of a winter storm can have an impact on a community or region for weeks or even months. Winter storms can cause road closures, hinder public transportation, and impede emergency response. By disrupting everyday life in the community and hampering mobility, such storms can harm the economy. Secondly, power outages and structural damage to buildings can occur. The weight of snow can cause roofs to collapse, as well as knock down trees and power lines.

The highest density of socially vulnerable populations are located in urban areas such as Troy and East Greenbush (east of Albany).

¹⁹⁷ Source: [Map | National Risk Index \(fema.gov\)](https://www.fema.gov/national-risk-index)

¹⁹⁸ Source: [Health and Safety Concerns for All Disasters | Natural Disasters and Severe Weather \(cdc.gov\)](https://www.cdc.gov/disasters/severe-weather/)



2020 Social Vulnerability Index for Rensselaer County

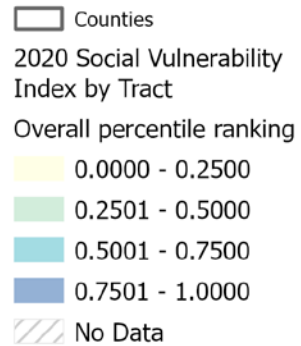


Figure 193: Overall Social Vulnerability¹⁹⁹

COMMUNITY LIFELINES

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Community Lifelines are essential for the well-being of any community. They provide support and assistance to individuals who require help, especially during times of crisis. FEMA Community Lifelines are a critical component of emergency management in the United States.

¹⁹⁹ [CDC/ATSDR Social Vulnerability Index 2020](#)

These Lifelines are designed to address the essential needs of a community during and after a disaster. There are eight Lifelines, each with its own focus and purpose.



Figure 194: FEMA Community Lifelines

All eight FEMA Lifelines are applicable for winter storms. Heavy snowfall and ice accumulation can have disastrous consequences, such as collapsing roofs, falling trees, and power outages resulting in frozen and burst pipes and a lack of life-saving heat sources. This can result in homes and farms being cut off for several days. In rural regions, livestock that are not properly shielded may be at risk. The economic impact of snow removal expenses, repair work, and lost business can be severe in urban areas. Road conditions may be severe enough to impede emergency service vehicles, causing delayed medical care.

VULNERABILITY SCORE

In Rensselaer County, ice storms are common and, although their potential consequences are high, they have not historically caused significant damages. The NRI includes data on the EAL to individual natural hazards, historical loss, and overall risk at a county and Census tract level. The following table provides an overview of each category at the county level.

Table 94: National Risk Index - Ice Storm²⁰⁰

Ice Storm	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Relatively High	High	Relatively High	\$538K	High

Based on the NRI, Rensselaer County has a relatively high ice storm risk, with a risk index score of **88.1** for ice storm, which is higher than the national average percentile (see Figure 195).

²⁰⁰ Map | National Risk Index (fema.gov)

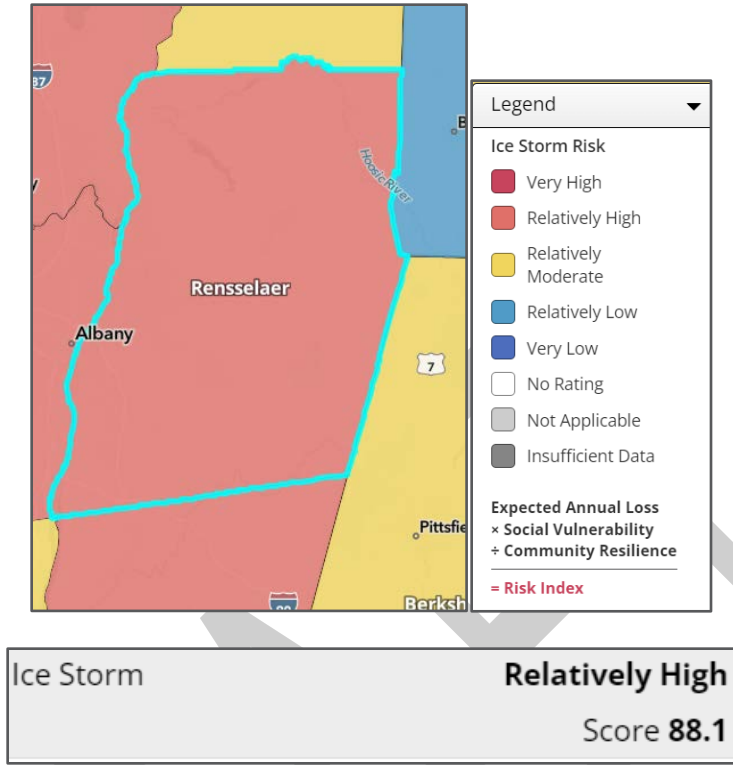


Figure 195: National Risk Index for Ice Storm in Rensselaer County²⁰¹

In Rensselaer County, winter storms are common and, although their potential consequences are high, they have not historically caused significant damages. The NRI includes data on the EAL to individual natural hazards, historical loss, and overall risk at a county and Census tract level. The following table provides an overview of each category at the county level.

Table 95: National Risk Index - Winter Weather²⁰²

Winter Weather	Likelihood	Potential Consequence	Relative Risk	Average Annualized Losses	Hazard Priority
	Relatively low	High	Relatively low	\$35K	Low

Based on the NRI, Rensselaer County has a relatively low winter weather risk, with a risk index score of **36.8** for winter weather, which is lower than the national average percentile (Figure 196).

²⁰¹ Ibid

²⁰² [Map | National Risk Index \(fema.gov\)](https://www.fema.gov)

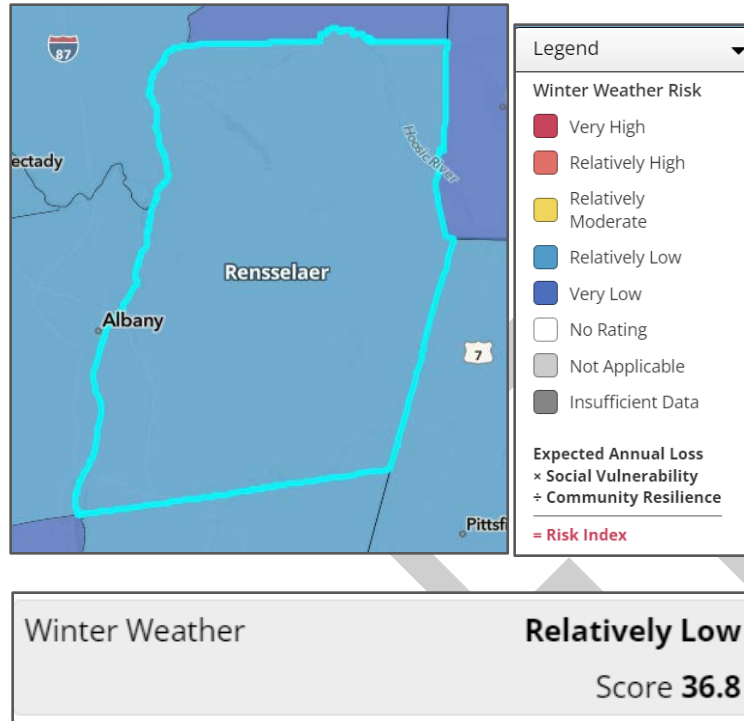


Figure 196: National Risk Index Score for Winter Weather in Rensselaer County²⁰³

Consequence Analysis

This section aims to systematically identify and assess possible consequences of potential impacts on public confidence, public safety, responder safety, continuity of operations, property, facilities, infrastructure, environment, and confidence in the jurisdictions' governance.²⁰⁴

The consequence analysis employs a quantitative ranking score to capture consequences related to the potential impacts. Impacts are defined as the unwanted or harmful effects a hazard can cause on the community. The Local Mitigation Committee may use the findings to enhance further resiliency approaches in its planning efforts and mitigation project implementation.

The tables below showcase the consequence analysis by combining categories and score rankings of minor, limited, critical, and catastrophic.

²⁰³ Ibid.

²⁰⁴ 2022 Emergency Management Accreditation Standards

Table 96: Categories and Descriptions

Categories	Description
Human Impacts	Public safety Responder safety
Property Impacts	Property Facilities Infrastructure
Operational Impacts	Continuity of operations Delivery of services
Environmental Impacts	Environment
Economic Impacts	Interruption of business services
Public Confidence Impacts	Public confidence in the jurisdictions' governance

Table 97: Severity Scale

Category	Probability	Score	Description
Human Impacts	Minor	1	The likelihood of injury or death is nonexistent or diminished.
	Limited	2	The likelihood of injury or death is limited.
	Critical	3	The likelihood of injury or death is moderate.
	Catastrophic	4	The likelihood of injury or death is significant.
Property Impacts	Minor	1	The likelihood of property damage or loss is nonexistent or limited. Temporary shutdown of critical facilities for a day.
	Limited	2	The likelihood of property damage or loss is over 10% Complete shutdown of critical facilities for 1+ days.
	Critical	3	The likelihood of property damage or loss is significantly over 25%. Complete shutdown of essential facilities for 30 days or more.
	Catastrophic	4	The likelihood of property damage or loss is significantly over 50%. Complete shutdown of critical facilities for 30+ days.
Operational Impacts	Minor	1	The likelihood of operational impacts is nonexistent or limited to 1 day.
	Limited	2	The likelihood of operational impacts is 1+ days.
	Critical	3	The likelihood of operational impacts may last up to 30 days.

Category	Probability	Score	Description
Environmental Impacts	Catastrophic	4	The likelihood of operational impacts may last 30+ days.
	Minor	1	The likelihood of environmental impacts is nonexistent or limited.
	Limited	2	The likelihood of environmental impacts over 10%.
	Critical	3	The likelihood of environmental impacts is significantly over 25%.
	Catastrophic	4	The likelihood of environmental impacts is significantly over 50%.
Economic Impacts	Minor	1	The likelihood of business disruption is nonexistent or limited.
	Limited	2	The likelihood of business disruption is over 10%.
	Critical	3	The likelihood of business disruption is over 25%.
	Catastrophic	4	The likelihood of business disruption is over 50%.
Public Confidence Impacts	Minor	1	The likelihood of a lack of public confidence is nonexistent or limited.
	Limited	2	The likelihood of a lack of public confidence is limited to less than 10%.
	Critical	3	The likelihood of a lack of public confidence is moderate, over 25%.
	Catastrophic	4	The likelihood of a lack of public confidence is significant, over 50%.

Table 98: Extreme Temperature (Cold and Heatwaves)

Category	Impact Score	Description
Human Impacts	2	Extreme temperatures may impact those who cannot stay inside during extreme temperature events. Additionally, there might be impacts for those inside a home with no or limited air-conditioning or heat. During these events, extreme heat or cold could worsen the conditions for vulnerable populations and those with medical issues.
Property Impacts	2	Properties may sustain structural damages due to exposure to extreme temperatures.
Operational Impacts	2	Partners tasked with providing essential services may experience a higher demand for services.
Environmental Impacts	2	Extreme temperatures may create a situation where flora and fauna could die off.

Category	Impact Score	Description
Economic Impacts	2	Public utilities, hospitals, and other businesses tasked with providing service to support may experience disruption as demand for additional services may increase.
Public Confidence Impacts	2	Elected officials are held responsible for the response to significant events. The public trust in the governance may decline if the recovery does not progress quickly or effectively.

Table 99: Hurricane/Tropical Storm

Category	Impact Score ²⁰⁵	Description
Human Impacts	3	The likelihood of injury or death may be significant.
Property Impacts	3	Properties may sustain structural damages, and restoration of services (utilities, communication) may take longer than expected.
Operational Impacts	3	Partners tasked with providing essential services may experience a higher demand for services (for food, water, shelter, search and rescue services).
Environmental Impacts	3	Significant impact on fauna and flora and destruction of wildlife habitat.
Economic Impacts	3	Public utilities, hospitals, and other businesses tasked with providing service to support may experience disruption as demand for additional services may increase.
Public Confidence Impacts	3	Elected officials are held responsible for the response to significant events. The public trust in the governance may decline if the recovery does not progress quickly or effectively.

Table 100: Lightning

Category	Impact Score	Description
Human Impacts	1	The likelihood of injury or death is nonexistent or limited.
Property Impacts	1	Properties may experience effects such as utility outages.
Operational Impacts	1	Partners tasked with providing essential services may experience a slight increase in demand for services.

²⁰⁵ The impact score will vary depending on the intensity of the event

Category	Impact Score	Description
Environmental Impacts	1	There is a likelihood of slight impacts on fauna and flora or the destruction of wildlife habitats. However, there may be increased risk due to secondary effects from the initial event.
Economic Impacts	1	Businesses may experience disruption due to potential impacts (utility outages or damage to buildings).
Public Confidence Impacts	1	Elected officials are held responsible for the response to significant events. The public trust in the governance may decline if the recovery does not progress quickly or effectively.

Table 101: Tornado

Category	Impact Score ²⁰⁶	Description
Human Impacts	1	The likelihood of injury or death may increase depending on the event's severity.
Property Impacts	1	The likelihood of damage may increase depending on the event's severity; restoration of services (utilities, communications) may be needed.
Operational Impacts	1	Government service may limit or shut down scheduled operations for nonessential services.
Environmental Impacts	1	There is a likelihood of slight impacts on fauna and flora or the destruction of wildlife habitats. However, there may be increased risk due to secondary effects from the initial event.
Economic Impacts	1	Depending on the event's severity, businesses may experience disruptions from commodity damages.
Public Confidence Impacts	1	Elected officials are held responsible for the response to significant events. The public trust in the governance may decline if the recovery does not progress quickly or effectively.

²⁰⁶ The impact score will vary depending on the intensity of the event.

Table 102: High Winds

Category	Impact Score	Description
Human Impacts	1	The likelihood of injury or death may increase depending on the event's severity. Historical records indicate a total of 20 injuries have been reported.
Property Impacts	2	The likelihood of damage may increase depending on the event's severity. Historical records indicate the county suffered over 2.3 million in damages from high wind events. Restoration of services (utilities, communications) may be needed.
Operational Impacts	1	Government service may limit or shut down scheduled operations for nonessential services.
Environmental Impacts	1	There is a likelihood of slight impacts on fauna and flora or the destruction of wildlife habitats.
Economic Impacts	1	Depending on the event's severity, businesses may experience disruptions from commodity damages. Historical records indicate the county suffered \$31,000 in agricultural damages.
Public Confidence Impacts	1	Elected officials are held responsible for the response to significant events. The public trust in the governance may decline if the recovery does not progress quickly or effectively.

Table 103: Winter Storms

Category	Impact Score ²⁰⁷	Description
Human Impacts	2	There might be impacts for those inside a home with no or limited heat. These events may worsen the conditions for the vulnerable populations and those with medical conditions.

²⁰⁷ The impact score will vary depending on the intensity of the event.

Category	Impact Score ²⁰⁷	Description
Property Impacts	2	The likelihood of damage may increase depending on the event's severity. There is a high likelihood that restoration of services (utilities, communications) may be needed.
Operational Impacts	2	Government service may limit or shut down scheduled operations for nonessential services. Partners tasked with providing essential services may experience a higher demand for services (for food, water, shelter, search and rescue services).
Environmental Impacts	2	There is a likelihood of impacts on fauna and flora and the destruction of wildlife habitats.
Economic Impacts	2	Depending on the event's severity, businesses may experience disruptions from restricted access to goods and services.
Public Confidence Impacts	1	Elected officials are held responsible for the response to significant events. The public trust in the governance may decline if the recovery does not progress quickly or effectively.

Table 104: Drought

Category	Impact Score ²⁰⁸	Description
Human Impacts	2	There is a higher likelihood of impact on vulnerable populations and those with medical conditions. Water restrictions may be implemented.
Property Impacts	1	There is potential for damage to utilities, communication structures, and other infrastructure. Homes and businesses could have foundational issues.
Operational Impacts	1	Government service may limit or shut down scheduled operations for nonessential services. Partners tasked with providing essential services may experience a higher demand for services (for food, water, shelter, search and rescue services).

²⁰⁸ The impact score will vary depending on the intensity of the event.

Category	Impact Score ²⁰⁸	Description
Environmental Impacts	2	A reduction in groundwater supplies will likely impact fauna and flora and the destruction of wildlife habitats. There is a higher likelihood of soil degradation.
Economic Impacts	2	Depending on the event's length and severity, businesses may experience disruptions. Agriculture and those businesses reliant on water services could experience immediate impacts, such as loss of crops and livestock.
Public Confidence Impacts	1	Elected officials are held responsible for the response to significant events. The public trust in the governance may decline if the recovery does not progress quickly or effectively.

Table 105: Flooding

Category	Impact Score ²⁰⁹	Description
Human Impacts	2	There is a likelihood of evacuations in various areas within the county. There is also a likelihood of displacement of residents, in addition to the potential for the loss of life and injury. Residents and responders could be exposed to hazardous materials.
Property Impacts	2	There is potential for damage to utilities, communications, structures) may be needed. Potential for short- or long-term road and transportation closures.
Operational Impacts	2	Government service may limit or shut down scheduled operations for nonessential services. Partners tasked with providing essential services may experience a higher demand for services (for food, water, shelter, search and rescue services).
Environmental Impacts	2	Flooding will likely impact fauna and flora and the destruction of wildlife habitats. There is a higher likelihood of soil degradation. There is a potential likelihood that drinking water may be affected.

²⁰⁹ The impact score will vary depending on the intensity of the event.

Category	Impact Score ²⁰⁹	Description
Economic Impacts	2	Depending on the event's length and severity, businesses may experience disruptions. Agriculture and those businesses reliant on water services could experience immediate impacts, such as loss of crops and livestock.
Public Confidence Impacts	1	Elected officials are held responsible for responding to significant events. If the recovery does not progress quickly or effectively, public trust in governance may decline.

Table 106: Earthquake

Category	Impact Score ²¹⁰	Description
Human Impacts	1	The potential risk from falling and ground debris is insignificant. Mapping indicates that Rensselaer County has a minimal likelihood of having an event.
Property Impacts	1	There is potential for damage to utilities, communications, and structures.
Operational Impacts	2	Government service may limit or shut down scheduled operations for nonessential services. Partners tasked with providing essential services may experience a higher demand for services (for food, water, shelter, search and rescue services).
Environmental Impacts	1	Impacts on the environment will depend on the event's location and severity.
Economic Impacts	1	Depending on the event's length and severity, businesses may experience disruption.
Public Confidence Impacts	1	Elected officials are held responsible for responding to significant events. If the recovery does not progress quickly or effectively, public trust in governance may decline.

²¹⁰ The impact score will vary depending on the intensity of the event.

Table 107: Landslide

Category	Impact Score ²¹¹	Description
Human Impacts	1	There is minimal potential that isolated residents may see a delay in services. Responders in isolated areas may experience an increase in fatigue.
Property Impacts	1	There is potential for damage to utilities, communications, and structures. Roads may temporarily close or have restricted access.
Operational Impacts	1	Government services near the impacted area may temporarily reduce or limit operational hours.
Environmental Impacts	2	Impacts on the environment will depend on the event's location and severity.
Economic Impacts	1	Businesses in nearby areas may be impacted and experience a temporary reduction in operations.
Public Confidence Impacts	1	Elected officials are held responsible for responding to significant events. If the recovery does not progress quickly or effectively, public trust in governance may decline.

Table 108: Wildfire

Category	Impact Score ²¹²	Description
Human Impacts	1	Residents and responders may be affected by smoke inhalation. There is a possibility for the displacement of residents. There is a higher likelihood of impact on vulnerable populations and those with medical conditions.
Property Impacts	1	There is potential for damage to utilities, communications, and structures. Roads may temporarily close or have restricted access.

²¹¹ The impact score will vary depending on the intensity of the event.

²¹² The impact score will vary depending on the intensity of the event.

Category	Impact Score ²¹²	Description
Operational Impacts	1	Government services near the impacted area may temporarily reduce or limit operational hours.
Environmental Impacts	2	Impacts on the environment will depend on the event's location and severity.
Economic Impacts	1	Businesses in nearby areas may be impacted and experience a temporary reduction in operations.
Public Confidence Impacts	1	Elected officials are held responsible for responding to significant events. If the recovery does not progress quickly or effectively, public trust in governance may decline.

Table 109: Hazardous Materials

Category	Impact Score ²¹³	Description
Human Impacts	3	There is a higher likelihood of impact on vulnerable populations and those with medical conditions. Depending on the event, the affected area may require residents to shelter in place. Responders would require equipment decontamination. Additionally, due to protection gear, responders will likely experience increased fatigue.
Property Impacts	2	There is potential for damage to utilities, communications, and structures. Roads may temporarily close or have restricted access.
Operational Impacts	1	Government services near the impacted area may temporarily reduce or limit operational hours.
Environmental Impacts	3	Impacts on the environment will depend on the event's location and severity. Clean-up restoration efforts might be extensive and complex.
Economic Impacts	1	Businesses in nearby areas may be impacted and experience a temporary reduction in operations and loss in revenue.

²¹³ The impact score will vary depending on the intensity of the event.

Category	Impact Score ²¹³	Description
Public Confidence Impacts	1	Elected officials are held responsible for responding to significant events. If the recovery does not progress quickly or effectively, public trust in governance may decline.

Table 110: Utility and Infrastructure Failure

Category	Impact Score ²¹⁴	Description
Human Impacts	3	There is a likelihood that the health and safety of residents and responders will be impacted. Lack of access to clean water, air-conditioning, or heating may worsen the medical conditions of vulnerable populations. Emergency response time can be impacted by traffic and communication conditions.
Property Impacts	2	There is potential for damage to utilities, communications, and structures. Roads may temporarily close or have restricted access.
Operational Impacts	2	Government services near the impacted area may temporarily reduce or limit operational hours. Partners tasked with providing essential services may experience a higher demand for services (for food, water, shelter, search and rescue services).
Environmental Impacts	3	Impacts on the environment will depend on the event's location and severity.
Economic Impacts	2	Businesses in nearby areas may be impacted and experience a temporary reduction in operations.
Public Confidence Impacts	1	Elected officials are held responsible for responding to significant events. If the recovery does not progress quickly or effectively, public trust in governance may decline.

²¹⁴ The impact score will vary depending on the intensity of the event.

Table 111: Terrorism

Category	Impact Score ²¹⁵	Description
Human Impacts	3	There is a likelihood that the health and safety of residents and responders will be impacted, including an increase in stress, anxiety, and fatigue. Depending on the event, responders may need protective gear to prevent exposure to hazardous materials.
Property Impacts	3	There is potential for damage to utilities, communications, and structures. Roads may temporarily close or have restricted access.
Operational Impacts	2	Government services near the impacted area may temporarily reduce or limit operational hours. Partners tasked with providing essential services may experience a higher demand for services (for food, water, shelter, search and rescue services).
Environmental Impacts	3	Impacts on the environment will depend on the event's location and severity.
Economic Impacts	3	Businesses in nearby areas may be impacted and experience a temporary reduction in operations.
Public Confidence Impacts	1	Elected officials are held responsible for responding to significant events. If the recovery does not progress quickly or effectively, public trust in governance may decline.

Capability Assessment

This capability assessment examines the plan participants' ability to implement and manage a comprehensive approach to mitigating risk, which includes a range of mitigation actions. This assessment identifies the strengths, opportunities for improvement, and resources of participating jurisdictions as a means of developing an effective hazard mitigation program. Furthermore, the capabilities identified in this assessment are collectively evaluated so as to develop recommendations that support the implementation of effective mitigation actions throughout the county.

²¹⁵ The impact score will vary depending on the intensity of the event.

As a part of this plan update, the participants attended a capability assessment meeting and shared activities that have effectively helped mitigate risk in their communities. Then, each participant was provided a questionnaire and self-assessment on their capabilities and their effectiveness in supporting mitigation measures. These capability assessment forms were based on FEMA templates. They requested information about existing plans, policies, and regulations that contribute to or could be enhanced to facilitate the effective implementation of hazard mitigation actions. The forms included an evaluation of four types of capabilities:

- Planning and regulatory
- Administrative and technical
- Financial
- Education and outreach

This section describes the activities currently underway that contribute to, or can be used for, hazard mitigation. Due to the limited response from participating jurisdictions, this capability assessment emphasizes the technical and financial resources available at the state and federal levels, which are accessible to the county’s communities for implementing an effective hazard mitigation program.

Capabilities and Resources – Rensselaer County Jurisdictions

Planning and Regulatory

Rensselaer County and its jurisdictions have several policies, programs, and capabilities that can be used to help prevent and minimize future damages resulting from hazards. These tools are valuable instruments in pre- and post-disaster hazard mitigation as they facilitate implementing mitigation activities through the community’s current legal and regulatory framework. These policies, programs, and capabilities are described in greater detail for the participating jurisdictions and the state and federal levels. The diamond symbol (◆) in each table indicates that the resource/capability was reported by the planning team as available in the local jurisdiction.

Table 112: Planning and Regulatory

Jurisdiction	Building Code	Zoning Ordinance	Subdivision Ordinance	Special Purpose Ordinance	Growth Management	Site Plan Review Requirements	Comprehensive/Master Plan	Capital Improvements	Economic Development	Emergency Response Plan	Post-Disaster Recovery Plan	Post-Disaster Recovery	Real Estate Disclosure
Town of Berlin	◆	◆	◆			◆				◆			
Town of Brunswick	◆	◆	◆	◆		◆	◆			◆	◆		
Village of Castleton-on-Hudson	◆	◆	◆	◆		◆	◆			◆			◆
Town of East Greenbush	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆		
Village of East Nassau	◆	◆	◆	◆	◆	◆	◆	◆		◆			
Town of Grafton	◆		◆	◆		◆	◆			◆			
Village of Hoosick Falls	◆	◆	◆	◆	◆	◆							
Town of Hoosick	◆	◆	◆	◆	◆	◆			◆	◆			
Town of Nassau	◆	◆	◆	◆	◆	◆				◆			
Village of Nassau		◆		◆		◆	◆	◆		◆			
Town of North Greenbush	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆		
Town of Petersburg	◆		◆	◆		◆							
Town of Pittstown	◆	◆	◆	◆		◆	◆			◆			
Town of Poestenkill	◆	◆	◆	◆		◆	◆			◆			
City of Rensselaer	◆	◆	◆	◆		◆	◆	◆	◆	◆			
Town of Sand Lake	◆	◆	◆	◆	◆	◆	◆		◆	◆			
Town of Schaghticoke	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	
Village of Schaghticoke		◆				◆	◆	◆					
Town of Schodack	◆	◆	◆	◆		◆	◆		◆	◆	◆		
Town of Stephentown	◆	◆	◆	◆		◆	◆			◆			◆

Jurisdiction	Building Code	Zoning Ordinance	Subdivision Ordinance	Special Purpose Ordinance	Growth Management	Site Plan Review Requirements	Comprehensive/ Master Plan	Capital Improvements	Economic Development	Emergency Response Plan	Post-Disaster Recovery Plan	Post-Disaster Recovery	Real Estate Disclosure
City of Troy	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆	◆
Village of Valley Falls	◆									◆			
County of Rensselaer							◆	◆		◆	◆		

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Administrative and Technical

A local government's ability to develop and implement mitigation projects, policies, and programs is contingent upon its staff and resources. Administrative capability is determined by evaluating whether there are an adequate number of personnel to complete mitigation activities. Similarly, technical capability can be evaluated by assessing the level of knowledge and technical expertise of local government employees, such as personnel skilled in surveying and the use of geographic information systems (GISs). Table 113 summarizes the administrative and technical capabilities currently in place in each participating jurisdiction. The diamond symbol (◆) indicates that the resource/capability was reported by the plan participants as known to be available in the local jurisdiction. It should be noted that several communities indicated that their administrative and technical capabilities are handled (in full or in part) by a consultant, with additional personnel hired as needed, and several stated that they did not have staff for any of the functions.

Table 113: Administrative and Technical

Jurisdiction	Planner(s) or Engineer(s) with Knowledge of Land Development and Management Practices	Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	Planner(s) or Engineer(s) with an Understanding of Natural and/or Human Caused Hazards	Floodplain Manager	Surveyors	Staff with Education or Expertise to Assess the Community's Vulnerability to Hazards	Personnel Skilled in Geographic Information Systems (GIS) and/or HAZUS	Scientists Familiar with the Hazards of the Community	Emergency Manager	Grant Writers	Staff with Expertise or Training in Benefit/Cost Analysis
Town of Berlin				♦							
Town of Brunswick	♦	♦	♦	♦		♦	♦				
Village of Castleton-on-Hudson				♦					♦	♦	♦
Town of East Greenbush	♦	♦	♦	♦	♦	♦	♦		♦	♦	♦
Village of East Nassau	♦	♦	♦	♦		♦			♦		
Town of Grafton	♦	♦	♦	♦		♦			♦		
Village of Hoosick Falls				♦		♦			♦		
Town of Hoosick				♦		♦			♦		
Town of Nassau	♦	♦		♦		♦			♦	♦	
Village of Nassau	♦		♦	♦							
Town of North Greenbush	♦	♦	♦	♦	♦	♦			♦	♦	♦
Town of Petersburg		♦		♦			♦		♦	♦	
Town of Pittstown				♦					♦		
Town of Poestenkill	♦	♦	♦	♦							
City of Rensselaer	♦	♦	♦	♦		♦	♦			♦	♦

Jurisdiction	Planner(s) or Engineer(s) with Knowledge of Land Development and Management Practices	Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	Planner(s) or Engineer(s) with an Understanding of Natural and/or Human Caused Hazards	Floodplain Manager	Surveyors	Staff with Education or Expertise to Assess the Community's Vulnerability to Hazards	Personnel Skilled in Geographic Information Systems (GIS) and/or HAZUS	Scientists Familiar with the Hazards of the Community	Emergency Manager	Grant Writers	Staff with Expertise or Training in Benefit/Cost Analysis
Town of Sand Lake	◆			◆						◆	◆
Town of Schaghticoke		◆	◆	◆		◆		◆			
Village of Schaghticoke	◆	◆	◆	◆	◆	◆			◆	◆	◆
Town of Schodack	◆	◆	◆	◆		◆			◆		
Town of Stephentown				◆		◆					
City of Troy	◆	◆	◆	◆		◆	◆				
Village of Valley Falls				◆							
County of Rensselaer	◆	◆	◆			◆	◆		◆	◆	

Financial

A local government's ability to implement mitigation activities is also associated with the funding available for policies and projects. Funding for such initiatives is often locally based on revenue, financing, and outside grants. Costs associated with mitigation activities range from staffing and administrative costs to the actual cost of the mitigation project. Table 3 summarizes the fiscal capabilities currently in place in each participating jurisdiction. The diamond symbol (◆) indicates that the planning team reported the resource/capability as available in the local jurisdiction. It should be noted that many communities reported not knowing whether they had one or more financial capabilities available to them. It is recommended that communities research the funding opportunities identified in this plan further during the plan maintenance phase so that they may make use of a wider range of financial capabilities for mitigation in the future.

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Table 114: Fiscal

Jurisdiction	Community Development Block Grants (CDBG)	Capital Improvements Project Funding	Authority to Levy Taxes for Specific Purposes	Fees for Water, Sewer, Gas, or Electric Service	Impact Fees for Homebuyers or Developers for New Developments/Homes	Incur Debt through General Obligation Funds	Incur Debt through Special Tax and Revenue Bonds	Incur Debt through Private Activity Bonds	Withhold Spending in Hazard-Prone Areas	State Mitigation Grant Programs	Other
Town of Berlin	◆	◆		◆		◆					
Town of Brunswick		◆	◆	◆	◆	◆	◆	◆	◆	◆	
Village of Castleton-on-Hudson	◆	◆	◆	◆	◆	◆					
Town of East Greenbush	◆	◆	◆	◆	◆	◆	◆		◆	◆	
Village of East Nassau		◆	◆	◆	◆	◆	◆		◆		
Town of Grafton	◆	◆	◆			◆	◆				
Village of Hoosick Falls	◆	◆	◆	◆		◆	◆				
Town of Hoosick	◆	◆	◆	◆		◆	◆			◆	
Town of Nassau	◆	◆	◆	◆	◆	◆	◆			◆	◆
Village of Nassau		◆	◆	◆		◆	◆				
Town of North Greenbush	◆	◆	◆	◆	◆	◆	◆	◆	◆		
Town of Petersburg			◆	◆		◆					
Town of Pittstown		◆	◆			◆	◆				
Town of Poestenkill			◆	◆		◆	◆				◆
City of Rensselaer	◆	◆	◆	◆	◆	◆	◆			◆	
Town of Sand Lake	◆		◆	◆	◆	◆		◆		◆	◆
Town of Schaghticoke	◆	◆	◆	◆	◆	◆	◆		◆		

Jurisdiction	Community Development Block Grants (CDBG)	Capital Improvements Project Funding	Authority to Levy Taxes for Specific Purposes	Fees for Water, Sewer, Gas, or Electric Service	Impact Fees for Homebuyers or Developers for New Developments/Homes	Incur Debt through General Obligation Funds	Incur Debt through Special Tax and Revenue Bonds	Incur Debt through Private Activity Bonds	Withhold Spending in Hazard-Prone Areas	State Mitigation Grant Programs	Other
Village of Schaghticoke	◆	◆	◆	◆		◆			◆		
Town of Schodack	◆	◆	◆	◆	◆	◆					
Town of Stephentown	◆	◆	◆			◆	◆			◆	
City of Troy	◆	◆	◆	◆	◆	◆	◆			◆	
Village of Valley Falls		◆	◆	◆		◆	◆				
County of Rensselaer	◆	◆	◆	◆		◆	◆	◆	◆	◆	



Education and Outreach

Table 115: Education and Outreach

Jurisdiction	Community Newsletters	Hazard Awareness Campaigns (e.g., Firewise, Storm Ready, Severe Weather Awareness Week, School Programs)	Public Meetings/Events (Please Describe)	Emergency Management Listserv	Local News	Distributing Hard Copies of Notices (e.g., Public Libraries, Door-to-Door Outreach)	Insurance Disclosures/Outreach	Organizations that Represent, Advocate for, or Interact with Underserved and Vulnerable Communities (Please Describe)	Social Media (Please Describe)	Other? (Please Describe)
Town of Berlin										
Town of Brunswick										
Village of Castleton-on-Hudson	◆	◆	◆	◆	◆	◆			◆	
Town of East Greenbush	◆		◆			◆		◆		
Village of East Nassau										
Town of Grafton										
Village of Hoosick Falls	◆		◆		◆	◆		◆	◆	
Town of Hoosick										
Town of Nassau	◆		◆		◆	◆			◆	
Village of Nassau										
Town of North Greenbush		◆	◆	◆	◆	◆			◆	
Town of Petersburg	◆	◆	◆		◆				◆	

Jurisdiction	Community Newsletters	Hazard Awareness Campaigns (e.g., Firewise, Storm Ready, Severe Weather Awareness Week, School Programs)	Public Meetings/Events (Please Describe)	Emergency Management Listserv	Local News	Distributing Hard Copies of Notices (e.g., Public Libraries, Door-to-Door Outreach)	Insurance Disclosures/Outreach	Organizations that Represent, Advocate for, or Interact with Underserved and Vulnerable Communities (Please Describe)	Social Media (Please Describe)	Other? (Please Describe)
Town of Pittstown	♦	♦			♦	♦				
Town of Poestenkill	♦		♦		♦	♦		♦		
City of Rensselaer										
Town of Sand Lake										
Town of Schaghticoke	♦		♦		♦	♦				
Village of Schaghticoke	♦	♦	♦	♦	♦	♦	♦			♦
Town of Schodack									♦	♦
Town of Stephentown			♦		♦	♦			♦	
City of Troy										
Village of Valley Falls										
County of Rensselaer			♦					♦	♦	

Participation in the National Flood Insurance Program

Flooding is the costliest natural hazard in the United States, and with the promulgation of recent federal regulations, homeowners nationwide are experiencing increasingly high flood insurance premiums. Community participation in the National Flood Insurance Program (NFIP) provides an opportunity for additional grant funding associated specifically with flooding issues. Assessment of the jurisdiction's current NFIP status and compliance provides planners with a greater understanding of the local flood management program, opportunities for improvement, and available grant funding opportunities.

The NFIP's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Participants are offered discounted flood insurance premium rates to reflect the reduced flood risk resulting from the community actions' meeting the three goals of the CRS. These goals are reducing flood damage to insurable property, strengthening and supporting insurance aspects of the NFIP, and encouraging a comprehensive approach to floodplain management.

This section identifies and evaluates existing programs for each participating jurisdiction.

The following Rensselaer County jurisdictions participate in the NFIP:

- Town of Berlin
- Town of Brunswick
- Village of Castleton-on-Hudson
- Town of East Greenbush
- Village of East Nassau
- Town of Grafton
- Village of Hoosick Falls
- Town of Hoosick
- Town of Nassau
- Village of Nassau
- Town of North Greenbush
- Town of Petersburg
- Town of Pittstown
- Town of Poestenkill
- City of Rensselaer
- Town of Sand Lake

- Town of Schaghticoke
- Village of Schaghticoke
- Town of Schodack
- Town of Stephentown
- City of Troy
- Village of Valley Falls

For more detailed information, please refer to the annexes.

Conclusion

This capability assessment finds that, based on updated capability assessment worksheets submitted by each plan participant, Rensselaer County's communities have generally limited resources with which to implement hazard mitigation strategies. Each capability assessment can be found separately in each jurisdiction annex. The following sections summarize the overall capabilities and opportunities for improvement for the jurisdictions combined.

Each jurisdiction's capabilities have been thoroughly assessed, and their respective annexes have clearly outlined opportunities for improvement. These documents provide valuable insights into the strengths and areas that need enhancement, enabling the development of targeted strategies. By leveraging existing capabilities while addressing identified gaps, jurisdictions can foster growth and improve the overall effectiveness of their operations.

The assessment of legal and regulatory capabilities for implementing hazard mitigation strategies revealed that 36 percent of jurisdictions rated these capabilities moderate to high. In contrast, only 18 percent recognized their technical capabilities at this level. At the same time, slightly better results were seen for administrative capabilities, with 23 percent of jurisdictions falling into the moderate-to-high category. Alarming, only 9 percent of communities reported having moderate-to-high financial resources dedicated to hazard mitigation initiatives. Additionally, the commitment of political leadership to advancing policies aimed at reducing hazard vulnerabilities was rated as moderate or high by only 45 percent of respondents. These findings underscore the variability in capabilities across jurisdictions and highlight the need for targeted strategies to strengthen resources and engage leadership effectively in mitigating hazards.

Capabilities and Resources – State of New York

The 2025 SHMP includes evaluating capabilities and resources at the state's disposal for disaster preparedness, response, recovery, and mitigation. The evaluation consists of assessments of state resources in the following categories:

- NYS Capabilities

- Agencies
- Resiliency
- Risk assessment
- Technical support
- Funding
- Project management
- Construction
- Outreach
- Research
- Climate
- Historic/environmental
- Regulatory

The Rensselaer County multijurisdictional hazard mitigation plan (MJHMP) incorporates many of the resources identified in the State Plan so as to clarify which capabilities local jurisdictions should consider in developing local hazard mitigation.

A snapshot of state capabilities is briefly described in this assessment portion.

The 2019 SHMP section on New York State’s (NYS’s) capabilities provides more detailed information, which can be found online at: <https://mitigateny.availabs.org/capabilities>.

State Agencies, Departments, and Partnerships with Roles in Mitigation

- **DPC.** The State of New York, through the New York State Consolidated Laws, Executive Law Article 2-B entitled “State and Local: Natural and Man-Made Disaster Preparedness,” established the Disaster Preparedness Commission (DPC) to examine all aspects of natural and human-induced disasters. The DPC is tasked with examining all disaster prevention, response, and recovery aspects, and preparing state disaster preparedness plans. It comprises commissioners, directors, and chairs of 29 state agencies, the American Red Cross, and four participating federal agencies (FEMA, NOAA, USACE, and USGS). The DPC meets annually to discuss hazard management programs across the state. The DPC’s responsibilities include preparing state disaster plans, directing state disaster operations, and coordinating those with local government operations and federal, state, and private recovery efforts.
- **DHSES.** The Division of Homeland Security and Emergency Services (DHSES) is the state’s primary agency for response, recovery, and mitigation. DHSES manages FEMA’s Public Assistance (PA), Hazard Mitigation Assistance (HMA), and Individual Assistance (IA) programs. These programs provide annual and/or disaster-specific funding resources to assist communities when the damages incurred exceed

local resources. The DHSES also works to fund, coordinate, and implement specific and appropriate efforts for local hazards and oversees the development of federally mandated HMPs.

- **DOS.** The NYS Department of State (DOS) works to fund, coordinate, and implement efforts that are specific and appropriate for hazards in local contexts. The DOS oversees the development of Countywide Resiliency Plans and strives to strengthen resiliency through a better understanding of risk. DOS offers local governments many forms of assistance for preparing, implementing, and sustaining mitigation activities. For instance, the DOS Division of Coastal Resources provides local governments with technical assistance in the completion of Local Waterfront Revitalization Plans (LWRP). These comprehensive land and water use plans contain many components and address such issues as coastal erosion management and waterfront development. Upon completion of the LWRP, the DHSES Mitigation Section reviews the plan to ensure that the policies and strategies outlined do not place people or property at undue risk of a hazardous event. Approximately 66 local jurisdictions in NYS have approved LWRPs.
- **DEC.** The NYS Department of Environmental Conservation (DEC) directs many programs and assistance useful to local governments in developing mitigation strategies. The DEC provides technical assistance to local governments through the Floodplain Management Program (FMP) and the Flood Protection Bureau (FPB). The FMP assists local governments in adopting and administering local floodplain management ordinances. Similarly, the FPB provides technical assistance in eligibility requirements for the NFIP to qualify local governments for entrance into the program. Each of these forms of assistance aids local governments in developing and implementing flood mitigation activities to eliminate or reduce future flood damages. Further technical assistance in floodplain management is provided through Community Assistance Visits administered by the DEC in collaboration with the DHSES. These two agencies partner together to provide technical assistance on floodplain management program development. The visits are prioritized by assessing needs, as conducted by the DEC and the DHSES. In addition to the Community Assistance visits, these agencies also coordinate to provide assistance for flood mitigation planning and sponsor technical assistance workshops for local governments interested in developing flood mitigation programs.
- **DOT.** The NYS Department of Transportation (DOT) incorporates mitigation techniques into routine design, construction, and maintenance procedures. It engages in mitigation projects, technical assistance activities, and training. For example, the DOT guides local communities in developing plans for the long-term re-routing of traffic due to a disaster. Furthermore, the DOT engages in mitigation projects, such as elevating roads in flood-prone areas, cleaning ditches and streams, managing stormwater erosion, tree pruning, and the bi-annual inspection of bridges. The DOT also develops and conducts training sessions on heavy snow removal and snow plowing for highway maintenance supervisors and equipment operators.
- **GOSR.** The Governor’s Office of Storm Recovery (GOSR) was created to manage the statewide recovery effort in response to Hurricane Sandy. The State Hazard Mitigation Planning Team is currently evaluating ways to integrate the GOSR into existing state agency structures for future administration of disaster recovery funding.
- **IAWG.** The Interagency Adaptation Working Group (IAWG) addresses climate change and climate adaptation issues through an interagency partnership of 11 agencies. The IAWG has conducted

downscaled climate change projections, a statewide assessment of climate change adaptation needs, sea level rise mapping, impacts of climate variables (e.g., precipitation, wind, heat) on various sectors, and has created a Climate Change Science Clearing House with centralized information on the latest science on climate in NYS (available online at: <https://www.nyclimatescience.org/>).

Statewide Planning Efforts

- **CEMP.** The NYS Comprehensive Emergency Management Plan (CEMP) identifies the state's overarching policies, authorities, and response organizational structure that should be implemented pre- or post-emergency/disaster. The CEMP includes three volumes: Volume 1 is the NYS HMP, Volume 2 is the State Response and Short-Term Recovery Plan, and Volume 3 is the State Long-Term Redevelopment Plan.
- **CEPA.** The New York County Emergency Preparedness Assessments (CEPA) is a tool to help state and local stakeholders assess risk, capabilities, and the potential need for support and resources during emergencies or disasters.
- **EMAP.** The NYS Emergency Management Accreditation Program (EMAP) is a voluntary assessment and accreditation process for state and local government programs responsible for coordinating prevention, mitigation, preparedness, response, and recovery activities for disasters.

Technical Support, Training, and Funding Resources

- **Technical Support and Training Resources.** NYS offers many programs to assist individuals and communities in assessing, communicating, and mitigating natural hazard risk. Local municipalities can access state-level technical support programs and specialized training resources to build individuals' and communities' capacities to implement mitigation actions and projects. The 2019 SHMP identifies 66 technical support and training capabilities. More information can be found online at: <https://mitigateny.availabs.org/capabilities/techsupport>.
- **Funding Resources.** Financial capabilities are the resources that a jurisdiction has access to, or is eligible to use, to fund mitigation actions. The state and federal governments administer funding to encourage the development and implementation of long-term, cost-effective, and resilient mitigation projects. The 2019 SHMP identifies over 75 state and federal funding resources for hazard mitigation. More information can be found online at: <https://mitigateny.availabs.org/capabilities/administerfunding>.

Conclusion: State Resources

This capability assessment finds that the State of New York's various departments collectively have significant legal, technical, and fiscal tools and resources necessary to implement hazard mitigation strategies and support local governments' mitigation initiatives.

Capabilities and Resources: Federal

FEDERAL RESOURCES

FEMA has developed many documents addressing hazard mitigation at the local level. In what follows, brief descriptions of key resource documents are provided.

- **Local Mitigation Planning Handbook.** This handbook is the official guide for local governments to develop, update, and implement local mitigation plans. While federal requirements have not changed, the Handbook provides revised and expanded guidance, offering practical approaches, tools, worksheets, and local mitigation planning examples for how communities can engage in effective planning to reduce long-term risk from natural hazards and disasters. The Handbook can be found on the FEMA website at: <http://www.fema.gov/library/viewRecord.do?id=7209>.
- **Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards, January 2013.** This document aims to provide a resource that communities can use to identify and evaluate a range of potential mitigation actions for reducing the risk of natural hazards and disasters. This document focuses on mitigation, an action taken to reduce or avoid long-term hazard risk. Ideas for mitigation actions are presented for the following natural hazards: drought, earthquake, erosion, extreme temperatures, flood, hail, landslide, lightning, sea level rise, severe wind, severe winter weather, storm surge, subsidence, tornado, tsunami, and wildfire. This resource can be found on the FEMA website at: http://www.fema.gov/media-library-data/20130726-1904-25045-0186/fema_mitigation_ideas_final508.pdf.
- **Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials.** This document aims to provide brief and practical information to local government officials on best integrating hazard mitigation into the full range of community planning activities. It is intended for those engaged in any local planning, but is primarily designed for community planners and emergency managers responsible for hazard mitigation planning. This resource can be found on the FEMA website at: http://www.fema.gov/media-library-data/20130726-1908-25045-0016/integrating_hazmit.pdf.
- **How-to Guides.** FEMA has developed a series of nine “how-to guides” to assist states, communities, and tribes in enhancing their hazard mitigation planning capabilities. The first four guides mirror the four major phases of hazard mitigation planning used in developing the Rensselaer County MJHMP. The last five address special topics in hazard mitigation planning, such as using benefit-cost analyses and integrating human-made hazards. The use of worksheets, checklists, and tables makes these guides a practical source of guidance for all stages of the hazard mitigation planning process. They also include special tips on meeting DMA 2000 requirements.
- **Post-Disaster Hazard Mitigation Planning Guidance for State and Local Governments. FEMA, DAP-12, September 1990.** This handbook explains the basic concepts of hazard mitigation. It is intended to show state and local governments how to develop and achieve mitigation goals within the context of FEMA’s post-disaster hazard mitigation planning requirements. The handbook focuses on approaches to mitigation, with an emphasis on multi-objective planning.

- **Mitigation Resources for Success CD. FEMA 372, September 2001.** This CD contains a wealth of useful mitigation information for state and local government planners and other stakeholders in the mitigation process. It provides mitigation case studies, success stories, information about federal mitigation programs, suggestions for mitigation measures for homes and businesses, appropriate and relevant mitigation publications, and contact information.
- **A Guide to Federal Aid in Disasters. FEMA 262, April 1995.** When disasters exceed the capabilities of state and local governments, the President’s disaster assistance program (administered by FEMA) is the primary source of federal assistance. This handbook discusses the procedures and process for obtaining this assistance and briefly overviews each program.
- **The Emergency Management Guide for Business and Industry. FEMA 141, October 1993.** This guide provides a step-by-step approach to emergency management planning, response, and recovery. It also details a planning process that companies can follow to better prepare for various hazards and emergencies. This effort can enhance a company’s ability to recover from financial and market share losses, damages to equipment, and product or business interruptions. This guide could greatly assist Rensselaer County’s industries and businesses in hazard-prone areas.

IMPORTANT WEBSITES

The following websites provide focused access to valuable planning resources for communities interested in sustainable development initiatives.

- <http://www.fema.gov> – The FEMA website includes links to information, resources, and grants that communities can use to plan and implement sustainable measures. Most notably:
 - > <http://www.fema.gov/what-mitigation> – To learn more about mitigation and how to make it work.
 - > <http://www.fema.gov/multi-hazard-mitigation-planning> – For information about multi-hazard mitigation planning.
 - > <http://www.region2coastal.com/> – For the latest information about coastal New York and New Jersey flood risk.
 - > <https://www.floodsmart.gov/floodsmart/> – The official site of FEMA’s NFIP.
- <http://mitigationguide.org/> – “Beyond the Basics: Best Practices in Local Mitigation Planning” is a website developed as part of a multi-year research study funded by the U.S. Department of Homeland Security and led by the Center for Sustainable Community Design within the Institute for the Environment at the University of North Carolina at Chapel Hill.
- <http://www.planning.org> – The American Planning Association is a non-profit professional association that serves as a resource for planners, elected officials, and citizens concerned with planning and growth initiatives.
- <https://www.planning.org/nationalcenters/hazards/mitigationplanning.htm> – Includes information about hazard mitigation planning prepared by the association’s Hazards Planning Research Center.

- <http://www.ibhs.org> – The Institute for Business and Home Safety is an initiative of the insurance industry to reduce deaths, injuries, property damage, economic losses, and human suffering caused by natural disasters. Online resources provide information on natural hazards, community land use, and ways to protect one’s property from damage.

FEDERAL TECHNICAL ASSISTANCE AND FUNDING

The federal government offers a wide range of funding and technical assistance programs that communities can access to assist in their long-term recovery. Some of these programs are geared toward disaster preparedness and mitigation planning, while others focus on the long-term vitality of communities. Table 116 to Table 118 summarize the federal funding sources available for mitigation activities. Further information on these and other federal programs can be found in the 2019 SHMP at <https://mitigateny.availabs.org/strategies/funding> and in the Catalog of Federal Domestic Assistance (CFDA) available online at www.cfda.gov.

Table 116 Federal Funds Available for Mitigation Activities

Funding Source	Description
Funding that Requires an Approved Hazard Mitigation Plan (HMP):	
Building Resilient Infrastructure and Communities Program (BRIC)	Availability: Pre-disaster; annually Description: The BRIC program funds projects that enhance a community’s capability to withstand and recover from disasters, such as floods, hurricanes, and wildfires. This can include investments in infrastructure improvements, planning initiatives, and capacity building to prepare for, respond to, recover from, and mitigate the impacts of disasters.
Flood Mitigation Assistance Program (FMA)	Availability: Pre-disaster; annually Description: The FMA provides funds for planning and projects to reduce or eliminate the long-term risk of flood damage to repetitive loss (RL) properties and severe repetitive loss (SRL) properties, including residential and non-residential structures insured under the National Flood Insurance Program (NFIP).
Hazard Mitigation Grant Program (HMGP)	Availability: Post-disaster; after FEMA disaster and emergency declarations Description: Following a major presidential disaster declaration, the state receives 15% of the total federal share of the declared disaster damage amount to fund HMPs and projects under the HMGP. The HMGP funds projects in accordance with priorities identified in state, tribal, or local HMPs and enables mitigation measures to be implemented during disaster recovery. The federal government may fund up to 75% of total eligible project costs, with a 25% non-federal match.
High Hazard Potential Dam Program (HHPD)	Availability: Pre-disaster; designated application periods often aligned with federal grant cycles Description: The program is designed to address the risks posed by dams that could cause significant loss of life or major property damage in the event of a failure. This program aims to enhance community safety and infrastructure resilience by focusing on pre-disaster planning and risk mitigation.

Funding Source	Description
Pre-Disaster Mitigation Program (PDM)	Availability: Pre-disaster; annually Description: To provide funds to states, territories, Native American Tribal governments, and communities for hazard mitigation planning and implementing mitigation projects before a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while simultaneously reducing reliance on funding from disaster declarations.
Public Assistance Program (PA) Mitigation	Availability: Post-disaster; after FEMA disaster and emergency declarations Description: Section 406 of the Stafford Act provides funding for mitigation measures in conjunction with the repair of disaster-damaged public facilities. This allows the opportunity to maximize recovery dollars by building back stronger and more resilient, thus reducing potential damage in the future.
Other Available Federal Funds for Mitigation Planning and Implementation:	
Risk Mapping, Assessment, and Planning (RiskMAP)	Availability: Pre-disaster Description: FEMA’s RiskMAP program provides high-quality flood maps and information, tools to better assess the risk from flooding, and planning and outreach support to communities to help them take action to reduce (or mitigate) flood risk. Each RiskMAP flood risk project is tailored to the needs of each community and may involve different products and services.
National Flood Insurance Program (NFIP)	Availability: Pre- or post-disaster Description: The New York State Department of Environmental Conservation administers the NFIP within the State of New York. The office of the State NFIP Coordinator facilitates municipal participation in the NFIP; provides technical assistance, training, and support to local Floodplain Administrators on the minimum NFIP design standards; and encourages participation in the Community Rating System (CRS) program.
FEMA Cooperating Federal Partners (CTP)	Availability: Pre-disaster Description: FEMA’s Cooperating Technical Partnership (CTP) program was created to partner with communities, state or regional agencies, universities, or Native American Tribal governments to enhance hazard data in creating Flood Insurance Rate Maps (FIRMs) and Digital FIRMs. The DHSES intends to pursue this partnership in the future and enhance our awareness of and involvement in the RiskMAP process.

Table 117: Federal Funds Available for Mitigation Activities

Funding Source	Description
Fire Management Assistance Grant Program	Availability: Post-disaster Description: Assistance for the mitigation, management, and control of fires on publicly or privately owned forests or grasslands, which threaten such destruction as would constitute a major disaster.

Funding Source	Description
<p>Community Development Block Grant (CDBG) and Community Development Block Grant – Disaster Recovery (CDBG-DR)</p>	<p>Availability: Pre- or post-disaster Description: Federal grant provided to CDBG “entitlement communities” (typically, municipalities with populations over 50,000 and urban counties with populations over 200,000) and to all states. The CDBG and Community Development Block Grant – Disaster Recovery (CDBG-DR) funds are some of the limited numbers of federal grant funds that lose federal identity when allocated to the state and, therefore, can be used to assist with meeting the non-federal match for Hazard Mitigation Assistance (HMA) grant programs. The 2019 New York State Hazard Mitigation Plan (NYSHMP) notes that the state uses Hurricane Sandy CDBG-DR to assist with meeting non-federal matches for several disasters, including Hurricane Sandy (DR-4085) HMGP projects.</p>
<p>Reimbursement for Firefighting on Federal Property</p>	<p>Availability: Post-disaster Description: Provides reimbursement only for direct costs and losses over and above average operating costs.</p>
<p>National Dam Safety Program (NDSP)</p>	<p>Availability: Pre-disaster Description: The NDSP was formally established by the Water Resources and Development Act of 1996. Led by FEMA, the NDSP is a partnership of the states, federal agencies, and other stakeholders to encourage individual and community responsibility for dam safety. It provides vital support for the improvement of the state dam safety programs that regulate most of the 79,500 dams in the United States.</p>
<p>Land and Water Conservation Fund (LWCF)</p>	<p>Availability: To states, local and conservation organizations Description: Funding for outdoor recreational development, renovation, land acquisition, and planning. The program is divided into two distinct funding pots: state grants and federal acquisition funds.</p>
<p>The Forest Legacy Program (FLP)</p>	<p>Availability: Participation in the FLP is limited to private forest landowners Description: A federal program, in partnership with states, supports state efforts to protect environmentally sensitive forest lands. Designed to encourage the protection of privately owned forest lands, the FLP is entirely voluntary. To maximize the public benefits it achieves, the program focuses on the acquisition of partial interests in privately owned forest lands. The FLP helps states to develop and enact their forest conservation plans. It encourages and supports the acquisition of conservation easements and legally binding agreements transferring a negotiated set of property rights from one party to another without removing the property from private ownership. Most FLP conservation easements restrict development, require sustainable forestry practices, and protect other values. To qualify, landowners are required to prepare a multiple resource management plan as part of the conservation easement acquisition. The federal government may fund up to 75% of project costs, with at least 25% coming from private, state, or local sources. Further to gains associated with the sale or donation of property rights, many landowners also benefit from reduced taxes associated with limits placed on land use. In</p>

Funding Source	Description
	2008, New Jersey had one project funded: Sparta Mountain South at \$2,474,000.

Table 118: Federal Funds Available for Mitigation Activities

Funding Source	Description
Transportation Trust Fund (TTF)	<p>Availability: Pre- and post-disaster</p> <p>Description: Grants are funded by the TTF through a competitive application-based process administered by the Local Aid District Offices. The County Aid Program is funded through the TTF and provides funding for eligible costs of projects included in the county’s approved Annual Transportation Program. The program is intended to improve road and bridge infrastructure under county jurisdiction. Each county receives an annual formula-based allotment that considers county road lane mileage and population.</p>

Mitigation Strategy

The mitigation strategy is often the heart of the plan. This key element details the participants’ vision for reducing risk in each community. Rensselaer County’s mitigation strategy emerged through discussions during plan update meetings, which included recommendations from the public and a risk assessment, an appraisal of existing resources and capabilities, and a review of the proposed hazard mitigation actions within the 2020 plan. The mitigation strategy was developed in three steps:

4. Development of mitigation goals and objectives.
5. Development of hazard mitigation actions.
6. Evaluation and prioritization of mitigation actions.

This section provides a summary of the plan’s goals and the mitigation actions considered. Additional actions are incorporated into the relevant jurisdictional annexes.

Mitigation Goals

FEMA defines goals as “broad, long-term policy and vision statements that explain what is to be achieved by implementing the mitigation strategy.”²¹⁶ These goals apply to each plan participant intending to adopt the plan. The mitigation goals for this plan were developed through consultation with plan participants at a mitigation strategy meeting. During this meeting, the participants considered the

²¹⁶ FEMA, Local Mitigation Planning Policy Guide, [Local Mitigation Planning Policy Guide \(fema.gov\)](https://www.fema.gov/local-mitigation-planning-policy-guide), April 19, 2023.

updated New York State Hazard Mitigation Plan (SHMP) goals and objectives and the goals of the previous Rensselaer County Hazard Mitigation Plan.

The 2023 New York SHMP includes six goals:

1. Protect and Improve the Health and Safety of All People and Communities
2. Federal, State, and Local Coordination
3. Protect Existing Property
4. Increase Awareness
5. Preserve and Restore Natural Systems
6. Build Stronger

These goals are further defined by objectives that describe how they will be accomplished. During the previous plan update, Rensselaer County provided additional details about the goals, similar to the state plan’s objectives. The same format for the mitigation goals is used in this plan. The participants evaluated the previous plan’s goals and agreed they continued to reflect the intention of mitigating risk within the county. However, it was decided that additional emphasis should be given to increasing public awareness and reaching socially vulnerable populations, such as the elderly and low-income households, in particular. These changes are reflected in the revised goals for this updated plan.

The goals of the 2025 Rensselaer County Hazard Mitigation Plan are as follows:

1. **Increase public awareness.** Promote and sustain disaster resilient communities by increasing the awareness of hazard risks within the whole community (general public, elderly and low income, County government, local governments, and key stakeholders), and how this risk can be mitigated.
2. **Improve capabilities.** Enhance and support the capacity and capability of the County and its communities to prepare for, respond to, and recover from disasters and ensure continuity of operations.
3. **Protect existing assets.** Reduce the potential dangers and losses caused by hazards that pose a significant risk to Rensselaer County through implementation of hazard mitigation initiatives that will protect people and property in harm's way (structures, infrastructure, and critical facilities) during future hazard events.
4. **Promote resilient new development.** Promote mitigation actions and construction and design techniques that will minimize or eliminate potential impacts of natural hazards at sites where new development is taking place or where existing development is being expanded.

Mitigation Actions

After identifying mitigation goals, the plan participants evaluated and then selected a comprehensive range of mitigation actions. They include the four types of mitigation actions defined by FEMA:

- **Local Planning and Regulations:** Government authorities, policies, or codes that influence how land and buildings are developed and constructed.
- **Structure and Infrastructure Projects:** Modifying existing public or private structures and infrastructure to protect them from a hazard or remove them from a hazard area.
- **Natural Systems Protection:** Includes green infrastructure and low-impact development, nature-based solutions, engineering with nature, and bioengineering that incorporate natural features or processes into the built environment.
- **Education and Awareness Programs:** Informing the public about the mitigation of potential natural disasters.

The actions selected aim to reduce risk to existing buildings, structures, and infrastructure as well as new development and redevelopment, benefit underserved communities and socially vulnerable populations, protect community lifelines, and reduce flood risk by protecting critical facilities to the 0.02 percent probability flood event.

Mitigation Alternatives Considered

A wide range of potential mitigation actions was considered for each hazard identified by the county and city/town/village planning teams. The actions set out in Table 1 through Table 12 were developed by adapting and simplifying guidance in the FEMA’s Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013). They provide an overview of the mitigation options available to the county and participating jurisdictions, both for this plan update and future updates. Further information on each opportunity type can be found at [Mitigation Ideas](#).

Table 119: Cold wave/Heatwave

Type of Opportunity	Mitigation Action
Local Planning and Regulations	Reduce urban heat island effect.
Education and Awareness Programs	Increase awareness of extreme temperature risk and safety.
	Assist vulnerable populations.
	Educate property owners about freezing pipes.

Table 120: Hurricane/Tropical Storm Wind

Type of Opportunity	Mitigation Action
Local Planning and Regulations	Adopt and enforce building codes.
	Promote or require site and building design standards to minimize wind damage.
	Assess vulnerability to severe wind.
	Protect power lines and infrastructure.

Type of Opportunity	Mitigation Action
Structure and Infrastructure Projects	Retrofit residential buildings.
	Retrofit public buildings and critical facilities.
Education and Awareness Programs	Increase severe wind risk awareness.

Table 121: Hurricane/Tropical Storm Flood

Type of Opportunity	Mitigation Action
Local Planning and Regulations	Incorporate flood mitigation in local planning.
	Form partnerships to support floodplain management.
	Limit or restrict development in floodplain areas.
	Adopt and enforce building codes and development standards.
	Improve stormwater management planning.
	Adopt policies to reduce stormwater runoff.
	Improve flood risk assessment.
	Join or improve compliance with National Flood Insurance Program (NFIP).
Local Planning and Regulations	Manage the floodplain beyond minimum requirements.
	Participate in the Community Rating System (CRS).
	Establish local funding mechanisms for flood mitigation.
Structure and Infrastructure Projects	Remove existing structures from flood hazard areas.
	Improve stormwater drainage system capacity.
	Conduct regular maintenance for drainage systems and flood control structures.
	Elevate or retrofit structures and utilities.
	Floodproof residential and non-residential structures.
	Protect infrastructure.
	Protect critical facilities.
	Construct flood control measures.
Natural Systems Protection	Protect and restore natural flood mitigation features.
	Preserve floodplains as open space.
	Increase awareness of flood risk and safety.
Education and Awareness Programs	Educate property owners about flood mitigation techniques.

Table 122: Lightning

Type of Opportunity	Mitigation Action
Structure and Infrastructure Projects	Protect critical facilities and equipment.
Education and Awareness Programs	Conduct lightning awareness programs.

Table 123: Tornado

Type of Opportunity	Mitigation Action
Local Planning and Regulations	Encourage construction of safe rooms.
	Require wind-resistant building techniques.
Education and Awareness Programs	Conduct tornado awareness activities.

Table 124: Wind

Type of Opportunity	Mitigation Action
Local Planning and Regulations	Adopt and enforce building codes.
	Promote or require site and building design standards to minimize wind damage.
	Assess vulnerability to severe wind.
	Protect power lines and infrastructure.
Structure and Infrastructure Projects	Retrofit residential buildings.
	Retrofit public buildings and critical facilities.
Education and Awareness Programs	Increase severe wind risk awareness.

Table 125: Winter Storm

Type of Opportunity	Mitigation Action
Local Planning and Regulations	Adopt and enforce building codes.
Structure and Infrastructure Projects	Protect buildings and infrastructure.
	Protect power lines.
	Reduce impacts to roadways.
Education and Awareness Programs	Conduct winter weather risk awareness activities.
	Assist vulnerable populations.

Table 126: Drought

Type of Opportunity	Mitigation Action
Local Planning and Regulations	Assess vulnerability to drought risk.
	Monitor drought conditions.
	Monitor water supply.
	Plan for drought.
	Require water conservation during drought conditions.
	Prevent overgrazing.
Structure and Infrastructure Projects	Retrofit water supply systems.
Natural Systems Protection	Enhance landscaping and design measures.
Education and Awareness Programs	Educate residents on water saving techniques.
	Educate farmers on soil and water conservation practices.
	Purchase crop insurance.

Table 127: Flooding

Type of Opportunity	Mitigation Action
Local Planning and Regulations	Incorporate flood mitigation in local planning.
	Form partnerships to support floodplain management.
	Limit or restrict development in floodplain areas.
	Adopt and enforce building codes and development standards.
	Improve stormwater management planning.
	Adopt policies to reduce stormwater runoff.
	Improve flood risk assessment.
	Join or improve compliance with National Flood Insurance Program (NFIP).
	Manage the floodplain beyond minimum requirements.
	Participate in the Community Rating System (CRS).
	Establish local funding mechanisms for flood mitigation.
Structure and Infrastructure Projects	Remove existing structures from flood hazard areas.
	Improve stormwater drainage system capacity.
	Conduct regular maintenance for drainage systems and flood control structures.
	Elevate or retrofit structures and utilities.
	Floodproof residential and non-residential structures.

Type of Opportunity	Mitigation Action
	Protect infrastructure.
	Protect critical facilities.
	Construct flood control measures.
	Dam mitigation measures.
Natural Systems Protection	Protect and restore natural flood mitigation features.
	Preserve floodplains as open space.
Education and Awareness Programs	Increase awareness of flood risk and safety.
	Educate property owners about flood mitigation techniques.

Table 128: Earthquake

Type of Opportunity	Mitigation Action
Local Planning and Regulations	Adopt and enforce building codes.
	Incorporate earthquake mitigation into local planning.
	Map and assess community vulnerability to seismic hazards.
	Conduct inspections of building safety.
Structure and Infrastructure Projects	Protect critical facilities and infrastructure.
	Implement structural mitigation techniques.
Education and Awareness Programs	Increase earthquake risk awareness.
	Conduct outreach to builders, architects, engineers, and inspectors.
	Provide information on structural and non-structural retrofitting.

Table 129: Landslide

Type of Opportunity	Mitigation Action
Local Planning and Regulations	Map and assess vulnerability to landslides.
	Manage development in landslide hazard areas.
Structure and Infrastructure Projects	Prevent impacts to roadways.
	Remove existing buildings and infrastructure from landslide hazard areas.

Table 130: Wildfire

Type of Opportunity	Mitigation Action
Local Planning and Regulations	Map and assess vulnerability to wildfire.
	Incorporate wildfire mitigation in the comprehensive plan.

Type of Opportunity	Mitigation Action
	Reduce risk through land use planning.
	Develop a wildland urban interface code.
	Require or encourage fire-resistant construction techniques.
Structure and Infrastructure Projects	Retrofit at-risk structures with ignition-resistant materials.
	Create defensible space around structures and infrastructure.
	Conduct maintenance to reduce risk.
Natural Systems Protection	Implement a fuels management program.
Education and Awareness Programs	Participate in Firewise program.
	Increase wildfire risk awareness.
	Educate property owners about wildfire mitigation techniques.

Example mitigation actions for each hazard type include the following:

- Drought: Study and implement recommendations for secondary water sources in the event of drought.
- Earthquake: Retrofit critical infrastructure.
- Extreme temperatures: Use nature-based solutions to reduce the urban heat island effect.
- Flooding: Support the acquisition/elevation/reconstruction of repetitive loss structures and protect critical infrastructure to the 0.2% probability flood event.
- Hazardous materials: Develop and enhance partnerships to monitor and mitigate incidents of hazardous materials.
- High winds: Adopt and enforce building codes and develop and implement tree trimming programs.
- Hurricane/Tropical storm: Educate homeowners about mitigation measures.
- Landslide: Map and assess vulnerability and implement slope stabilization projects for evacuation routes.
- Lightning: Protect critical facilities and equipment.
- Terrorism: Expand monitoring capabilities and build partnerships to reduce risk.
- Tornado: Require wind-resistant building techniques.
- Utility/Infrastructure failure: Identify and upgrade utilities and infrastructure at risk of failure, such as XYZ facility.
- Wildfire: Implement community defensible space programs.
- Winter storm: Develop programs to support elderly populations through home retrofits and senior centers.

The public was also surveyed to gain their opinions on the potential mitigation actions.

Mitigation Action Funding

FEMA's Hazard Mitigation Assistance (HMA) grants fund eligible mitigation measures to reduce future disaster losses (see Table 131). Eligible applicants include state agencies, local governments, special districts, federally recognized tribes, and private non-profit organizations.

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Table 131: FEMA Mitigation Funding Sources

Program	Timeframe	Description	Lead Agency or Agencies	Resource(s)
Hazard Mitigation Grant Program (HMGP)/404 Mitigation	Post-disaster—the application period opens on the date of the Presidential Declaration	Provides funding to state, local, tribal, and territorial governments to develop hazard mitigation plans and implement mitigation projects to reduce or eliminate future disaster losses. Eligible project types include planning and enforcement, flood protection, retrofitting, and construction. An approved hazard mitigation plan is required to receive funding. Because the State of California has an enhanced hazard mitigation plan, the state is eligible for additional HMGP funds up to 20% of the federal share of the disaster assistance provided following a federally declared disaster.	Federal Emergency Management Agency (FEMA)	https://www.fema.gov/grants/mitigation/hazard-mitigation https://www.fema.gov/grants/mitigation/hazard-mitigation-assistance-guidance
HMGP Post Fire (HMGP-PF)	State’s first Fire Management Assistance Grants (FMAG) declaration of a fiscal year to six months after the end of that fiscal year	Supports communities to implement hazard mitigation measures following a wildfire disaster. Funding depends on the 10-year national average assistance provided FMAG declarations by states.	FEMA	https://www.fema.gov/grants/mitigation/hazard-mitigation-assistance-guidance https://www.fema.gov/sites/default/files/2020-07/fema_DRRRA-1204-policy.pdf
Fire Management Assistance Grants	Following a Fire Management Assistance Declaration	Available to states, local, and tribal governments for mitigating, managing, and controlling fires on public or privately owned forests or grasslands.	FEMA	https://www.fema.gov/sites/default/files/documents/fema_fmaggppg_063121.pdf

Program	Timeframe	Description	Lead Agency or Agencies	Resource(s)
Public Assistance 406 Program	Following a federal Disaster Declaration	Public assistance funded mitigation measures for disaster-damaged facilities. Limited to eligible counties and damaged facilities, and only the damaged parts of a facility. Designed to reduce the potential for future losses from a similar disaster to the same facility.	FEMA	https://www.fema.gov/press-release/20220328/fema-hazard-mitigation-grants-404-and-406
Flood Mitigation Assistance (FMA) Grant Program	Annual	Funding for cost-effective measures 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).	FEMA	https://www.fema.gov/grants/mitigation/floods
Building Resilient Infrastructure and Communities (BRIC)	Annual	Provides funding to states, local communities, tribes, and territories for mitigation projects. This program is designed to support capability and capacity-building, promote partnerships, and enable large projects. It emphasizes nature-based solutions, community lifelines, and benefitting underserved communities. Each state has allocated funds and there is also a national competitive fund.	FEMA	https://www.fema.gov/sites/default/files/documents/fema_bric-policy-fp-008-05_program_policy.pdf https://www.fema.gov/sites/default/files/documents/fema_riskmap-nature-based-solutions-guide_2021.pdf https://www.fema.gov/sites/default/files/documents/fema_fy-22-mitigation-action-portfolio.pdf

Program	Timeframe	Description	Lead Agency or Agencies	Resource(s)
Pre-Disaster Mitigation (PDM) Grant Program	Congressionally appropriated	Provides funding to state, local, tribal, and territorial governments to plan for and implement sustainable cost-effective measures to reduce the risk to individuals and property from future natural hazards. Previously replaced by the BRIC program, the Consolidated Appropriations Act (2022) reauthorized the PDM for FY22.	FEMA	https://www.fema.gov/grants/mitigation/pre-disaster
Rehabilitation of High Hazard Potential Dam (HHPD) Grant Program	Annual	Provides technical, planning, design, and construction assistance through grants for the rehabilitation of eligible high hazard potential dams. A dam must be located in a jurisdiction with a FEMA-approved plan that includes dam risks.	FEMA	Rehabilitation Of High Hazard Potential Dam (HHPD) Grant Program FEMA.gov
National Flood Insurance Program (NFIP)	Ongoing	Eligible property owners, renters, and businesses that purchase flood insurance through the NFIP may be eligible for funds to repair their property. Increased Cost of Compliance claim benefits may be available for compliance activities, including elevation, flood-proofing, relocation, and demolition.	FEMA	https://www.fema.gov/flood-insurance

Planning partners may soon be able to access additional mitigation funds through FEMA's new Safeguarding Tomorrow Revolving Loan Fund Program. The Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Act became law on January 1, 2021, and authorized FEMA to provide grants to eligible entities, including the State of New York, to develop a revolving loan fund for hazard mitigation initiatives. Once established, this fund will provide low-interest loans to jurisdictions to reduce vulnerability to natural disasters, foster resilience, and reduce disaster suffering. These loans may be used as the non-federal cost match for other HMA grant applications. The first STORM funding application period is currently open.

FEMA funds should not be the only source of mitigation funding that a community considers. Table 132 summarizes other federal resources available.

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Table 132: Federal Funding Sources

Program	Timeframe	Description	Lead Agency or Agencies	Resource(s)
Community Development Block Grant Disaster Recovery (CDBG-DR)	Congressionally appropriated	Provides grants to state and local governments to develop viable communities (e.g., housing, suitable living environment, expanded economic opportunities) and recover from federally declared disasters. Principally for low and moderate income areas.	U.S. Department of Housing and Urban Development (HUD)	https://www.hud.gov/program_offices/comm_planning/cdbg
CDBG Mitigation (CDBG-MIT)	Congressionally appropriated	Supports a range of mitigation activities focused on reducing or eliminating the long-term impacts of future disasters.	HUD	https://www.hud.gov/program_offices/comm_planning/cdbg-dr/cdbg-mit
Section 108 Loan Guarantee Program	Upon request	Provides low-cost, long-term financing for economic and community development projects, including improvements to increase resilience.	HUD	https://www.hudexchange.info/programs/section-108/section-108-program-eligibility-requirements/#overview
Natural Resources Conversation Services (NRCS)	Ongoing	Provides funding and technical assistance to communities to address threats to watersheds, including conducting damage assessment and evaluating potential solutions.	U.S. Department of Agriculture (USDA)	https://www.nrcs.usda.gov/
Urban Waters Small Grants Program	Every two years	Protects and restores urban waters by improving water quality through activities supporting community revitalization and other local priorities.	U.S. Environmental Protection Agency (EPA)	https://www.epa.gov/urbanwaterspartners/urban-waters-small-grants

Program	Timeframe	Description	Lead Agency or Agencies	Resource(s)
Clean Water State Revolving Fund (CWSRF)	Annual	Provides low-cost financing for a range of water infrastructure projects.	EPA	Clean Water State Revolving Fund (CWSRF) US EPA https://www.epa.gov/nps/funding-resources-watershed-protection-and-restoration
WaterSMART	Annual	Provides funding opportunities supporting adequate and safe water supplies through water conservation, water management, and restoration projects.	Bureau of Reclamation	WaterSMART Bureau of Reclamation
Partners for Fish and Wildlife	Ongoing	Offers financial and technical assistance to private landowners, corporations, local governments, and universities interested in pursuing restoration projects affecting wetlands and riparian habitats.	U.S. Fish and Wildlife Service (FWS)	https://www.fws.gov/program/partners-fish-and-wildlife
National Coastal Resilience Fund	Annual	Funds nature-based solutions designed to improve the resilience of coastal communities and ecosystems.	National Fish and Wildlife Foundation	https://www.nfwf.org/programs/national-coastal-resilience-fund?activeTab=tab-1
Flood Risk Management Program (FRMP)	Upon request	Designed to focus the U.S. Army Corps of Engineers (USACE) policies, programs, and expertise toward reducing flood risk. USACE works with local government partners to coordinate flood risk management activities through shared responsibility, including helping communities understand and communicate their flood risk and develop solutions.	USACE	https://www.iwr.usace.army.mil/Missions/Flood-Risk-Management/Flood-Risk-Management-Program/Partners-in-Shared-Responsibility/State-and-Local/

Program	Timeframe	Description	Lead Agency or Agencies	Resource(s)
Community Wildfire Assistance	Ongoing	Provides technical and funding assistance for wildfire mitigation measures and training.	Department of Interior, Bureau of Land Management	https://www.blm.gov/site-page/programs-public-safety-and-fire-fire-and-aviation-regional-information-montana-dakotas-3
Emergency Management Performance Grant (EMPG)	Annual	Designed to support state, local, tribal, and territorial emergency management agencies implement the National Preparedness System and the National Preparedness Goal of a secure and resilient nation. The FY23 EMPG program also emphasized the national priorities of equity, climate resilience, and readiness.	DHS/FEMA	https://www.fema.gov/grants/preparedness/emergency-management-performance
Emergency Watershed Protection	Ongoing	Offers technical and financial assistance to local communities to help relieve imminent threats to life and property caused by natural disasters that impair the watershed.	NRCS	Emergency Watershed Protection Natural Resources Conservation Service
Watershed and Flood Prevention Operations Program	Ongoing	Provides technical and financial assistance to help plan and implement watershed projects.	USDA	https://www.nrcs.usda.gov/

Mitigation Action Plan

All Mitigation Action Plans can be found within the relevant annex for each jurisdiction.

Table 133: Mitigation Success Stories

Jurisdiction	Title	Description
City of Rensselaer	Partition Street Culvert Replacement 2022–2023	This project replaced the aging, hydraulically insufficient culvert and hanging utilities with a new, larger box culvert with improved hydraulic flow and redirected utilities under Quackenderry Creek, eliminating the choking effect on stream flow the hanging utilities caused by catching debris. The reduced hydraulic capacity would back up creek flow onto upstream properties during heavy rainfall events. The new, larger culvert has eliminated this problem for properties north of Partition Street along the creek.

Plan Maintenance and Implementation

A formal plan maintenance process for monitoring, evaluating, and updating the hazard mitigation plan (HMP) must take place to ensure that the HMP—and specifically the mitigation strategy—remains current and relevant. Updates are required every five years from the date the plan is approved. Regularly scheduled evaluations during the five-year cycle are important to assess the effectiveness of the program and to reflect changes that may affect mitigation priorities, and a process must be undertaken to keep the public engaged throughout the plan’s ongoing implementation. As a part of the 2025 plan update, the prior 2019 plan update was reviewed and the maintenance strategy modified for the next five years in order to include the new Emergency Preparedness Coordinator for Rensselaer County as well as a documented process for providing status updates that should help prepare for future plan updates.

The RCBPS will continue to take the lead role in coordinating the overall plan maintenance effort, with ongoing support and feedback from the County Emergency Preparedness Coordinator. Each planning team member will take the lead role on plan maintenance activities for their respective jurisdiction. Details of what this looks like is included in this section as well as how the plan will be and has been integrated into other planning mechanisms.

Monitoring the Plan

An important step in any mitigation planning process is to document the method by which the plan's implementation will be monitored over its five-year lifecycle. The representatives of each jurisdiction from in the current plan update process coordinates with other departments and agencies responsible for implementing hazard mitigation actions identified in the plan in order to maximize the opportunities to implement actions, track progress of actions, identify and address any barriers to implementation of the actions, and to take advantage of grant funding opportunities. Monitoring the plan, therefore, becomes part of the regular function of the office and the position to which it is assigned. The county can also help facilitate this ongoing discussion throughout the planning life cycle.

Past Progress (2011 to 2019)

The 2011 HMP was approved by FEMA in November 2011; therefore, Annual Work Progress Monitoring Reports were targeted for municipal completion and submittal to RCPBS in November of each year thereafter. Jurisdictions took strides toward implementing their hazard mitigation initiatives. However, formal project tracking and monitoring were hampered by lack of funds and lack of staff. RCPBS received a very limited number of Annual Work Progress Monitoring Reports during the first plan maintenance cycle (2011–2019). Monitoring tended to occur on a more ad-hoc level, with oral evaluations and discussions as opposed to direct, paper tracking. This highlighted a need for increased vigilance at the local level to both implement mitigation strategies and monitor progress accordingly.

- **2011 to 2017** – Plan monitoring occurred on an ad-hoc basis at the jurisdiction and county levels, with oral evaluations and discussions of progress as opposed to direct, paper tracking.
- **2018 to 2019** – As part of this hazard mitigation plan update, project progress was tracked via Worksheet #6 for all progress made on mitigation projects over the whole of the first plan maintenance cycle. Detailed tracking for each jurisdiction is included in each municipal annex.

Past Progress (2019 to 2024)

The plan monitoring approach outlined in the 2011 HMP was reselected for the next five-year cycle. The prior plan included Annual Work Progress Monitoring Reports for the plan participants to track the progress of their respective mitigation actions. A schedule for submitting these reports was established and RCBPS was identified as the primary collector of these forms at least once per year. There was limited implementation of this approach to plan monitoring between 2019 and 2024.

Approach (2025 to 2030)

RCBPS, including the County Emergency Preparedness Coordinator, will help facilitate monitoring of the plan through annual plan evaluation meetings and the completion of Annual Work Progress Monitoring Reports. The Annual Work Progress Monitoring Reports (included at the end of this section) should be completed prior to the annual plan evaluation meeting. These reports will be completed for any

mitigation action identified in the plan which has a status update. The annual meeting may be called on a regular yearly basis, or after a disaster event. The RCBPS will monitor community involvement and availability and select a time that works best given ongoing conditions.

Evaluating the Plan

After a mitigation plan is formally approved by FEMA and adopted by participating jurisdictions, it should be evaluated on a regular basis in order to assess the effectiveness of the plan at achieving its stated purpose and goals.

Past Progress (2011 to 2019)

The 2011 HMP was approved by FEMA in November 2011. According to the process outlined in the 2011 HMP, annual plan evaluation meetings were targeted for November of each year thereafter. However, plan evaluation discussions occurred on an ad-hoc basis at the jurisdiction and county levels, with oral evaluations and discussions of progress as opposed to direct, paper tracking. This highlighted a need for increased vigilance at the local level to both implement mitigation strategies and monitor progress and overall plan evaluation accordingly.

Past Progress (2019 to 2024)

The 2011 plan evaluation approach was reselected for the 2019 Plan Update. The annual plan evaluation meeting was intended to serve as a forum for discussion and evaluation of the plan's effectiveness following completion of the Annual Work Progress Monitoring Reports. Effectiveness criteria were identified to discuss. In addition to reviewing the Annual Work Progress Monitoring Reports, these criteria were intended to serve as the meeting's agenda.

Approach (2025 to 2030)

A modified version of the prior plan maintenance approach has been selected to evaluate the plan's effectiveness moving forward. The plan will continue to be evaluated at the annual plan evaluation meetings as well as during the plan update process. At each meeting, RCBPS will lead the plan participants in reviewing the Annual Work Progress Monitoring Reports. Then, the plan participants will evaluate the effectiveness of the plan at achieving its stated purpose and goals including the following:

- Do the goals and objectives address current and expected conditions?
- Have the nature and magnitude of risks changed? Are there new data or maps that should be incorporated?
- Are there any implementation problems (such as technical, political, and/or legal), or coordination issues with the other agencies and/or committee members?
- For projects that are completed, have the outcomes occurred as expected?

- Where shortcomings are identified, what can be done to bring things back on track? What lessons learned from completed projects could benefit in-progress projects?
- Are there any new actions that should be added? Do actions selected reflect current grant funding opportunities?
- What is the current progress with regard to plan integration? What opportunities are upcoming?
- Have any comments been received on the plan from municipalities, the general public, or other stakeholders?

Following each annual plan evaluation meeting, the RCBPS will prepare meeting minutes that will document, at a minimum, the plan participants responses to the questions above. RCBPS will distribute meeting minutes to all plan participants via email and will post meeting minutes on the website.

Updating the Plan

As part of the process to maintain FEMA mitigation funding eligibility, a plan update must always be submitted to NYSDHSES and FEMA for their review. This must occur within five years of the plan's approval by FEMA (and during subsequent five-year cycles thereafter).

Past Progress (2011 to 2019)

The 2011 HMP was first approved by FEMA in November 2011. An update was due in November 2016. Actual update proceedings were not initiated until 2018, due primarily to a lack of funds to complete the update and changes in staff at RCBPS. Rensselaer County initiated the process for this first required plan update by submitting a planning grant application to FEMA on May 11, 2016, under the PDM program. Notification of grant award was received on October 6, 2017. A request for proposal was issued on March 16, 2018, with proposals due on April 30, 2018. AECOM was identified by the county to facilitate the update process, with notification of award on June 11, 2018, and a contract and notice to proceed was issued on October 1, 2018. A project initiation meeting was held between AECOM and the county on November 5, 2018, and a project kickoff meeting was held with the County Planning Group on December 10, 2018. The 2019 plan update represented the first required update of the 2011 HMP.

Past Progress (2019 to 2024)

The plan update approach outlined in the 2011 plan was expanded upon and slightly modified as a part of the 2019 plan update. The plan was funded by FEMA through a mitigation grant. The RCBPS was identified as the lead for plan development, in addition to being responsible for ensuring the plan was maintained in accordance with all applicable guidance and regulations.

Approach (2025 to 2030)

The recommended approach for moving forward remains the same as in prior updates. The RCBPS and, in particular, the Emergency Preparedness Coordinator for Rensselaer County will lead the next plan update

on behalf of the participating jurisdictions. Funding should be sought at least three years from the expiration date of the current plan. The plan update should begin at least two years prior to the expiration of the current plan. Regardless of whether or not a plan update is grant funded, the following must occur within five years from the date that the plan is adopted by the first of its participating jurisdictions:

- An updated planning process must be undertaken.
- An updated plan document must be prepared.
- The updated document must be resubmitted to FEMA (through NYSDHSES).
- The updated plan must be reviewed by FEMA, which will provide formal comments indicating both required and recommended revisions.
- At a minimum, all required revisions must be addressed. Recommended revisions may also be addressed to enhance the plan update.
- The revised document needs to be routed back to FEMA, which will review to ensure that all required revisions have been satisfactorily addressed. If so, FEMA will deem the plan “approvable pending adoption.”
- The plan must then be adopted by participating jurisdictions.

The plan update involves a comprehensive review and evaluation of each section of the plan and also discusses the results of evaluation and monitoring activities detailed in the Plan Maintenance section of the previously approved plan. Plan updates may validate the information in the previously approved plan or may involve a major plan rewrite. A plan update cannot be an annex referring to the previously approved plan; it must stand on its own as a complete and current plan. Plans are required to be updated to reflect changes in development, progress in local mitigation actions, and changes in priorities. Other criteria considered during the update included the following:

- If priorities for the plan update have changed, such as emphasis on new vulnerable populations or hazards
- If changing situations have modified goals, objectives, actions, and/or hazards
- If additional information is available to perform more accurate vulnerability assessments
- If it is determined that participating jurisdictions wish to be added to and/or removed from the plan
- If it is determined that the plan no longer addresses current and expected future conditions

At the time of each update, RCBPS shall consult with NYSDHSES and FEMA for the latest guidance in place regarding plan updates to ensure that the latest criteria are addressed in the update process. Plan updates will be posted on the county website and made available in hard copy at the RCBPS offices.

Public Participation in Plan Maintenance

The public and other stakeholders must be given opportunities to become involved during the plan’s regular maintenance and implementation. It is important to understand perceptions of the plan’s

effectiveness and degree of success to help maintain support for the plan and provide accountability for those responsible for its maintenance and implementation.

Past Progress (2011 to 2019)

RCBPS reported the following progress was made in continued outreach to the public and other stakeholders over the first plan maintenance cycle:

- RCBPS has successfully continued to maintain the mitigation planning website.
- Continual outreach was made to the public at various events.
- RCBPS provides Multi-Jurisdictional Hazard Mitigation Plan Fact Sheet and website information to county staff.
- Beginning in 2018, all participating jurisdictions conducted regular outreach to the public and other stakeholders regarding the plan update. Their activities, along with any comments received, are summarized in each jurisdictional annex.

Past Progress (2019 to 2024)

The public was kept informed of hazard mitigation through the RCBPS website. The website continued to message the importance of hazard mitigation as well as providing the Multi-Jurisdictional Hazard Mitigation Plan Fact Sheet and copy of the hazard mitigation plan for the public. Additionally, the public was invited to contact the RCBPS as needed. Participating jurisdictions were also encouraged to link to the hazard mitigation plan on their respective websites as well.

Approach (2025 to 2030)

RCBPS will continue to maintain the mitigation planning website. This website will include annexes for each jurisdiction, as well as the base plan, which is applicable for all jurisdictions. Each participating jurisdiction will be encouraged to maintain a link on their jurisdiction's web page to the county mitigation planning website, including their jurisdictional annex. The mitigation planning website will also invite the public to comment on the plan by contacting the RCBPS. The RCBPS will present any feedback to the applicable jurisdictions and amend the plan as appropriate.

The RCBPS will share meeting minutes from the annual plan evaluation meetings with the participating jurisdictions. If any progress or plan amendments are noted, this will be publicized on the county mitigation planning website. Participating jurisdictions will be encouraged to share this information with the public via social media as well as posting the updates where applicable. If participating jurisdictions receive any additional feedback from the public on the plan, they will be responsible for keeping track of them and bringing them forward for discussion at the annual plan evaluation meetings.

Plan Integration

For a participating jurisdiction to succeed in reducing risk in the long term, the information and recommendations of the hazard mitigation plan must be integrated into day-to-day local government operations, as well as into comprehensive plans. Throughout the planning process, partnerships are formed between departments and agencies, and sustained actions between these partners will increase the community's resilience to disasters. "Plan integration" can be thought of as the process whereby each participating jurisdiction will incorporate the mitigation plan findings and projects into other planning mechanisms (those local governance structures that are used to manage local land use development, building codes and community decision making).

Past Progress (2011 to 2019)

As part of the 2019 plan update, the targeted plan integration activities from the 2011 HMP were put into tabular form on a worksheet, and each jurisdiction was asked to complete the worksheet to indicate their respective accomplishments over the first plan maintenance cycle. A summary of plan integration activities undertaken by the county and each community is provided in each jurisdictional annex. Overall, plan integration activities that were undertaken were generally limited, highlighting a need for increased vigilance at the local level to both implement mitigation strategies and monitor progress and overall plan evaluation accordingly. The overall approach of the 2011 HMP included various plan integration options for municipalities to choose from during the plan maintenance phase. It was not specific as to which jurisdictions would undertake which activities. However, the latest FEMA guidance requires multi-jurisdictional plans to be more specific, identifying what particular activities will be undertaken by each specific jurisdiction. To this end, as part of the 2019 plan update process, municipalities were asked to consider a range of possible plan integration activities, and by completing a worksheet, select a series of jurisdiction-specific activities from this list of options (with flexibility to add additional, unlisted options at their individual discretion). Each jurisdiction's identified plan integration activities that will be undertaken during the 2019 to 2024 plan maintenance cycle are included in each jurisdictional annex.

Past Progress (2019 to 2024)

One early challenge identified during the 2024 plan update was the limited documentation of prior plan maintenance and implementation. Additional efforts to maintain the plan will help ensure mitigation measures are accomplished. One way to increase the odds of success is to integrate components of the mitigation plan, including elements of the risk assessment and specific mitigation actions, into other planning mechanisms. As a part of this plan update, participants were asked to identify prior plan integration and future plan integration opportunities. If the plan was integrated into another planning mechanism, participants were asked to list them and specifically describe how the plan was integrated. This discussion could include the following:

- The integration of the hazards to which the community is vulnerable
- The data and analysis presented in the risk assessment

- The goals of the mitigation plan
- Potential projects or actions to carry out in the future

Table 134 summarizes the previous plan integration that has occurred over the last five years.

Table 134: Previous Plan Integration

Plan Participant	Planning Mechanism	Description
Rensselaer County	None	No specific integration of the prior hazard mitigation plan.
City of Rensselaer	Natural Resource Inventory (May 2021)	Identified natural resources, ideal uses, potential risks, and ways to mitigate those risks.
	Waterfront Connectivity Study (March 2023)	Offered recommended improvements to create better and safer access to the waterfront in the north end of the city.
City of Rensselaer (cont.)	Open Space Plan (March 2024)	Provided a priority-based framework of projects that will increase resiliency and connectivity between existing parks, open spaces, trails, and conservation areas.
City of Troy	None	No specific integration of the prior hazard mitigation plan.
Town of Berlin	None	No specific integration of the prior hazard mitigation plan.
Town of Brunswick	None	No specific integration of the prior hazard mitigation plan.
Town of East Greenbush	2021 Comprehensive Plan	Hazard mitigation was referenced in the Comprehensive Plan’s “Natural Resources and the Environment” section as an opportunity for the town to retain ecologically significant areas.
Town of Grafton	None	No specific integration of the prior hazard mitigation plan.
Town of Hoosick	None	No specific integration of the prior hazard mitigation plan.
Town of Nassau	None	No specific integration of the prior hazard mitigation plan.

Plan Participant	Planning Mechanism	Description
Town of North Greenbush	Stormwater Management Program (SWMP) Plan	The town’s Stormwater Management Program Plan has recently been audited by EPA and DEC. Comments from the audit are being used to improve the SWMP Plan, which has multiple provisions related to outreach and education and hazard (stormwater) risk management
Town of Petersburg	None	No specific integration of the prior hazard mitigation plan.
Town of Pittstown	None	No specific integration of the prior hazard mitigation plan.
Town of Poestenkill	None	No specific integration of the prior hazard mitigation plan.
Town of Sand Lake	None	No specific integration of the prior hazard mitigation plan.
Town of Schaghticoke	None	No specific integration of the prior hazard mitigation plan.
Town of Schodack	Local Waterfront Revitalization Plan	Integrated floodplain and flood risk information.
Town of Stephentown	None	No specific integration of the prior hazard mitigation plan.
Village of Castleton-on-Hudson	Comprehensive Plan	General plan for future progress in the village, incorporating information from mitigation plan for planning and zoning.
	Local Waterfront Revitalization Plan	Waterfront plan in conjunction with Town of Schodack, incorporating floodplain information.
	Complete Streets Plan	Transportation safety plan, incorporating planning and code information.
Village of East Nassau	None	No specific integration of the prior hazard mitigation plan.
Village of Hoosick Falls	None	No specific integration of the prior hazard mitigation plan.
Village of Nassau	None	No specific integration of the prior hazard mitigation plan.

Plan Participant	Planning Mechanism	Description
Village of Schaghticoke	None	No specific integration of the prior hazard mitigation plan.
Village of Valley Falls	None	No specific integration of the prior hazard mitigation plan.

Approach (2025 to 2030)

As part of the plan update, plan participants were asked to consider the planning mechanisms where the updated hazard mitigation information and actions may be integrated and how. In this case, planning mechanisms refers to not just plans but the programs, policies, codes, ordinances, budgets, and other resources that make plan implementation possible. The following discussion helps inform future plan integration efforts.

Table 135: Future Plan Integration

Plan Participant	Planning Mechanism	Description
Rensselaer County	Comprehensive Emergency Management Plan (currently being updated)	Hazard risk data can be incorporated into the comprehensive emergency management plan.
	Capital Improvement Plan	Mitigation projects that receive grant funding could be incorporated into the capital improvement plan.
City of Rensselaer	Rensselaer Rising - Brownfield Opportunity Area (BOA) Study (currently underway)	Yearlong planning process to attract investment redevelop unused and underutilized property in our BOA designated study area—primarily the downtown, some of which is in the floodplain.
	Update of the 2006 Comprehensive Plan (anticipated in 2025)	The updated plan will include approaches to hazard mitigation.
City of Troy	Capital Improvement Plan	Mitigation projects can be incorporated into the city's budget.
Town of Berlin	Comprehensive Plan (in process)	The updated comprehensive plan can include additional information on hazard risk and mitigation.

Plan Participant	Planning Mechanism	Description
Town of Brunswick	Capital Improvement Plan	Mitigation projects can be incorporated into the town’s budget. Actions which incorporate climate change can be integrated.
Town of East Greenbush	Zoning Map and Text Amendments, Subdivision Regulations	The town should incorporate hazard mitigation planning within the establishment of the updated regulatory documents in response to the adoption of the 2021 Comprehensive Plan.
Town of Grafton	Comprehensive Plan Update	Ensure that local comprehensive plans incorporate natural disaster mitigation techniques.
Town of Hoosick	Comprehensive Plan	The town can incorporate risk assessment data and mitigation actions into the comprehensive plan update.
Town of Nassau	Comprehensive Plan	The next comprehensive plan update could incorporate additional mitigation actions.
Town of North Greenbush	Housing Assessment Plan	The town is in the process of developing a housing assessment plan to provide more housing options for all demographics. This plan should, in some way, address issues that will minimize risks (overdevelopment, overclearing, flooding, etc.).
Town of Petersburg	Comprehensive Plan	Ensure that local comprehensive plan incorporates natural disaster mitigation techniques.
Town of Pittstown	Comprehensive Plan	Making sure that the comprehensive plans incorporate natural disaster mitigation.
Town of Poestenkill	Comprehensive Plan	Expand comprehensive plan to include mitigation including natural disaster mitigation techniques.

Plan Participant	Planning Mechanism	Description
Town of Sand Lake	Local Codes and Ordinances	There is limited willingness to develop new plans. However, current codes and ordinances can be reviewed against the selected hazards in this plan to determine whether there need to be any amendments to address identified hazards and where a need is identified, modify or amend the codes/ordinances as applicable.
Town of Schaghticoke	Budget	Mitigation actions from this plan can be incorporated into the town's budget and federal grant application process.
Town of Schodack	Comprehensive Plan Update, Local Code/Ordinance Updates, Budget	There are multiple opportunities for future plan integration including when plans, codes, and ordinances are reviewed and updated. Both hazard data as well as mitigation actions can be incorporated into these other planning mechanisms. Additionally, the town can incorporate projects into budgeting and grant applications for federal funding.
Town of Stephentown	Floodplain Management Ordinance, Code/Ordinance Update	Information from this plan, including hazard and hazard mitigation considerations, could be incorporated into existing local codes and ordinances including the floodplain management ordinance when it is updated.
Village of Castleton-on-Hudson	Micro-Grid Energy Plan	Plan to redistribute power throughout the village in order to reduce outages caused by weather events that take out single power lines. This plan can incorporate hazard risk and mitigation action data from the mitigation plan.

Plan Participant	Planning Mechanism	Description
Village of East Nassau	Heat Emergency Plan	The village is in the process of developing a heat emergency plan with the Climate Smart Committee and Cornell Cooperative Extension. This plan could include data from the mitigation plan on hazards such as extreme temperature, as well as mitigation actions.
Village of Hoosick Falls	Emergency Plan	The village is seeking to develop an emergency plan that will include mitigation measures for identified hazards. Information from the hazard mitigation plan including risk assessment data, maps, and mitigation actions can be incorporated into this plan.
Village of Nassau	Subdivision Law	The village is currently reviewing existing subdivision regulations. Future updates could consider hazard risk and mitigation measures including items identified throughout this plan.
Village of Schaghticoke	Budget	The village has limited planning mechanisms and often looks to the county for planning support. At times, the village has used grant funding. Mitigation can be supported by incorporating mitigation actions in this plan into future funding applications and the local budget.
Village of Valley Falls	Floodplain Management Ordinance	The village does not currently participate in the National Flood Insurance Program (NFIP) but is interested in joining. This would adopt and implement a floodplain management ordinance that reflects NFIP requirements as well as flood risk and mitigation information outlined in this plan.

Annual Work Progress Monitoring Report

Municipality: <i>Click or tap here to enter text.</i>		Project Report Period: <i>Click or tap here to enter text.</i>	Date Prepared: <i>Click or tap to enter a date.</i>
Project title or brief project description: <i>Click or tap here to enter text.</i>			
Hazard addressed: <i>Click or tap here to enter text.</i>			
Who is responsible for implementing the action? Contact person (include name, title, department, phone, email): <i>Click or tap here to enter text.</i>			
List supporting agencies and contacts (if any):			
Has the project been initiated (check one): <input type="checkbox"/> Yes <input type="checkbox"/> No		If yes, when? <i>Click or tap to enter a date.</i> If no, why not? <i>Click or tap here to enter text.</i>	
Status (check one): <input type="checkbox"/> On schedule <input type="checkbox"/> Completed <input type="checkbox"/> Delayed*			
* If delayed subsequent to initiation, explain here: <i>Click or tap here to enter text.</i>			
Original target date for completion: <i>Click or tap to enter a date.</i>			
Current estimated target date for completion: <i>Click or tap to enter a date.</i>			
Project milestones (e.g. grant application, approval, design, permitting, construction, etc.) complete? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Estimated Projected Completion Date: <i>Click or tap to enter a date.</i>			
Indicator of success: <i>In most cases, you will describe any damages/losses that have been avoided as a result of the project. Leave blank if project is not completed. In cases where it is difficult to quantify the benefits in dollar amounts, you will use other indicators, such as the number of people who now know about mitigation or who are taking mitigation actions to reduce their vulnerability to hazards.</i>			
<i>Click or tap here to enter text.</i>			
If the project is in progress, what was accomplished during this reporting period?			
<i>Click or tap here to enter text.</i>			

Municipality: Click or tap here to enter text.	Project Report Period: Click or tap here to enter text.	Date Prepared: Click or tap to enter a date.
<p>What obstacles, problems, or delays did you encounter, if any?</p> <p>Click or tap here to enter text.</p>		
<p>How was each problem resolved?</p> <p>Click or tap here to enter text.</p>		
<p>What are the next steps to be accomplished over the next reporting period?</p> <p>Click or tap here to enter text.</p>		
<p>If the actions have been completed, were the outcomes as expected?</p> <p>Click or tap here to enter text.</p>		
<p>Other comments:</p> <p>Click or tap here to enter text.</p>		