Greene County Hazard Mitigation and Resilience Plan

Greene County Emergency Services

June 2023

Crawford & Associates, LLC

Acknowledgements

Thank you to the participating jurisdictions for their assistance with providing details of previous hazard events, status of completed and current mitigation activities and proposed actions for the plan update. Thank you as well for reviewing your revised annexes and the final version of the base plan and providing feedback.

A special thank you to County Departments, especially Greene County Soil and Water Conservation District for their continued support and assistance throughout the mitigation planning process. Their contributions to this plan are invaluable.

We would also like to thank Crawford & Associates, LLC for their assistance in coordinating the plan update process, creating a community survey for the public and working with the planning team members to ensure the plan provides the information needed to help the County mitigate the hazards they face and become more resilient.

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Executive Summary

The *Greene County Hazard Mitigation and Resilience Plan, 2023* is an update to the previous plan, which was approved and adopted in 2017. This plan represents the collaboration of County departments, Town and Village representatives, and other elected and appointed government officials who worked together to develop this framework to protect community assets, preserve the economic viability of the County and jurisdictions within, and save lives.

Greene County residents and infrastructure are at risk each year from various hazards, including severe winter storms, ice storms, flooding, wind events and severe storms. This plan provides a long-term approach to reducing the likelihood that a natural hazard will turn into a disaster. The plan incorporates updated data for assessing vulnerabilities and presents updated strategies for making Greene County a safer and more sustainable community.

This plan will help the County to implement mitigation projects aimed at breaking the cycle of merely responding to and recovering from hazard events, but rather working to prevent their effects in the first place. With this plan update the County aims to maintain eligibility for federal mitigation project funding such as the Hazard Mitigation Grant Program (HMGP); Building Resilient Infrastructure and Communities (BRIC) Program; Flood Mitigation Assistance (FMA) Program and Repetitive Flood Claims (RFC) Program, in addition to other diverse funding sources that are available. The plan also strives to aid the County in becoming more resilient, which is defined as "the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions."[1]

In addition to working to become more resilient, with this update the County continues to take into consideration the continued impacts of climate change. The previous version introduced the role of global climate change in estimating probability for the identified hazards. This update also takes the role of climate change into consideration for both current and future impacts and any new risks they may bring. A new element added to this update, in accordance with the updated Federal Emergency Management Agency (FEMA) Local Mitigation Planning Policy Guide (2022)[2] , is the inclusion of whole community planning approach. Whole community planning is integral to ensuring ***everyone*** in the community is safe from the potential impacts of disasters, especially those populations that may be disproportionately impacted and/or are socially vulnerable. Throughout the planning process, from assessing hazards and risks; identifying mitigation actions and conducting public outreach, the planning team worked to ensure equity and inclusion were central to the process.

The hazard mitigation planning process used to create this plan consisted of creating a community survey for residents and businesses to provide input on questions related to preparedness and mitigation. The survey was made available on-line as well as in print format to ensure it was accessible to everyone. In addition, the County posted the 2016 version of the Hazard Mitigation and Resilience Plan and associated Jurisdictional Annexes on the Emergency Services webpage to solicit

[1] https://hazards.fema.gov/nri/community-resilience
[2] Federal Emergency Management Agency. (2022). Local Mitigation Planning Policy Guide (FP 206-21-0002).

public feedback. There were also regular planning team meetings, both in person and virtual as well as three community engagement meetings to provide residents and businesses with an overview of hazard mitigation, benefits of participating in the process and present mitigation actions that have been implemented in their region. The team also reviewed data publicly available from various sources and utilized Greene County's Geographic Information Systems (GIS) data to identify and map critical infrastructure in hazard-prone areas, such as floodplains and develop jurisdiction specific maps. In addition, cross over planning was conducted with the Comprehensive Emergency Management Plan (CEMP) planning team, which was working on the update to that plan at the same time as this update. The CEMP planning team was incorporating Community Lifelines into their Emergency Support Functions; therefore, it was imperative the two teams collaborate to ensure potential impacts to community lifelines and potential mitigation actions were considered in the updated plan. County officials and representatives of local jurisdictions proposed and evaluated strategies that might be effective in mitigating the negative effects of natural hazards. As a result, this plan contains over 100 mitigation actions ranging from public education and outreach projects to structural projects, such as relocating critical facilities out of floodplains, increasing culvert sizes, and replacing bridges.

By adopting this updated plan, the County and its participating towns and villages commit to working with each other to make their communities safer, more resilient and include the whole community.

Section 1 – Introduction

Greene County is located in southeast central New York State, just west of the Hudson River and south of Albany. The northern and eastern regions are mostly low-lying flatlands, and the southern and western areas rise sharply into the Catskill Mountains. Part of the county lies within the Catskill Park and includes some of the tallest peaks south of the Adirondacks such as Hunter Mountain. In addition, there are many waterfalls in the county such as the famed Kaaterskill Falls[3]. Figure 1 shows the location of the County with respect to the rest of the state.

The County is part of the Upper Hudson Valley Region (capital district), located in the Catskill Mountains region which is known for its natural beauty. Catskill is a cultural and geographic region generally defined as those areas close to or within the borders of the Catskill Park, a 700,000-acre forest preserve protected from many forms of development under New York state law. According to the 2020 Census, the County's population decreased slightly to 48,499[4] residents.

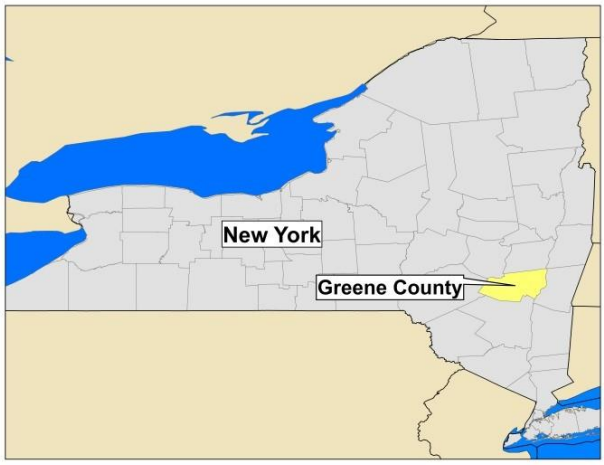


Figure 1: Location of Greene County in New York

1.1 Plan Background, Purpose and Authority

The *Greene County Hazard Mitigation and Resilience Plan, 2023* (hereafter referred to as "the plan") is an update to the previous plan, *The Greene County Hazard Mitigation and Resilience Plan, 2016*, which was approved and adopted for implementation by the County and its 19 Jurisdictions in 2017. The 2016 plan update replaced what was known as the *2009 Greene County Multi-Jurisdictional All-Hazards Mitigation Plan* and introduced the concept of resilience into the plan, based on the impacts of Hurricane Irene, Tropical Storm Lee and Superstorm Sandy.

This plan will help the County to implement mitigation projects aimed at breaking the cycle of merely responding to and recovering from hazard events, but rather working to prevent their effects in the first place.

Greene County residents and infrastructure are at risk each year from various hazards, including flooding, severe winter storms/ice storms, and severe storms/wind events (Section 4 provides specific details on the hazards). This plan provides a long-term approach to reducing the likelihood that a natural hazard will turn into a disaster. The plan incorporates updated data for assessing vulnerabilities and presents updated strategies for making Greene County a safer and more

[3]NY.gov website - https://www.ny.gov/counties/greene
[4] 2020 Census Data, Quick Facts Greene County, NY - https://www.census.gov/quickfacts/greenecountynewyork

sustainable community. In addition, the updated version includes continued consideration for the impacts of climate change and incorporates the whole community approach to planning to ensure equitable outcomes for all mitigation activities.

The emergency management community, citizens, elected officials, and others in Greene County recognize the potential impacts of natural hazards on their community and in response have developed this plan to help mitigate the risk from natural hazards.

Hazard mitigation actions are projects, activities, process, or a specific action taken to reduce or eliminate the long-term risk from hazards and their impacts to people and property in the County. Mitigation actions generally fall into one of the following primary types:

- Local Plans and Regulations
- Structure and Infrastructure Projects
- Natural Systems Protection
- Education and Awareness Programs

The mitigation actions of this plan are linked to other community plans, programs, reports, and policies to inform and influence community decisions about growth and development. One of the goals of this plan is for mitigation to become a way of doing business in the community. Every decision – from future land use/zoning policies to acquisition of flood prone properties to public awareness/education campaigns – should consider its effect on reducing risk for the whole community and ensuring equitable outcomes.

Adoption of this plan ensures that Greene County and participating jurisdictions will continue to be eligible to apply for and receive certain Federal grant funds that are administered by the New York State Department of Homeland Security and Emergency Services (NYS DHSES) for the Federal Emergency Management Agency (FEMA). This plan complies with the requirements of the Disaster Mitigation Act of 2000 and its implementing regulations published in Title 44 of the Code of Federal Regulations (CFR) Section 201.6, as amended. The Local Mitigation Plan Review Tool (see Appendix I), which is produced by FEMA, was used by the planning team to ensure all requirements have been addressed.

This is a multi-jurisdictional plan that geographically covers the 19 participating jurisdictions within Greene County's boundaries (hereinafter referred to as the Planning Area). All but one of the 19 towns and villages that participated in the 2016 plan update also participated in the development of the 2023 plan update. Table 1 shows the jurisdictions in the planning area, organized by the three geographic regions (mountaintop towns, river towns and valley towns) of the County. All participating jurisdictions in the planning area will adopt this plan and will authorize jurisdictional government staff to implement the proposed mitigation actions. Figure 2 shows the graphic depiction of the regions within the County.

Table 1: Greene County Jurisdictions, by Geographic Region

Geographic Region	Jurisdiction
Mountaintop Towns	Town of Ashland Town of Halcott Town of Hunter Village of Hunter Town of Jewett Town of Lexington Town of Prattsville Village of Tannersville Town of Windham
River Towns	Town of Athens Village of Athens Town of Catskill Village of Catskill Town of Coxsackie Village of Coxsackie Town of New Baltimore
Valley Towns	Town of Cairo (did not participate in plan update) Town of Durham Town of Greenville

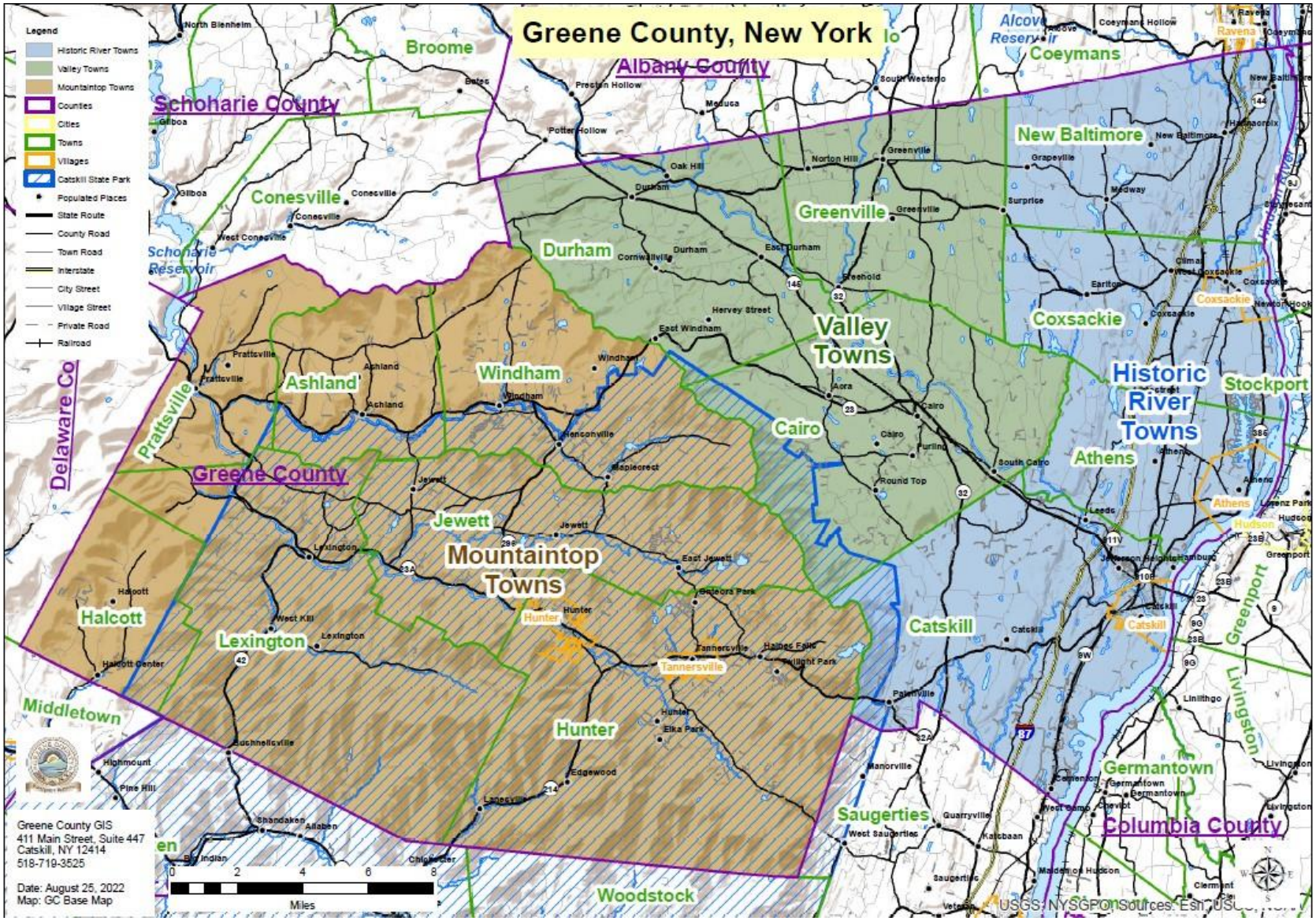


Figure 2: Participating jurisdictions by geographic regions of the County

1.2 Organization of the Plan

The Plan consists of the sections, appendices and annexes listed below:

Table 2: Plan Sections, Appendices and Annexes with descriptions

Type of Section	Description of the Section
Section 1: Introduction	Explains the purpose and organization of the plan.
Section 2: Planning Process	Describes the jurisdictions that have participated in plan development, how they participated, and the steps followed for developing this plan. This section also describes how each section of this plan is updated from the previous plan and includes information sources used to develop this plan.
Section 3: Community Profile and Capability Assessment	Discusses existing conditions, including development trends and current County government capabilities related to hazard mitigation, including actions completed in last 5 years.
Section 4: Risk Assessment	Identifies the natural hazards that may affect Greene County, describes their location, extent, previous occurrences and likelihood of future occurrences, and overall summary of vulnerability and potential impact of each identified hazard.
Section 5: Mitigation Strategy	Includes goals, alternative mitigation actions available and summary of actions in progress or proposed for the next five years. This section explains how actions were prioritized and how they will be implemented and incorporated into other plans.
Section 6: Implementation and Maintenance	Explains how mitigation actions will be implemented and monitored and how the plan will be evaluated and updated.
Section 7: References and Resources	Provides references for documents cited in the plan as well as resources used.
Appendices	Include documentation of the planning process and community engagement, critical facilities, potential funding sources, supporting plans, proposed mitigation actions and FEMA/NYS Local Mitigation Plan Review Tool.
Jurisdictional Annexes	Provide information on each of the jurisdictions that participated in the plan to include a summary of the hazards, risk and vulnerabilities they face, capabilities within the jurisdiction, mitigation actions, changes in development, etc.

Section 2 – Planning Process

In June 2022, the planning process for the update to the plan began. Greene County Emergency Services, as the lead agency for the plan update, worked with their contracted vendor to develop a community survey to solicit input on the hazards of concern for the communities and the types of mitigation activities participating jurisdictions should undertake. The survey was distributed widely through pre-existing databases and email distribution lists, social media and at public events (such as the Youth Fair, held at the end of July) and was made available in both online and paper format to ensure it was accessible in multiple formats. Greene County Emergency Services also identified core planning team members from both the County and each of the 19 participating jurisdictions. The planning team met in person, virtually and communicated via email to obtain the information needed. The County also reached out to NY DHSES to engage the mitigation team as part of the planning process. The state mitigation team participated in an initial meeting with Greene County Emergency Services and their contracted vendor to review feedback from the 2016 update and identify any new elements that should be incorporated into the updated version. They also attended the kick-off meeting with the core planning team and provided guidance throughout the planning process, as requested. The remaining piece of the planning process was the inclusion of the public. The 2016 plan and its associated Jurisdictional Annexes were posted to the County website where the public could review them and use the feedback form provided on the site. The planning team conducted three community engagement meetings (one in each of the three regions – mountaintop, valley and river) to provide an overview of the planning process, discuss identified hazards and risks and possible mitigation actions as well as to ask for their input. The public was also afforded the opportunity to review and provide feedback on the draft version of the plan before it went for final review and approval.

In addition, cross over planning was conducted with the Comprehensive Emergency Management Plan (CEMP) planning team, which was working on the update to that plan at the same time as this update. The CEMP planning team was incorporating Community Lifelines into their Emergency Support Functions; therefore, it was imperative the two teams collaborate to ensure potential impacts to community lifelines and potential mitigation actions were considered in the updated plan.

2.1 Core Planning Team

The planning process was designed to reach and receive input from not only County officials, but also all participating towns and villages. Therefore, the core planning team was led by Greene County Emergency Services and included representatives from several County Agencies as well as a representative from 18 of the 19 jurisdictions (the Town of Cairo did not participate in the update process). About a quarter of the 2023 planning team also participated in the 2016 update.

Since the plan needs to be adopted and implemented by each participating jurisdiction, multiple attempts were made to obtain participation from each municipality and various opportunities were made available for all stakeholders to genuinely participate.

The planning team's role was to review the 2016 Plan and provide any recommendations for areas to improve; review current hazards and recommend any new additions; identify new areas or risk/vulnerability; complete status reports on current mitigation actions and identify new actions to be incorporated in the update and support community outreach. In addition, planning team members were responsible for attending scheduled planning meetings, both in person and virtually and for responding to emails or requests for information in a timely manner. Members of the planning team from each jurisdiction were also tasked with supporting the planning process by working with representatives within their jurisdiction to obtain feedback, collect data and gather input on the plan update. The additional jurisdictional representatives that provided input on the plan and associated Jurisdictional Annex are listed within the associated Jurisdictional Annex.

Table 3: Greene County 2023 Hazard Mitigation Core Planning Team

Jurisdiction	Name	Position/Title
Ashland	Rich Tompkins	Supervisor
Athens – Town	Michael Pirone	Supervisor
Athens – Village	Amy Serrago	Mayor
Catskill – Town	Patrick McCulloch	Councilman
Catskill – Village	Patrick McCulloch	Councilman
Coxsackie – Town	Rick Hanse	Supervisor
Coxsackie – Village	Mark Evans	Mayor
Durham	Shawn Marriott	Supervisor
Greenville	Paul Macko	Supervisor
Halcott	Innes Kasanof	Supervisor
Hunter – Town	Sean Mahoney	Supervisor
Hunter – Village	Carl Giangrande	Floodplain Administrator/CEO
Jewett	Greg Kroyer	Supervisor
Lexington	Carl Giangrande	Code Enforcement
New Baltimore	Alan VanWormer	Highway Super
Prattsville	Gregg Cross	Supervisor
Tannersville	Carl Giangrande	Code Enforcement
Windham	Tom Hoyt	Supervisor
County Agency	Name	Position/Title
Administration	Shaun Groden	County Administrator
Administration	Warren Hart	Deputy County Administrator
Economic Development	Teri Weiss	Director of Business Marketing
Emergency Services	John Farrell	Director
Emergency Services	Dan King	Emergency Manager
Highway & Solid Waste	Scott Templeton	Superintendent
Soil & Water	Michelle Yost	Watershed Assistance Program Coordinator

2.2 Planning Team Activities

Three meetings were held with the Planning Team. Meetings were held in person as well as virtually to seek as much engagement as possible from County staff as well as the participating jurisdictions. In addition to scheduled meetings, email was used to solicit and gather information from planning team members as needed. Table 4 lists milestone planning team activities. Additional planning team documentation, such as meeting invites, agenda, presentations and meeting notes are contained in Annex B.

Table 4: Planning Activities

Date	Activity/Meeting	Purpose
July 12, 2020	Planning Team Kick-off Meeting	Introduce the planning team, provide an overview of the update process, roles and expectations of the planning team, public involvement, and project timeline.
Aug. 2, 2022	Planning Team Meeting #2	Review hazards and associated risks, jurisdictional questionnaire, survey data to date and provide information on community outreach meetings.
Nov. 3, 2022	Planning Team Meeting #3	Review of final draft plan and jurisdictional annexes

2.3 Community Engagement

At the beginning of the planning process, a Community Survey was developed for residents and businesses as a means for the County to understand what the community believes are the hazards of most concern, what the risks and vulnerabilities are and types of mitigation actions that could be undertaken to reduce damage/disruptions. The survey was distributed widely through pre-existing databases and email distribution lists, social media, newspaper articles and at public events and was made available in both online and paper format to ensure it was accessible in multiple formats. At the Youth Fair, held at the end of July, Greene County Emergency Services had a booth set up and encouraged people to take the survey. There was a poster on display that contained a QR code people could scan to take the survey, Chromebooks were made available for people to take the survey on the spot and hard copies were also available for anyone that wanted them. See Figure 3 below for photos from the event. Local jurisdictions were also asked to promote the survey within their community to ensure there was equal representation across the County. In total, 398 surveys were completed, 140 of which were from businesses, and the results were used to select hazards and rank their effects within the county as well as to aid in the selection of mitigation actions. In addition to the survey providing an opportunity for the community to give their input on hazard mitigation, it also gave residents and businesses a means to provide comments. Some of these comments prompted the County to reach out to the residents to ensure they were okay and that they had access to any services they needed. Without having the survey in place, the County might not have otherwise know these residents were in need, so this was a very positive outcome from the survey that was not initally anticipated when the survey was developed. Additional survey information can be found in Appendix B and the Jurisdictional Annexes.

Figure 3: Greene County Emergency Services at the County Youth Fair

The County also posted the 2016 version of the Hazard Mitigation and Resilience Plan and associated Jurisdictional Annexes on the Emergency Services webpage to solicit additional public input for the update. There were also 3 community outreach meetings (one in each of the three regions – Mountaintop [Windham 8/29/22], Valley [Cairo 9/14/22] and River [Catskill 9/13/22]) to provide an overview of the planning process, discuss identified hazards and risks and possible mitigation actions and seek input from the public. Locations for each meeting were identified by taking into consideration the needs of the community to ensure the facility was accessible and conveniently located for all who wanted to attend. For the most part the community meetings were well attended and provided an opportunity to identify additional areas within the County at risk and potential mitigation actions. The public was also afforded the opportunity to review and provide feedback on the draft version of the plan before it went for final review and approval. Input received on the draft was used to refine the final version of the plan and prepare it for submission. Appendix B provides documentation of community engagement efforts and public participation.

Figure 4:Windham Community Engagement Meeting

2.4 Other Agency/Organization Participation

A copy of the draft plan was made available on the County Emergency Services website to solicit input from the public, but also from neighboring counties/jurisdictions; utilities, nonprofit organizations and others as noted in the table below. Individual emails were sent to these stakeholders requesting their input. Appendix B contains copies of the email sent.

Following the initial review of the plan by NYS DHSES, they requested that additional stakeholders be afforded the opportunity to provide input into the plan. Therefore, in early May 2023, the County invited representatives from businesses, academia, private organizations, and non-profit and community-based organizations the work with or support underserved communities and socially vulnerable populations to review the draft plan and provide any input or feedback they may have. In addition, paper copies of the plan and a feedback form were placed in each of the nine County Library's to provide underserved areas or those populations that do not have access to a computer or the internet an opportunity to review and provide input and feedback on the plan. Additional information about these efforts can be found in Appendix B.

Table 5: Other Agency/Organization Participation

Organization	Point of Contact	Title
Albany County Emergency Services	Brian Wood	Commander
Columbia County Emergency Services	David Harrison	Emergency Manager
Delaware County Emergency Services	Steven Hood	Emergency Manager
Rensselaer County Emergency Services	Jay Wilson	Director of Public Safety
Schoharie County Emergency Services	Ron Stevens	Sheriff
Ulster County Emergency Services	Michael Madison	Emergency Manager
Catskill Watershed Corporation	Jason Merwin	Executive Director
Greene County Chamber of Commerce	Pamela Geskie	Director
American Red Cross	John Vale	Executive Dir. Hudson Valley Region

	Agency	
Adaptive Sports Foundation	Greene County Rural Health Network	Prattsville Art Centre and Residency
Athens Cultural Center	Greene County Soil and Water Conservation District	Prattsville Community Church Food Pantry
Baliwick Animal Park and Riding Stables	Greene County Transit	QuestarIII Boces
Blackhead Mountain Lodge & Country Club	Greene County Chamber of Commerce	Red Cross
Buy in Greene – Greene County Businesses	Greene Land Trust	Riedlbauer's Driving Range
Cairo Chamber of Commerce	Greenville Central School	Rip Van Winkle Country Club
Cairo-Durham Central School District	Heermance Memorial Library	Rivertown Senior Apartments
Capital District YMCA	Historians/ Greene County Historical Society	Riverview Marine
Catholic Charities of Columbia and Greene County	Historic Catskill Point	RUPCO (Greene County Housing Choice Voucher Program)
Catskill Central School district	Hop-O-Nose Marina	Saenger Outdoor Sports, LLC
Catskill Community Center	Hudsom-Athens Lighthouse	Sail Hope, Inc
Catskill Golf Resort	Hull-O Farms Pheasant Game Preserve	Scenic Hudson
Catskill Mountain Foundation	Hunter Foundation	Screaming Eagle Outdoor Adventures
Catskill Mountain Housing Development Corporation	Hunter Mountain	Shady Harbor Marina
Christman's Windham House Country Inn and Golf Resort	Hunter-Tannersville School District	Sunny Hill Golf Course
Colonial Country Club	Independent Living Center of the Hudson Valley	The Arc of Mid-Hudson
Columbia-Greene Board of Realtors	Island Green	The Autism Connection
Columbia-Greene Community College	Matthew 25 Food Pantry	The D.R. Evarts Library
Columbia-Greene Workforce Investment Board	Mental Health Association of Columbia-Greene	Thomas Cole National Historic Site
Common Ground Dispute Resolution	Mountain Brook Farm	Thomas Cole National Historic Site
Community Action of Greene County	Mountain Top Arboretum	Thunderhart Golf Course and Resort
Cornell Cooperative Extension: Columbia & Greene Counties	Mountain Top Historical Society	Town of Hunter Chamber of Commerce
Coxsacie-Athens Central School District	Mountaintop Cares Coalition	Twin County Recovery Services
Early Childhood Learning Center of Greene County	Mountaintop Library	Windham Ashland Jewett Central School District
Greene County Agricultural Society	National Alliance on Mental Illness – Greene County	Windham Chamber of Commerce
Greene County Council on the Arts	New Baltimore Conservancy	Windham Country Club
Greene County Courts in Third Judicial District	Northeast Parent & Child Society	Windham Mountain
Greene County Farm Bureau	Olana	
Greene County Industrial Development Agency	Pratt Museum and Pratt Rock	

2.5 References and Documents

While updating the plan, the planning team used several resource documents, reports and references. Table 6 contains a comprehensive list of those items and how they were incorporated into the plan.

Table 6: References and Documents Used

Referenced Document or Technical Source	Resource Type	Description of Reference and its use in the plan
FEMA National Risk Index	Technical Resource	Utilized for assessing hazards and determining risk for the County to include social vulnerability
FEMA Local Mitigation Planning Policy Guide	Technical and Planning Resource	Updated policy guidance that will take effect in early 2023. Utilized to ensure new policy requirements were incorporated into the plan and completed the Plan Review Tool as part of the plan submission
FEMA Local Mitigation Planning Handbook	Technical and Planning Resource	A tool for local planners to use for developing or updating local hazard mitigation plans. Utilized a guidance document to ensure requirements were met and to explore additional approaches to meeting the requirements by reviewing examples and best practices provided.
FEMA Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards	Technical and Planning Resource	This document contains a range of potential mitigation actions communities can take to reduce their risk to a number of natural hazards. This document was used to identify alternative mitigation actions that are available to communities.
FEMA Flood Insurance Rate Maps (FIRM)	Technical and Planning Resource	All jurisdictions participate in the NFIP, therefore, the FEMA FIRMs were used by all participating jurisdictions to identify the flood hazard area and risk within their community
New York State, Division of Homeland Security and Emergency Services – Hazard Mitigation	Technical and Planning Resource	Utilized for local hazard mitigation planning guidance to ensure compliance with NYS requirements; reached out for technical support with questions during the plan update process and participated in meetings and calls regarding plan status, assistance needed and questions .

New York State website	Website data	Information on County demographics used in community profile
Local Flood Analysis	Technical and Planning Resource	The Catskills Stream website provides information on the Local Flood Analysis (LFA) that were conducted in 13 communities in Greene County. The LFA were used as part of the hazard identification and risk assessment process as well as when identifying new mitigation actions.
FEMA Community Lifelines	Technical and Planning Resource	Information on the community lifelines was used for critical infrastructure assessment as well as the risk assessment to ensure essential services in the hazard areas are addressed.
National Centers for Environmental Information (NCEI)	Technical Resource	Resource for climate related data and historic event data of the hazards for the risk assessment.
NOAA/NCEI, National Climate Data Center (NCDC)	Technical Resource	Resource for climate related data and historic event data for the hazards that was used for the risk assessment.
National Oceanic and Atmospheric Administration (NOAA)	Technical Resource	Resource for hazard and risk information and graphics for risk assessment
2019 NY State Hazard Mitigation Plan	Technical Resource	Resource for hazard and risk information for risk assessment
Presentation: Economic Impact of Visitors in New York 2020 – Catskills Focus	Technical Resource	Provides data for the impact of tourism on the County. Used information as part of the county profile.
NOAA's, National Integrated Drought Information System	Technical Resource	Resource for historical information on drought conditions in the US. Information was used as part of the hazard identification process.
NYS Dept. of Environmental Conservation (DEC)	Technical Resource	Provided information on updated NFIP policy numbers, claims and claim amounts.
Fourth National Climate Assessment – US Global Change Research Program (USGCRP)	Technical Resource	This assessment on the effects of global climate change was used to understand the current and future impacts of climate change on the identified hazards.
Inventory of Dams – New York State (NYSDEC)	Technical Resource	This document contains the metadata used to update the dataset for dams in the County.
NY GIS Data Clearinghouse	Technical Resource	This site was used by the County to create the updated map of the location of dams in the County

Greene County Real Property Tax Service/Geographic Information Services (GIS)	Technical Resource	This resource was used to create the maps used in the plan and to update loss information provided in Section 4, based on HAZUS data
FEMA HAZUS	Technical Resource	The County utilized the tools and data available in Hazus to aid in estimating risks outlined in Section 4
Community Survey Results	Planning Resource	The survey results were used to validate the Risk Assessment and Mitigation Strategy and inform Mitigation Actions
Jurisdictional Questionnaires	Planning Resource	The questionnaires were used to inform various sections on the plan, such as risk assessment, mitigation strategy and Jurisdictional Annexes

2.6 Presentation of Draft Plan

In early November 2022, the planning team held a meeting to do a high-level review of the base plan, annexes, and appendices. Following the meeting, each jurisdiction received a copy of the draft plan for their review and input in terms of modifications for improved accuracy, and missing information for the Jurisdiction Annexes and Mitigation Action Worksheets, particularly regarding priorities for identified action items. Table 7 shows the communities that reviewed the draft plan.

In addition, in late November, the draft plan was posted on the Greene County Emergency Services website for public review and comment and was also sent to adjacent Counties and other stakeholders requesting their review and feedback. The County's social media outlets were used to inform residents about the public review process and encouraged residents to review the plan and provide feedback. No feedback was received.

Following the initial review of the plan by NYS DHSES, they requested that additional stakeholders be afforded the opportunity to provide input into the plan. Therefore, in early May 2023, the County invited an additional ~80 representatives from businesses, academia, private organizations, and non-profit and community-based organizations to review the plan and provide feedback. In addition, hard copies of the plan were available in the County libraries along with feedback forms. In addition, the plan was still posted on the County's website to continue to receive feedback beyond the initial November timeframe. No feedback was received from these efforts.

2.7 Summary of Jurisdictional and Stakeholder Participation

As described previously, the planning process used to develop this plan included many opportunities for jurisdictions and stakeholders to participate in the planning process. Opportunities included the participation of jurisdiction and County representatives on the Core Planning Team, regional community outreach meetings open to all stakeholders and the public, as well through outreach via

email and phone calls to obtain jurisdictional or County specific information. A summary of jurisdictional and stakeholder participation is shown in Table 7.

Table 7: Summary of Jurisdiction and Stakeholder Participation

Jurisdiction/ Stakeholder	Attended Planning Team Meetings	Attended Community Engagement Meetings	Completed Jurisdiction Question-naire	Updated Annex	Provided Input on Mitigation Actions	Reviewed Draft Plan
Town of Ashland	✓		✓	✓	✓	✓
Town of Athens	✓	✓	✓	✓	✓	✓
Town of Cairo						
Town of Catskill	✓	✓	✓	✓	✓	
Town of Coxsackie	✓	✓	✓	✓	✓	✓
Town of Durham	✓		✓		✓	
Town of Greenville	✓		✓		✓	
Town of Halcott			✓	✓	✓	✓
Town of Hunter	✓	✓	✓	✓	✓	✓
Town of Jewett		✓	✓	✓	✓	✓
Town of Lexington	✓	✓	✓	✓	✓	✓
Town of New Baltimore			✓		✓	
Town of Prattsville			✓	✓	✓	✓
Town of Windham	✓	✓	✓	✓	✓	✓
Village of Athens	✓		✓	✓	✓	✓
Village of Catskill	✓	✓	✓		✓	
Village of Coxsackie	✓		✓	✓	✓	✓
Village of Hunter	✓		✓	✓	✓	✓
Village of Tannersville	✓		✓	✓	✓	✓
Greene County Administration	✓		n/a	n/a	✓	✓
Greene County Economic Development, Tourism and Planning	✓		n/a	n/a	✓	✓
Greene County Emergency Services	✓	✓	✓	✓	✓	✓
Greene County Highway and Solid Waste	✓		n/a	n/a	✓	
Greene County Soil and Water Conservation District	✓	✓	n/a	n/a	✓	✓

2.8 Adoption Resolutions

All participating jurisdictions will adopt the plan after FEMA Region II determines that this plan is approvable pending adoption. An approvable plan meets planning requirements specified in 44 CFR Section 201.6. A plan is fully approved after it is adopted. Signed adoption resolutions will be included with the plan when the plan is submitted for final approval by FEMA Region II.

Section 3 - County Profile

3.1 Location

Greene County is located in the mid-eastern part of New York State in the northern end of the Catskill Mountains and is part of the Upper Hudson Valley Region. The northern and eastern parts are mostly low-lying flatlands, while the southern and western parts rise sharply into the Catskill Mountains. Along the Hudson River, the lowest elevation is at sea level. The County is bordered to the south by Ulster County, to the east by Columbia County and the Hudson River, to the north by Albany and Schoharie Counties, and to the west by Delaware County.

The varying topography between mountains and water bodies heightens the effects of weather events by increasing the possibility of localized flooding, which is also exacerbated by the high number of creeks. There is one town in the County that can only be accessed from Delaware County (Town of Halcott. There is only one bridge that crosses the Hudson River in Greene County, the Rip Van Winkle Bridge. The County is also along the flight path of Albany Airport.

Greene County includes 19 local jurisdictions: 5 villages and 14 towns. The jurisdictions are divided into three specific geographic areas: River Towns, Valley Towns, and Mountaintop Towns (refer to Table 2). The location of the jurisdictions is shown in Figure 2. The Town of Catskill is the county seat.

According to the 2020 U.S Census, the County has a total area of 658.05 sq. mi., 647.16 sq. mi. of which is land and 10.89 sq. mi. of which is water. Also, according to the Census, Greene County had a population of 48,499 people, a population density per square mile of 74.1, and a housing density per square mile of 44.8.

3.2 Geography

There are numerous ponds, lakes, creeks, and rivers in Greene County. The major bodies of water and waterways within Greene County include the following:

- Hudson River
- Schoharie Reservoir
- Schoharie Creek (Main Stem)
- Manor Kill
- Batavia Kill
- West Kill
- East Kill
- Stony Clove Brook
- Broadstreet Hollow Brook
- Catskill Creek
- Hollister Lake
- Kaaterskill Creek
- Shingle Kill
- Potic Creek
- Hans Vosen Kill
- Sleepy Hollow Lake

All of these features are within three major watersheds (which are further located within the Hudson River Basin): the Middle Hudson Watershed, Schoharie Watershed, and the East Branch Delaware Watershed. The Hudson River Basin, which includes the Upper Hudson, Middle Hudson, Lower Hudson and Mohawk River sub-basins, is one of the largest drainage basins in the eastern United States. The Hudson River Basin encompasses approximately 13,300 square miles in parts of New York State, Vermont, New Jersey, Massachusetts, and Connecticut.

The Middle Hudson Watershed, with a total drainage area of 2,401 square miles and 1,965 miles of streams, is in both New York and Massachusetts. It covers 10 counties including Greene County and includes 30 different bodies of water including the Hudson River, Catskill Creek, and Stony Clove Brook. The Schoharie Watershed, with a total drainage area of 930 square miles and over 930 miles of streams, covers seven counties, including Greene County, and drains into the Mohawk River. Thirteen different bodies of water are located within the watershed including the Schoharie Creek, Batavia Kill, and East Kill. Finally, the East Branch Delaware Watershed has a total drainage area of 836 square miles and approximately 560 miles of streams in both New York and Pennsylvania. It covers five different counties, including Greene County, and includes eight different bodies of water.

A map of the watersheds in the County can be found in Section 4.3.1, Figure 15.

3.3 Climate

The climate in Greene County is typical of the northeast with warm summers, cold winters and mild temperatures in spring and fall. Average temperatures county wide range from single digit lows in the winter to the upper 70's in the summer, with slight variations at higher elevations. As depicted in Table 8 below, rainfall is fairly consistent regardless of the time of year, with an average of approximately 4.5 inches of rain monthly, with a slight increase in September and October. Snowfall is experienced mostly from November through April, with January and February having the highest amounts. Snow can also fall as late as May and as early as October in any given year.

Table 8: Average climate data for Greene County, NY

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg High **Low (F)**	30 8	32 8	39 16	52 27	64 38	72 46	76 51	74 49	68 42	56 32	44 24	34 17
Avg Rainfall (Inches)	4.1	3.0	4.3	4.5	4.2	4.8	4.6	4.5	5.2	5.6	4.7	4.3
Avg Snowfall (Inches)	21.4	20.3	17.4	5.0	0.2	0	0	0	0	2.3	5.7	18.4

Source: NOAA

3.4 Historical Overview

The first settlement in Greene County was found along the Hudson River: a Native American flint mining site south of present-day Coxsackie. Later the Catskill Indians, a subtribe of the Algonquin Nation, built numerous villages in the Catskill vicinity to take advantage of the natural harbor, flint mine deposits to the north and abundance of fish and game in the surrounding area.

In 1609, Henry Hudson first anchored the Half Moon off the shore of what is at present Catskill Village. He was met by these Native Americans which were described as "a very loving people". Forty-one years later a permanent dwelling was established at the mouth of Catskill Creek marking the beginning of European settlement in the area.

The Dutch were the first European settlers, arriving in the early part of the 17th century. Many were fur traders. Subsequent development took place along the Hudson River where the Dutch built several farmsteads. The land proved to be excellent for farming. Today these early Dutch homes are historic and scenic attractions. The Bronck House is an excellent example and serves as the home of the Greene County Historical Society.

Greene County was formed by an act of the New York State Legislature on March 25, 1800. It included the townships of Catskill, Coxsackie, Freehold and Durham, with a population of about 13,000. By 1852, the present pattern of towns and villages had emerged, following a series of subdivisions and mergers. Today, Greene County consists of 14 towns and 5 villages.

The river towns and villages flourished as boat building, brick making and milling centers, as well as serving as supply points for inland settlers. In the mountains, several communities developed as tanning sites, utilizing the now depleted stock of hemlock forest.

By the mid-nineteenth century Greene County was becoming a fashionable resort area catering to the upper class and was marked by competition between the Catskill Mountain House and Hotel Kaaterskill for the tourist trade. Although these resorts and the Otis Elevated Railway leading to them are no longer in operation, remnants of this era can be viewed in the Town of Hunter.

A booming tourist and sportsmen's trade in the mountains, farming in the north and east and industry and water sports along the Hudson River has culminated today into a thriving county of over 48,000 people, endowed with a rich historical heritage.[5]

3.5 Government

County Government

The County Chair of the Legislature serves as the Chief Executive Officer (CEO) of the County and head of the County Legislature made up of a fourteen (14) member, elected council who exercise executive duties. The day-to-day functions of Greene County Government are managed by a contracted County Administrator and county agencies.

[5] Greene County NY Facts and History - https://www.greenegovernment.com/our-community/facts-and-history

The Greene County Sheriff is elected every four years pursuant to Article 13 Section 13 of the New York State Constitution. Other law enforcement support is provided by various Municipal Police Departments.

Fire protection is provided by 5 organized fire districts/battalions, made up of approximately 27 volunteer Fire Departments located throughout the County. There is no statutory authority for fire protection in unincorporated areas of the County beyond those established by fire departments.

Greene County Emergency Management Program activities are headed by the Greene County Department of Emergency Services Director with help from an Assistant Director and Emergency Management Specialist. Daily operations are conducted out of 25 Volunteer Drive, Cairo, New York.

Health responsibilities are provided by the Greene County Public Health, local municipal health officers, and the medical centers located near the County.

Local Towns & Villages

Greene County is made up of fourteen towns and five villages. Each town is governed by an elected Town Board and headed by an elected Town Supervisor.

Each Village is governed by an elected village board and headed by an elected village mayor, except for the village of Catskill, which is headed by a board-appointed Village President.

3.6 Economy

Greene County's economy is comprised of a diversified set of variables that has shown growth in job creation, average wages, home sales, and area median income while maintaining steady tax levies and consistent year-over-year (YoY) increases in sales tax receipts.

Much of the county's economy is reliant on tourism-based activities. Greene County is home to two major resort mountains, spurring ongoing development in the lodging/hospitality, food services, and retail trade industries. In 2021, Greene County realized its twelfth consecutive year of increased sales tax receipts, which has largely helped the County to stabilize its levy base for several years. The County plans to continue this trend for the near future.

As of Q2 2022, Greene County hosts 1,307 total businesses, with retail trade and accommodations and food services business encompassing a combined 367 (28%) total businesses. Together, semiannual countywide sales tax figures are $17,948,970, outpacing YoY figures by 24%.

The County's total available workforce is approximately 20,300 as of Q2 2022, representing roughly 42% of the population. Total unemployment figures estimate 700 individuals are available to work but remain unemployed. When compared to Q2 2021, Greene County's unemployment rate is 3.6%, a YoY decline of 150 basis-points, and below national unemployment figures.

2022 Greene County employment data suggest leading sectors are Government, Retail Trade, and Accommodation and Food Service workers, together making up roughly 52% of the total workforce. All Greene County employment sectors are as follows:

Table 9:Employment Sectors in Greene County

Sector	Jobs	Percent of Workforce
Government	4,088	26%
Retail Trade	2,331	15%
Accommodation and Food Services	1,873	12%
Health Care and Social Assistance	1,081	7%
Manufacturing	1,010	6%
Wholesale Trade	830	5%
Construction	765	5%
Other Services (except Public Administration)	661	4%
Arts, Entertainment, and Recreation	632	4%
Transportation and Warehousing	561	4%
Professional, Scientific, and Technical Services	419	3%
Administrative and Support and Waste Management	401	3%
Finance and Insurance	321	2%
Information	222	1%
Agriculture, Forestry, Fishing, and Hunting	196	1%
Real Estate and Rental and Leasing	185	1%
Educational Services	113	1%
Management of Companies and Enterprises	91	1%
Utilities	90	1%

Average earnings across all listed sectors equated $68,891 as of July 2022, representing a 24% increase since 2018. The 2022 fiscal year annual median income is $79,000, 35% higher when compared to 2021 ($58,500).

Total closed home sales in 2021 rose 0.2% to 893 YoY while the same year's median sales price rose 19.5% to $287,325, keeping on track for statewide growth in median sales price. The full value tax rate in Greene County dropped from 4.55% in 2020 to 4.31% in 2021, with 2022 decreasing further to 4%.

3.7 Population and Demographics

The County has a large aging population (25% of population is over the age of 60) with major populations residing in river towns. The mountain regions house a high percentage of seasonal residents which are difficult to access, in fact, countywide, 35% of housing is second homes. There has been a notable increase in residents moving to the County during the summer months. Some parts of the County have communication issues, including little or no internet connectivity, significant gaps in cellular coverage, and continued use of dial up and satellite connectivity. The County also has a substantial amount of contained communities. Some summer camps and campgrounds welcome large, varying demographic groups such as Boy Scouts, Hasidic Jewish, and special needs populations camps (e.g., Camp Harriman). There is no hospital in the County (no trauma centers, but some immediate care facilities). Two New York State correctional facilities are in the County–Greene and Coxsackie Correctional facilities– and the Census population reported includes the prison population.

Based upon a review of the 2020 U.S. Census, Greene County had a total population of 48,499 people in 2020, which is slightly lower than in 2010. Table 10 shows population statistics for Greene County and the municipalities within it based on the 2010 and 2020 U.S. Census data.

Table 10: Population Statistics

Jurisdiction	Census Population	
	2010	2020
Greene County	**49,221**	**48,499**
Town of Ashland	784	682
Town of Athens	2,421	2,330
Village of Athens	1,668	1,586
Town of Cairo	6,670	6,644
Town of Catskill	7,694	7,553
Village of Catskill	4,081	3,745
Town of Coxsackie	6,105	5,636
Village of Coxsackie	2,813	2,746
Town of Durham	2,725	2,627
Town of Greenville	3,739	3,741
Town of Halcott	258	249
Town of Hunter	1,691	2,606
Village of Hunter	502	429
Town of Jewett	953	879
Town of Lexington	805	770
Town of New Baltimore	3,370	3,226
Town of Prattsville	700	774

Village of Tannersville	539	568
Town of Windham	1,703	1,708

Source: US Census Bureau and Greene County Economic Development

The U.S. Census identified 17,681 households and 29,746 total housing units in Greene County in 2020. Of the 29,746 total housing units in the County, the 2020 U.S. Census put the number of occupied housing units at 17,681 with 76.6 percent owner-occupied and 23.4 percent renter occupied. The median price of a single-family home in Greene County was estimated at $185,400 in 2020 (U.S. Census, 2020).

Table 11: Greene County Demographics

County Demographics	2020	County Demographics	2020
Population	48,499	Median household income	$56.681
White	89.5%	In civilian labor force age 16+	53.6%
Black or African American	6.3%	Persons with a disability under 65	9.5%
American Indian and Alaskan Native	0.5%	Persons under 5 years	4.3%
Asian	1.3%	Persons under 18 years	15.9%
Two or more races	2.4%	Persons 65 years and over	23.0%
Hispanic or Latino	6.8%	Persons in poverty	11.2%
White, non-Hispanic or Latino	84.2%	Households with internet	73.8%
Foreign born persons	5.8%		

Source: US Census Bureau

Socially Vulnerable Populations

Social vulnerability is the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood.[6] Some factors used to help determine social vulnerability include socioeconomic status; age, race and ethnicity; renters; home ownership; family structure; education and social dependence to name a few. Understanding the vulnerability and exposure of these populations to natural hazards can aid jurisdictions in implementing mitigation actions to help lessen the impacts prior to an event and to aid in recovery following an event.

As part of FEMA's National Risk Index, a Social Vulnerability score and rating is assigned to each Census Track. The score and rating correspond to a community's relative level of social vulnerability as compared to other communities with similar scores. The Social Vulnerability Score is only one factor that is used to determine a community's overall Risk Index Score, however, the higher the Social Vulnerability Score the higher the overall Risk Score.

As Figure 5, below, shows, Greene County's overall Social Vulnerability Score is 35.40, which is relatively low compared to the rest of the United States. Although the score indicates that social groups in the County may not be as susceptible to experiencing adverse impacts from natural

[6] FEMA's National Risk Index, Social Vulnerability: https://hazards.fema.gov/nri/social-vulnerability

hazards, the County is committed to the whole community planning approach to ensure equity and inclusion of all populations. This approach includes ensuring socially vulnerable populations are included in mitigation activities for the County and consideration is given to such groups when developing mitigation actions. Information about the social vulnerability for each jurisdiction can be found in the Jurisdictional Annexes for each participating community.

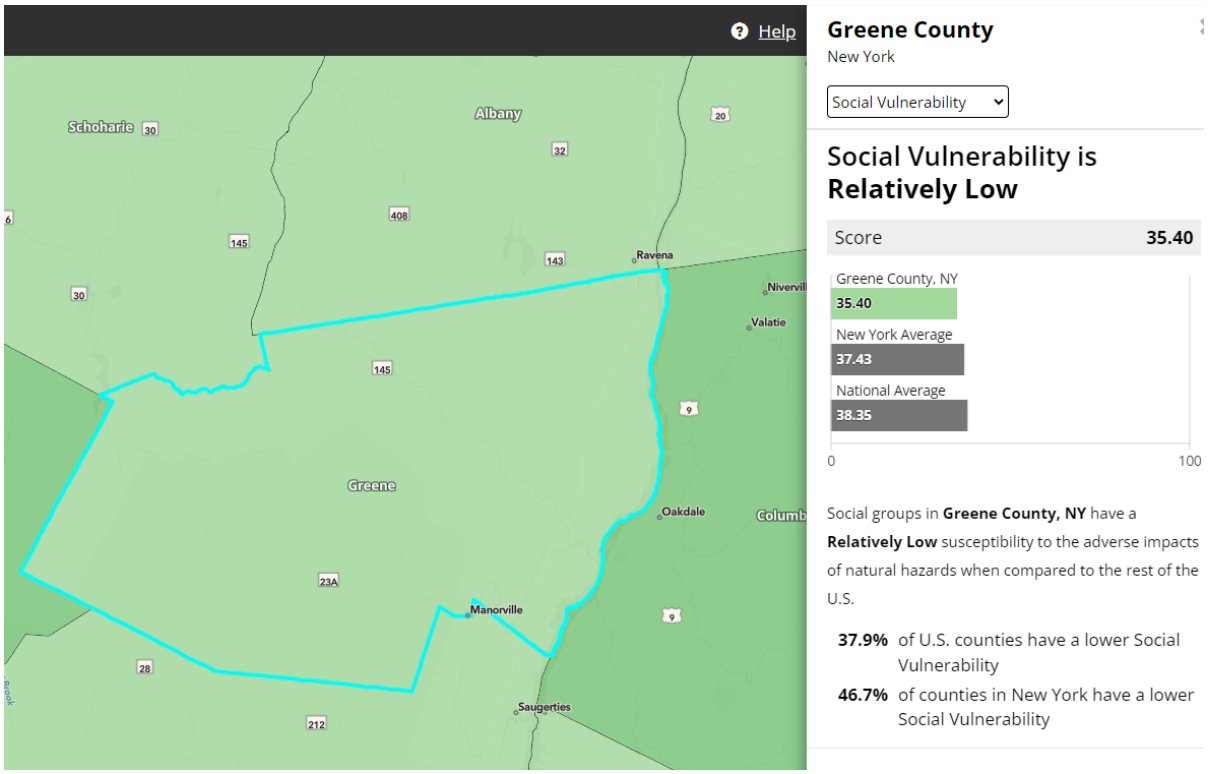


Figure 5: Greene County's Social Vulnerability Score and Rating (Source: FEMA, NRI)

3.8 Transportation

Transportation facilities include the West Shore and New Baltimore Line (carload freight service) of CSX. Highways include the New York State Thruway (with an interchange at Catskill and New Baltimore), State Routes 9W, 23, 23A, 32, 42, 81, 144, 145, 214 and 296 and a network of County and Town roads. The Rip Van Winkle Bridge at Catskill provides access across the Hudson River to the City of Hudson and Dutchess County. Air transportation is available at Albany International Airport and the New York Stewart Airport in Newburgh as well as several smaller airports in the County. Figure 6 below illustrates the geographic and transportation features of the County.

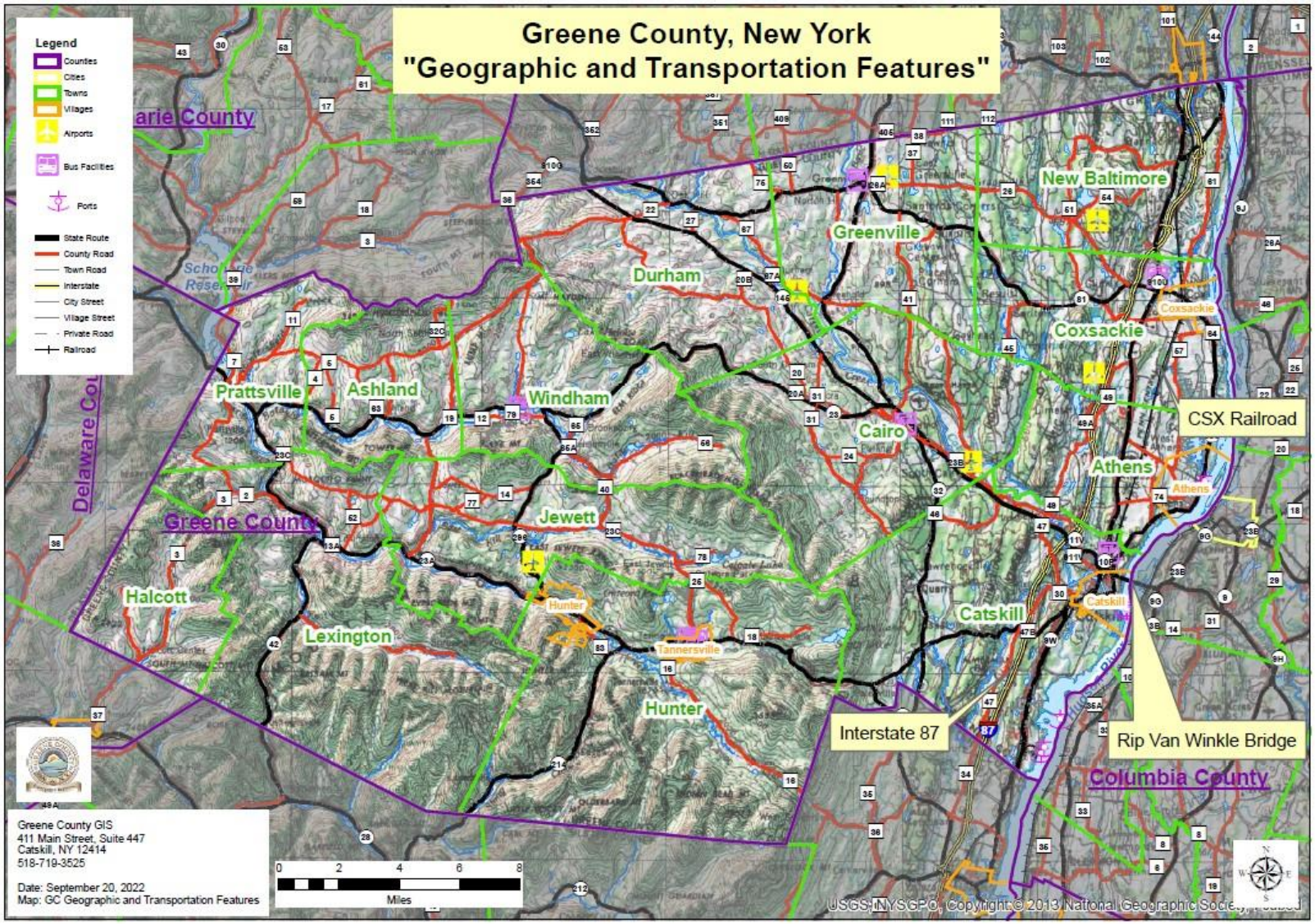


Figure 6: Geographic and Transportation Features in the County

3.9 Land Use and Development Trends

Land Use

Greene County is a combination of small urban centers, suburban areas, and rural development, but is predominantly rural in nature. It includes the built environment, the Catskill Mountains, river valley flatlands, waterbodies (including many rivers and streams), farmland, forest, brush land, and fields. Much of the County's forested areas were cleared in the mid-nineteenth century for use in forest and wood-based products and replaced with pastureland used to grow and keep livestock. However, as farming became more mechanized, hillside farms were abandoned in favor of the level farmland in the valleys, some of which remains in production today. In recent decades, some of the former pasture lands have been developed as residential housing and supportive commercial, employment, and industrial uses.

Land uses in Greene County are found in Table 12. Residential, vacant, and wild/forested/conservation lands/public lands are the top three land use categories within the County. This is also visible in Figure 7 which was created using current GIS data for land use from the County.

Table 12: Land Use Statistics for Greene County

Land Use Classification	Acreage
Residential	139,941
Vacant	115,680
Forested, Conservation Lands, and Parks	13,124
Agricultural	16,540
Commercial	9,165
Recreation and Entertainment	7,184
Community Services	5,588
Industrial	4,893
Public Services	2,468
Unknown Land Use	1,321
TOTAL	**405,902**

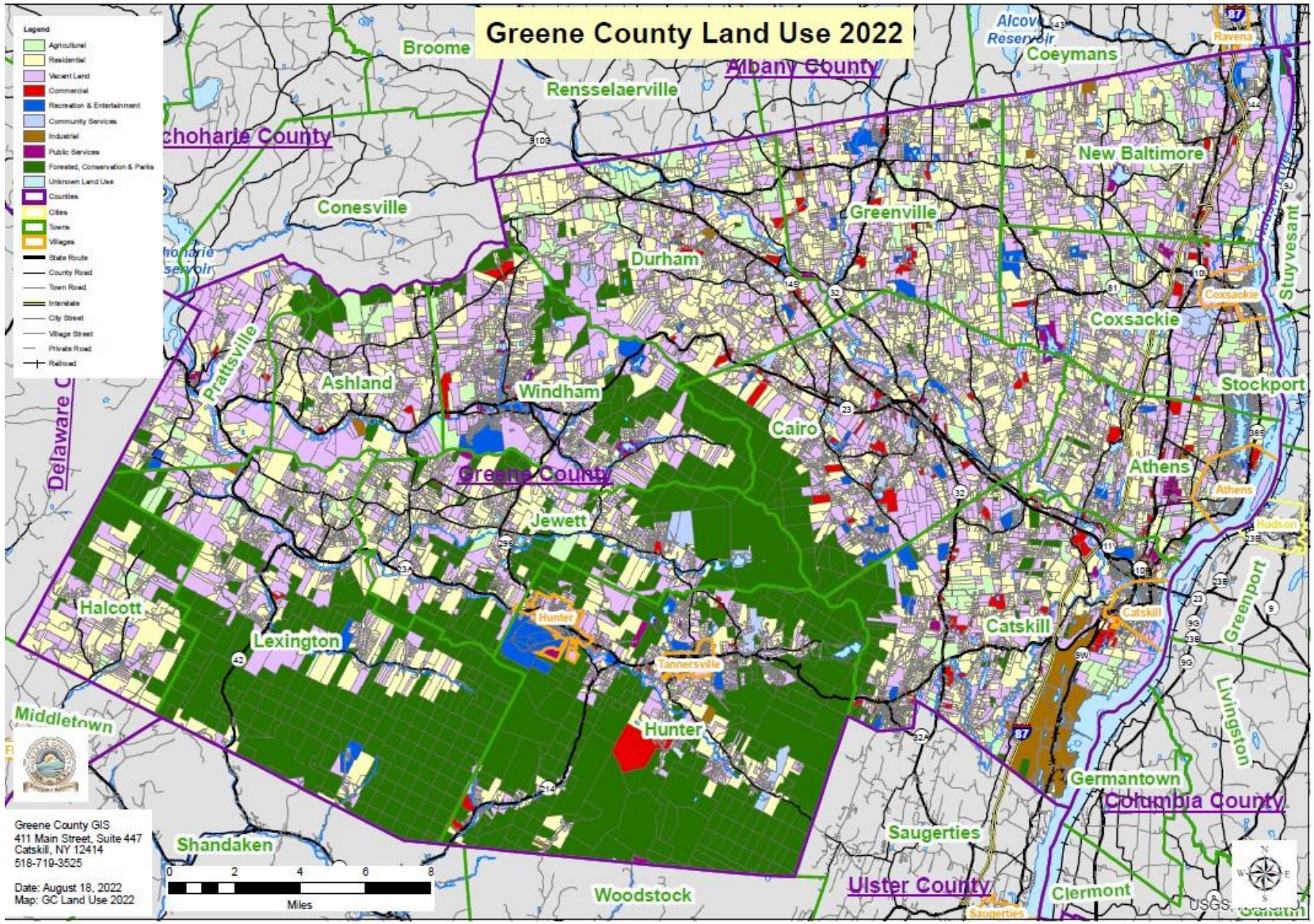


Figure 7: Greene County Land Use Map

Development Trends

Major development is happening throughout the County, to include new construction within industrial park areas, National Gas expansion to the park, investment in downtown areas such as purchasing and renovating resorts, two new medical facilities and a county health services building. One new development of note is the Windham Mountain Development, which recently completed a project that provides an enhanced storm water collection and conveyance system (due to effects from Hurricane Irene), to protect the resort infrastructure of Windham Mountain and a new lower slope side ski trail with access to the base lodge. This project was part of a larger $33.5 million tourism destination project at Windham Mountain.

Additional information regarding development was collected from all the towns and villages and is contained in the jurisdictional annexes.

3.10 Critical Facilities and Community Lifelines

Critical facilities provide essential services and functions to a community and need to always remain functional and accessible, especially following a natural disaster or event. If these facilities are offline or not operational, the impacts to the community can be devastating. Critical facilities in a community generally consist of police, fire and Emergency Medical Services (EMS); emergency operations centers (EOCs); public and private utility facilities; drinking water and wastewater treatment plants; medical facilities; schools; communication towers and Tier 2 (hazardous materials) facilities. In addition to critical facilities, Greene County also incorporates the recently released concept by FEMA, known as Community Lifelines[7]. Lifelines are the fundamental services that, when stable, allow other facets of communities to function. Lifelines allow critical government and business functions to continue to operate and they are essential to the health and safety of the public. As noted in the Executive Summary, cross over planning was conducted with the CEMP planning team, which was working on the update to that plan at the same time as this update. The CEMP planning team was incorporating Community Lifelines into their Emergency Support Functions; therefore, it was imperative the two teams collaborate to ensure potential impacts to community lifelines and potential mitigation actions were considered in the updated plan. As part of these planning efforts, critical facilities were categorized by their associated Community Lifeline and that is how they are presented in this plan.

There are seven Community Lifelines as defined by FEMA.

- Safety and Security
- Food, Water, Sheltering
- Health and Medical
- Energy
- Communications
- Transportation
- Hazardous Materials

[7] FEMA Community Lifelines: https://www.fema.gov/emergency-managers/practitioners/lifelines

As noted above, the critical facilities that were identified by the planning team and other sources, were categorized by their associated Lifeline. Below, those critical facilities are displayed on maps that were created by each of the seven Lifelines, along with a brief description of the types of facilities within each Lifeline. Within each Jurisdictional Annex there is additional information on critical facilities and lifelines in the hazard areas within the jurisdiction. In addition, a full listing of the names and location of the critical facilities is contained in Appendix C, which is not for public disclosure.

Below is the Critical Facilities Legend for the maps that follow:

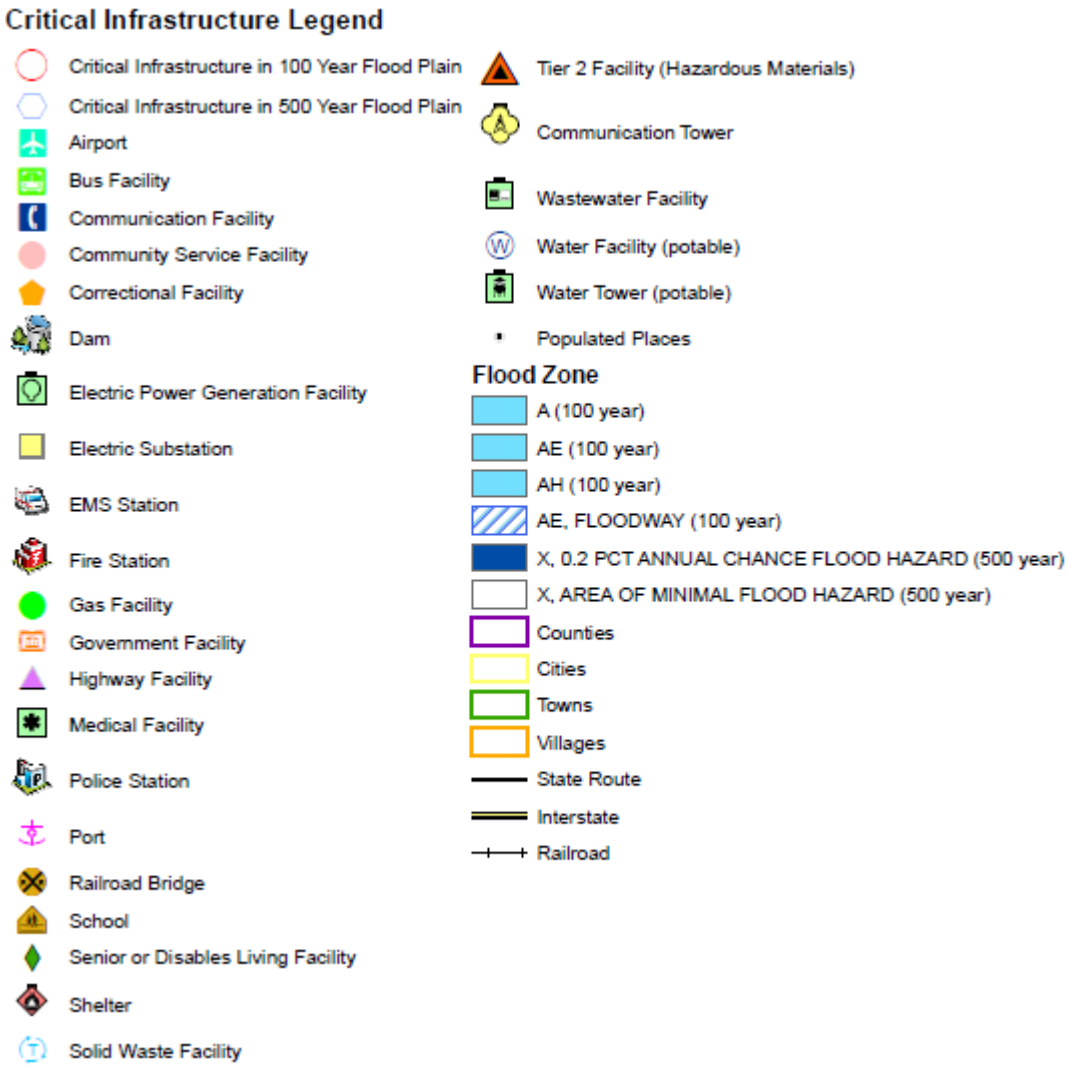


Figure 8: Safety and Security Map - This map displays the location of Correctional Facilities; Emergency Operations Center; EMS Facilities; Fire Stations; Government Facilities (including solid waste facilities) and Police Stations.

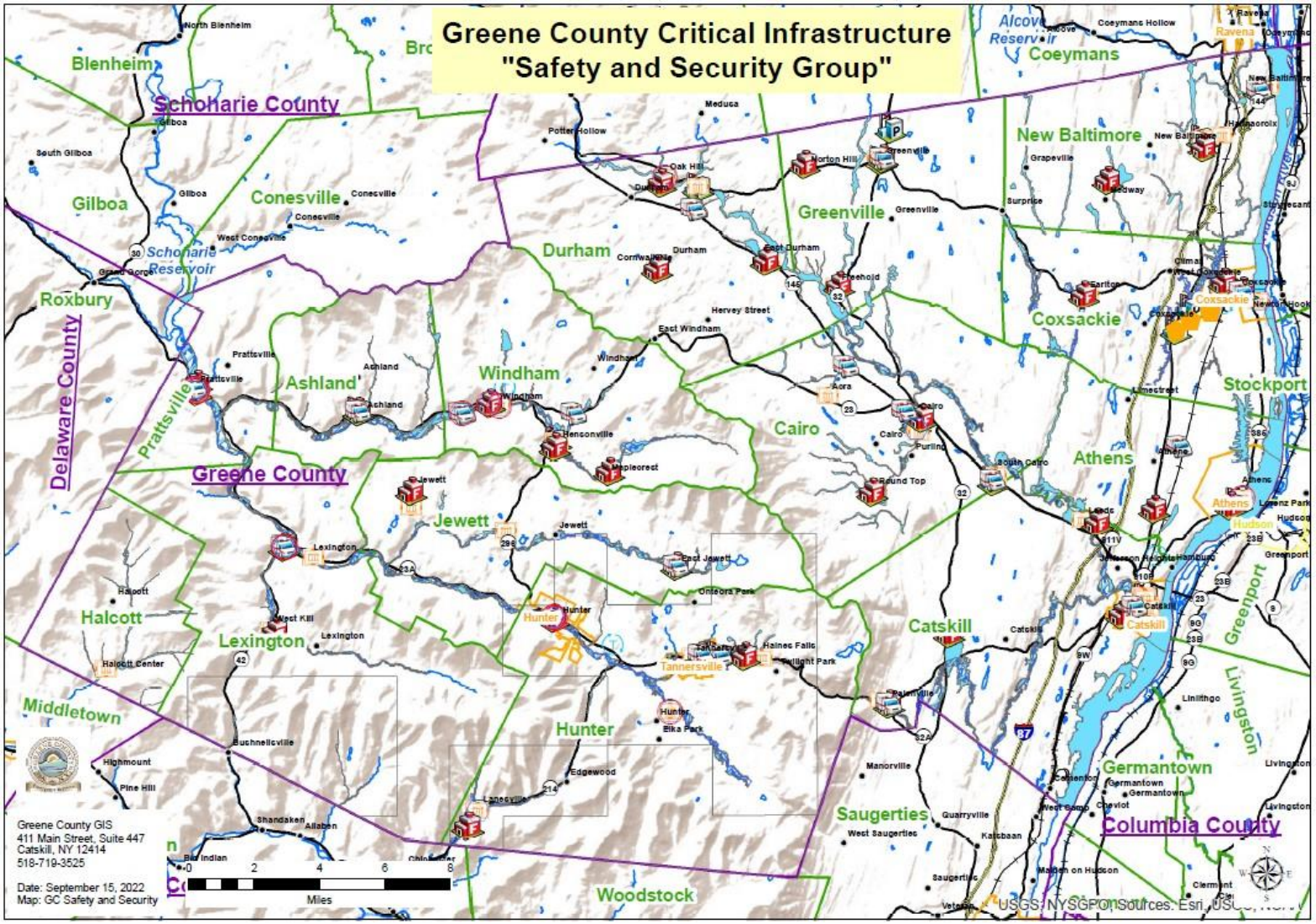


Figure 9: Food, Water and Sheltering Map - This map displays the location of NY City Aqueduct Shaft; Private and Public Water and Waste Water Facilities; Pump Stations; Water Supply Towers; American Red Cross Shelters and Schools.

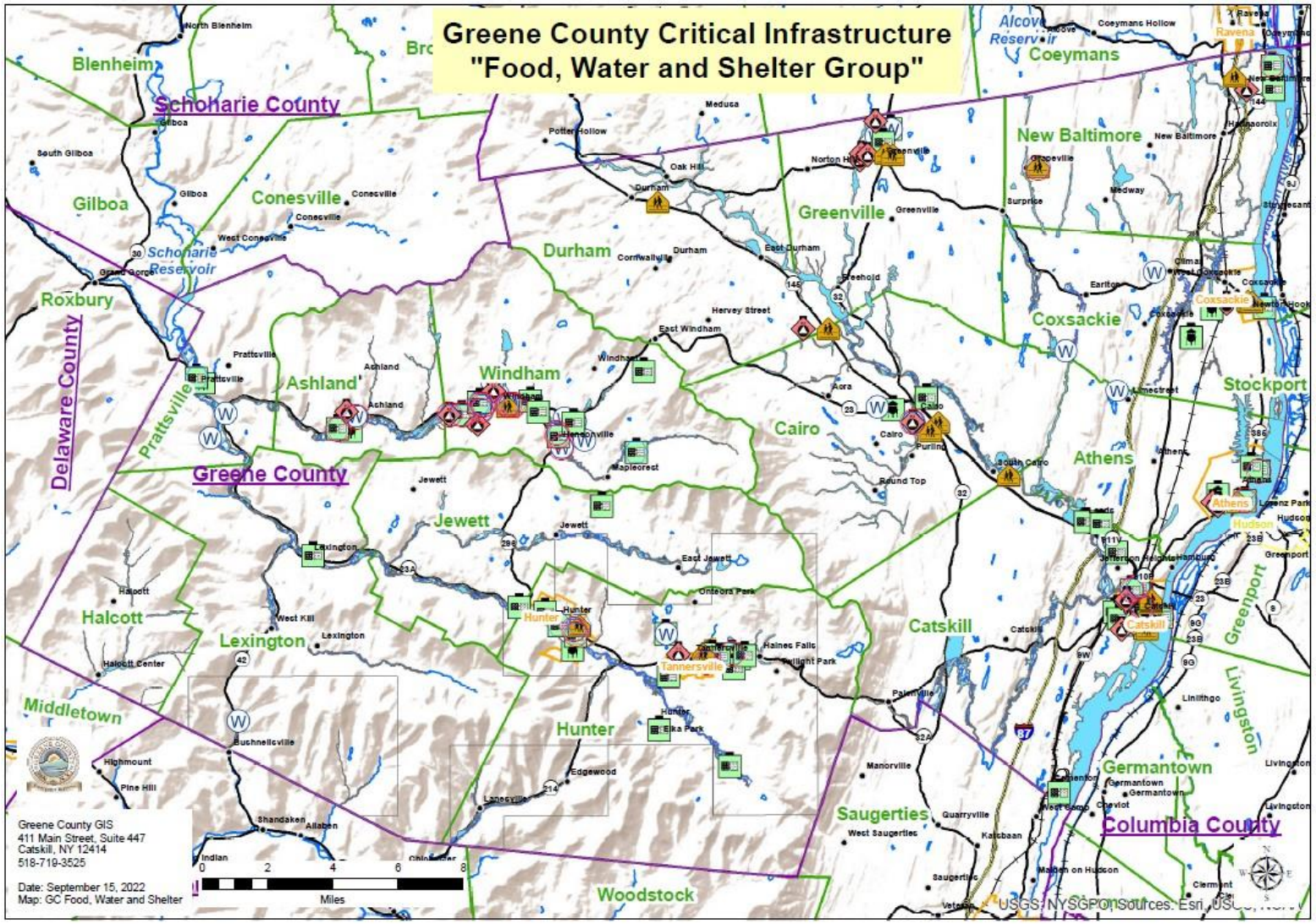


Figure 10: Health and Medical Map - This map displays the location of Community Service Facilities; Homes for Developmentally Disabled Adults; Senior Apartments; Adult Care and Assisted Living and Medical Facilities.

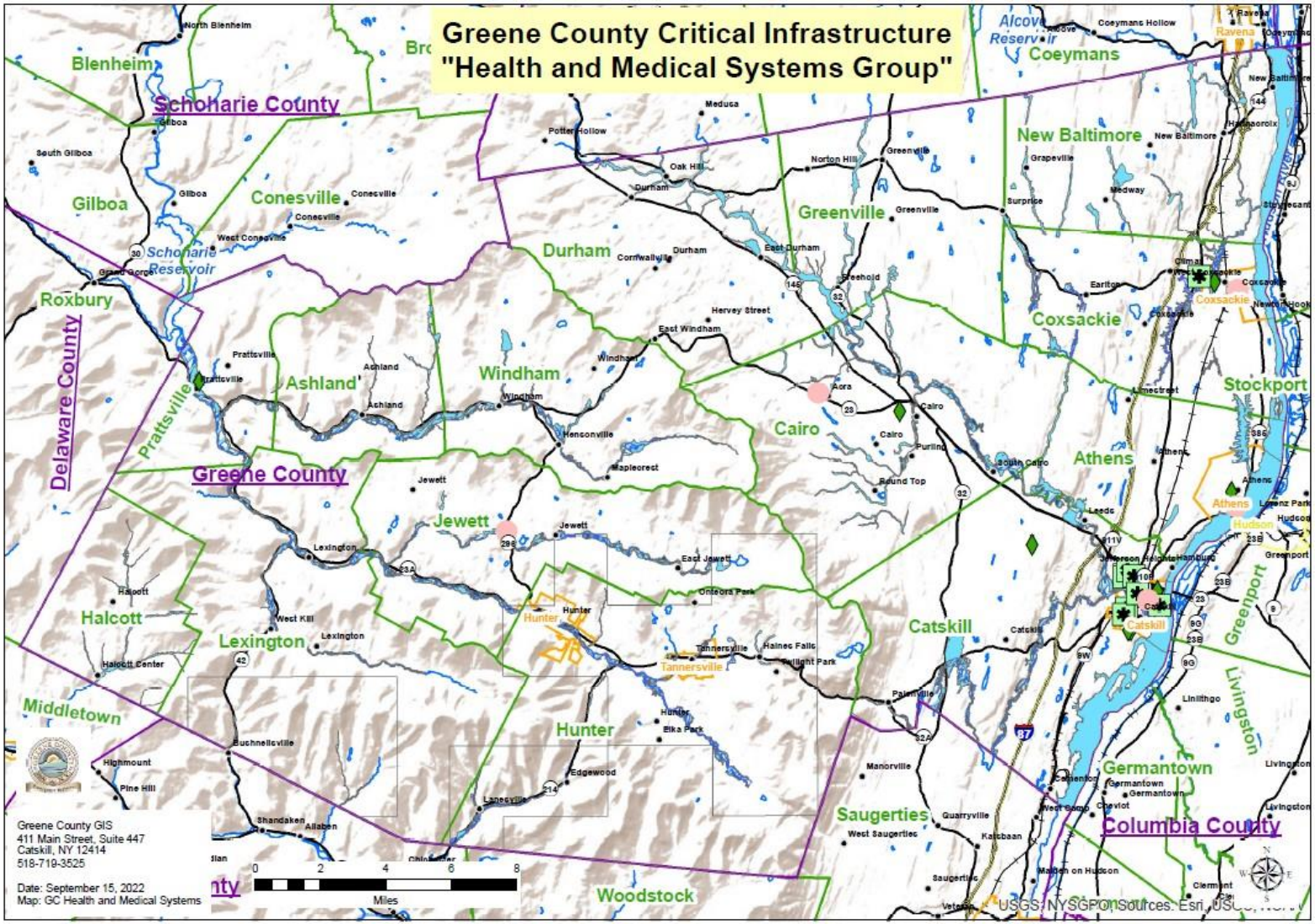


Figure 11: Energy Map - This map displays the location of Electric Facilities; Power Plants and Substations; Natural Gas Facilities and Solar Generation Facilities.

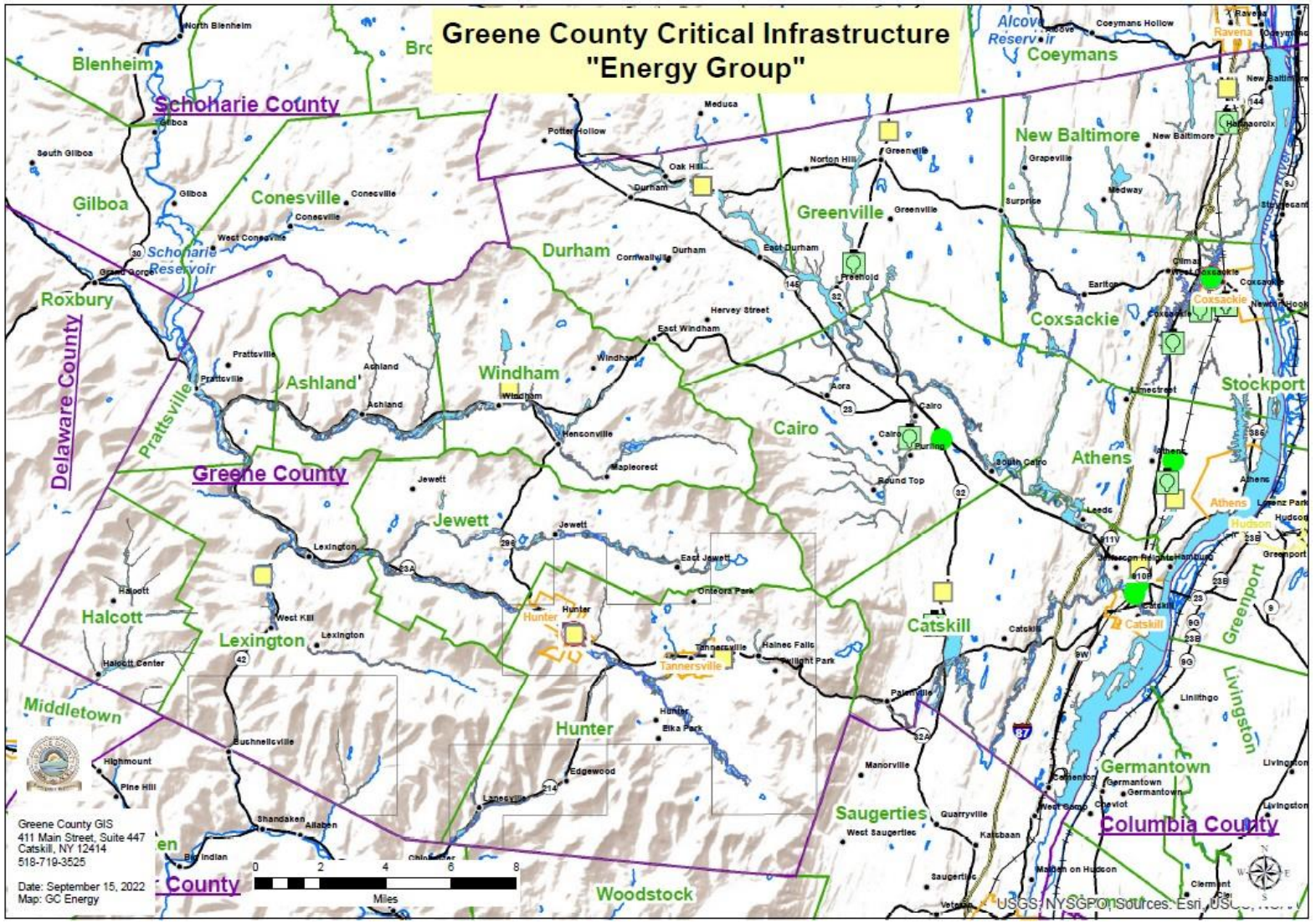


Figure 12: Communications Map- This map displays the location of Aviation Towers; Cablevison Towers; Communication and Public Safety Towers; and Communication Facilities.

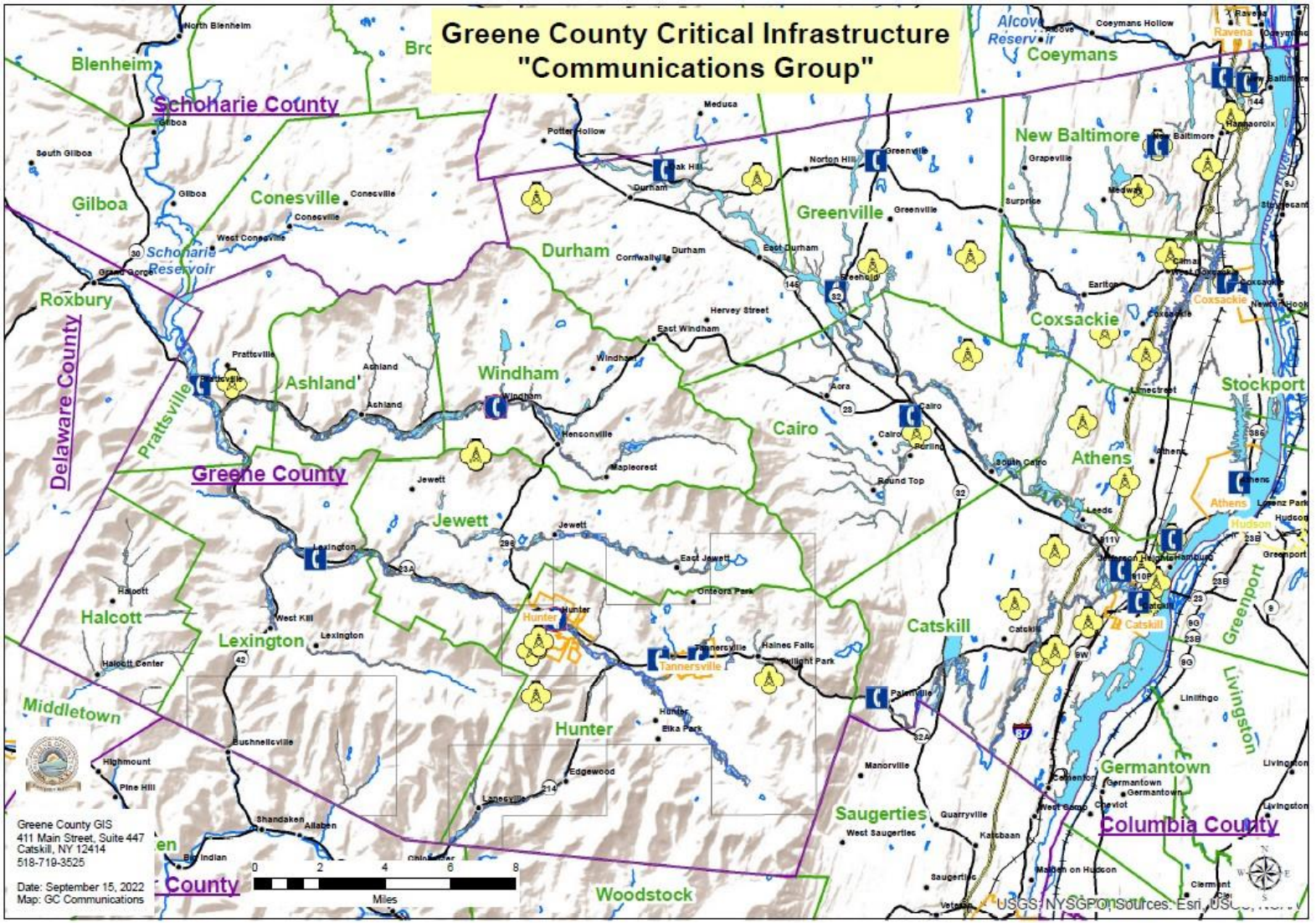


Figure 13: Transportation Map - This map displays the location of Airports; Bus Stations; Highway Facilities; Ports and Railroad Bridges.

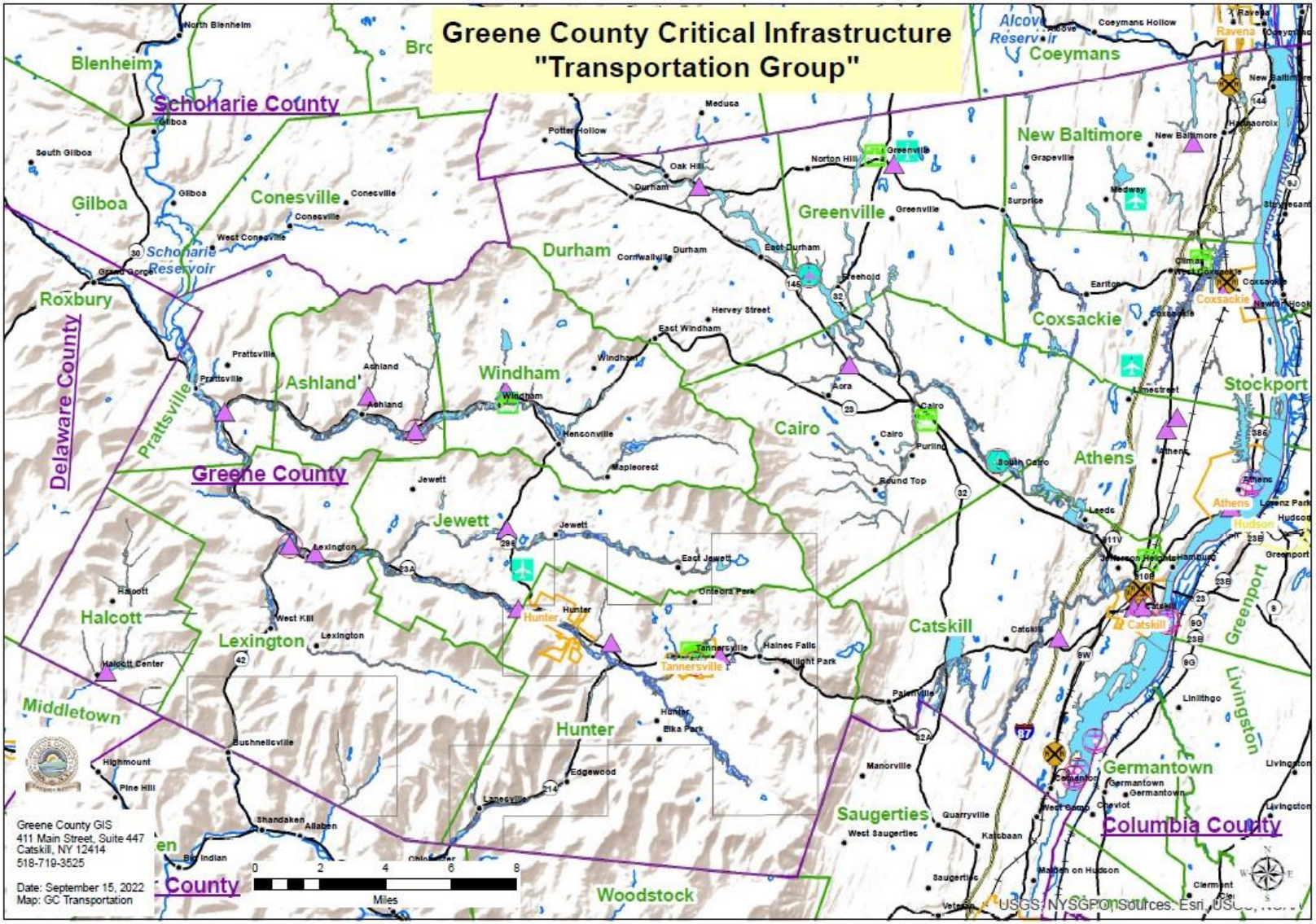
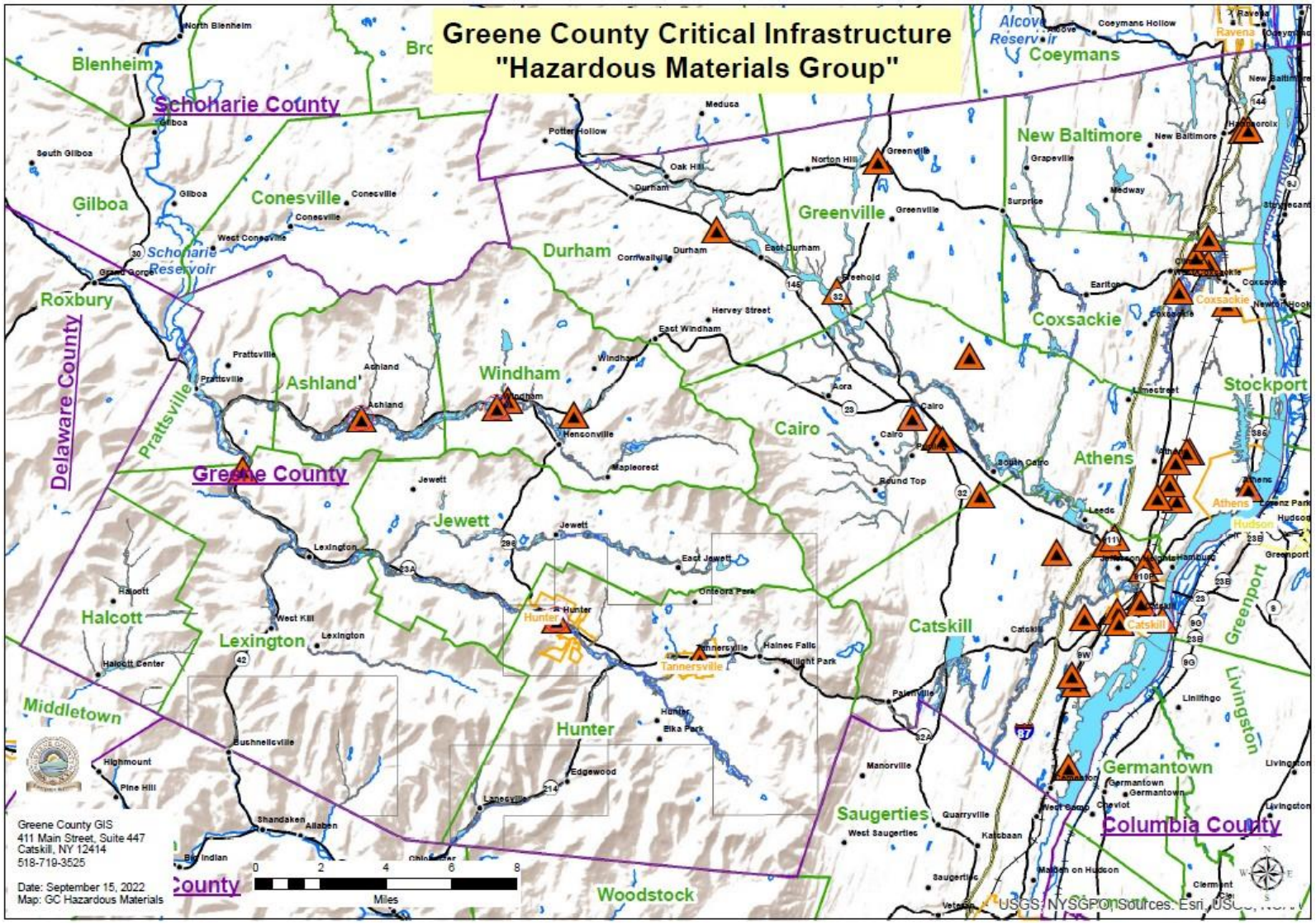


Figure 14: Hazardous Material Map- This map displays the location of Tier 2 Facilities.



Section 4 - Risk Assessment

The risk assessment process consists of hazard identification, profiling the hazards, identifying community assets at risk; analyze the risk and estimate losses.

The updated risk assessment for the County and participating jurisdictions was conducted using a County and jurisdiction wide approach since most, if not all, of the hazard events are likely to affect numerous jurisdictions within the County and not just a single jurisdiction. The goal of the risk assessment was to review the assessment information in the previous plan and identify if/how the hazards and risks may have changed since the last update.

For the risk assessment, the planning team utilized information contained in the 2022 County Emergency Preparedness Assessment (CEPA) and the results of a Community Survey, which was completed by 398 residents and businesses in the County. The planning team also utilized the three community engagement meetings that were held to obtain additional input from residents and officials regarding hazards and their potential impacts. GIS analysis and FEMA's Hazus software were also utilized to estimate potential losses from hurricane winds and riverine flooding using Hazus default building stock inventory data. The results of the Hazus model analysis include annualized loss estimates for each municipal jurisdiction in Greene County so that potential loss values throughout the County can be compared (see Section 4.3.1 and 4.3.2).

New to the risk assessment process with this update is the inclusion of whole community planning approach. Whole community planning is integral to ensuring *everyone* in the community is safe from the potential impacts of disasters, especially those populations that may be disproportionately impacted and/or are socially vulnerable.

Section 4.1 contains the disaster declaration history; Section 4.2 describes the hazard identification and Section 4.3 profiles the identified hazards and assesses vulnerability.

4.1. Presidentially Declared Disasters and Emergency Declarations

As part of the risk assessment, the Planning Team researched the Presidential Declared Disasters (DR) and Emergency Declarations (EM) that have occurred since the last update in 2016. Table 13 below contains the history of the disaster declarations in the County 2016-2022. A listing of Presidentially Declared Disasters and Emergency Declarations prior to 2016 can be found in Appendix A.

Table 13: Presidentially Declared Disasters in Greene County 2016-2022

Type of Event	Date of Declaration	Declaration No.	Comments
Blizzard	July 12, 2017 (Incident occurred March 14-15, 2017)	DR-4322	This snowstorm was regarded as the largest snowstorm to impact upstate New York since the Valentine's Day 2007 Snowstorm/Blizzard. Most areas saw 15-25 inches, with some western parts of the

			area picking up an amazing 30-42 inches of snowfall. The winds brought considerable blowing and drifting of snow along with numerous power outages.
Hurricane Henri	Aug. 22, 2021	EM-3565	Tropical Cyclone Henri spun across eastern New York on Monday, August 23, 2021, producing additional moderate to locally heavy rainfall with Greene County being the hardest hit. Storm total rainfall from Henri spanning August 22nd to 23rd ranged between 4.00 to 7.50 inches across much of Greene County. This additional rainfall on the 23rd led to some incidents of flash flooding across the county.

Source: FEMA (2022) and NOAA/NCEI NCDC

4.2 Hazard Identification

For the update to this plan, the planning team collected and analyzed data on the natural hazards that have affected the County since the last update of the plan in 2016 to determine the natural hazards that have affected the area, with the goal of refining the list to reflect only those natural hazards that pose the greatest risk.

The identification of natural hazards involved the following:

- Input from the County
- Input from the jurisdictions participating in the plan
- Input from the Community Survey
- Review of the 2022 CEPA
- Review of the 2019 New York State Hazard Mitigation Plan
- Review of the National Risk Index information for Greene County
- Review of local, state, and federal information on the frequency, magnitude, and costs associated with the various hazards that have affected the region
- Qualitative or anecdotal information on natural hazards and the perceived vulnerability of the County's assets to them

Table 14 below summarizes the process that was used to identify the natural hazards of concern for further evaluation.

Following review of the data, the Planning Team determined that flooding, severe storms, and severe winter storms could lead to a disaster in the County. In fact, based upon recent history and further consideration, as part of the 2022 CEPA update, the County adjusted their Risk Assessment to reflect an increased risk of Flooding, Ice Storms (at least a ½ inch or more) and Severe Wind/Tornado. Below

is an excerpt from the CEPA that shows the Relative Risk Score for the natural hazards that pose the greatest risk to the County.

Table 14: Excerpt from the 2022 Updated Greene County CEPA Risk Assessment

Hazard	Likelihood	Consequence	Relative Risk Score
Ice Storms (at least a ½ inch or more)	High	High	16
Hurricanes/Tropical Storm (Wind/Surge and Rainfall)	Medium	High	12
Severe Winter Snowstorms	High	Medium	12
Flooding	High	Medium	12
Severe Wind/Tornado	High	Medium	12

Source: County Emergency Preparedness Assessment (CEPA), Greene County 2022

Based on the data and information contained in the CEPA, the Planning Team grouped the natural hazards by similar impacts, with equal ranking, as follows:

- **Flooding** – Riverine and flash flooding due to rainfall and flooding caused by an ice jam or dam failure.
- **Severe storm/wind event** – Windstorms, thunderstorms, hail, tornados, and hurricanes or tropical storms. While there is no history of a full-force hurricane in Greene County, residual tropical storms impact the County as Severe Storm events and are therefore included in this hazard category.
- **Severe winter storm/ice storm** – Heavy snow, blizzards, sleet, freezing rain, ice storms (at least ½ inch or more), Nor'easters, and extreme cold.

Of note, in the 2016 plan, the Planning Committee had identified two additional hazards: earthquakes and landslides. Upon further consideration by the Planning Team as part of this update, it was decided that these two hazards be removed from consideration in the plan since neither hazard is likely to lead to a disaster in the County and that both therefore present a low risk.

Table 15: Greene County Hazard Identification

Hazard	Risk	Determination	Source of Hazard Information
Flooding	High	The Planning Team considers flooding the natural hazard that poses a high risk to the County. Since the last plan update, eight flooding events have occurred in the County.	NOAA/NCEI, NCDC NWS FEMA Greene County Greene County CEPA Planning Team

		Flooding occurs throughout the County with some areas seeing upwards of 4"-6" of rain in recent events.	2019 NYS HMP National Risk Index Community Survey NY GIS Data Clearinghouse
Severe Storm/ Wind Event	High	The Planning Team considers Severe Storms/Wind Events as posing a high risk to the County. Since the last plan update, 26 Severe Storm events have occurred in the County. Severe storms have occurred throughout the County, and most happen frequently.	NOAA/NCEI, NCDC NWS FEMA Greene County Greene County CEPA Planning Team Community Survey 2019 NYS HMP National Risk Index
Severe Winter Storm/ Ice Storm	High	The Planning Team considers Severe Winter Storms/Ice Storms as posing a high risk to the County. Since the last plan update, 24 Winter Storm events have occurred in the County. Winter storm events have occurred throughout the County.	NOAA/NCEI, NCDC NWS FEMA Greene County Greene County CEPA Planning Team Community Survey 2019 NYS HMP National Risk Index

Based on the information provided above, the Planning Team determined that the following three hazards would be profiled and assessed for risk for this plan:

- Flooding
- Severe storm/Wind Event
- Severe winter storm/Ice Storm

Other hazards the Planning Team considered but decided not to address in this plan are noted below. The Planning Team will continue to monitor these events and will reassess their risk as part of the next update. The team will also monitor any potential impacts of these hazards due to climate change, which is expected to increase the occurrence of the hazards over time.

a. Forest fires were considered because two forest fires occurred in the County, but none since the last update in 2016. Since both previous fires were minor and quickly controlled, and neither one was started by natural causes, the Planning Team determined that forest fires would not be profiled for this plan but would continue to be monitored for occurrences. Of note, the 2019 New York State Hazard Mitigation Plan lists Greene County as a High-Risk County for Wildfire.

b. Drought was considered because the County has experienced moderate drought conditions periodically since the last update, according to NOAA's, National Integrated Drought

Information System. The most significant occurrence was from April 2016 through May 2017 when the county was classified as being in "moderate drought" and "severe drought" for an extended period. However, Greene County has never been included in a declared disaster for drought. As such, the Planning Team decided not to include drought in a plan since the focus is on mitigation and not drought management strategies that focus on preparedness or response.

c. Extreme heat was considered since there have been 3 occurrences of excessive heat since the last update. There were no injuries or fatalities, but on two occasions the hot airmass provided fuel for thunderstorms that resulted in minor wind damage and some scattered power outages. However, Greene County Emergency Services prepares for and responds to this hazard in the same manner as extreme cold, i.e., there are procedures in place for elderly residents to call-in and/or receive messages about assistance and cooling shelters before, during and after an event, therefore, the Planning Team decided not to consider this hazard for the plan update but will continue to monitor future occurrences.

The participating jurisdictions were asked to review and update their individual annexes, which included ranking the hazards based on the impacts to their jurisdiction and identifying any other hazards that may impact the jurisdiction. No other hazards, other than those noted above, were identified by the jurisdictions. The ranking of the hazards can be found in the Table below, as well as in the Jurisdictional Annexes. Ranking used a scale of 1 to 3, with 1 being the highest risk.

Table 16: Hazard ranking by Jurisdiction

Jurisdiction	Flooding	Severe Storm/Wind Event	Severe Winter Storm/ Ice Storm
Ashland	1	2	3
Athens – Town	2	1	3
Athens – Village	1	2	3
Cairo			
Catskill – Town	1	1	1
Catskill – Village	1	1	1
Coxsackie – Town	2	1	3
Coxsackie – Village	1	2	3
Durham	2	3	1
Greenville	2	3	1
Halcott	2	3	1
Hunter – Town	2	3	1
Hunter – Village	1	2	3
Jewett	1	2	3
Lexington	1	3	2
New Baltimore	1	3	2
Prattsville	1	2	3
Tannersville	1	2	1
Windham	2	3	1

4.3 Hazard Profiles and Vulnerability Assessment

This section contains the profiles of the three hazards that the Planning Team selected for profiling: flooding, severe storm/wind event, and severe winter storm/ice storm. The profiles consist of information on location, extent, previous occurrences, probability of future events, role of global climate change in estimating probability, vulnerability, and impact, and estimated potential loss. The flooding hazard profile includes information on the Repetitive Loss Properties in the County.

4.3.1 Flooding

Flooding in Greene County can occur at any time of the year, but most of the larger floods have occurred in late winter or in early spring when snowmelt adds to heavy spring rains. Flooding along the Greene County waterways may also be due to or exacerbated by ice jams or the result of dam failure.

Location

The Mohawk River and Middle Hudson River subbasins of the Hudson River watershed extend through large portions of Greene County. These subbasins have many tributaries that experience frequent flooding. The tributaries in the Mohawk River Basin are the Schoharie Creek (Main Stem), Manor Kill, Batavia Kill, West Kill, and East Kill. The tributaries in the Middle Hudson River Basin are the Stony Clove Brook, Broadstreet Hollow Brook, Catskill Creek, Coxsackie Creek, Hollister Lake, Kaaterskill Creek, Shingle Kill, Potic Creek, Hans Vosen Kill, and Sleepy Hollow Lake. See Figure 15 below for the watersheds in Greene County.

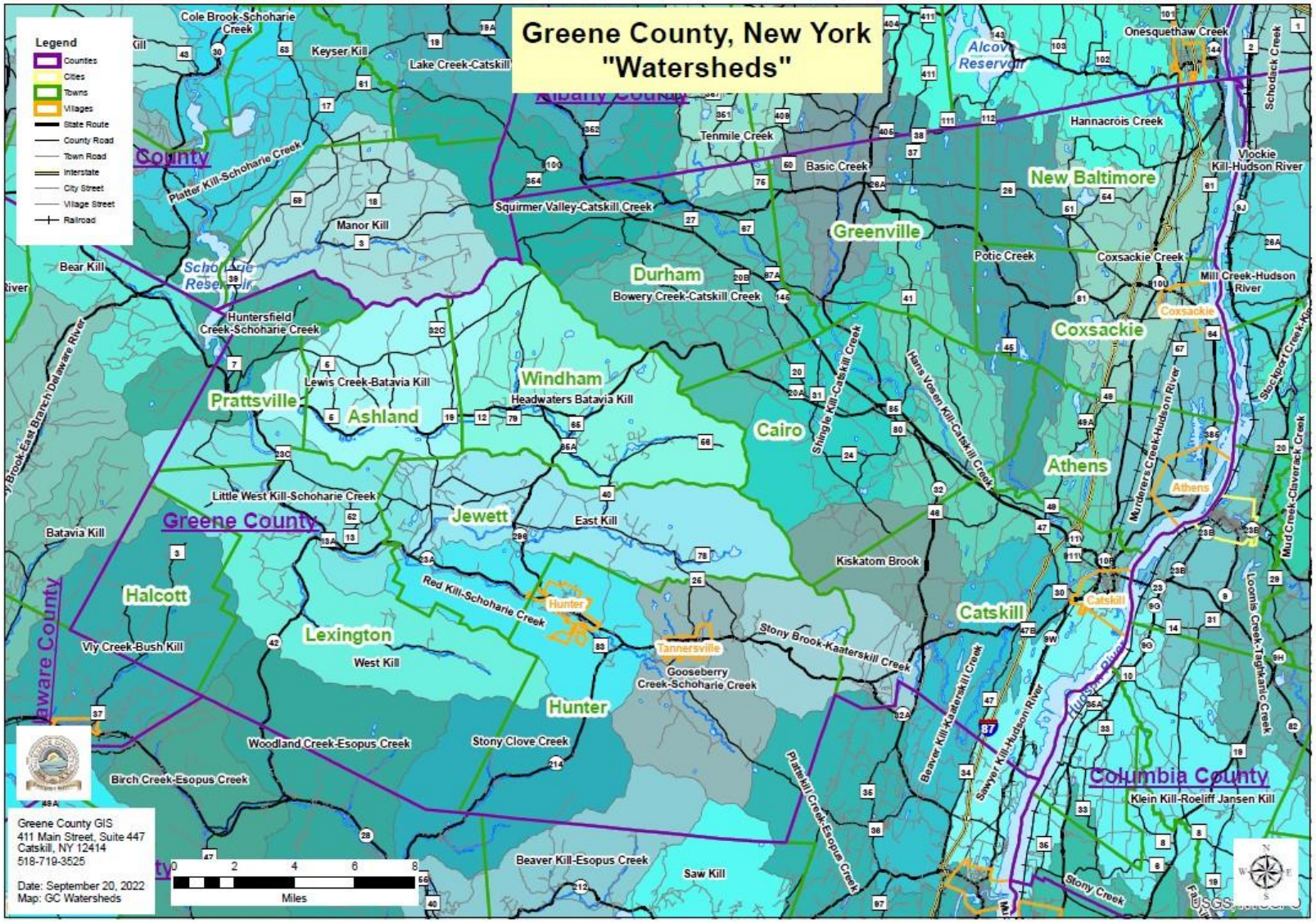


Figure 15: Watersheds in Greene County

FEMA identifies areas with the highest risk of flooding as Special Flood Hazard Areas (SFHAs). SFHAs are determined using engineering modeling that is based on records of river flow and rainfall, information from the community, topographic surveys, and hydrologic and hydraulic analyses. Flood hazard zones, including SFHAs, are delineated on FEMA's Flood Insurance Rate Maps (FIRMs). FIRMs indicate the base flood elevation (BFE), which is the elevation of floodwaters with at least a 1 percent chance of being equaled or exceeded in any given year. FIRMs also indicate the boundaries of the floodways that are needed to discharge floodwaters.

Figure 16 below illustrates the regulatory 100-year and 500-year floodplains in the County.

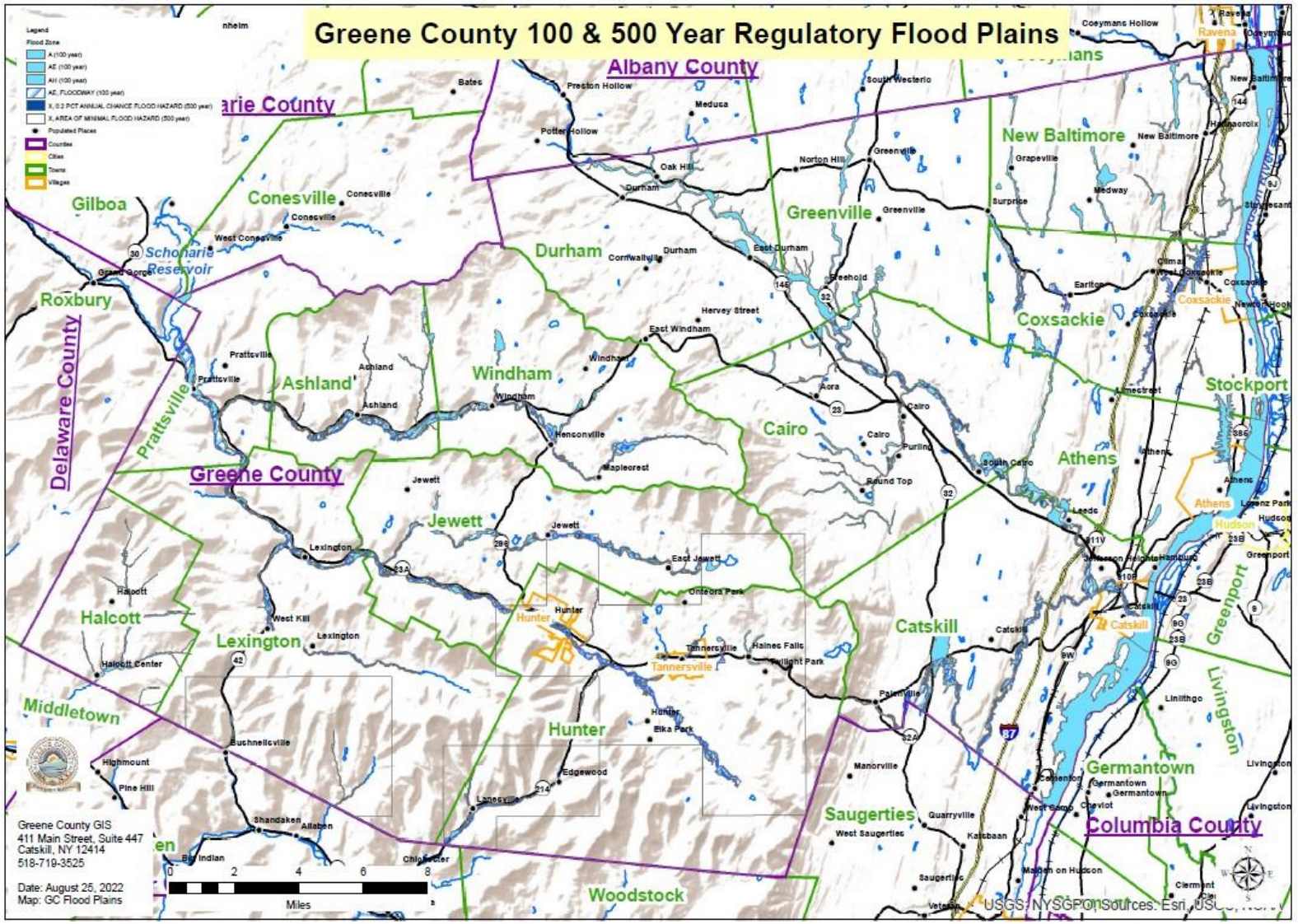


Figure 16: Greene County 100- and 500-year regulatory flood plains

As noted above, flooding along the Greene County waterways and drainage areas may be caused by dam failure. The hazard classification of a dam is assigned according to the potential downstream impact of a dam failure pursuant to 6 NYCRR Part 673.3. The hazard classifications are:

- Low Hazard (Class A) – Dam failure would affect isolated buildings, undeveloped lands, or township or county roads and/or would not cause significant economic loss or serious environmental damage.
- Intermediate Hazard (Class B) – Dam failure could damage isolated homes, main highways, and minor railroads; interrupt the use of relatively important public utilities; and/or cause significant economic loss or serious environmental damage.
- High Hazard (Class C) – Dam failure may cause loss of human life, serious damage to homes, industrial or commercial buildings, important public utilities, main highways or railroads, and/or cause extensive economic loss.

Greene County has 90 dams (NYSDEC, NPDP, 2022). See Appendix A for a list of the dams and their hazard classification, location, type, owner, and purpose. The hazard classifications of the 90 dams are Low (62), Intermediate (7), High (7), and No Hazard (14). Figure 17 shows the locations of the dams.

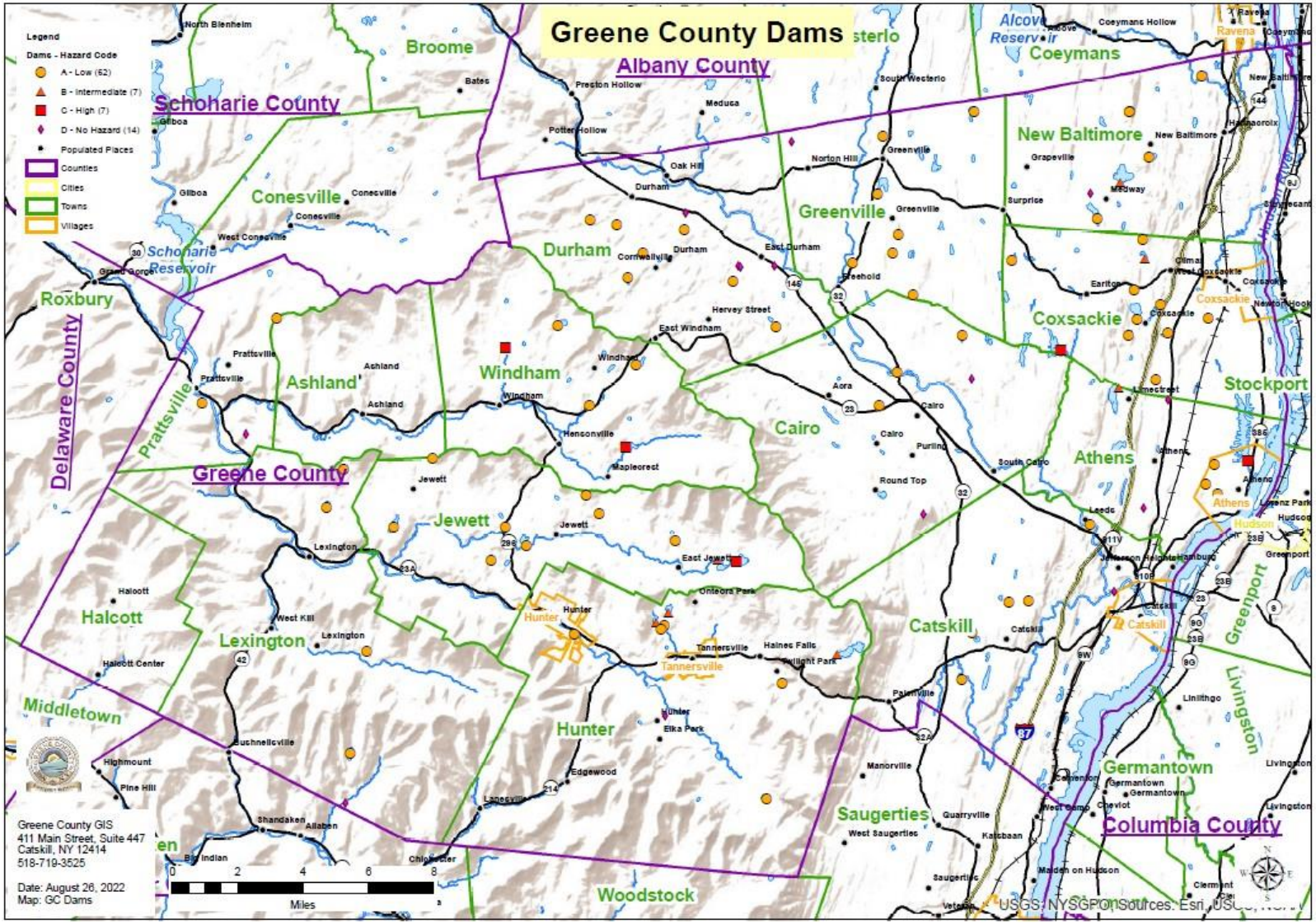


Figure 17: Locations of the 90 dams in Greene County

Extent (Magnitude or Severity)

The 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.

Flood severity from a dam failure is measured as low, medium, or high:

- Low severity – No buildings are washed off their foundations; structures are exposed to depths of less than 10 feet (3.3 meters).
- 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 (3.3 meters).
- High severity – Floodwaters sweep the area clean, and nothing remains. Locations are flooded by the near instantaneous failure of a concrete dam, or an earth-fill dam washes out in seconds rather than minutes or hours. In addition, the flooding caused by the dam failure sweeps the area clean and little or no evidence of the prior human habitation remains after the floodwater recedes.

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.

Previous Occurrences

Between 1953 and 2022, Greene County had 103 flooding events (NCDC), leading to approximately $15 million in property damage. Since the last plan update in 2016, there have been 8 flooding events in the County. Table 17 summarizes the flooding events in the County between the last plan update in 2016 and 2022.

There was one EM declared for flooding since the last plan update. Tropical Cyclone Henri spun across eastern New York on Monday, August 23, 2021, producing additional moderate to locally heavy rainfall with Greene County being the hardest hit. Storm total rainfall from Henri spanning August 22nd to 23rd ranged between 4.00 to 7.50 inches across much of Greene County. This additional rainfall on the 23rd led to some incidents of flash flooding across the county.

Table 17: Flooding Events in Greene County, 2016-2022

Date	Affected Location	Type	Deaths	Injuries	Reported Property Damage	Reported Crop Damage
8/3/18	Catskill	Flash Flood	0	0	$1,000	0
	West Coxsackie	Flash Flood	0	0	0	0
12/25/20	Jewett	Flood	0	0	$85,000	0
	Spruceton	Flood	0	0	0	0
	Lanesville	Flood	0	0	0	0
	Palenville	Flood	0	0	$75,000	0
	Prattsville	Flood	0	0	0	0
	Leeds	Flood	0	0	0	0
	Catskill	Flood	0	0	0	0
	West Kill	Flood	0	0	0	0
7/18/21	Prattsville	Flash Flood	0	0	0	0
8/23/21	Kiskatom	Flash Flood	0	0	0	0
	Cairo	Flash Flood	0	0	0	0
	West Coxsackie	Flood	0		0	0
9/8/21	West Coxsackie	Flash Flood	0	0	0	0
10/26/21	Hensonville	Flood	0	0	0	0
	Durham	Flood	0	0	0	0
	Cornwallville	Flood	0	0	0	0
	Jefferson Hgts	Flood	0	0	0	0
11/12/21	West Coxsackie	Flood	0	0	0	0
4/7/22	Climax	Flood	0	0	$20,000	0
	Acra	Flood	0	0	$20,000	0
	Palenville	Flood	0	0	0	0

Source: NOAA/NCEI, NCDC (2022)

Selected events that have occurred since the plan was updated in 2016 are described below. See Appendix A for descriptions of significant flooding events that affected Greene County before 2016.

December 25, 2020 - An area of low-pressure tracking from the Great Lakes to Hudson Bay advected in an unseasonably warm air mass into the region from Thursday, December 24 to Friday, December 25, 2020. Rain gradually overspread the region from west to east during the day on December 24 with the steadiest, heaviest rainfall during the overnight hours and early morning hours of December 25. Rain showers continued through the day on December 25 and changed to snow showers during the evening and overnight hours of December 25-26 as colder air returned.

The region still dealt with nearly the entire snowpack from the blockbuster winter storm from December 16-17. While the snow compacted over time, very little water was lost from the snow. Observations concluded that between 1.50 to 3.00 inches of water was in the snowpack prior to this event, most, if not all of which, melted during this event.

Rainfall totals across eastern New York were generally between 1 to 3 inches; however, the eastern Catskills received 4 to 6 inches of rain. These amounts do not include the additional 1.50 to 3.00 inches of water that melted from the snowpack. The combination of warm air, rainfall, and melting snowpack led to aerial and river flooding across the region. There were numerous reports of roads being closed due to the flooding. Local emergency managers had to evacuate a few communities due to the rising waters. Some roads across Greene and Ulster counties were washed out and had to be rebuilt. Two area rivers reached or exceeded moderate flood stage, Esopus Creek and Schoharie Creek.

August 23, 2021 - The broad circulation of what was once Tropical Cyclone Henri spun across eastern New York on Monday, August 23, 2021, producing additional moderate to locally heavy rainfall with Greene County being the hardest hit. Storm total rainfall from Henri spanning August 22nd to 23rd ranged between 4.00 to 7.50 inches across much of Greene County. This additional rainfall on the 23rd led to some incidents of flash flooding across the county. Greene County was one of the several counties that Governor Andrew Cuomo declared a State of Emergency prior to Henri's arrival. President Joe Biden later approved a pre-landfall disaster declaration.

October 26, 2021 - A coastal storm brought a prolonged period of moderate rainfall across portions of eastern New York, mainly on Tuesday, October 26, 2021. While the rain was not falling particularly heavily, persistent rainfall rates of 0.25 to 0.50 of an inch an hour occurred for several hours across portions of Ulster, Greene, Schoharie and Schenectady counties. This resulted in rainfall amounts of 2 to 5 inches across the region. Minor flooding began as early as the late morning hours on October 26, but the greatest coverage of flooding occurred during the afternoon and evening hours as roads began to close. Rivers, creeks and streams also began overflowing their banks leading to additional flooding. Rain ended during the overnight hours, slowly allowing water to recede. However, roads damaged by the flooding remained closed into the daytime hours of October 27. Gusty winds between 30 and 40 mph also accompanied the storm which resulted in a few downed trees and some power outages.

New York Governor Kathy Hochul declared a State of Emergency for selected counties across New York State including Greene, Montgomery, Schenectady, Schoharie and Ulster.

April 7, 2022 - A slow moving frontal system produced widespread heavy rainfall and flooding across eastern New York from April 7-8, 2022. Rainfall amounts between 1.50 and 3.00 inches were common, though a few localized areas received upwards of 4.50 inches. Periods of light to moderate rainfall began during the daytime hours on April 7 with the steadiest and heaviest rainfall arriving during the evening hours on April 7 into the overnight hours on April 8 before ending. This heavy rainfall led to over a dozen rivers to exceed minor flood stage with a few rivers reaching moderate flood stage. For some, it took days after the event for waters to recede.

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

As of October 2015, which is the best available data at the time of the plan update, Greene County has 52 RL properties, mostly in the Towns of Lexington (9), Catskill (7), Prattsville (6), and Hunter (6), and the Village of Catskill (5). Of the 52 properties, 37 are single-family homes, 6 are other residences, which include 2- to 4-family residences and condos, and 9 are non-residential. Table 18 provides a summary of RL properties in Greene County. The number of RL properties in each town or village is included in the Jurisdictional Annexes and Appendix G. Mitigation of repetitive loss properties is very cost-effective and is therefore possible to fund through federal mitigation grant funding. Mitigating repetitive loss properties is a win-win as it reduces the financial burden on the NFIP and prevents repeated suffering for residents.

Table 18: Repetitive Loss Properties in Greene County as of October 2015

Type of Property	Number
Residential	37
Other residential*	6
Non-residential	9
Total properties	**52**
Total claims payouts	**$6,598,703**

Source: FEMA Region II

*2- 4-family residence or condo

Probability and Climate Change

Based on historic and recent flood events, the probability of future occurrences in Greene County is high. With 54 flooding events in the last 22 years, the probability of future events is 2.5 floods per year, or greater than a 100 percent chance of flooding in any given year. According to the Fourth National Climate Assessment Report[8] the Northeast has been experiencing increases in rainfall

[8] Fourth National Climate Assessment – US Global Change Research Program (USGCRP): https://nca2018.globalchange.gov/

intensity, which has exceeded those in other regions in the United States. This trend is expected to continue, with increases expected in both winter and spring.

This is supported by the 2019 NY SHMP which notes that the increase in historic occurrences, climate change and the rise in sea levels, increases the probability of more frequent flood hazard events. In addition, more frequent and intense flash flooding may occur as a result of climate change.

Vulnerability and Impacts

Flooding is a significant concern for Greene County. There are several components involved in assessing Greene County's vulnerability to the flood hazard – which critical facilities are vulnerable, which areas would suffer the greatest losses (so they can be prioritized for mitigation), and repetitive loss properties that were discussed previously. Potential losses in the county were calculated for riverine flooding for 100-year and 500-year flood events, regardless of whether the cause is rainfall, snowmelt, dam failure, or ice jams.

Potential impacts of flooding in Greene County include road closure, destruction or damage to structures and infrastructure, disruption of businesses and government services, power outages, evacuations, and fatalities. As such, many of the carry over and new mitigation actions contained in the Jurisdictional Annexes will help eliminate or alleviate future flooding impacts due to climate change.

Estimated Potential Loss from Flooding

To estimate potential residential loss from a flood hazard, a Hazus analysis was conducted for riverine and coastal flooding. Table 19 shows the estimated residential building losses in 100- and 500-year flooding event scenarios.

Although it doesn't impact the results, it is worth noting that while Greene County staff were working on this flood analysis, they noticed some issues with it so reached out to the HAZUS team with FEMA. Due to the problems they were having, FEMA uncovered an issue with the program that some census blocks are included in the analysis for the 100-year flood, but then those blocks aren't also included in the analysis for the 500-year flood (when they should be included in both the 100-year and 500-year). This issue is easy to see when you look at the table below for Ashland, Athens Village, and Hunter Village as the 500-year residential losses are less than the 100-year residential losses. According to FEMA, this is something that will likely take them months to remedy in the program, so the information below contains the HAZUS data as-is for now. FEMA did confirm with us that the analysis results are still within the range of uncertainties for the HAZUS analysis, regardless of that issue with some census blocks.

Table 19: Estimated Potential Residential Building Loss from Flooding

Jurisdiction		Residential Building Exposure	100-Year Flood Residential Building Losses	500-Year Flood Residential Building Losses
Town	Ashland	$115,197,000	$2,471,000	$2,413,000
	Athens	$247,071,000	$164,000	$364,000
	Cairo	$723,889,000	$7,082,000	$8,961,000
	Catskill	$827,054,000	$7,072,000	$12,135,000
	Coxsackie	$369,872,000	$1,191,000	$1,456,000
	Durham	$369,189,000	$2,509,000	$3,170,000
	Greenville	$355,893,000	$611,000	$1,029,000
	Halcott	$53,676,000	$666,000	$779,000
	Hunter	$334,192,000	$7,170,000	$11,905,000
	Jewett	$247,708,000	$5,883,000	$6,246,000
	Lexington	$154,949,000	$6,156,000	$8,730,000
	New Baltimore	$322,415,000	$120,000	$131,000
	Prattsville	$84,474,000	$11,867,000	$14,158,000
	Windham	$605,561,000	$29,519,000	$32,252,000
Village	Athens	$217,830,000	$560,000	$512,000
	Catskill	$380,258,000	$17,955,000	$22,569,000
	Coxsackie	$317,114,000	$2,335,000	$3,130,000
	Hunter	$115,800,000	$8,385,000	$5,776,000
	Tannersville	$102,710,000	$0	$0
	Total	**$5,944,852,000**	**$111,716,000**	**$135,716,000**

Figure 18 below illustrates the 100-year flood residential building loss.

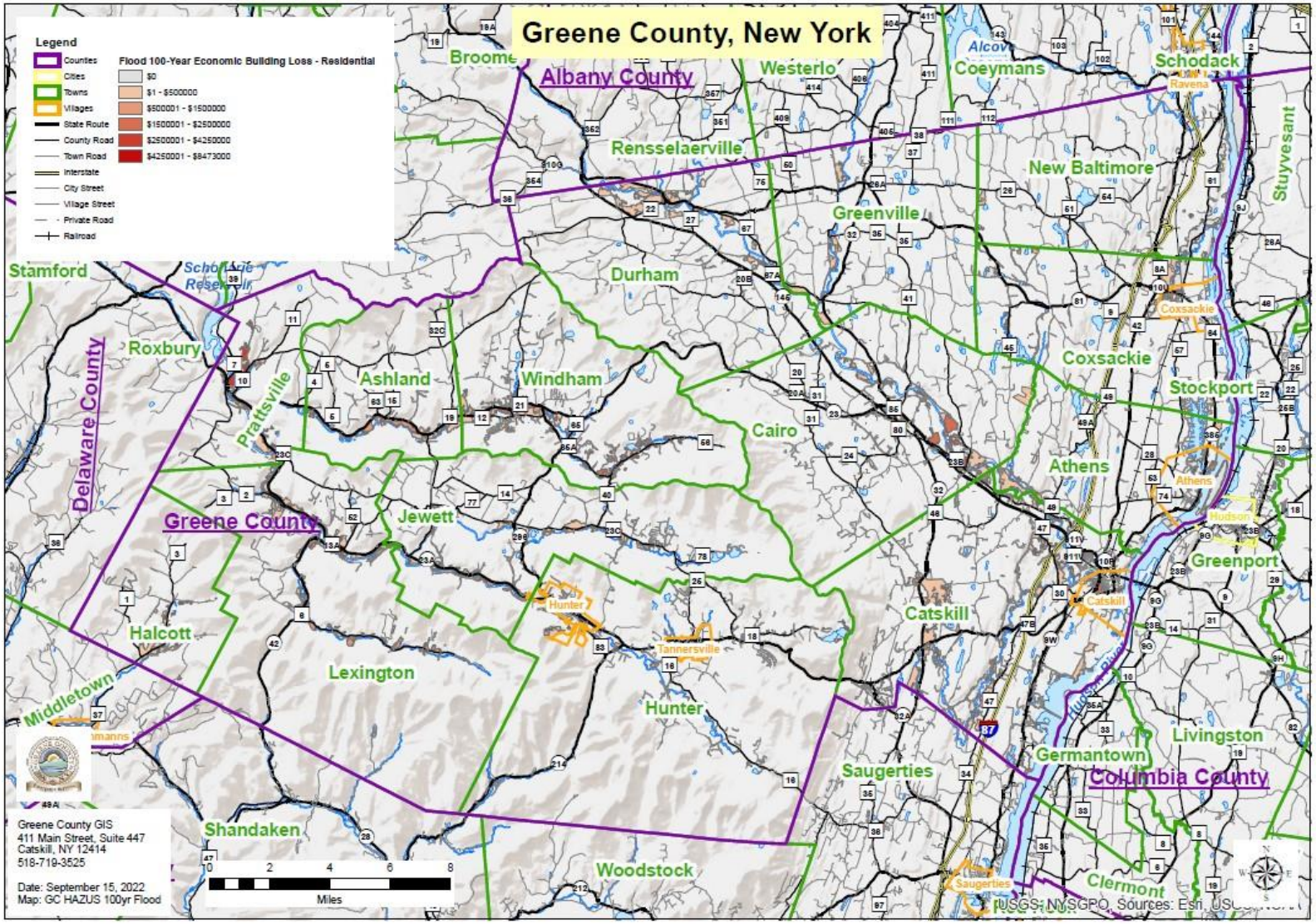


Figure 18: 100-Year Flood Residential Building Loss

Critical Facilities and Lifelines

A Greene County GIS analysis shows that several critical facilities and lifelines in the County are exposed to the 1-percent-annual-chance (100-year) flood and 0.2-percent-annual-chance (500-year) flood. The table below provides lists the total number of each type of critical facilities and lifelines in the flood hazard areas. More information specific to each jurisdiction can be found in the Jurisdictional Annexes.

Table 20: Types of Critical Facilities and Lifelines exposed to a 100- and 500- year flood.

Facility Type	Lifeline Classification	Total Count of Facility Type	# in 100 yr. Flood	# in 500 yr. Flood
Airport	Transportation	6	2	2
Bus Facility	Transportation	7	0	1
Communication Facilities	Communications	20	2	3
Electric Substations	Energy	11	1	2
EMS Stations	Safety and Security	19	3	3
Fire Stations	Safety and Security	34	3	3
Natural Gas Facilities	Energy	7	1	1
Government Facilities	Safety and Security	54	9	13
Highway Facilities	Transportation	26	5	4
Police Stations	Safety and Security	16	1	1
Ports	Transportation	7	6	7
Schools	Food, Water, Shelter	21	1	3
Shelters	Food, Water, Shelter	22	1	1
Tier 2 Facilities	Hazardous Materials	45	4	6
Waste Water Facilities	Food, Water, Shelter	46	11	17
Water Facilities	Food, Water, Shelter	35	13	13
	Totals:	**376**	**63**	**80**

Summary of Vulnerability Assessment

Based on an analysis of the available data, flooding was determined to be a significant hazard with a high probability of occurring in any given year. Flooding events have caused numerous bridges to be washed away and parts of several roads and Interstates have closed due to flooding. Many communities get cut off from supplies, electricity, and running water. Being cut off from such critical services can negatively impact vulnerable populations within the county and put them at higher risk of negative outcomes. Therefore, jurisdictions will work to consciously identify and implement mitigation actions that can alleviate or eliminate the impact to these populations and the community as a whole. For example, critical facilities located in the floodplain and repetitive loss properties are perfect candidates for mitigation to maximize benefits and save lives.

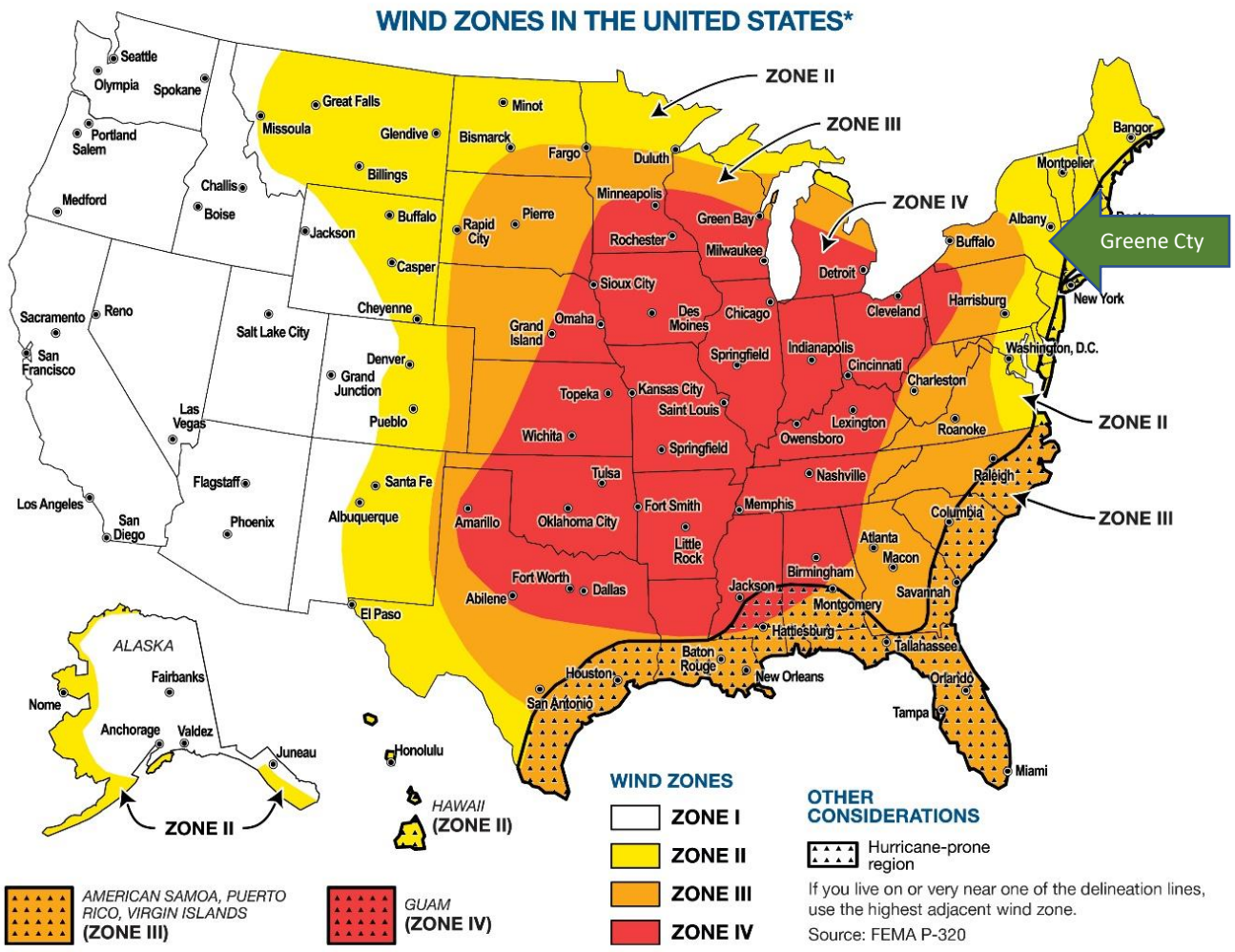
4.3.2 Severe Storm/Wind Event

As noted in Section 4.2, Severe storm/wind event includes windstorms, thunderstorms, hail, tornados, and hurricanes or tropical storms. While there is no history of a full-force hurricane in Greene County, residual tropical storms impact the County as Severe Storm events and are therefore included in this hazard category.

Location

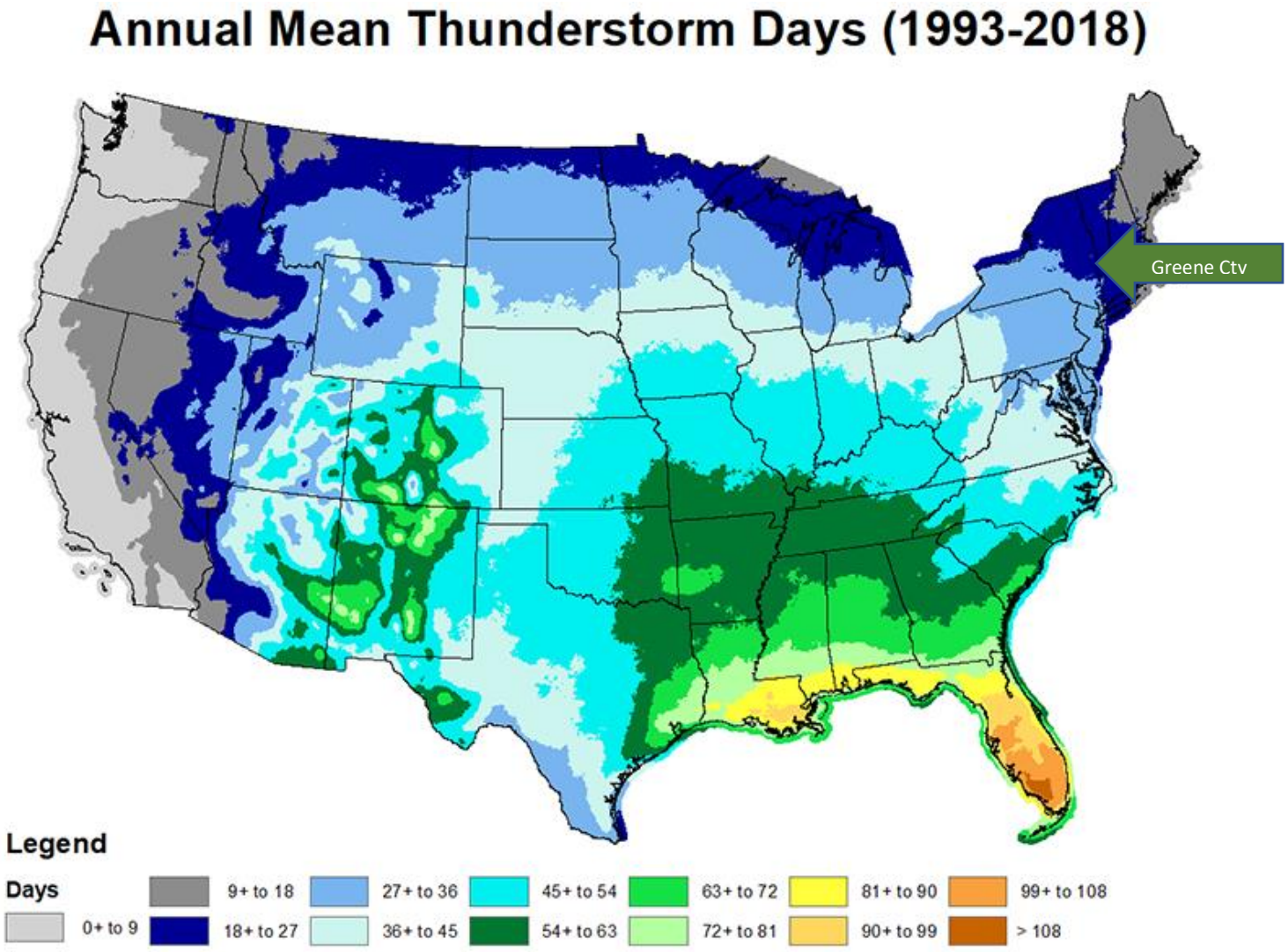
Severe storms are a common natural hazard in New York State. All of Greene County is susceptible to severe storms. The locations of hailstorms, windstorms, thunderstorms, tornados, hurricanes, and tropical storms are as follows:

- **Hailstorms** – Hailstorms can happen anywhere in the State, including Greene County (State of New York, State Hazard Mitigation Plan, 2019). There was one recorded instance of hail in the County in the last 5 years, which occurred in Place Corners on May 31, 2017.
- **Windstorms** – Greene County is located in Wind Zone II in which wind speeds of up to 160 mph are possible and in the Hurricane Susceptibility Region, which extends along the northeastern coastline of the United States (see Figure 19). Figure 19 is based on 40 years of tornado history and 100 years of hurricane history.
- **Thunderstorms** – Thunderstorms typically affect relatively small, localized areas. Thunderstorms can strike in all regions of the United States. Thunderstorms vary greatly in size, location, intensity, and duration and are considered frequent occurrences throughout the State and Greene County. Figure 20 shows the annual mean thunderstorm days each year in the continental United States and shows that Greene County has an average of 18 to 27 thunderstorm days per year.
- **Tornado** – An average of over 1200 tornadoes affect the United States every year. Tornadoes result in an average of 80 deaths and over 1,500 injuries annually. Figure 21 shows tornado activity in the United States between 1995 and 2014, which show New York State experiences between 0 and 9 tornadoes annually. Appendix A describes previous events in detail including Figure A-1 shows the path and damage from the 2003 tornado in Greene County.
- **Hurricanes/Tropical Storms** – Greene County has experienced the indirect landward effects of hurricanes and tropical storms including high winds, heavy rains, and major flooding



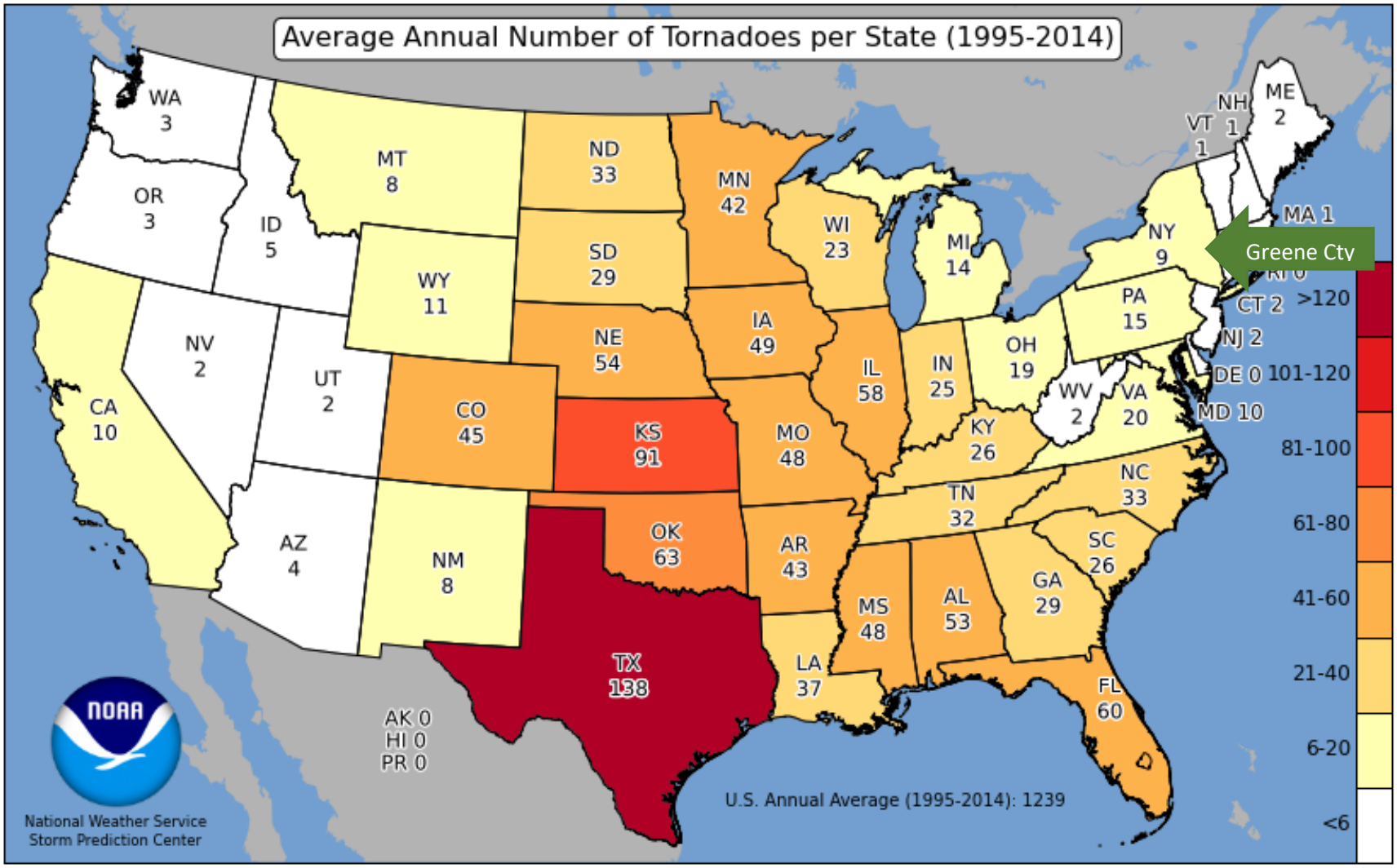
Source: FEMA

Figure 19: Wind Zones in the United States



Source: NOAA

Figure 20: Annual Mean Thunderstorm Days in the US (1993-2018)



Source: NOAA

Figure 21: Average Annual Number of Tornadoes per State (1995-2014)

Extent (Magnitude and Severity)

The extent (magnitude and severity) of a severe storm depends largely on sustained wind speed. The straight-line winds that are typically associated with a thunderstorm, hurricane, or tropical storm can cause wind gusts that exceed 100 mph in Greene County. These winds are responsible for most of the wind damage. In addition, thunderstorms can produce hail, which depending on the size of the hail can cause minor to severe damage.

The magnitude and severity of hail, tornadoes and hurricanes are as follows:

- **Hail –** Hail forms inside thunderstorm updrafts when raindrops are carried upward into extremely cold air. The hail then falls when the updraft can no longer support the weight of the hailstone. Hail size can vary from pea size to the size of a grapefruit. How hail size is estimated is provided below from information obtained from NOAA.

Estimating Hail Size

Hail size is often estimated by comparing it to a known object. Most hailstorms are made up of a mix of different sizes, and only the very largest hail stones pose serious risk to people caught in the open. When reporting hail, estimates comparing the hail to a known object with definite size are good, but measurements using a ruler, calipers, or a tape measure are best.

- Pea = 1/4 inch diameter
- Mothball = 1/2 inch diameter
- Penny = 3/4 inch diameter
- Nickel = 7/8 inch
- Quarter = 1 inch — hail quarter size or larger is considered severe
- Ping-Pong Ball = 1 1/2 inch
- Golf Ball = 1 3/4 inches
- Tennis Ball = 2 1/2 inches
- Baseball = 2 3/4 inches
- Tea cup = 3 inches
- Softball = 4 inches
- Grapefruit = 4 1/2 inches

- **Tornado** – The Enhanced Fujita (EF) Scale is used to rate tornadoes based on estimated wind speeds and related damage. Tornado-related damage is compared to a list of Damage Indicators and Degrees of Damage to estimate the wind speeds produced by the tornado. The tornado is then assigned a rating from EF0 to EF5, representing increasing Degrees of

Damage. The EF Scale was revised to better reflect tornado damage. The new scale is related to how most structures are designed and their potential for damage.

The intensity of a tornado in Greene County is expected to be limited to the EF0 category with only light damage anticipated. The EF Scale is explained in Figure 22.

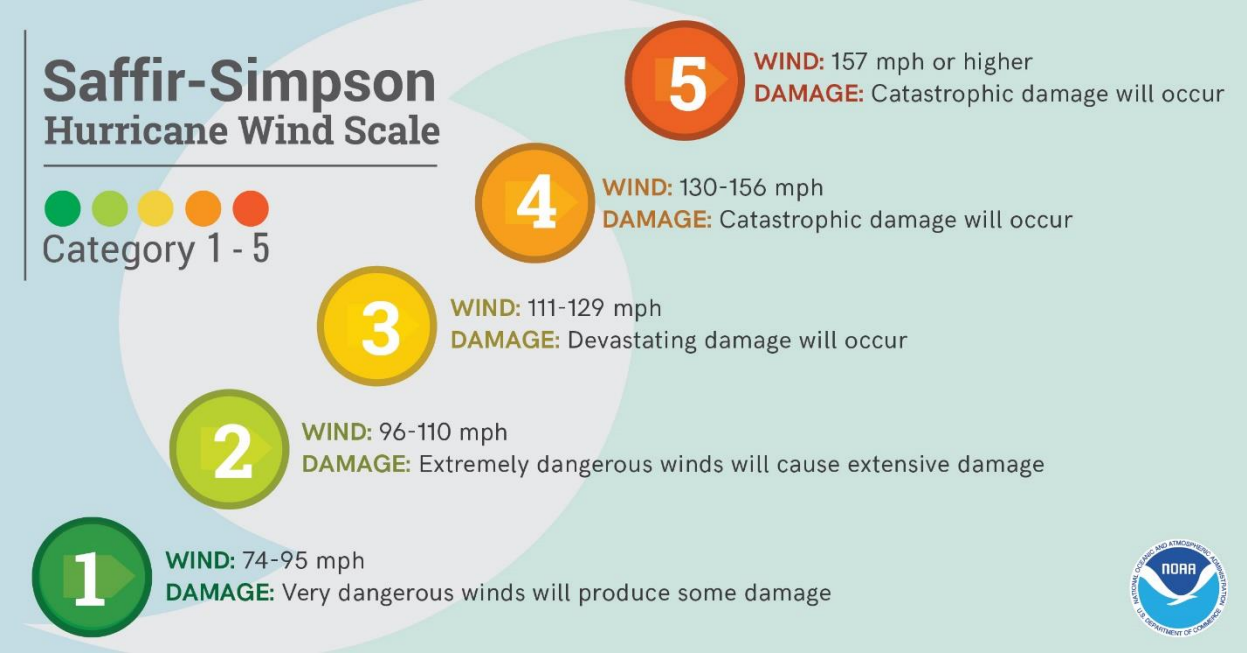
EF Rating	Wind Speeds	Expected Damage		
EF-0	65-85 mph	'Minor' damage: shingles blown off or parts of a roof peeled off, damage to gutters/siding, branches broken off trees, shallow rooted trees toppled.		
EF-1	86-110 mph	'Moderate' damage: more significant roof damage, windows broken, exterior doors damaged or lost, mobile homes overturned or badly damaged.		
EF-2	111-135 mph	'Considerable' damage: roofs torn off well constructed homes, homes shifted off their foundation, mobile homes completely destroyed, large trees snapped or uprooted, cars can be tossed.		
EF-3	136-165 mph	'Severe' damage: entire stories of well constructed homes destroyed, significant damage done to large buildings, homes with weak foundations can be blown away, trees begin to lose their bark.		
EF-4	166-200 mph	'Extreme' damage: Well constructed homes are leveled, cars are thrown significant distances, top story exterior walls of masonry buildings would likely collapse.		
EF-5	> 200 mph	'Massive/incredible' damage: Well constructed homes are swept away, steel-reinforced concrete structures are critically damaged, high-rise buildings sustain severe structural damage, trees are usually completely debarked, stripped of branches and snapped.		

Source: NOAA

Figure 22: Explanation of EF-Scale Ratings

Previous occurrences and losses associated with historical tornado events (described in Appendix A) that occurred before the EF Scale went into effect in February 2007 are based on the Fujita Damage Scale.

- **Hurricanes** – The Saffir-Simpson Hurricane Scale is used to categorize the extent of a hurricane from 1 (Minimal) to 5 (Catastrophic) based on intensity. The categorization is used to provide an estimate of the property damage and flooding that will occur along the coast after a hurricane makes landfall. Wind speed is the determining factor because storm surge depends highly on the slope of the continental shelf and the shape of the coastline in the landfall region. The Saffir-Simpson Scale is explained in Figure 23 below.



Source: NOAA

Figure 23: Saffir-Simpson Hurricane Wind Scale used to categorize hurricanes.

Previous Occurrences

Between 1962 and 2022, New York experienced 60 severe storm-related disasters classified as one or a combination of the following disaster types: severe storm, thunderstorm, hurricane, coastal storms, flooding, high tides, and heavy rain. Greene County was declared a disaster area in 10 of the severe storm-related disasters.

Between 2009 and 2015 there were 27 severe storm events in the County and between 2016 and 2022 there were 26 severe storm events in the County (see Table 21). Five of these events caused property damage, for a total of $18,000 in damage; one storm caused $1,000 in crop damage and one storm resulted in 2 injuries.

Table 21: Severe Storms in Greene County, 2016-2022

Date	Affected Location	Type	Deaths	Injuries	Reported Property Damage	Reported Crop Damage
3/16/16	Palenville	Lightning	0	2	0	0
8/13/16	West Coxsackie	Thunderstorm Wind	0	0	0	0
	Climax	Thunderstorm Wind	0	0	0	0

2/25/17	Jefferson Heights	Thunderstorm Wind	0	0	0	0
5/31/17	Place Corners	Hail	0	0	0	0
6/30/17	Surprise	Thunderstorm Wind	0	0	0	0
7/12/17	New Baltimore	Lightning	0	0	$1,000	0
5/4/18	Catskill	Thunderstorm Wind	0	0	0	0
7/27/18	Coxsackie	Thunderstorm Wind	0	0	0	0
8/3/18	Halcott Center	Tornado (EF0)	0	0	0	0
6/30/19	Cornwall-ville	Thunderstorm Wind	0	0	0	0
7/6/19	Catskill	Thunderstorm Wind	0	0	0	0
7/30/19	Catskill	Thunderstorm Wind	0	0	0	0
8/3/19	Purling	Thunderstorm Wind	0	0	0	0
	Catskill	Thunderstorm Wind	0	0	0	0
	Alsen	Thunderstorm Wind	0	0	0	0
8/8/19	Cairo	Thunderstorm Wind	0	0	0	0
	Athens	Thunderstorm Wind	0	0	0	0
10/31/19	Cairo	Thunderstorm Wind	0	0	0	0
4/13/20	Freehold	Thunderstorm Wind	0	0	$1,000	0
5/15/20	Durham	Thunderstorm Wind	0	0	0	0
	Greenville RNBOW ARP	Thunderstorm Wind	0	0	0	0
	New Baltimore	Thunderstorm Wind	0	0	0	0
	West Coxsackie	Thunderstorm Wind	0	0	0	0
7/27/20	East Durham	Thunderstorm Wind	0	0	0	0
8/23/20	South Cairo	Thunderstorm Wind	0	0	0	0

8/27/20	Halcott Center	Tornado (EF1)	0	0	0	0
8/29/20	Spruceton	Thunderstorm Wind	0	0	0	0
10/7/20	West Coxsackie	Thunderstorm Wind	0	0	0	$1,000
	Catskill	Thunderstorm Wind	0	0	$10,000	0
6/21/21	West Kill	Thunderstorm Wind	0	0	0	0
7/7/21	Roberts Hill	Thunderstorm Wind	0	0	0	0
	Coxsackie	Thunderstorm Wind-Straight Line Wind	0	0	0	0
7/27/21	West Coxsackie	Thunderstorm Wind	0	0	$3,000	0
	Athens	Thunderstorm Wind	0	0	$3,000	0
9/8/21	Kiskatom	Thunderstorm Wind	0	0	0	0
3/7/22	Cairo	Thunderstorm Wind	0	0	0	0

Source: NOAA/NCEI, NCDC (2022)

Selected events that have occurred since the plan was updated in 2009 are described below. See Appendix A for descriptions of significant flooding events that affected Greene County before 2016.

March 16, 2016 - Two campers were injured by a lightning strike near North-South Lake near Kaaterskill Falls in Greene County on Wednesday, March 16th around 6 pm. The two campers, a man and a woman, were camping off a trail in a hemlock grove, when lightning struck a tree about 5 to 10 feet away. The lightning traveled down the tree and towards the camper's tent. The woman lost consciousness and the man may have as well. The woman received superficial burns, but the man received more severe burns, as well as other injuries, and needed to be hospitalized.

August 3, 2018 - A tornado touched down over southwest Greene County and continued 1.9 miles on the ground towards the northeast for 8 minutes. This weak tornado was approximately 200 feet wide and contained estimated maximum winds of 75 mph. The tornado was rated EF-0. Many trees were snapped and uprooted along the path of this tornado, but there was no observed structural damage associated with this tornado.

August 27, 2020 - Severe thunderstorms developed along a warm front during the afternoon and two of the storms became quite intense as they tracked from the northern Catskills through the Mid-Hudson Valley and into the Taconics. These storms spawned a brief tornado in a forested area in Greene County, which The National Weather Service confirmed as and EF1. An eyewitness reported about 15 trees with their tops torn off in a forested area on a hilltop at about 2400 feet elevation,

which aligned with strong rotation evident on Doppler radar imagery. The maximum estimated winds were 90 miles per hour.

July 7, 2021 - Strong to severe thunderstorms developed during the afternoon hours. Several reports of downed trees and wires resulted from the severe storms. A microburst was confirmed in Greene County where an estimated 70 to 90 mph winds caused significant damage in the town of Coxsackie. A state of emergency was declared in the town of Coxsackie as a result of the damage.

Probability and Climate Change

Greene County and all of its jurisdictions will continue to experience severe storms annually that may induce secondary hazards such as flooding. Impacts of severe storms include infrastructure deterioration or failure, utility failures, power outages, transportation delays, roof damage, accidents, and inconveniences.

Based on historic and recent severe storm events, the probability of future occurrences in Greene County is high. With 53 severe storm events in the last 13 years, the probability of future events is 4.0 severe storms per year, or greater than a 100 percent chance of severe storms in any given year.

The changing climate is likely to increase the number and intensity of severe storms, including thunderstorms and hurricanes and their associated winds. According to the 2019 NY SHMP, global warming will cause sea level rise and the intensifying of storms, such as hurricanes. However, it's unclear if climate change will have the same influence on the severity and/or frequency of tornado occurrences in NY. Therefore, the overall impacts of climate change on severe storms are difficult to assess given the current understanding and should continue to be monitored.

Vulnerability and Impact

To understand its vulnerability to natural hazards, a community must determine which assets are exposed or vulnerable in the hazard area. All of Greene County has been identified as a hazard area for severe storms. Therefore, all assets in Greene County (population, structures, critical facilities, and lifelines), as described in Section 3 and the Jurisdictional Annexes, are vulnerable.

Severe 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. Flooding can also occur as a result of severe storms and as such, many of the carryover and new mitigation actions contained in the Jurisdictional Annexes will help eliminate or alleviate future flooding impacts due to climate change.

Estimated Potential Loss from Hurricanes

Because 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 the 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, estimating the potential losses from all these hazards is challenging. Because the current Hazus hurricane model analyzes only hurricane winds and is not capable of modeling and estimating cumulative losses from all hazards associated with hurricanes, only hurricane winds were analyzed.

Since there have been no hurricanes near Greene County, a probabilistic scenario was created using Hazus to assess the vulnerability of Greene County to hurricane winds. Table 22 shows estimated potential losses for the 100- and 500-year hurricane wind event scenarios by jurisdiction.

Table 22: Estimated Potential Residential Loss from Hurricanes

Jurisdiction		Residential Building Exposure	100-Year Hurricane Residential Building Losses	500-Year Hurricane Residential Building Losses
Town	Ashland	$115,197,000	$0	$411,740
	Athens	$247,071,000	$108,490	$276,890
	Cairo	$723,889,000	$122,332	$980,218
	Catskill	$827,054,000	$180,350	$828,845
	Coxsackie	$369,872,000	$133,861	$362,145
	Durham	$369,189,000	$30,180	$799,430
	Greenville	$355,893,000	$54,718	$752,254
	Halcott	$53,676,000	$0	$92,650
	Hunter	$334,192,000	$50,721	$699,067
	Jewett	$247,708,000	$0	$716,494
	Lexington	$154,949,000	$0	$468,344
	New Baltimore	$322,415,000	$152,891	$431,810
	Prattsville	$84,474,000	$0	$339,754
	Windham	$605,561,000	$0	$1,824,797
Village	Athens	$217,830,000	$59,079	$173,216
	Catskill	$380,258,000	$69,006	$217,563
	Coxsackie	$317,114,000	$53,950	$155,256
	Hunter	$115,800,000	$1,493	$125,933
	Tannersville	$102,710,000	$9,269	$232,504
Total		**$5,944,852,000**	**$1,026,340**	**$9,888,910**

Figures 24 and 25 illustrate locations that may experience losses due to hurricane wind. Darker colored areas would experience greater wind damage.

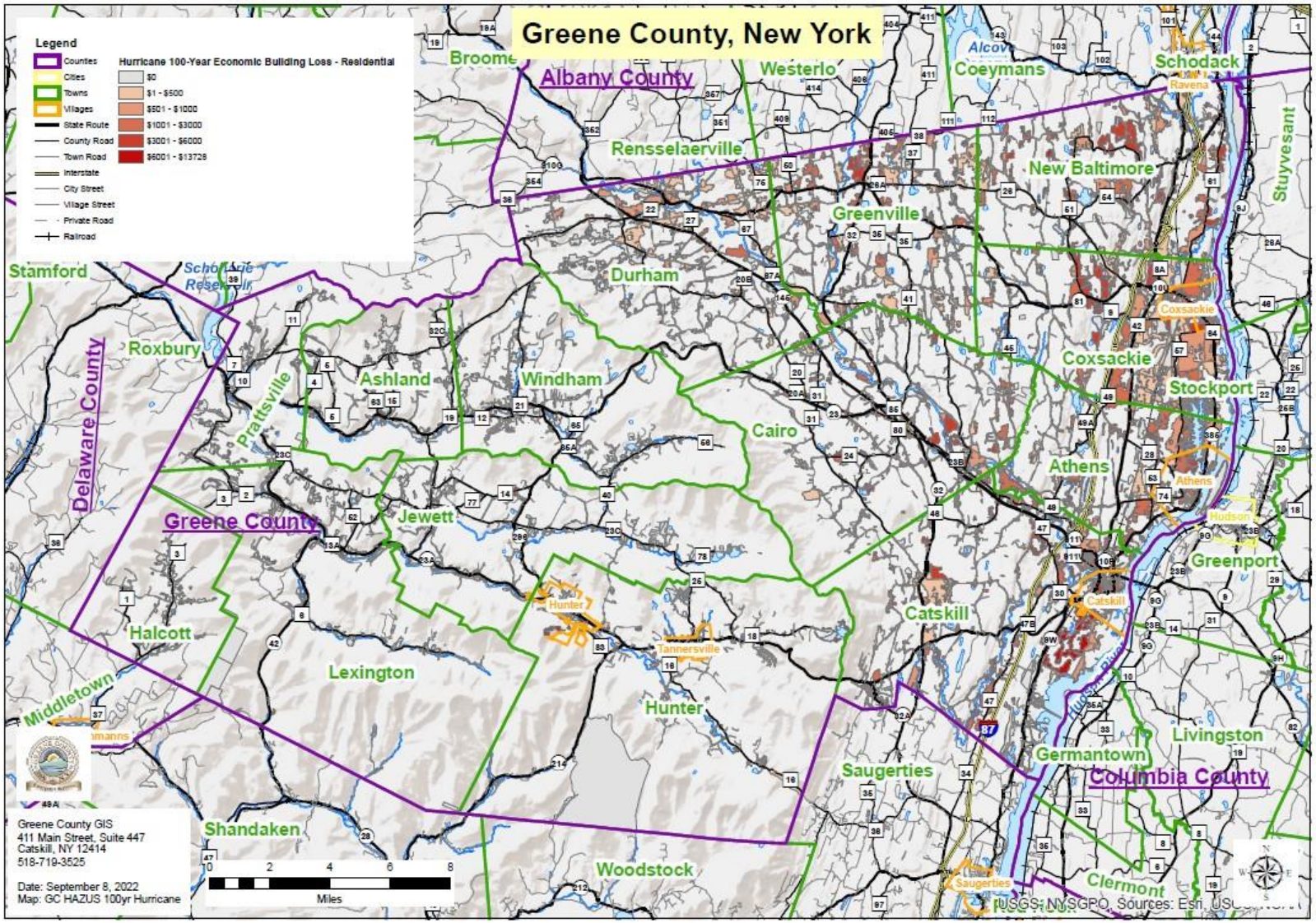


Figure 24: Potential residential building losses in Greene County from a 100-year hurricane

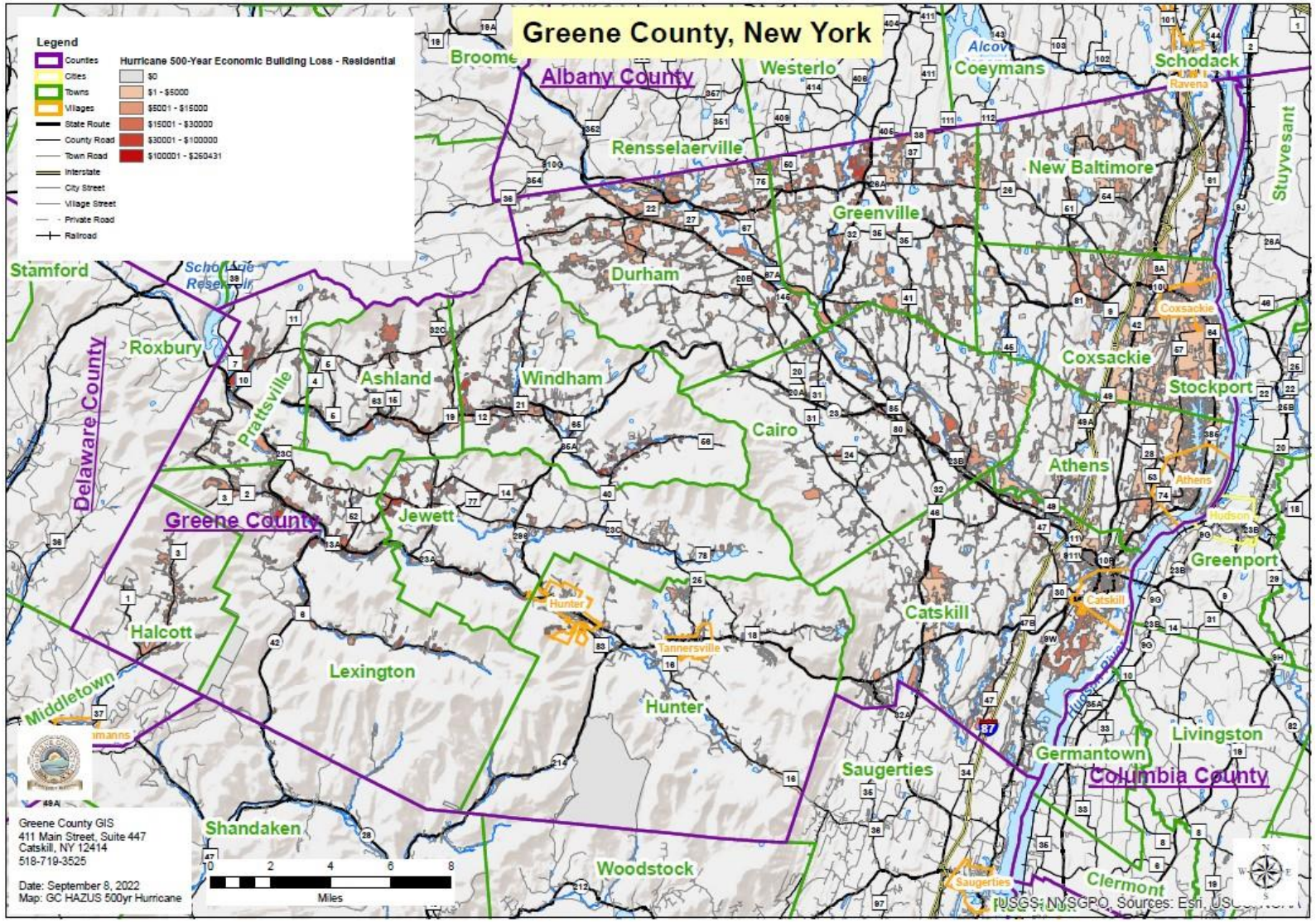


Figure 25: Potential residential building losses in Greene County from a 500-year hurricane

Greene County and all of its jurisdictions will continue to experience severe storms annually that may induce secondary hazards such as flooding. Impacts of severe storms include infrastructure deterioration or failure, utility failures, power outages, transportation delays, roof damage, accidents, and inconveniences.

Summary of Vulnerability Assessment

Severe storms are common, often causing losses to homes, businesses, government facilities, utilities, and the residents of Greene County. Tropical storms have caused damage to infrastructure such as bridges and have cut off communications, making immediate emergency response efforts more difficult. Straight line winds that are associated with thunderstorms have toppled trees that damaged homes and brought down power lines. The impacts to homes and businesses from severe storms can be felt by everyone, but particularly vulnerable populations and those disproportionately impacted by these types of events. Jurisdictions will continue to work to identify and implement mitigation actions that can alleviate or eliminate the impact of this hazard.

4.3.3 Severe Winter Storm/Ice Storm

A severe winter storm is defined as heavy snow, blizzard, sleet, freezing rain, ice storm, Nor'easter, or extreme cold.

Location

All of Greene County is susceptible to severe winter storms. Extreme cold temperatures occur throughout most of the winter season and generally accompany most winter storms throughout the state.

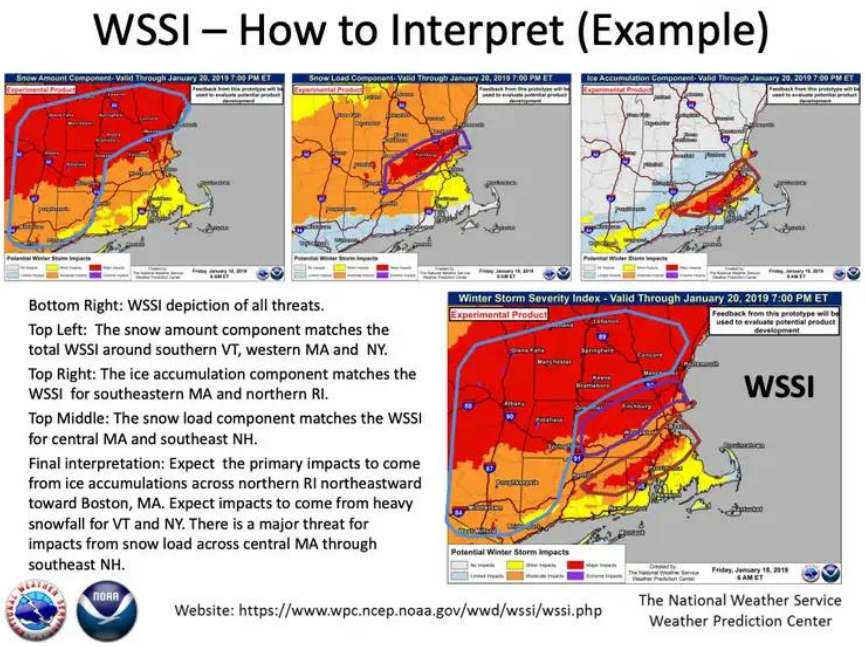
Extent (Magnitude and Severity)

The extent (magnitude and severity) of a severe winter storm depends on factors such as climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, and time (during the day and season). To aid in determining the impacts of winter storms, the National Weather Service Weather (NWS) recently developed the Winter Storm Severity Index (WSSI) Scale. see Figures 26 and 27 below for the WSSI Scale as well as how it is used. This index is used by the NWS to convey what the impacts may be from a winter storm and how significant they may be. The index accounts for temperature, snowfall, wind, ice, population and location. Including these factors aids in overcoming the misconception that snow totals alone determine a storm's severity. This index should not be used as the sole source of information for winter storms and is not intended to replace other forecast products.

WSSI Descriptor	General Description of Expected Storm Severity and Impacts
None	No snow or ice forecast and no potential Ground Blizzard conditions
Limited	Small accumulations of snow or ice forecast. Minimal impacts, if any, expected. In general, society goes about their normal routine.
Minor	Roughly equates to NWS Advisory Level criteria. Minor disruptions, primarily to those who were not prepared. None to minimal recovery time needed.
Moderate	Roughly equates to NWS Warning Level criteria. Definite impacts to those with little preparation. Perhaps a day or two of recovery time for snow and/or ice accumulation events.
Major	Significant impacts, even with preparation. Several days recovery time for snow and/or ice accumulation events.
Extreme	Historic. Widespread severe impacts. Many days to at least a week of recovery needed for snow and/or ice accumulation events.

Source: NOAA/National Weather Service

Figure 26: Winter Storm Severity Index (WSSI) scale descriptions



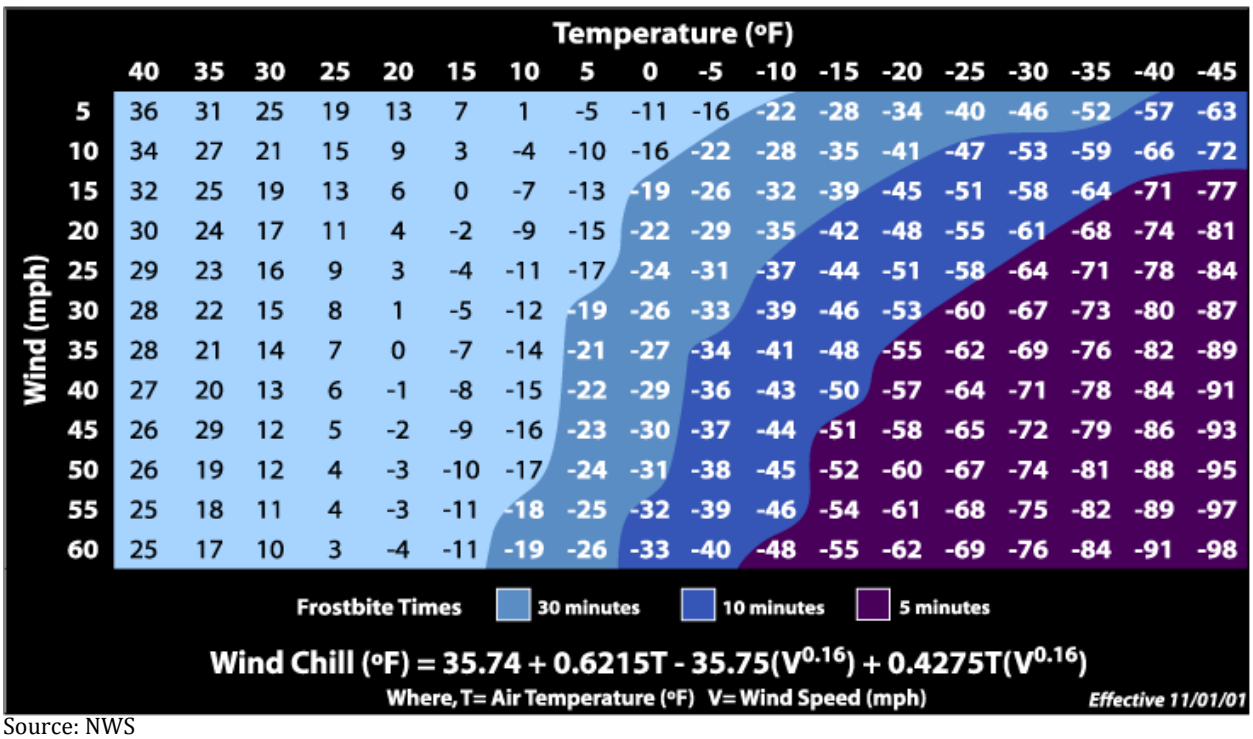
Source: NOAA/National Weather Service

Figure 27: Example of how to interpret the WSSI

Winter weather can affect New York State as early as October and is usually in full force by late November. Average winter temperatures are between 20 and 40°F and are usually below 0°F more than once each winter.

The extent (magnitude and severity) of extreme cold temperatures is generally measured using the Wind Chill Temperature (WCT) Index. When the temperature is below normal and wind speed increases, heat leaves a person's body more rapidly than usual. The WCT Index is the temperature a person feels when the air temperature is combined with wind speed and is based on the rate of heat loss from exposed skin from the effect of wind and cold. As the speed of the wind increases, the rate of heat loss increases, causing skin temperature to drop. High winds can make serious weather-related health problems more likely, even when the temperatures are not extreme. The WCT Index is important as an indicator of how to dress properly for winter weather to avoid extreme cold affects to human health.

The Wind Chill Chart, Figure 28 below, shows the difference between actual air temperature and perceived temperature and amount of time until frostbite occurs.



Source: NWS

Figure 28: Wind Chill Chart

Previous Occurrences

Since the 2016 plan update, there have been 24 severe winter storm events in the County (see Table 23). No deaths, injuries, property damage or crop damage were reported for any events.

Table 23: Severe Winter Storm Events, 2016 - 2022

Date	Affected Location	Type
2/13/16	Western and Eastern Greene County	Extreme Cold/ Wind Chill
11/20/16	Eastern Greene County	Heavy Snow
2/9/17	Western and Eastern Greene County	Heavy Snow
2/12/17	Western and Eastern Greene County	Winter Storm
3/14/17	Western and Eastern Greene County	Blizzard
1/1/18	Western Greene County	Extreme Cold/ Wind Chill
1/5/18	Western and Eastern Greene County	Extreme Cold/ Wind Chill
3/2/18	Western and Eastern Greene County	Winter Storm
3/7/18	Western and Eastern Greene County	Winter Storm
11/15/18	Western and Eastern Greene County	Winter Storm
1/19/19	Western and Eastern Greene County	Winter Storm
1/20/19	Western Greene County	Extreme Cold/ Wind Chill
1/29/19	Western and Eastern Greene County	Winter Storm
1/30/19	Western Greene County	Extreme Cold/ Wind Chill

2/1/19	Western Greene County	Extreme Cold/ Wind Chill
2/12/19	Western and Eastern Greene County	Winter Storm
12/1/19	Western and Eastern Greene County	Heavy Snow
12/16/20	Western and Eastern Greene County	Heavy Snow
2/1/21	Western and Eastern Greene County	Winter Storm
1/14/22	Western Greene County	Extreme Cold/ Wind Chill
1/16/22	Western and Eastern Greene County	Winter Storm
2/25/22	Western and Eastern Greene County	Winter Storm
3/12/22	Western Greene County	Winter Storm
4/18/22	Western Greene County	Winter Storm

Source: NOAA/NCEI, NCDC (2022)

Selected recent events since the plan was updated in 2016 are described below. Significant severe winter events that impacted Greene County before 2009 are described in Appendix A.

March 14, 2017 - A very significant coastal snowstorm impacted the region March 14 through 16, featuring extremely heavy snowfall and blizzard conditions. The bulk of the snowstorm occurred during the day on Tuesday, March 14th. This snowstorm was regarded as the largest snowstorm to impact upstate New York since the Valentine's Day 2007 Snowstorm/Blizzard. Most areas saw 15-25 inches, with some western parts of the area picking up an amazing 30-42 inches of snowfall. The snow fell at 1 to 4 inches per hour for much of the day. 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 cancelled, and all flights were grounded at Albany International Airport. According to media reports, total statewide government costs for response and recovery from the storm were $31.4 million, allowing the state to qualify for a federal disaster declaration. In addition to the snowfall, gusty winds up to 45 mph resulted in near-zero visibility and blizzard conditions across the Mid-Hudson Valley, Catskills, Capital District, Taconics, and Lake George-Saratoga Region. The winds brought considerable blowing and drifting of snow along with numerous power outages. Although the most severe impacts from

the storm occurred on March 14, periods of light snow and blowing snow continued to affect the region through the early morning hours of March 16.

January 5, 2018 - A deep upper-level trough swept across the southern US and turned northeastward offshore of the east coast from the morning of January 3 through the morning of January 4, 2018. As the system pulled away, brutally cold Arctic air rushed southward into New York, resulting in an extended period of extremely cold conditions from January 5 through January 7. The coldest wind chills occurred during the mornings of January 6 and 7, when frigid air combined with westerly winds gusting to 30-40 mph resulted in widespread wind chills as low as 20 to 40 degrees below zero. High temperatures on January 6 were mainly in the single digits above and below zero. Many warming shelters were opened across the state.

February 1, 2019 - An arctic airmass that had infiltrated the region during the last two days of January persisted into the morning of February 1st. Wind chills fell to 15 to 35 degrees below zero. The wind chills prompted many schools to close or delay opening.

February 25, 2022 - An area of low pressure pushed across the region during the morning and early afternoon hours on Friday, February 25, 2022, producing a period of snow, heavy at times, with sleet and freezing rain mixing in at times for portions of the eastern Catskills and mid-Hudson Valley. Snowfall amounts ranged from as low as 2 to 4 inches (common in parts of the mid-Hudson Valley) to as much as 6 to 9 inches elsewhere. The heaviest snow fell at the time of the morning rush hour with snowfall rates in excess of 1 inch per hour at that time, resulting in significant impacts including several vehicle accidents with some minor injuries reported.

The New York State Thruway reduced its speed limit to 45 mph during the early morning hours due to the difficult travel conditions. Many area colleges and universities cancelled or delayed classes. Dozens of outgoing and incoming flights were cancelled at Albany International Airport.

The snowstorm led to the issuance of snow emergencies for some municipalities including Kingston, Catskill, Athens, Greenport, Cairo and Chatham.

Key impacts: travel delays, vehicle accidents, flight cancellations, school closures.

Probability and Climate Change

Winter storms occur annually in New York since the State is located at relatively high latitude. Winter temperatures fall below freezing during much of the fall through early spring. The probability of extreme cold temperatures is 100 percent in any given year.

With 76 events in 13 years, the probability of future events is approximately 5 to 6 severe winter events per year or more than 100 percent chance of severe winter in any given year. Based on historical records, the probability of at least one winter snowstorm of emergency declaration proportions, occurring during any given calendar year, is likely for the entire state. Based on historical snow-related disaster declarations, the probability of occurrence for the County is high.

According to the 2019 NY SHMP, it is difficult to determine the impact of climate change on severe winter storms, ice storms and extreme cold. The data that is currently available is either limited or inconclusive for these types of events, therefore, these types of events should continue to be monitored.

Vulnerability and Impacts

To understand its vulnerability to natural hazards, a community must determine the assets that are exposed or vulnerable in the hazard area. For severe storms, the entire County has been identified as the hazard area. Therefore, all assets in Greene County, as described in Section 3 and the Jurisdictional Annexes, are vulnerable. The elderly population is most vulnerable and therefore Greene County Emergency Services has a process to both proactively call the elderly and monitor their condition, and for the vulnerable population to call for support. Other preparedness procedures include closing down senior centers and distributing food packages. Power outage at critical facilities hampers the ability to respond; therefore, backup power at fire stations and police stations is critical.

Severe winter storms and extreme cold temperature events are of significant concern to Greene 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 community 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. 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.

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. As such, some of the carry over and new mitigation actions contained in the Jurisdictional Annexes will help eliminate or alleviate future impacts due to climate change.

Summary of Vulnerability Assessment

Winter storms and cold temperatures are common and affect the entire county. They cause disruptions, delays, accidents, and power outages and may lead to damage and fatalities. Severe winter storms can also cause property damage due to toppled trees or roof collapse. Impacts to critical infrastructure, including utilities, can cause school and business closures, as well as life safety issues. The most vulnerable population in severe winter storms are the elderly and homeless. As such, jurisdictions have preparedness processes in place to provide support to these populations.

Section 5 - Capability Assessment

The capability assessment looks to identify polices, programs, authorities, staff and funding resources available to help determine the ability of a jurisdiction to implement a mitigation strategy. The actions taken to develop a capability assessment help determine what mitigation actions are likely to be implemented based on the capacity of the lead agency, in this case the County, and municipalities within to carry out the prioritized mitigation actions.

As part of the plan update process, jurisdictions were asked to update their capabilities in Planning and Regulatory; Administrative and Technical; Financial and Education Outreach. Specifics on the capabilities of the County and each municipality are provided in the Jurisdictional Annexes.

5.1 National Flood Insurance Program

FEMA's National Flood Insurance Program (NFIP) maintains information on insured structures, including the number and location of flood insurance policies, number of claims per insured property, dollar value of each claim and aggregate value of claims, and repetitive flood loss properties.

Participation in the NFIP is based on an agreement between a community and the federal government. If a community adopts and enforces a floodplain management ordinance that will reduce flood risk to new construction and substantial improvements in floodplains, the federal government makes flood insurance available to residents of the community as a financial protection against flood losses. The insurance is designed to provide an alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by flooding.

All of the towns and villages in Greene County participate in the NFIP. Based on information received from the NYSDEC, between the last plan and August 9, 2022, Greene County filed 21 flood-related claims, and the payouts to the County totaled over $370 thousand. In addition, the number of policies in the County decreased by 194. The drop in policy numbers was seen in most communities and neither DEC nor the County can provide an explanation for what drove the decrease in policies. However, one theory is that a portion of real estate transactions in the past few years, driven in large part by the pandemic, were cash deals and therefore since there was no mortgage people may have not taken out a policy.

Table 24 provides the number of current policies, total claims made and the total claims payouts as of August 9, 2022, in Greene County by jurisdiction.

Table 24: NFIP Policy and Claim Information for Greene County by Jurisdiction

Jurisdiction		Number of Policies	Number of Claims	Total Claims Payouts
Town	Ashland	11	13	$353,473.85
	Athens	1	5	$154,647.84
	Cairo	28	44	$562,020.70

	Catskill	47	132	$4,734,536.79
	Coxsackie	3	3	$11,398.88
	Durham	13	14	$222,436.08
	Greenville	5	2	$67,611.00
	Halcott	3	2	$18,826.39
	Hunter	14	28	$308,311.38
	Jewett	18	26	$356,958.29
	Lexington	28	52	$1,180,727.63
	New Baltimore	13	6	$32,422.06
	Prattsville	35	98	$4,341,211.67
	Windham	68	49	$2,746,214.75
Village	Athens	9	23	$725,254.35
	Catskill	51	40	$2,423,114.66
	Coxsackie	15	15	$251,480.03
	Hunter	18	26	$225,872.27
	Tannersville	13	27	$233,346.40
	Total	**393**	**605**	**$18,949,856.02**

Source: DEC (2022)

The Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premium rates are discounted to reflect the reduced flood risk resulting from community actions that meet the three goals of the CRS: (1) reduce flood losses, (2) facilitate accurate insurance rating, and (3) promote the awareness of flood insurance. No jurisdictions in the County currently participate in the CRS.

5.2 Evacuation Routes and Emergency Shelters

The County does not currently have a county-wide evacuation plan except for dam specific routes detailed in the evacuation plan for each dam. Evacuation and emergency sheltering are addressed in the Comprehensive Emergency Management Plan, especially in the Sheltering Plan (included in Appendix E). Greene County has 20 formally identified shelter locations. All but two locations are operated by the American Red Cross. In addition, Greene County has a pet sheltering plan with pre-identified potential pet shelter locations.

5.3 Displaced Residents Plan

The County has identified potential locations to be used as Intermediate Term temporary housing locations, where mobile homes could be placed for a period while long-term housing solutions are developed for displaced residents. Not all communities have an identified location, which is due to available land and/or geography. All identified locations are above the flood plain for the given area and have access to electricity, water, and sewer services.

As each situation is unique, the best housing solution may lie outside of the resident's home jurisdiction. Recovery staff should consider all factors affecting the population before deciding on a location. Specifically, the following items should be evaluated.

1. Access to recovery services for the residents.
2. School district- attempt to keep children in their same school district
3. Ease of utility connections
4. Public Transportation Routes- If affected population usually utilize public transportation, attempt to keep the temporary housing location along public transportation routes.
5. If affected population is comprised of specific Cultural or religious or ethnic groups, attempts should be made to ensure those groups remain together in the temporary housing solution.

Appendix F contains the full list of locations that have been identified by the County.

5.4 List of Potential Funding Sources for Mitigation

The Federal government offers a wide range of funding and technical assistance programs that communities can access. Some of these programs are geared to disaster preparedness and mitigation planning, while the focus of others is the long-term vitality of the communities. In addition to federal funding sources, there are also state and local funding sources that are available to communities to aid them in their mitigation efforts. A full list of resources can be found in Appendix D.

Section 6 - Mitigation Strategy

The Greene County updated mitigation strategy emerged as a result of the discussions held during Core Planning Team meetings, results of the Community Survey, a review of the previously proposed mitigation actions, and a review of existing resources and capabilities. In addition, members of the planning team worked closely with jurisdictions to assist them in updating their annexes, which included updating their mitigation strategies.

The County and its jurisdictions have always experienced storms and flooding due to the natural topography, location and climate, but the need for mitigation has been highlighted by the experience after Irene, Lee and Sandy storms. The River towns manage risk through acquisition and other state, regional and local programs. Mountaintop communities were especially affected in Irene and have conducted Local Flood Analyses to define and address the flooding problem.

Each jurisdiction's individual Annex contains the status of mitigation actions from the 2016 plan; previous mitigation actions that were completed; all proposed mitigation actions (both carried forward and new) as well as a minimum of two Action Worksheet for proposed mitigation activities in accordance with NYS Hazard Mitigation Planning Standards. The full list of Mitigation Actions from 2016 and for 2023 can be found in Appendix H.

6.1 Mitigation Goals

The Planning Team reviewed the 2016 goals and decided to keep them, with a slight modification, since they are still relevant for this update. The goals of this plan are:

1. Prevent loss of life from natural hazards, especially addressing vulnerable populations
2. Protect and enhance community buildings, critical facilities, infrastructure and lifelines to make them more resilient
3. Enhance capabilities to mitigate, respond and recover from natural hazard events
4. Foster resilience paradigm across all levels, County, jurisdictions, and public by discussing and incorporating hazard considerations wherever possible

The first two goals focus on saving lives and reducing property damage. The intent of the third and fourth goal is to institute enhanced capabilities and process changes for a resilient Greene County.

6.2 Mitigation Alternatives Considered

A wide range of potential mitigation actions were considered for each of the identified hazards by the County and each Town/Village. Mitigation alternatives for forest fires are included for general awareness since that hazard was considered during hazard identification.

The list below is developed by simplifying and adapting what's in the 2013 FEMA Mitigation Ideas document. The intent is to provide an overview of mitigation options available to the County and participating jurisdictions, not only for this plan but continuously in future.

All-Hazards (floods, severe storms/wind events, severe winter storms/ice storms)

Various methods are available to protect existing and future buildings from damage due to natural hazards. The techniques could be structural retrofitting (e.g., floodproofing), non-structural retrofitting (e.g., elevating utilities or bracing of contents to prevent earthquake damage) and infrastructure retrofits, i.e. measures to reduce risk to existing utility systems, roads, and bridges).

Retrofitting Against Flooding: Flood retrofitting measures include dry floodproofing where all areas below the flood protection level are made watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings (doors, windows, and vents) are closed, either permanently, with removable shields, or with sandbags. Dry floodproofing of new and existing nonresidential buildings in the regulatory floodplain is permitted under State, FEMA and local regulations. Dry floodproofing of existing residential buildings in the floodplain is also permitted as long as the building is not substantially damaged or being substantially improved. Owners of buildings located outside the regulatory floodplain can always use dry floodproofing techniques. The alternative to dry floodproofing is wet floodproofing: water is let in and everything that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. This is the approach used for the first floor of the elevated homes illustrated in the previous section. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace, water heater, and laundry facilities are permanently relocated to a higher floor. Where the flooding is not deep, these appliances can be raised on blocks or platforms.

Retrofitting Against Wind: The high wind forces of tropical storms, hurricanes and tornadoes can be resisted by securing the roof, walls and foundation with adequate fasteners or tie downs. These help hold the building together when the combination of high wind and pressure differences work to pull the building apart. Another retrofit is to strengthen garage doors, windows and other large openings. If winds break the building's "envelope," the pressures on the structure are greatly increased. Windows can be protected with storm shutters or special glass.

Retrofitting Against Earthquake: Earthquake retrofitting measures include removing masonry overhangs that will fall onto the street during shaking. Bracing the building provides structural stability but can be very expensive. Less expensive approaches may be more cost effective for an area like that faces a relatively low earthquake threat. These include tying down appliances, water heaters, bookcases and fragile furniture so they won't fall over during a quake and installing flexible utility connections that will not break when shaken.

Infrastructure/Utility

- Burying utility lines is a retrofitting measure that addresses the winds from hurricanes, tornadoes, thunderstorms, and the ice that accompanies winter storms.

- Installing or incorporating backup power supplies minimizes the effects of power losses caused by downed lines.
- Roofs can be replaced with materials less susceptible to damage by hail, such as modified asphalt or formed steel shingles.
- Winter storm retrofitting measures include improving insulation on older buildings, relocating water lines from outside walls to interior spaces, and insulating water lines in crawlspaces and under elevated buildings.
- Windows can be sealed or covered with an extra layer of glass (storm windows) or plastic sheeting.

Floods

Note about all flood mitigation projects: The NYS DHSES Hazard Mitigation Planning Standards emphasize that flood mitigation projects protect critical facilities to a 500-year flood event or the actual worst-damage scenario, whichever is greater, in addition to conforming to other applicable State and local regulations.

Property Acquisition and Structure Demolition: Voluntary acquisition of an existing flood-prone structure and conversion of the land to open space through the demolition of the structure.

Property Acquisition and Structure Relocation: Voluntary physical relocation of an existing structure to an area outside of a hazard-prone area, such as the Special Flood Hazard Area (SFHA) or a regulatory erosion zone.

Structure Elevation: Physically raising and/or retrofitting an existing structure. Elevation may be achieved through a variety of methods, including elevating on continuous foundation walls; elevating on open foundations, such as piles, piers, posts, or columns; and elevating on fill. Foundations must be designed to properly address all loads and be appropriately connected to the floor structure above, and utilities must be properly elevated as well.

Mitigation Reconstruction: The construction of an improved, elevated building on the same site where an existing building and/or foundation has been partially or completely demolished or destroyed. Mitigation reconstruction is only permitted for structures outside of the regulatory floodway or Coastal High Hazard Area (Zone V) as identified by the existing best available flood hazard data.

Dry Floodproofing: Explained in previous sub-section.

Localized Flood Risk Reduction Projects: These are projects that reduce the frequency or severity of flooding, and decrease predicted flood damage, within an isolated and confined drainage or catchment area that is not hydraulically linked or connected to a larger basin. These projects include but are not limited to installation or modification of culverts and other stormwater management facilities; construction or modification of retention and detention basins; and construction or modification of floodwalls, dams, and weirs.

Non-localized Flood Risk Reduction Projects: These are projects that reduce the frequency or severity of flooding, and decrease predicted flood damage, within an area that is hydraulically linked or connected to a drainage basin that is regional in scale. These projects may include the construction, demolition, or rehabilitation of dams; construction or modification of dikes, levees, floodwalls, seawalls, groins, jetties, breakwaters, and stabilized sand dunes; and large-scale channelization of a waterway.

Severe Storms/Wind Events

Wind Retrofit Projects: The purpose of a wind retrofit project is to reduce the vulnerability of and damage from wind and wind-driven rain intrusion during a high wind event such as a hurricane.

Safe Room Construction: Safe room construction projects are designed to provide immediate life-safety protection for people in public and private structures from tornadoes and severe wind events, including hurricanes.

Severe Winter Storms/Ice Storms

Mitigation of damages from winter storms also comprises of adopting and enforcing building codes, so that future development is safe (which is being practiced by most Towns and Villages), and retrofitting existing buildings and infrastructure, focusing on critical facilities.

For existing buildings, especially older ones, mitigation may mean improving insulation, relocating water lines from outside walls to interior spaces, and insulating water lines in crawlspaces and under elevated buildings.

Burying utility lines is a retrofitting measure that addresses the ice that accompanies winter storms. Installing or incorporating backup power supplies minimizes the effects of power losses caused by downed lines.

Planning/Regulations and Public Education for all hazards

Planning Review prior to construction of a Subdivision or parcel: Review criteria to avoid building in hazard prone areas, e.g., steep slopes could have been applicable but in Greene County the Planning and Economic Development department does not have the legal authority. Individual towns like Town of Jewett are encouraging and enforcing building code, development code, stormwater management regulations and floodplain regulations that support reducing flooding risk.

Post-Disaster Code Enforcement: Projects designed to support the post-disaster rebuilding effort by ensuring that sufficient expertise is on hand to ensure appropriate codes and standards are used and enforced.

Public Education: About the concept of mitigation and resilience, how simple actions (raising utilities) can protect homes and businesses from flood damage, fire education for visitors and tourists to County parks, what to do in a flood or flash flood, and about earthquake mitigation activities appropriate for homes, schools, and businesses such as securing furnishings, anchoring bookcases, and restraining appliances.

6.3 Selection and Prioritization of Mitigation Actions

This section summarizes the types of mitigation actions proposed for implementation by Greene County and the participating jurisdictions. The plan proposes the actions determined to be the most appropriate for the resources and capabilities of the County and each of the participating jurisdictions based on the experience of local officials and the public.

Overall, the County is still working towards the goal of disaster resilience, which was started with the 2016 planning process. The plan update makes attempts to maintain connection with the previous plan and describes the status of previous actions for each participating municipality in the Jurisdictional Annexes, many of which have been continued in the plan update.

The relatively large number of flood mitigation actions proposed in the Greene County mitigation strategy reflects the recommendations that were made as part of the Local Flood Analysis that were conducted for many communities. Actions determined to be appropriate for the plan were discussed during planning meetings and there was consensus that those intended to mitigate the effects of flooding should be the highest priorities.

Potential actions were reviewed relative to potential financial as well as administrative and legal costs and the degree to which they would be endorsed by the public. Potential actions were discussed during meetings relative to their potential benefit of effectiveness in saving lives, protecting the natural environment, and reducing disruption and damage. Prioritization was given to those actions where the cost of the project would provide more benefits than the alternatives. For example, a project to replace a culvert would be given a high priority ranking if the cost of replacing the culvert reduced or eliminated reoccurring flooding and was more cost effective than continually repairing the culvert after flooding events, which will only be exacerbated by the effects of climate change.

The above-mentioned prioritization criteria were applied subjectively by the town or village, or County department who assigned relative priorities (high, medium, low) to the actions that they're responsible for.

The mitigation strategy proposes actions reflecting the commitment of the County and all participating jurisdictions to comply with requirements of the NFIP. Actions to protect existing structures and infrastructure are:

- Elevating roadways at risk of flooding
- Stabilizing steep slopes to prevent landslides along roadways
- Acquiring and demolishing residential and commercial properties at risk of flooding

Carry-over action that will enhance community resilience:

- The first resilience-building action is the flood mitigation activity of acquisition, which removes to flood prone properties out of harm's way and restores flood prone land to their

natural state so that they can perform the natural, beneficial functions of a floodplain by storing flood water and slowly releasing it to surface and ground water.

In general, in addition to considering the cost of the project and the associated benefit provided when establishing prioritization of actions, the high priority status was also assigned to actions that were determined to be the most effective in saving lives, protecting the natural environment, and reducing damages in the event of a flood, or other hazards identified. Actions related to the hazards determined to be much less likely than flooding to occur and/or to lead to considerably less damage than flooding or the other hazards identified were rated as being lower priority actions.

6.4 Mitigation Actions for the County and Jurisdictions

As previously noted, as part of the planning process each jurisdiction was asked to review their jurisdictional annex as well as their mitigation actions that were part of the 2016 plan. Participating jurisdictions, and the County, reported on the status of those mitigation actions and identified if they were Complete; In Progress/Ongoing; Delayed/No Progress or No Longer Relevant. The jurisdictions also identified whether they wanted to include the action in this update. A table containing the updated status of each of the 2016 mitigation actions is contained in each of the jurisdictional annexes.

The actions that were identified to be included as part of the update formed the basis for the 2023 Mitigation Action Plan for the County and its jurisdictions. In addition to the carry over actions, many jurisdictions also identified new mitigation actions to be implemented over the next few years. Furthermore, the results of the Community Survey that was conducted as part of this plan update identified that property owners and residents would like information on ways to reduce damage caused by natural hazards, hazard risks and high hazard areas. Therefore, three public education and awareness mitigation actions were identified as multi-jurisdictional actions for the County and all participating jurisdictions to implement for each of the three hazards identified in this plan. The combination of these actions makes up the 2023 Mitigation Action Plan. The actions for each jurisdiction are contained in their jurisdictional annexes along with a minimum of two mitigation action worksheets in accordance with NYS Hazard Mitigation Planning Standards.

Section 7 - Plan Implementation and Maintenance

This section provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and proposed schedule for monitoring, updating, and evaluating the plan. The section also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

Given that this is multi-jurisdictional plan, Greene County Emergency Services will lead the implementation efforts at the County level and will work the Planning Team and municipalities on the various strategies noted in this section.

7.1 Integration with Other Planning Mechanisms

A highly effective and low-cost implementation mechanism is the incorporation of hazard mitigation plan concepts and recommendations into existing planning efforts, such as was done with the recent update to the County Comprehensive Emergency Management Plan. As such, participating jurisdictions will incorporate information from this updated Plan into the periodic or required updates of their other planning documents, such as comprehensive plans, economic development plans, transportation plans, new building codes or zoning ordinances, etc. In addition, while the County and participating jurisdictions already implement policies and programs to reduce losses to life and property from hazards, as identified in their jurisdictional Capability Assessments, it is important to identify additional opportunities to encourage mitigation strategies. It is the County's and participating jurisdiction's goal to assimilate mitigation strategies into the day-to-day functions and priorities.

At the County level, integration is envisioned through the following actions:

- Annual meeting between departments to identify programs and policies for coordination and opportunities to implement mitigation strategies
- Share recommendations provided in the updated mitigation plan with State and Regional transportation authorities to show support for protecting roadways from the effects of erosion/landslide and flooding
- Incorporate language in the next update of the Greene County Economic Development Plan to present hazard mitigation as an important strategy for supporting local businesses by reducing the threat of disruption due to flooding
- Incorporate emergency preparedness and response actions (e.g., purchase of generators or a new radio system) into Greene County Comprehensive Emergency Management Plan

In addition to the integration actions noted above, all participating jurisdictions will utilize the "Plan Integration: Linking Local Planning Efforts" document that was published by FEMA to identify additional strategies they can use to better integrate hazard mitigation into their overall planning framework.

7.2 Plan Maintenance

It is important to monitor, evaluate, and further update the plan so that it continues to be accurate and appropriate for participating jurisdictions. This section describes a process for regular monitoring of mitigation actions, evaluating the planning process, reviewing the information used for the risk assessment, reviewing community priorities, and updating the plan again within five years.

Monitoring

Greene County Planning Team, led by Greene County Emergency Services, is responsible for maintaining the plan and will review it annually (starting one year from the first jurisdiction adoption date) and following each emergency declaration. Each review process will focus on the implementation of the actions, whether progress is being made, any barriers experienced and how implementation strategy can be adjusted.

Evaluation

The Greene County Planning Team will complete a Hazard Mitigation Progress Report to evaluate the status and accuracy of the plan and record the Team's review process. Greene County Emergency Services will maintain a copy of these records.

One month after conducting the annual monitoring of mitigation actions, the Greene County Emergency Services will schedule an annual meeting of the Planning Team to evaluate the mitigation planning process, implementation of the plan, and conditions in Greene County that suggest the need to modify either planning data or planning actions. Participating jurisdictions will be invited to attend the evaluation meetings. The evaluation meeting will include a presentation of the results of the monitoring of mitigation actions and will answer the following questions:

- Do mitigation goals and objectives reflect current community concerns as well as the finding of the risk assessment?
- Have conditions in the County changed so that the findings of the risk assessment should be updated?
- What hazards have caused damage in the County since the plan was written?
- Were these anticipated and evaluated in the plan or should these hazards be added to the plan?
- Have conditions in the County changed so that the magnitude of risk as expressed in this plan has changed?
- Are new sources of data available that will improve the risk assessment?
- Are current resources sufficient for implementing mitigation actions?
- For each mitigation action that has not been completed, what are the obstacles to implementation?
- What are potential solutions for overcoming these obstacles?

- Is each completed mitigation action effective in reducing risk? What action is required to further reduce the risk addressed by the completed action?
- What mitigation actions should be added to the plan and proposed for implementation?
- Should any proposed mitigation actions be deleted from the plan? What is the rationale for deleting previously proposed actions from the plan?
- Based upon the evaluation, should the plan be updated as soon as possible, or should the plan be updated as scheduled 5 years after it was adopted?

Greene County Emergency Services will document the results of the annual evaluation meeting and submit the findings to each jurisdiction in the County for review within 3 weeks. Documentation of the annual evaluation meeting will be maintained by Emergency Services. If the Planning Committee determines that the Plan should be updated as soon as possible, Emergency Services will take action to initiate the plan update.

Update

This Plan must be updated within 5 years and again adopted by the County and participating jurisdictions to maintain compliance with the regulations stated in 44 CFR Part 201.6 and ensure eligibility for applying for and receiving certain Federal mitigation grant funds. Monitoring and evaluation will identify necessary modifications to the plan including changes in mitigation strategies and actions that should be incorporated in the next update.

The update will have more current information about previous occurrences of hazards, ensure that the hazard vulnerability data and risk analysis reflect current conditions of the County, the capabilities assessment accurately reflects local circumstances, and that the hazard mitigation strategies are updated based on the County's damage assessment reports and local mitigation project priorities.

Greene County Emergency Services will initiate the process of updating the plan no more than 3 years after the plan was adopted or immediately upon a determination by the Planning Committee that the plan should be updated sooner. This will allow approximately 1 year for securing funding and/or staff for updating the plan and 1 year for conducting research and writing the updated plan.

Continued Public Involvement

Greene County Emergency Services will provide printed copies of the plan to key Greene County departments as well as to the largest public library in the County so that the public has access to printed copies of the plan. A copy of the adopted plan will be posted on the County Web site for 5 years so that the public has electronic access to the plan. The Web site will include an easy-to-access feedback option so that residents, business owners, and others who read the plan will be able to provide a comment about the plan or about the mitigation strategies. Greene County Emergency Services will maintain these comments and will provide them to the Planning Committee for consideration at the annual plan evaluation meetings.

Greene County Emergency Services will post notices of annual mitigation plan evaluation meetings using the usual methods for posting meeting announcements in the County to invite the public to

participate. In addition to posting announcements on the County Web site, at least one newspaper press release will be published during the process of updating the plan inviting public participation.

Greene County is committed to the continued involvement of the public. Therefore, copies of the Plan will be made available for review during normal business hours at the Emergency Services Office. The County will also consider conducting an annual survey, that would help evaluate if/how the public's responses change over time.

A notice regarding annual updates of the Plan and the location of Plan copies will be publicized annually after the Planning Committee's annual evaluation and posted on the public website. Each jurisdiction's Supervisor/Mayor or Clerk shall be responsible for receiving, tracking, and filing public comments regarding their Jurisdiction Annexes.

Acronyms

BFE	Base Flood Elevation
BRIC	Building Resilient Infrastructure and Communities
CEMP	Comprehensive Emergency Management Plan
CEPA	County Emergency Preparedness Assessment
CRF	Code of Federal Regulations
CRS	Community Rating System
DEC	Department of Environmental Conservation
DHSES	Department of Homeland Security and Emergency Services
DR	Declared Disaster
EF	Enhanced Fujita (Scale)
EM	Emergency Declaration
EMS	Emergency Medical Services
EOC	Emergency Operations Center
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
NCDC	National Climate Data Center
NCEI	National Centers for Environmental Information
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NPDP	National Performance of Dams Project
NWS	National Weather Service
NYS	New York State
RFC	Repetitive Flood Claims
SFHA	Special Flood Hazard Area
SHMP	State Hazard Mitigation Plan

WCT	Wind Chill Temperature
WSSI	Winter Storm Severity Index
YoY	Year over year

APPENDIX A - Hazard Descriptions and Previous Significant Events

Disaster Declarations 1955– 2012

For historical prospective, Table 1 contains the history of Presidential Disaster Declarations (DR) and Emergency Declarations (EM) between 1955 and 2012.

Table 1: Disaster Declarations 1955 – 2012

Type of Event[1]	Date of Declaration	Declaration No.	Approximate Loss	Comments
Hurricane/Flooding	August 1955	DR-45	Unknown	—
Flooding	October 1955	DR-52	Unknown	—
Flooding	April 1987	DR-792	$2 million	Damage to public infrastructure in the West Kill watershed
Severe Winter Storm	November 1987	DR-801	Unknown	
Severe Blizzard	March 1993	EM-3107	Unknown	
Blizzard	January 1996	DR-1083	$160,000	
Severe Storms and Flooding	January 1996	DR-1095	$10 million[1]	
Hurricane/Tropical Storm Floyd	September 1999	DR-1296	$3 million[1]	
Severe Storms	September 2000	DR-1335	$115,000[1]	
Snowstorm	February 2003	EM-3173	$462,000	
Snowstorm	March 2003	EM-3184	Unknown	
Severe Storms, Tornadoes and Flooding	August 2003	DR-1486	$75,000[1]	Tornado damage. Most of the damage was in Catskill and Athens.
Severe Storms and Flooding	April 2005	DR-1589	$1.3 million[1]	Flood damage.
Severe Storms and Flooding	July 2006	DR-1650	$609,000	Flood damage, particularly in the Towns of Catskill and Greenville.
Severe Storms and Inland and Coastal Flooding (also identified as a Nor'easter)	April 2007	DR-1692	$1.3 million	The Town of Cairo and Village of Catskill experiencing the most losses.

Type of Event(1)	Date of Declaration	Declaration No.	Approximate Loss	Comments
Severe Winter Storm	December 2008	EM-3299	Unknown	
Severe Winter Storm	March 2009	DR-1827	$1.2 million	
Hurricane Irene	August 2011	EM-3328 DR-4020	Unknown	
Tropical Storm Lee	September 2011	EM-3341	Unknown	
Hurricane Sandy	October 2012	EM-3351 DR-4082	Unknown	

Source: FEMA (2015); NCDC (2015)
(1) Type of event = disaster classification assigned by FEMA
(2) NCDC; SHELDUS

Floods

Description

Floods are one of the most common natural hazards in the United States. They can develop slowly over a period of days or develop quickly, with disastrous effects that can be local (impacting a neighborhood or community) or regional (affecting entire river basins, coastlines, and multiple counties or states). Floods are the most frequent and costly natural hazards in New York State in terms of human hardship and economic loss, particularly to communities that lie within flood-prone areas or floodplains of a major water source.

The FEMA definition for flooding is "a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from the overflow of inland or tidal waters or the rapid accumulation of runoff of surface waters from any source."

A floodplain is defined as the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that becomes inundated with water during a flood. Most often floodplains are referred to as 100-year floodplains. A 100-year floodplain is the flood that has a one-percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time.

Most floods fall into three categories: riverine, coastal, and shallow. Other types of floods could include ice-jam floods, dam failure floods, and floods associated with local drainage or high groundwater. For the purposes of this plan and as deemed appropriate by the County; riverine, flash,

ice-jam, and dam failure flooding are the main flood types of concern that could impact the county and are discussed as follows:

Riverine/Flash Floods – Riverine floods, the most common flood type, occur along a channel and include overbank and flash flooding. Channels are defined features on the ground that carry water through and out of a watershed. They may be called rivers, creeks, streams, or ditches. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas. Theses floods usually occur after heavy rains, heavy thunderstorms, or snowmelt, and can be slow or fast-rising, and generally develop over a period of hours to days.

Ice-Jam Floods – As indicated by the Northeast States Emergency Consortium (NESEC), an ice jam is an accumulation of ice in a river that acts as a natural dam and can flood low-lying areas upstream. Downstream areas also can flood if the jam releases suddenly, releasing a wave of ice and water.

An ice jam occurs when warm temperatures and heavy rains cause rapid snow melt. The melting snow combined with the heavy rain causes frozen rivers to swell. The rising water breaks the ice layers into large chunks, which float downstream and often pile up near narrow passages and obstructions such as bridges and dams. The ice jam may then build to a thickness great enough to raise the water level and cause flooding. Some of the most devastating winter floods have been associated with a combination of heavy rainfall, rapid snowmelt, and ice jams.

It is difficult to identify particular areas that are generally prone to ice jams because the hazard can be very localized. However, based on causal characteristics, ice jam flood hazard is most prevalent in locations of flat terrain but also where climate includes extended periods of below freezing temperatures.

Most ice jam events create significant economic, environmental, and social impacts to areas located along rivers, streams, reservoirs, and/or tributaries. Impacts can include structural damages, disruption of geomorphology (e.g., bank erosion or channel shifting), and natural habitat loss to fish populations and microbial communities. Ice jams can result in damage to infrastructure through direct impact or through associated flooding of roads, bridges, buildings, and homes. This can cost communities thousands to millions of dollars.

Dam Failure Floods – A "dam" is an artificial barrier that has the ability to impound water, wastewater, or any liquid-borne material for the purpose of storage or control of water (different types of dams). Dams are man-made structures built for the purpose of power production, agriculture, water supply, recreation, and flood protection. A levee is a natural or artificial barrier that diverts or restrains the flow of a stream or other body of water for the purpose of protecting an area from inundation by flood waters. According to FEMA, dam failure is a catastrophic type of failure characterized by the sudden, rapid, and uncontrolled release of impounded water or the likelihood of such an uncontrolled release. It is recognized that there are lesser degrees of failure and that any malfunction or abnormality outside the design assumptions and parameters that adversely affect a dam's primary function of impounding water is properly considered a failure. These lesser degrees of failure can progressively lead to or heighten the risk of a catastrophic failure. They are, however,

normally amenable to corrective action. A dam failure can result in severe loss of life, economic disaster, and extensive environmental damage, primarily due to their unexpected nature and high velocity floodwater. According to FEMA, dams can fail for one or a combination of the following reasons:

- Overtopping caused by floods that exceed the capacity of the dam (inadequate spillway capacity);
- Prolonged periods of rainfall and flooding;
- Deliberate acts of sabotage (terrorism);
- Structural failure of materials used in dam construction;
- Movement and/or failure of the foundation supporting the dam;
- Settlement and cracking of concrete or embankment dams;
- Piping and internal erosion of soil in embankment dams;
- Inadequate or negligent operation, maintenance, and upkeep;
- Failure of upstream dams on the same waterway; or
- Earthquake (liquefaction/landslides).

Table 2 presents details of dams located in Greene County.

Table 2: Type, Hazard Classification, Owner, and Purpose of Dams in Greene County

Name	Hazard Classification	Nearest City/Town	Type	Owner	Purpose
Herbert Wolff Farm Pond Dam #2	Low	High Falls	RE - Earth	Private	Recreation
High Falls Extension Mill Dam	Low	Catskill	MS - Masonry	Private	Other
Friar Tuck Pond Dam	Low	None	RE - Earth	Private	Recreation
Timber Lake Club Dam	Low	Allaben	RE - Earth, CN - Concrete Gravity	Town of Lexington	Recreation
(176-1176)	No Hazard		OT - Other	Not Found	Other
Cerny Pond Dam	Low	South Jewett	RE - Earth	Not Found	Recreation
Adar Dam	Low	Spruceton	RE - Earth	Private	Recreation
Lake Rip Van Winkle Dam	Low	Tannersville	CN - Concrete Gravity	LOCAL GOVERNMENT	Recreation
Onteora Pond Dam	Intermediate	Tannersville	RE - Earth	Town of Hunter	Irrigation
Tranquility Camp Dam	Low	Leeds	RE - Earth	Private	Recreation
Coxsackie Reservoir #2 Dam	Intermediate	West Coxsackie	CN - Concrete Gravity	State	Water Supply - Secondary

Name	Hazard Classification	Nearest City/Town	Type	Owner	Purpose
Beaver Dam Lake Dam	Low	Earlton	RE - Earth	Private	Recreation
Aiello Pond #1 Dam	Low	Paradise Hill	RE - Earth	Private	Recreation
Aiello Pond #2 Dam	Low	Paradise Hill	RE - Earth	Private	Fire Protection, Stock, Or Small Farm Pond, Recreation
Coxsackie Corr Fclty Retention Pnd Dam	Low	West Coxcackie	RE - Earth	State	Flood Control and Storm Water Management
Lloyd Zimmerman Dam	Low	West Coxsackie	RE - Earth	Not Found	Water Supply - Secondary
Mill Pond Dam	Low	Catskill	CN - Concrete Gravity	Private	Hydroelectric
Moore Pond Dam	Low	Coxsackie	RE - Earth	Not Found	Other
(210-1038)	No Hazard		OT - Other	Not Found	Other
Herbert Wolff Farm Pond Dam #1	Low	High Falls	RE - Earth	Private	Recreation
Prattsville Barrier Dam	Low	Prattsville	CN - Concrete Gravity	State	Other
East Jewett Campsite Dam	Low	East Jewett	RE - Earth	Not Found	Recreation
Tannersville Reservoir #3 Dam	Intermediate	Tannersville	RE - Earth	Town of Hunter	Water Supply - Primary
Camp Harriman Dam	High	East Jewett	ER - Rockfill, RE - Earth	Town of Jewett	Recreation
Nyc Police Pond Dam	Low	Platte Clove	RE - Earth	Not Found	Other, Recreation
Tannersville Reservoir #1 Dam	Low	Tannersville	RE - Earth, MS - Masonry	LOCAL GOVERNMENT	Water Supply - Primary
Dibble Dam	No Hazard	Hunter	CN - Concrete Gravity	LOCAL GOVERNMENT	Water Supply - Primary
Tannersville Reservoir #2 Dam	Low	Tannersville	RE - Earth	LOCAL GOVERNMENT	Water Supply - Primary
South Lake Dam	Low	Kaaterskill Falls	RE - Earth	State	Recreation
Dolan Lake Dam	Low	Hunter	OT - Other	Not Found	Other
Levy Dam	Low	Camp Beecher	RE - Earth	Private	Recreation

Name	Hazard Classification	Nearest City/Town	Type	Owner	Purpose
Twilight Park Dam (upper)	Low	Palenville	CN - Concrete Gravity	Private	Other
Hunter Mountain Lake Dam	High	Hunter	RE - Earth	Town of Hunter	Water Supply - Secondary
R & E Banks Dam	Low	Lexington	RE - Earth	Private	Recreation
William Mead Dam	Low	Lexington	RE - Earth	Private	Recreation
Szabo Pond Dam	No Hazard	Prattsville	RE - Earth	Private	Recreation
Masucchia Pond Dam	Low	Lexington	RE - Earth	Private	Recreation
Ilnseher Pond Dam	Low	Jewett Center	RE - Earth	Private	Recreation
Potuck Reservoir Dam	High	Leeds	RE - Earth	Town of Coxsackie	Water Supply - Primary
Athens Dam	Low	Athens	CN - Concrete Gravity	LOCAL GOVERNMENT	Water Supply - Secondary
Albanese Pond Dam	Low	Cornwallville	RE - Earth	Not Found	Recreation
Nicholsen Pond Dam	Low	Woodstock	RE - Earth	Private	Recreation
Batavia Kill Watershed Dam #4a	High	Windham	RE - Earth	Town of Windham	Flood Control and Storm Water Management
Hull Farm Pond Dam	Low	Durham	RE - Earth	Not Found	Fire Protection, Stock, Or Small Farm Pond, Recreation
Schmollinger Pond Dam	Low	Cairo	RE - Earth	Town of Greenville	Irrigation
Batavia Kill Watershed Dam #3	High	Windham	RE - Earth	Town of Windham	Flood Control and Storm Water Management
Athens Water Supply Dam	Intermediate	Limestreet	RE - Earth	Town of Athens	Water Supply - Primary
Collins & Meurer Dam	Low	West Coxsackie	RE - Earth, CN - Concrete Gravity	Not Found	Recreation
Coxsackie Reservoir Dam	Intermediate	Climax	RE - Earth	Village of Coxsackie	Water Supply - Primary
Bronck Lake Dam	Low	West Coxsackie	RE - Earth	Private	Recreation, Water Supply - Primary

Name	Hazard Classification	Nearest City/Town	Type	Owner	Purpose
Deans Mill Dam	Low	None	CN - Concrete Gravity	Village of Ravena	Water Supply - Primary
Sportsmen Wildlife Marsh Dam	Low	Surprise	RE - Earth, CN - Concrete Gravity	Private	Recreation
Albright Brothers Pond Dam	Low	Athens	RE - Earth	Private	Fire Protection, Stock, Or Small Farm Pond, Recreation
Zimmerman Pond #1 Dam	Low	None	RE - Earth	Not Found	Recreation
Wilkinson Pond Dam	Low	None	RE - Earth	Private	Fire Protection, Stock, Or Small Farm Pond, Recreation
Medway Dam	Intermediate	Medway	RE - Earth	Village of Coxsackie	Water Supply - Primary
South Cairo Rod & Gun Club Dam	No Hazard	South Cairo	RE - Earth	Private	Recreation
Ordes Pond Dam	Low	None	RE - Earth	Town of Cairo	Recreation
Batavia Kill Watershed Dam #1	High	Maplecrest	RE - Earth	Town of Windham	Flood Control and Storm Water Management, Recreation
Abbuhl & Hosley Pond Dam	Low	Cornwallville	RE - Earth	Not Found	Recreation
Bdk Corporation Dam #1	No Hazard	East Durham	RE - Earth	Not Found	Recreation
Knupfer Dam & Dike	Low	Sunnyside	RE - Earth	Private	Recreation
Sumner Pond Dam	No Hazard	Norton Hill	RE - Earth	Private	Recreation
Bullivant Pond Dam	No Hazard	East Durham	RE - Earth	Private	Recreation
Loughman Pond Dam	No Hazard	East Durham	RE - Earth	Private	Recreation
Helmut Philipp Pond Dam	Low	Greenville Center	RE - Earth	Private	Recreation
John Galt Dam	Low	Camp Beecher	RE - Earth	Private	Recreation
Country Estates Retention Basin Dam	Low	Greenville	RE - Earth	Town of Greenville	Flood Control and Storm Water Management
Cairo Water Company Dam #1	Low	Woodstock	RE - Earth	Private	Recreation

Name	Hazard Classification	Nearest City/Town	Type	Owner	Purpose
Vitacco Pond Dam	Low		CN - Concrete Gravity, LS - Laid Up Stone	Town of Jewett	Recreation
Bocklet Dam	Low	Catskill	RE - Earth	Town of Durham	Recreation
Durham Concert Site Dam And Dike	Low		RE - Earth	Town of Durham	Recreation
Colgate Lake Dam	Intermediate	Jewett	RE - Earth, CN - Concrete Gravity	Town of Jewett	Recreation
Ferrer Pond Dam	No Hazard	None	RE - Earth	Private	Recreation
Tailleur Wildlife Marsh Dam	Low	None	RE - Earth	Private	Recreation
Clowes Pond Dam	No Hazard	Jefferson Heights	RE - Earth	Private	Recreation
King Pond Dam	No Hazard	Catskill	RE - Earth	Private	Recreation
Sleepy Hollow Dam	High	Athens	RE - Earth	Town of Athens	Recreation, Water Supply - Primary
Girard Pond Dam	Low	Catskill	RE - Earth	Private	Recreation
Zimmerman Pond Dam	No Hazard	Athens	RE - Earth	Private	Fire Protection, Stock, Or Small Farm Pond, Recreation
Silver Lake Dam	Intermediate	Brooksburg	ER - Rockfill	Town of Windham	Irrigation, Recreation
St John Pond Dam	Low	Brooksburg	ER - Rockfill	Not Found	Irrigation, Recreation
Klatz Dam	Low	Cairo	CB - Buttress	Town of Cairo	Other
East Durham Pond Dam	No Hazard	East Durham	CN - Concrete Gravity	Not Found	Recreation
Carelas Lake Dam	Low	Freehold	RE - Earth	Private	Recreation
Lake Heloise Dam	Low	Windham	RE - Earth, LS - Laid Up Stone	Private	Recreation
Conservative Baptists Pond Dams A & B	Low	Freehold	RE - Earth	Not Found	Recreation
Beers Pond Dam	Low	East Jewett	RE - Earth	Private	Recreation
Sclonsky Pond Dam	Low		ER- Rockfill	Private	Recreation
Zimmer Road Dam	Low		RE-Earth	Not Found	Recreations

Name	Hazard Classification	Nearest City/Town	Type	Owner	Purpose
Total	90				

Source: Inventory of Dam – New York State (NYSDEC) 2022

Previous Occurrences (prior to 2016)

Further descriptions of select flood events that have impacted Greene County are provided below for events where details regarding their impact were available. These descriptions are provided to give the reader a context of the flood events that have affected the county and to assist local officials in locating event-specific data for their municipalities based on the time and proximity of these events. Flood impacts associated with hurricanes, tropical storms, or nor'easters are discussed in this profile and are also mentioned in their designated hazard profiles (Section 4.2.2 Severe Storm and Section 4.2.3 Severe Winter Storm – 2016 plan).

Monetary figures within the event descriptions were U.S. Dollar (USD) figures calculated during or within the approximate time of the event (unless present day recalculations were made by the sources reviewed). If such an event would occur in the present day, monetary losses would be considerably higher in USDs as a result of inflation.

August 29 - September 14, 1960 (Hurricane Donna): This event holds the record for retaining "major hurricane" status (Category 3 or greater on the Saffir-Simpson Hurricane Scale) in the Atlantic Basin for the longest period of time on record (a total of 17 days). The storm affected every state along the East Coast; producing hurricane-force winds (up to 115 mph) from South Carolina to Maine (Barnes and Lyons, 2007). Greene County experienced between 5 and 7 inches of rain.

In Greene County, the impacts of this event fell primarily within the Batavia Kill watershed. The Soil Conservation Service indicated that the storm devastated the Town of Windham, producing more than $750,000 in damages (1960 USD) to over 75 residences, 27 businesses, utilities, seven bridges, and multiple State, County, and Town roads. The Windham Country Club, two churches, and the Windham Ashland School all experienced damage. The flooding from this event caused water contamination in the Town of Windham, causing a boil water advisory for a period of time. Information regarding other areas throughout the county impacted from this event is limited or has not been disclosed in the materials reviewed to develop this plan.

April 3-6, 1987 (FEMA DR-792): Heavy rains from this event caused widespread flooding in southeastern New York State. As much as nine inches of rain fell throughout the Catskill Mountains. Flooding along the Schoharie Creek was the third largest since records began in the early 1900s and was exceeded only by the October 1955 and March 1980 floods. In 1987, NYSEMO estimated that flood damage to homes, businesses, farms, crops, roadways, and bridges in New York State exceeded $65 million.

In Greene County, the Schoharie Creek at Prattsville had a water discharge of 47,600 cfs and crested to 18.37 feet (6.37 feet above 12-foot flood stage) during this event (USGS, 2008). It was a recorded

peak event for the East Kill near Jewett Center, cresting 15.68 feet (USGS, Date Unknown). It also caused significant damages in the Batavia Kill watershed and resulted in approximately $2 million in property damage to public infrastructure in the West Kill watershed.

January 18-20, 1996 (FEMA DR-1095): Precipitation from a strong storm combined with unseasonably warm temperatures that caused rapid snowmelt, resulted in extensive flooding throughout New York State.

Greene County received between 1.5 and 4.5 inches of rain during this event, resulting in widespread flooding along the major rivers and small streams of the county. The Schoharie Creek at Prattville experienced its highest flood stage ever documented since the beginning of record floods at the gage in 1904. Floodwaters at the station crested at 19.4 feet (7.4 feet above 12-foot flood stage) with peak flows of 52,800 cfs, reaching its 100-year flood stage and representing "disastrous" flooding. Many residential and commercial properties, infrastructure, roadways, bridges, and transportation systems experienced significant damage throughout the county. In Athens, Coxsackie, and New Baltimore flooding of the Hudson River resulted in multiple evacuations and damage to sewer treatment plants. The Prattsville Water System experienced severe damage. Flooding along the Hudson River damaged several marinas and parks including Riverside Park in Coxsackie, Athens Riverfront Park, and the marina section of New Baltimore. Some of the most severe flooding occurred in Palenville, Athens, Windham, and Lexington. Residents in Palenville were evacuated due to the flooding of Kaaterskill Creek. Road washouts were primarily reported in the mountainous terrain of the county. Eighty-percent of the roads in the Town of Durham suffered damage with six roads washed out. Severely damaged State routes within the county included Routes 42, 214, 296, 32 and 81. Melodywood Condominiums, along the Schoharie Creek in the Village of Hunter, suffered extreme streambank failure from this event, with the immediate safety of the structure and additional adjoining properties threatened.

This event resulted in nearly $2 million in property damage to public infrastructures in the West Kill watershed. NOAA-NCDC and SHELDUS indicated that Greene County experienced approximately $10 million in total property damages from this event. With the extent of damage created throughout the County during this event, County and State officials began the preparation and initiation of a series of flood hazard mitigation and stream restoration projects throughout Greene County, particularly along Schoharie Creek, West Kill, Batavia Kill, East Kill and Stony Clove Creek.

September 16, 1999 (Hurricane/Tropical Storm Floyd) (FEMA DR-1296):

New York State experienced approximately $62.2 million in property damages from this event. In Greene County, rainfall totals ranged between 6.9 inches (Prattsville) and 12.21 inches (Cairo). NOAA NCDC and SHELDUS indicated that Greene County experienced approximately $3 million in flood damages. Over 12 inches of rain was recorded in Cairo, the most recorded amount of rainfall associated with the storm in the state. The Schoharie Creek at Prattsville had a water discharge of 42,800 cfs and crested to 17.64 feet (5.64 feet above 12-foot flood stage). This event created unstable conditions throughout many rivers and streams of the county and exacerbated the degradation and streambank erosion that was initially created during the January 1996 flood.

May through September 2000 (FEMA DR-1335): Between May and September 2000, multiple severe storm events occurred throughout New York State resulting in significant flooding and over $34.6 million in damage throughout various New York State counties. In Greene County, NOAA NCDC indicated that flooding during this time period particularly occurred on June 6-7, 2000, when heavy rain fell across the Catskills with as much as 5.77 inches falling in East Jewett in Greene County. A portion of State Route 385 was closed in Athens. In New Baltimore, two roads and culvert bridges were closed as a result of flooding. In Leeds, 23 people had to be evacuated from homes along State Highway 23B as the Catskill creek rose out of its banks. Greene County experienced over $115,000 in flood damages during this time period.

July 21 through August 15, 2003 (FEMA DR-1486): A series of slow-moving thunderstorms, accompanied by torrential rainfall, caused flash flooding throughout much of New York State, including Greene County. Although $1 million in damages resulted from a tornado outbreak in July, Greene County suffered the most amount of flood damage in early August.

On August 2, the area experienced severe weather when isolated thunderstorms affected the Catskill region. Approximately four to five inches of rain fell in less than two hours throughout eastern Greene County. The heavy rainfall resulted in flooded roads in both Leeds and Catskill. In Catskill, the Catskill Creek overflowed onto State Highway 23B and a mudslide was reported on Sandy Plain Road. The Poltic Creek overflowed its banks and washed away a small bridge. Homes in the cities of Catskill and Athens took on significant water in their basements. According to NOAA NCDC and SHELDUS, Greene County had approximately $60,000 in flood damage due to the storms.

Another slow-moving series of thunderstorms developed in the area on August 11, producing torrential rainfall and flooding. In Greene County, portions of Route 296 in Hensonville were washed out and flooding was noted on Route 23 near Cairo. According to NOAA NCDC and SHELDUS, Greene County had approximately $15,000 in flood damage due to the series of storms.

April 2-4, 2005 (FEMA DR-1589): A slow moving storm moved up through the Appalachians and into the northeast U.S. The heavy rainfall from this event produced flooding throughout New York, New Jersey, and Pennsylvania (NCDC, 2005). Prior to this storm, the rivers and streams in the area had high flow-rates due to a previous rainstorm on March 28 and snowmelt. This substantially increased flooding and caused additional damage, along with the damage produced by this storm.

The NWS reported the heaviest rain and the worst flooding occurred in Greene and Ulster Counties. The NYS HMP indicated that New York State experienced approximately $66.2 million in damages from this event.

In Greene County, NOAA NCDC indicated that many municipalities were impacted by floodwaters from this event. The Hamlet of East Jewett experienced the most rainfall, resulting in significant flooding. Many of the county's roads were closed, including: Paul Saxe, Embought, and Mountain Roads in the Town of Catskill and County Routes 77, 23C, 14, and State Route 23A in the Town of Jewett. In Haines Falls, State Route 23A was washed out and Route 32 was under water in Greenville Center. In Leeds, Lexington Road and Route 23B were under water. The Schoharie Creek at Prattsville

crested to 17.41 feet (5.41 feet above 12-foot flood stage). The West Kill reached flood stage at 3.0 feet in Spruceton. Rainfall totals throughout the county ranged between 1.5 inches in New Baltimore and 5.54 in East Jewett. According to NOAA NCDC and SHELDUS, Greene County experienced approximately $1.3 million in flood damages from this event.

June 25 through July 10, 2006 (FEMA DR-1650): This severe storm event resulted in significant flooding that affected much of the Mid-Atlantic region. The flooding was widespread, affecting numerous rivers, lakes, and communities from upstate New York to North Carolina. Rain totals throughout the eastern U.S. ranged from 2 to 17 inches, particularly between June 27 and 29, with the largest accumulations falling in Maryland, Pennsylvania, and New York State. Overall, the storm resulted in over 16 deaths and millions of dollars in damages throughout the affected states.

Some sources indicated that this flooding event was the largest and most costly natural disaster that New York State has encountered since Hurricane Agnes in 1972. The NYS HMP indicated that the counties affected throughout the state experienced approximately $246.3 million in damages during this flood.

In Greene County, precipitation totals averaged between 3 and 12 inches of rain, with the largest accumulations generated in the south central portion of the county. Rain totals between June 26 and June 30 included: Tannersville (12.20 inches), East Jewett (8.3 inches), Catskill (4.43 inches), and Windham (3.14 inches) (NWS, 2006). Law enforcement personnel reported that several roads in Greene County were closed in and near the Towns of Catskill, Cairo, and Haines Falls due to flooding. Part of Route 23-A remained closed between Palenville and Haines Falls, where a retaining wall gave way. Cost estimates of property damage in Greene County were unavailable in the materials reviewed to develop this plan.

In Greene County, NOAA NCDC indicated that the heavy rain from this event led to widespread flooding of small streams and creeks. Precipitation totals for the county ranged between three and six inches, with the greatest accumulations centrally located in the Towns of Lexington, Jewett, and Hunter. Other sources indicate that specific rainfall totals in Greene County ranged from 3.97 inches in Cairo to 7.9 inches in Tannersville. Numerous roads were closed throughout Greene County, including County Route 61 in Coxsackie, and several roads near Catskill. The Schoharie Creek at Prattsville crested to 12.98 feet (0.98 feet above 12-foot flood stage). The Catskill Creek in the Town of Catskill experienced continued stream bank erosion and migration from this event, which would cost an estimated $1 to $1.5 million to restore. A reported landslide occurred along Warren Stein Road in the Town of Cairo.

The Greene County Department of Emergency Services indicated that preliminary storm damage totals eligible for Federal Public Assistance (PA) in Greene County totaled nearly $472,000; with the Town of Cairo and the Village of Catskill experiencing the most losses. Storm damage totals for Individual Assistance (IA) in the county totaled $111 million, with the Town and Village of Catskill experiencing the most losses, totaling $110 million. IA losses to the County were denied by FEMA. Other sources indicate that final losses eligible for PA were estimated at $1.3 million as a result of flood damage, response and debris removal costs throughout the County. Additionally, final loss

estimates to homeowners were tallied at $547,000. These conflicting monetary figures indicate that a discrepancy exists regarding total damages to the county.

December 1, 2010 – A strong cold front swept across east-central New York on Wednesday, December 1, bringing strong and gusty winds and heavy rains to the area. With the passage of the cold front, winds quickly shifted from the south-southeast to the west, and temperatures rapidly dropped from the 50s into the 30s. Rain changed to sleet across the Mohawk Valley in the wake of the cold front, leading to minor traffic accidents.

Ahead of the cold front, a very strong south-to-southeast low-level jet resulted in wind gusts of up to 55 mph, and with the passage of the front, there were wind gusts up to approximately 50 mph. The strong wind gusts downed trees and power lines, resulting in power outages.

One to 3 inches of rain fell across the area with 5 to 7 inches of rainfall across the higher terrain of the eastern Catskills. Moderate to major flooding was reported in western Ulster and Greene Counties. Riverine flooding occurred in the eastern Catskills, southern Adirondacks, and Mohawk Valley. Urban and small stream flooding also occurred across the local area. Three planes, including one in route from Newfoundland to Newark Liberty International Airport, were forced to land at the Albany International Airport due to the extreme weather conditions along the East Coast.

Roads were closed because of flash flooding on Route 145 between Frank Hitchcock Street and Route 23, Snyder Lane, and Lincoln Drive in Cairo, and water was reported moving across Route 23.

August 28, 2011- Hurricane Irene (FEMA DR-4020) – Catastrophic flooding was reported throughout Greene County during Hurricane Irene, especially in the Catskill areas. Evacuations and rescues were widespread, along with widespread road closures and damage and houses that were swept away. Record flooding most likely occurred on the Schoharie Creek at Prattsville before the gage was lost in the flood. One death occurred in Maplecrest when a woman drowned when the house she was in was swept away by floodwaters. The combination of strong winds and extremely saturated soil led to numerous downed trees and power lines across the region and widespread, prolonged power outages. Approximately 18,000 people in Greene County were affected by power outages.

October 29, 2012 – Superstorm Sandy (FEMA DR-4085) – Superstorm Sandy moved northward off the eastern seaboard of the United States during the last week of October 2012. Due to a very strong blocking ridge of high pressure over the Atlantic Ocean, the storm turned back to the northwest and rapidly strengthened as it moved toward the mid-Atlantic coast.

Although less than an inch of rain fell in valley areas, higher terrain areas of the northern and eastern Catskills received over an inch of rain. It was reported that 3.25 inches of rain fell in the Borough of Halcott Center, Greene County. Wind gusts of 40 to 60 mph were common from the afternoon of October 29 until the early morning hours of October 30. Wind gusts reached 50 mph in Greene County. Numerous trees were reported down throughout Halcott Center due to high winds.

The powerful storm also caused a storm surge that moved up the Hudson River from the New York City area. Record flooding occurred on the Hudson River at Poughkeepsie as the river reached

9.54 feet. The surge of water moved all the way up to Albany. Flooding occurred along the Hudson River in Greene County, causing damage to homes and businesses near the river.

Businesses were flooded from tidal flooding near the confluence of Hudson River and Catskill Creek in Catskill.

FEMA approved more than $384,000 in Hurricane Sandy assistance to fund emergency efforts and help repair and rebuild public infrastructure in Greene County.

July 22, 2013 – On the evening of Monday, July 22, 2013, a warm front was lifting northward from New Jersey into southern New York. Ahead of the warm front, a steady light-to-moderate rain was falling across the Catskills and Hudson Valley region. Embedded in the steady rain were pockets of heavy rainfall and thunderstorms that were moving north. The pockets of heavy rainfall and thunderstorms moved over the same locations across the mid-Hudson Valley as the warm front slowly lifted northward. As a result, very heavy rainfall repeatedly fell over the same locations over a several hours. The result was flash flooding across parts of eastern Greene County. Radar estimates and spotters reported 4 to 7 inches of rain across the region. Several roadways were closed as a result of the flooding and floodwaters covered a portion of the New York State Thruway. The water receded by early morning on Tuesday, July 23, as the rainfall tapered off across the region and the warm front continued to lift northward. Mansion Street in Coxsackie was closed due to flash flooding from heavy rainfall.

Potential Impact

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 or coastal) 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 farmers. 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 road blocks 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.

Severe Storms

Description

For the purpose of this Plan the severe storm hazard includes hailstorms, windstorms, thunderstorms, tornadoes, hurricanes, and tropical storms, which are defined below.

Hailstorm: According to the National Weather Service (NWS), hail is defined as a showery precipitation in the form of irregular pellets or balls of ice more than 5 millimeters in diameter, falling from a cumulonimbus cloud. Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight; they fall as precipitation, in the form of balls or irregularly shaped masses of ice. The size of hailstones is a direct function of the size and severity of the storm. Hailstorms are a potential damaging outgrowth of severe thunderstorms.

Windstorm: According to the Federal Emergency Management Agency (FEMA), wind is air moving from high to low pressure. It is rough horizontal movement of air (as opposed to an air current) caused by uneven heating of the Earth's surface. It occurs at all scales, from local breezes generated by heating of land surfaces and lasting tens of minutes to global winds resulting from solar heating of the Earth. The two major influences on the atmospheric circulation are the differential heating between the equator and the poles, and the rotation of the planet. Windstorm events are associated with cyclonic storms (e.g., hurricanes), thunderstorms, and tornadoes.

Thunderstorm: According to NWS, a thunderstorm is a local storm produced by a cumulonimbus cloud and accompanied by lightning and thunder. A thunderstorm forms from a combination of moisture, rapidly rising warm air, and a force capable of lifting air such as a warm and cold front, a sea breeze, or a mountain. Thunderstorms form from the equator to as far north as Alaska. These storms occur most commonly in the tropics. Although thunderstorms generally affect a small area when they occur, they are very dangerous because of their ability to generate tornadoes, hailstorms, strong winds, flash flooding, and damaging lightning. A thunderstorm produces wind gusts less than 57 miles per hour (mph) and hail, if any, of less than 3/4-inch diameter (20 millimeters) at the surface. A severe thunderstorm has thunderstorm related surface winds (sustained or gusts) of 57 mph or greater and/or surface hail 3/4-inch (20 millimeters) or larger. Wind or hail damage may be used to infer the occurrence/existence of a severe thunderstorm.

Tornado: A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. It is spawned by a thunderstorm (or sometimes as a result of a hurricane) and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. Tornado season is generally March through August, although tornadoes can occur at any time of year. Tornadoes tend to strike in the afternoons and evening, with over 80 percent of all tornadoes striking between noon and midnight. The average forward speed of a tornado is 30 mph, but can vary from nearly stationary to 70 mph. The NOAA Storm Prediction Center (SPC), indicates that the total duration of a tornado can last between a few seconds to over one hour; however, a tornado typically lasts less than 10 minutes.

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.

Tropical Storm: A tropical storm is an organized system of strong thunderstorms with a defined surface circulation and maximum sustained winds between 39 and 73 mph. Once a storm has reached tropical storm status, it is assigned a name. During this time, the storm itself becomes more organized and begins to become more circular in shape, resembling a hurricane. Tropical storms can cause a lot of problems, even without becoming a hurricane; however, most of the problems stem from heavy rainfall.

Hurricane: A hurricane is an intense tropical cyclone with wind speeds reaching a constant speed of 74 mph or more. It is a category of tropical cyclone characterized by thunderstorms and defined surface wind circulation. They are caused by the atmospheric instability created by the collision of warm air with cooler air. They form in the warm waters of tropical and sub-tropical oceans, seas, or Gulf of Mexico. Most hurricanes evolve from tropical disturbances. A tropical disturbance is a discrete system of organized convection (showers or thunderstorms), that originate in the tropics or subtropics, does not migrate along a frontal boundary, and maintains its identity for 24 hours or more. Hurricanes begin when areas of low atmospheric pressure move off the western coast of Africa and into the Atlantic, where they grow and intensify in the moisture-laden air above the warm tropical ocean. Air moves toward these atmospheric lows from all directions and circulates clock-wise under the influence of the Coriolis effect, thereby initiating rotation in the converging wind fields. When these hot, moist air masses meet, they rise up into the atmosphere above the low pressure area, potentially establishing a self-reinforcing feedback system that produces weather systems known to meteorologists as tropical disturbances, tropical depressions, tropical storms, and hurricanes.

Almost all tropical storms and hurricanes in the Atlantic basin (which includes the Gulf of Mexico and Caribbean Sea) form between June 1 and November 30, known as hurricane season. August and September are peak months for hurricane development. The threats caused by an approaching hurricane can be divided into three main categories: storm surge, wind damage, and rainfall/flooding:

- Storm surge is simply water that is pushed toward the shore by the force of the winds swirling around the storm. This advancing surge combines with the normal tides to create the hurricane storm tide, which can increase the mean water level 15 feet or more. Storm surge is responsible for nearly 90 percent of all hurricane-related deaths and injuries.
- Wind damage is the force of wind that can quickly decimate the tree population, down power lines and utility poles, knock over signs, and damage/destroy homes and buildings. Flying debris can also cause damage to both structures and the general population. When hurricanes first make landfall, it is common for tornadoes to form which can cause severe localized wind damage.

Rainfall/flooding: the torrential rains that normally accompany a hurricane can cause serious flooding. Whereas the storm surge and high winds are concentrated around the "eye," the rain may extend for hundreds of miles and may last for several days, affecting areas well after the hurricane has diminished.

Previous Occurrences (prior to 2016)

August 29-September 14, 1960 (Hurricane Donna): This event holds the record for retaining "major hurricane" status (Category 3 or greater on the Saffir-Simpson Hurricane Scale) in the Atlantic Basin for the longest period of time on record (a total of 17 days). The storm affected every state along the East Coast, producing hurricane-force winds (up to 115 mph) from South Carolina to Maine. Fifty fatalities were reported in the U.S., with damages totaling approximately $3 billion (2004 USD). Greene County experienced between 5 and 7 inches of rain.

In Greene County, the impacts of this event fell primarily within the Batavia Kill watershed. The Greene County Soil Conservation Service indicated that the storm was devastating to the Town of Windham, producing in excess of $750,000 in damages (1960 USD) to over 75 residences, 27 businesses, utilities, seven bridges, and multiple state, county, and town roads. Damages also occurred to the Windham Country Club, two churches, and the Windham Ashland School.

July 10, 1989 (Northeastern U.S. Tornado Outbreak): This event was a series of tornadoes which caused more than $130 million (1989 USD) in damage across the northeastern U.S. The storm system produced severe weather events that included hail up to 2.5 inches in diameter, thunderstorm winds up to 90 mph, and 17 tornadoes. More than 150 people were injured and one fatality occurred as a result of the tornado outbreak and one fatality occurred as a result of winds.

In New York State, the tornado outbreak reportedly devastated areas from Montgomery County to Greene County, injuring 20 people and causing $20 million in property damages. Although the SPC archives state that this outbreak was a single tornado, other sources indicate that it was actually three or more tornadoes, each ranking F3 or F4 on the F-Scale. The first tornado to hit the area touched ground three miles east of Ames (Montgomery County), moving southeast. It then passed through the Towns of Carlisle, Howe Caverns, Central Bridge, and Schoharie before lifting. The storm continued traveling southeast for 10 miles, and produced another tornado briefly near Rensselaerville. After another 10 miles, a third tornado touched down in Greenville and Surprise (Greene County). Greene County experienced wind and hail damage. According to SHELDUS, Greene County had approximately $1.25 million in property damages, $125,000 in crop damages, and five injuries.

July 14-15, 1995 ("The Ontario-Adirondack Derecho"): On the evening of July 14, thunderstorms producing severe weather occurred over upper Michigan and adjacent portions of Ontario near Sault Saint Marie. By late evening, the storms developed into a bowing line just northwest of the Mackinac Bridge. The thunderstorm gust front hit the bridge and a gust of 90 mph was measured. Sustained winds above 80 mph continued on the bridge for several minutes, which was the beginning of the

"Ontario-Adirondacks Derecho." This system caused hundreds of millions of dollars in damage, several deaths, and many injuries as it moved from the Great Lakes region to the Atlantic coast.

As the "Ontario-Adirondacks Derecho" entered New York State on July 15, severe wind damage continued in this area. Winds were estimated to be 100 mph or greater at several points along a band from Jefferson and western St. Lawrence counties. In the Adirondack Mountain region, over 30 campers and hikers in the area had to be removed by helicopter since their paths out of the forest were blocked by thousands of fallen trees. The NYS DEC estimated about 900,000 acres of forest were damaged with a value loss of timber over $200 million. In the more populated areas of central and eastern New York State, almost $190 million in damage was done to structures and vehicles. Many mobile homes were overturned and numerous homes and businesses were damaged. Several hundred thousands of people were without power due to the powerful derecho winds. Overall, New York State had five deaths, 11 injuries and nearly $400 million in damages.

According to NCDC and SHELDUS, Greene County suffered approximately $66,000 in property damages due to winds from the derecho. The most damage was seen in Coxsackie, Greenville, Haines Falls (Hunter), and New Albany.

January 18-20, 1996 (FEMA DR-1095): Unseasonably warm air ahead of a storm overspread the Northeast on January 18th and 19th. Temperatures reached the mid-50s to the mid and upper-60s. Melting snow and ice break-up during the evening of the 18th caused ice jam flooding across scattered areas of western Pennsylvania and western New York State. The storm brought over two inches of rain from northern West Virginia through Central Pennsylvania and over the Catskill Mountains in New York State. The worst of the flooding began on the 19th, due to the heavy rains causing rapid snow melt. Many drainage basins were overwhelmed and widespread flooding broke out. Thousands of people were forced to evacuate their homes in parts of Ohio, Pennsylvania, West Virginia, New Jersey, Maryland, and New York.

The storm produced damaging winds across eastern New York State, resulting in reports of downed trees, limbs, and power lines, producing $120,000 in property damage. Overall, this event claimed 10 lives, stranded hundreds of people, damaged or destroyed thousands of homes and businesses, and closed hundreds of roads. The most severely affected region was the Catskill Mountains. More than 4.5 inches of rain fell on at least 45 inches of snow in the Catskill Mountain region during this event and caused major flooding throughout the southeastern section of New York State.

In Greene County, the severe storms downed large limbs in Surprise (Greenville).. According to SHELDUS, Greene County had another $8,000 in property damage due to wind. The majority of damage was due to flooding along the major waterways of the county. Overall, according to NCDC and SHELDUS, Greene County experienced approximately $10 million in total property damages from this event.

This storm resulted in a FEMA Disaster Declaration (FEMA DR-1095) on January 24, 1996. Through this declaration, 41 counties were declared eligible for Federal and State disaster funds, including Greene County. Greene County received $916,839 in IA and $4.4 million in PA funding (1997 USD).

June 4-8, 1996: Severe thunderstorms entered the region on June 4 as a cold front moved east. Up to one-inch diameter hail fell on several parts of New York State. The storm produced strong winds, downing trees and causing minor damage to homes. On the 5th, unstable weather was reported throughout the New England states. The storms continued on the 8th, bringing three-quarter inch diameter hail and damaging winds to Greene and Dutchess counties due to thunderstorms. Damage in Greene County included lightning in Palenville and wind and lightning in Coxsackie, resulting in $29,000 in property damage.

September 16-17, 1999 (Hurricane/Tropical Storm Floyd) (FEMA DR-1296): According to the National Hurricane Center, this event was a large and intense storm that pounded the central and northern Bahama islands, seriously threatened Florida, struck near the coast of North Carolina and moved up the east coast of the U.S. into New England as a tropical storm. It neared the threshold of a Category 5 on the Saffir/Simpson Hurricane Scale as it approached the Bahamas, and caused a flood disaster of immense proportions in the eastern U.S., particularly from the eastern coast of North Carolina through New Jersey. Much of Floyd's impact was due to heavy rainfall, creating major losses from floodwaters throughout the eastern U.S. Common rainfall totals ranged between 4 and 12 inches. Ten states were declared major disaster areas, including New York.

As the remnants of Floyd passed by eastern New York State, strong winds pummeled the region with numerous reports of power outages and downed trees. Some of the reported downed trees were the result of the soft ground due to the excessive amount of rain. According to NWS, rainfall totals for Greene County ranged between 6.9 inches (Prattsville) to 12.21 inches (Cairo). Greene County's damage was mainly a result of flooding.

This storm resulted in a FEMA Disaster Declaration (FEMA DR-1296) on September 19, 1999. Through this declaration, 15 New York counties were declared eligible for Federal and State disaster funds, including Greene County.

May through September 2000 (FEMA DR-1335): Between May and September 2000, multiple severe storm events occurred throughout New York State, resulting in significant flooding and over $34.6 million in damage throughout the state.

The first series of storms began on May 18, 2000. A strong cold front crossed eastern New York State, bringing very strong winds. This system spawned a line of thunderstorms, producing the largest outbreak of severe weather across eastern New York State in nearly two years. The vast majority of damage was from thunderstorm winds, along with hail damage and two confirmed tornadoes. Thunderstorm winds knocked down large trees and powerlines in multiple counties, including Greene County. In Greene County, shingles were blown off a roof in Cairo. According to NCDC and SHELDUS, Greene County had approximately $110,000 in property damage due to this storm.

The second series of storms hit the area on June 2, 2000. A powerful cold front moved across eastern New York State, bringing an unstable air mass in front of a cold front. This generated straight line thunderstorm winds and hail and caused widespread severe weather damage. In Greene County, one-

inch diameter hail was reported in Catskill. According to NCDC and SHELDUS, Greene County had approximately $23,000 in property damage from this storm.

On June 6, 2000, an area of low pressure developed over the Delmarva Peninsula. The storm tracked up the coast and became a full-blown Nor'Easter. Tropical moisture was trapped and produced a very heavy rainstorm across eastern New York State, mainly from Albany southward. Albany had a total of 3.5 inches fall on June 6, while heavier rain fell across the Catskills with as much as 5.77 inches falling in East Jewett (Greene County). Many roads and bridges were closed throughout Greene County due to flooding. According to NCDC and SHELDUS, Greene County had approximately $115,000 in property damage from this storm, mainly related to flooding.

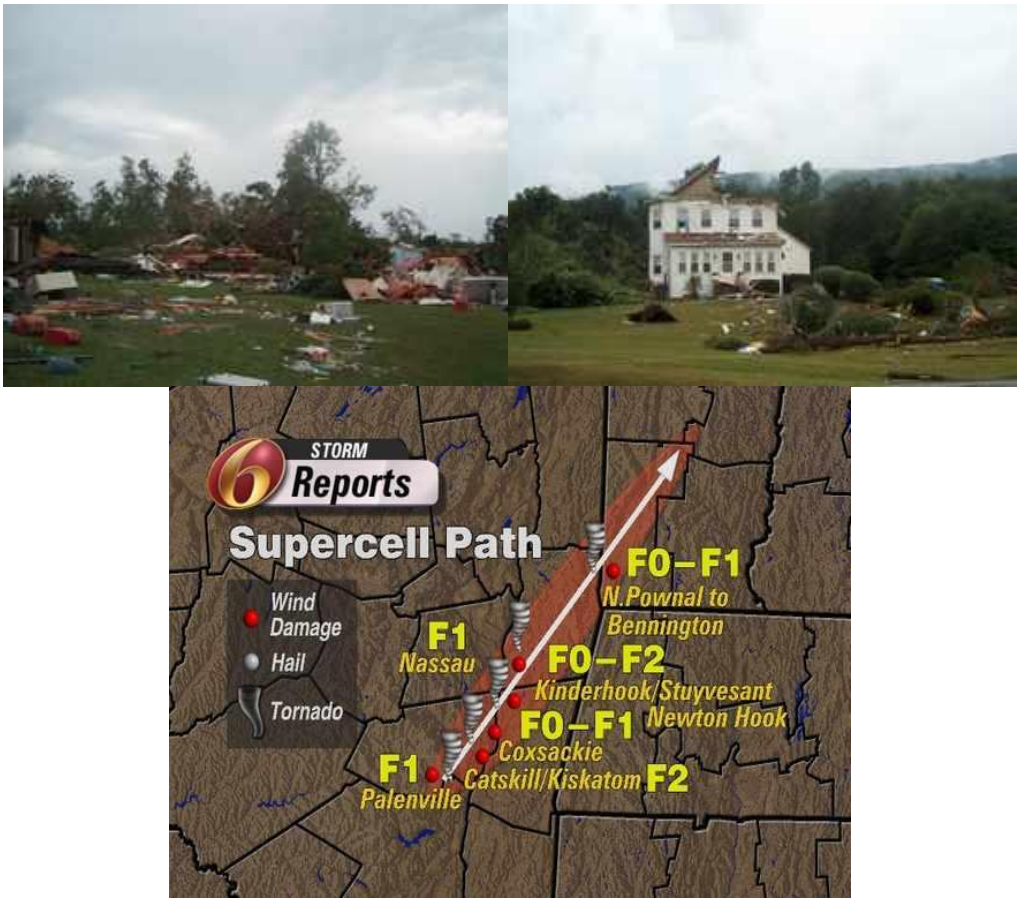
On August 3, 2000, numerous thunderstorms developed, producing dime size hail to a couple of New York State counties, including Greene County. Many other reports were in relation to wind damage. Many trees and power lines were down in several counties. In Greene County, a man was struck by lightning at the Earlton Hill Campground in Coxsackie. Cost estimates of property damage in Greene County were unavailable in the materials reviewed to develop this plan.

These storms resulted in a FEMA Declaration Disaster (FEMA DR-1335) on July 21, 2000. Through this declaration, 27 counties were declared eligible for Federal and State disaster funds, including Greene County. According to the Schoharie Creek SMP, Greene County received approximately $176,596 in disaster aid from this event.

July 21-August 13, 2003 (FEMA DR-1486): A series of slow-moving thunderstorms accompanied by torrential rainfall caused a tornado outbreak and flash flooding throughout much of New York State, including Greene County. This system produced a significant severe weather outbreak and the largest tornado outbreak since May 1998.

The first line of thunderstorms worked across the region during the afternoon of July 21. This line of storms produced spotty wind damage and downed trees and wires across several New York counties, including Greene County. The heavy rainfall caused torrential rains and flash flooding in some areas. During the evening hours of July 21, a stronger line of storms moved east from central to eastern New York State. One cell broke loose from the line of thunderstorms and became a supercell as it reached the mid-Hudson Valley, spawning a significant tornado. The tornado initially touched down in southeastern Greene County and produced a discontinuous path of 17 miles in the County. The tornado left a swath of destruction, including hundreds of trees uprooted and power and telephone wires down. Many roads in the county were impassable due to debris.

As the storm moved into Greene County, an F1 tornado (about 50 yards wide and a half-mile long) touched down in Palenville, near Pennsylvania Avenue. The tornado then touched down in the hamlet of Kiskatom in the town of Catskill. The storm damage in Kiskatom was rated F2, with a path width of 100 yards and a length of over one mile. Several houses were damaged beyond repair and several mobile homes were destroyed. Seven people were injured as a result of this tornado in Kiskatom.



(Source: Greene County Emergency Services)

Figure A-Error! No text of specified style in document.**: 2003 Tornado in Greene County**

The tornado path continued into Athens, where it was rated between an F0 and an F1. It had a path width of 50 yards and a length of one-half mile. In Coxsackie, the tornado was an F1 and caused damage to trees and a manufactured home. The total discontinuous path length of tornadic damage in Greene County was approximately 17 miles. At the height of the storm, 6,000 residents in Greene County were without power. The areas that saw the most damage from this storm was Pennsylvania Avenue in Palenville; Route 23 in Kiskatom; the flats at Lasher's Farm on Cauterskill Road; Paul Saxe Road; and Vedder Road. In Catskill, firefighters responded to reports of downed wires and trees, some on Woodland Avenue. According to NCDC and SHELDUS, Greene County had over $1.1 million in property damage due to the storms.

On August 2, the area experienced another severe weather event when isolated thunderstorms affected the Catskill region. Approximately 4 to 5 inches of rain fell in less than two hours throughout eastern Greene County. This heavy rainfall resulted in flooded roads in both Leeds and Catskill. In Catskill, the Catskill Creek overflowed onto State Highway 23B and a mudslide was reported on Sandy Plain Road. The Poltic Creek overflowed its banks and washed away a small bridge. Homes in the

cities of Catskill and Athens took on significant water in their basements. According to NCDC and SHELDUS, Greene County had approximately $60,000 in property damage due to the storms.

Another slow-moving series of thunderstorms developed in the area on August 11, producing flooding rains. A first batch of storms caused flooding in Greene County, washing out portions of Route 296 in Hensonville (Greene County). Flooding was also noted on Route 23 near Cairo, also in Greene County.

April 2-4, 2005 (FEMA DR-1589): A slow moving storm moved up through the Appalachians and into the northeast U.S. The heavy rainfall from this event produced flooding in parts of New York, New Jersey, and Pennsylvania. Prior to this storm, the rivers and streams in the area already had high flow-rates due to a previous rainstorm on March 28 and a snowmelt; therefore, flooding increased substantially and created additional damage as a result of this April storm.

In New York State, the heaviest rain and worst flooding reportedly occurred in Ulster and Greene Counties. The NYS HMP indicated that the State experienced approximately $66.2 million in damages from this event. Rainfall totals for Greene County ranged between 1.5 inches in New Baltimore to 5.54 inches in East Jewett. According to NCDC and SHELDUS, Greene County experienced approximately $1.3 million in flood damages from this event. The flood impact and losses of this event are further discussed in more detail in Section 5.4.1 (2009 plan) (Flood).

This storm resulted in a FEMA Disaster Declaration (DR-1589) on April 19, 2005. Through this declaration, 20 counties were declared eligible for Federal and State disaster funds, including Greene County. In a September 14, 2005 Press Release, FEMA indicated that nearly $35 million in disaster aid was made available to all declared counties as result of this event. In this press release, FEMA approved $1.1 million in Public Assistance (PA) reimbursements for the Towns of Cairo, Coxsackie, Durham, Greenville, Halcott, Hunter, Jewett, Lexington, New Baltimore, Prattsville and Windham; the Villages of Catskill, Hunter and Tannersville; and the East Durham, Lexington and Palenville fire departments. However, documentation provided by FEMA to Greene County Department of Emergency Services indicated that as of June 1, 2005, the County was approved for over $2.2 million in PA reimbursements. Aid was provided for various restoration and mitigation project costs generated as a result of flood damages during this event; particularly in the Towns of Hunter, Jewett, and Tannersville.

June 26-July 10, 2006 (FEMA DR-1650): This severe storm event resulted in a significant flood that affected much of the Mid-Atlantic region. The flooding was widespread, affecting numerous rivers, lakes, and communities from upstate New York to North Carolina. Rain totals across the affected states ranged between 2 and 16.67 inches. Overall, the storm resulted in over 16 deaths and millions in damages throughout the affected states.

Some sources indicated that this flooding event was the largest and most costly natural disaster that New York State has encountered since Hurricane Agnes in 1972. The NYS HMP indicated that the counties affected throughout the state experienced approximately $246.3 million in damages during this flood.

In Greene County, precipitation totals averaged between 3 to 10 inches of rain, with largest accumulations generated in the south central portion of the county. Rain totals from June 26 through June 30, 2006 included: Tannersville (12.20 inches), East Jewett (8.3 inches), Catskill (4.43 inches), and Windham (3.14 inches). The heavy rain led to widespread flooding throughout the county.

April 14-18, 2007 (FEMA DR-1692): An intense and powerful Nor'Easter brought flooding rains and heavy wet snowfall to the northeast U.S. Rainfall totals of six to eight inches were reported across the eastern Catskill Mountains, mid-Hudson Valley and western New England, resulting in widespread flooding. Snowfall accumulations of one to 1 1/2 feet were reported across the southern Adirondacks, eastern Catskills, Berkshires, and southern Green Mountains. The combined effects of high winds and heavy rainfall during this event led to flooding, storm damages, power outages and evacuations, and disrupted traffic and commerce.

Various counties in the eastern Catskills and Mid-Hudson Region of New York State were impacted by several inches of rain during this event. New York State experienced between $12.8 and $60 million in damages from this event. In Greene County, the heavy rains led to widespread flooding of small streams and creeks across the county. Rainfall totals ranged from 3.97 inches in Cairo to 7.9 inches in Tannersville.

August 28, 2011- Hurricane Irene (FEMA DR-4020) – Catastrophic flooding was reported throughout Greene County during Hurricane Irene, especially in the Catskill areas. Evacuations and rescues were widespread, along with widespread road closures and damage and houses that were swept away. Record flooding most likely occurred on the Schoharie Creek at Prattsville before the gage was lost in the flood. One death occurred in Maplecrest when a woman drowned when the house she was in was swept away by floodwaters. The combination of strong winds and extremely saturated soil led to numerous downed trees and power lines across the region and widespread, prolonged power outages. Approximately 18,000 people in Greene County were affected by power outages.

October 29, 2012 – Superstorm Sandy (FEMA DR-4085) – Superstorm Sandy moved northward off the eastern seaboard of the United States during the last week of October 2012. Due to a very strong blocking ridge of high pressure over the Atlantic Ocean, the storm turned back to the northwest and rapidly strengthened as it moved toward the mid-Atlantic coast.

Although less than an inch of rain fell in valley areas, higher terrain areas of the northern and eastern Catskills received over an inch of rain. It was reported that 3.25 inches of rain fell in the Borough of Halcott Center, Greene County. Wind gusts of 40 to 60 mph were common from the afternoon of October 29 until the early morning hours of October 30. Wind gusts reached 50 mph in Greene County. Numerous trees were reported down throughout Halcott Center due to high winds.

The powerful storm also caused a storm surge that moved up the Hudson River from the New York City area. Record flooding occurred on the Hudson River at Poughkeepsie as the river reached 9.54 feet. The surge of water moved all the way up to Albany. Flooding occurred along the Hudson River in Greene County, causing damage to homes and businesses near the river.

Businesses were flooded from tidal flooding near the confluence of Hudson River and Catskill Creek in Catskill.

FEMA approved more than $384,000 in Hurricane Sandy assistance to fund emergency efforts and help repair and rebuild public infrastructure in Greene County.

Severe Winter Storms

Description

For the purpose of this plan severe winter storm hazards include heavy snow, blizzards, sleet, freezing rain, ice, and extreme cold. Since most extra-tropical cyclones, particularly northeasters (or Nor'Easters), generally take place during the winter weather months (with some exceptions), Nor'Easters have also been grouped as a type of severe winter weather storm in this section. In addition, for the purpose of this plan and as consistent with the New York State HMP, extreme cold temperature events were grouped into this hazard profile as well. These types of winter events or conditions are further defined below.

Heavy Snow: According to NWS, heavy snow is generally snowfall accumulating to 4 inches or more in depth in 12 hours or less; or snowfall accumulating to 6 inches or more in depth in 24 hours or less. A snow squall is an intense, but limited duration period of moderate to heavy snowfall (e.g., snowstorm), accompanied by strong, gusty surface winds and possibly lightning (generally moderate to heavy snow showers). Snowstorms are complex phenomena involving heavy snow and winds, whose impact can be affected by a great many factors, including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, and occurrence during the course of the day, weekday versus weekend, and time of season.

Blizzard: Blizzards are characterized by low temperatures, wind gusts of 35 miles per hour (mph) or more and falling and/or blowing snow that reduces visibility to 0.25 miles or less for an extended period of time (three or more hours).

Sleet or Freezing Rain Storm: Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. Freezing rain is rain that falls as a liquid but freezes into glaze upon contact with the ground. Both types of precipitation, even in small accumulations, can cause significant hazards to a community.

Ice Storm: An ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication. These accumulations of ice make walking and driving extremely dangerous, and can create extreme hazards to motorists and pedestrians.

Nor'Easter: Nor'Easters, named for the strong northeasterly winds blowing in ahead of the storm, are also referred to as a type of extra-tropical cyclone. A Nor'Easter is a macro-scale extra-tropical storm whose winds come from the northeast, especially in the coastal areas of the Northeastern U.S. and Atlantic Canada. More specifically, it describes a low pressure area whose center of rotation is just off the coast and whose leading winds in the left forward quadrant rotate onto land from the northeast. Wind gusts associated with these storms can exceed hurricane force in intensity. Unlike tropical cyclones that form in the tropics and have warm cores (including tropical depressions, tropical storms, and hurricanes), Nor'Easters contain a cold core of low barometric pressure that forms in the mid-latitudes. Their strongest winds are close to the earth's surface and they often measure several hundred miles across. Nor'Easters may occur at any time of the year but are most common during the fall and winter months (September through April).

Nor'Easters can cause heavy snow, rain, gale force winds, and storm surge that can cause beach erosion, coastal flooding, structural damage, power outages, and unsafe human conditions. If a Nor'Easter stays just offshore, the results are much more devastating than if the cyclone meanders up the coast on an inland track. Nor'Easters that stay inland are generally weaker and only cause strong wind and rain. Those that stay offshore can bring heavy snow, blizzards, ice, strong winds, high waves, and severe beach erosion. In these storms, the warmer air is aloft. Precipitation falling from this warm air moves into the colder air at the surface, causing crippling sleet or freezing rain.

If a significant pressure drop occurs within a Nor'Easter, this change can turn a simple extra-tropical storm into what is known as a "bomb." "Bombs" are characterized by a pressure drop of at least 24 millibars within 24 hours (similar to a rapidly-intensifying hurricane). Even though "bombs" occasionally share some characteristics with hurricanes, the two storms have several differences. "Bombs" are extra-tropical, and therefore, are associated with fronts, higher latitudes, and cold cores. They require strong upper-level winds, which would destroy a hurricane.

Extreme Cold: Extreme cold events are when temperatures drop well below normal in an area. Extremely cold temperatures often accompany a winter storm, so individuals may have to cope with power failures and icy roads. Although staying indoors as much as possible can help reduce the risk of car crashes and falls on the ice, individuals may also face indoor hazards. Many homes will be too cold—either due to a power failure or because the heating system is not adequate for the weather. When people must use space heaters and fireplaces to stay warm, the risk of household fires and carbon monoxide poisoning increases.

What constitutes extreme cold and its effects can vary across different areas of the country. In regions relatively unaccustomed to winter weather, near freezing temperatures are considered "extreme cold." Exposure to cold temperatures, whether indoors or outside, can lead to serious or life-threatening health problems such as hypothermia, cold stress, frostbite, or freezing of the exposed extremities such as fingers, toes, nose and ear lobes.

According to the NOAA National Severe Storms Laboratory (NSSL), every year winter weather indirectly and deceptively kills hundreds of people in the U.S., primarily from automobile accidents, overexertion, and exposure. Winter storms are often accompanied by strong winds creating blizzard

conditions with blinding wind-driven snow, drifting snow, extreme cold temperatures, and dangerous wind chill. They are considered deceptive killers because most deaths and other impacts or losses are indirectly related to the storm. People can die in traffic accidents on icy roads, heart attacks while shoveling snow, or of hypothermia from prolonged exposure to cold. Wind Chill is not the actual temperature but rather how wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, driving down body temperature. Animals are also affected by wind chill; however, cars, plants, and other objects are not. Heavy accumulations of ice can bring down trees and power lines, disabling electric power and communications for days or weeks. Heavy snow can immobilize a region and paralyze a city, shutting down all air and rail transportation and disrupting medical and emergency services. Storms near the coast can cause coastal flooding and beach erosion as well as sink ships at sea. The economic impact of winter weather each year is huge, with costs for snow removal, damage, and loss of business in the millions.

Also, winter storms can generate coastal flooding, ice jams, and snow melt, resulting in significant damage and loss of life:

- Coastal Floods: Winds generated from intense winter storms can cause widespread tidal flooding and severe beach erosion along coastal areas.
- Ice Jams: Long cold spells can cause rivers and lakes to freeze. A rise in the water level or a thaw breaks the ice into large chunks that become jammed at manmade and natural obstructions. Ice jams can act as a dam, resulting in severe flooding.
- Snowmelt: Sudden thaw of a heavy snow pack often leads to flooding.

Previous Occurrences (prior to 2016)

March 11-14, 1888 ("Blizzard of '88" or "Great White Hurricane"): The "Blizzard of '88," remains perhaps the most infamous and unpredictable of all Northeast snowstorms. This event paralyzed the east coast of the United States and Atlantic Canada from the Chesapeake Bay to Maine, and including the Maritime Provinces of Eastern Canada. Telegraph infrastructure was disabled, isolating New York City, Boston, Philadelphia, Baltimore, and Washington, D.C. for days. Two hundred ships were grounded and at least 100 seamen died. Fire stations were immobilized; property losses from fire alone were estimated at $25 million. Overall, more than 400 deaths were reported. Sources vary, but NWS estimated that 40 inches of snow covered New York and New Jersey. Winds blew up to 48 mph, creating snowdrifts 40 to 50 feet high. It was identified that over 20 to 50 inches of snow had accumulated within various locations of Greene County. Cost estimates of property damage in Greene County were unavailable in the materials reviewed to develop this plan.

February 2-5, 1961: This 1961 storm produced a maximum of 40 inches of snow in central New York. A large area of 1 to 2 feet of snow accumulated across central New York and northeast Pennsylvania. In Greene County, 10 to 20 inches of snow fell during this event, resulting in over $80,000 in property damages.

October 4, 1987 (FEMA DR-801): This northeastern coastal storm broke records by dumping heavy, wet snow over eastern New York, Vermont, and western portions of Connecticut and

Massachusetts. From the Catskills and Berkshires of upstate New York to the Green and White Mountains of Vermont and New Hampshire, the snow transformed the landscape, isolating entire communities. This event was the earliest snow for the season on record in eastern New York since 1870. Throughout the four state area, the snow brought down power lines, resulting in a loss of electricity to about 333,000 customers, closed roads and airports, and brought down an untold number of trees and tree limbs that were still in full leaf. Many vehicles were damaged by the falling trees and limbs and many weather related traffic accidents resulted in death and injury.

In New York State, leaf-laden trees caught falling snow and the weight snapped branches and toppled trees across power lines and roads. Many highways and a 26-mile stretch of the Thomas E. Dewey Thruway were closed, and power failures hit 230,000 homes in New York State. Many traffic accidents were reported throughout the region and motorists were warned to stay off roads. Emergencies were declared in some communities in the Hudson Valley, and thousands of people were stranded at homes and weekend retreats. Crops of apples, peppers, eggplant, and sweet corn were reported damaged. The heaviest snow, 20 inches, was reported at East Jewett, in Greene County. Elsewhere in New York State, NWS reported accumulations of up to 15 inches in Ulster County, 13 inches in Rensselaer County, 12 inches in the Catskills, and 10 inches in Columbia County. Overall, New York State experienced approximately $13.5 million in eligible damages. Cost estimates of property damage in Greene County were unavailable in the materials reviewed to develop this plan.

This storm resulted in a FEMA Disaster Declaration (FEMA DR-801) on November 10, 1987. Through this declaration, nine counties were declared eligible for federal and State disaster funds including Greene County. Disaster aid for Greene County has not been disclosed in the materials reviewed to develop this plan.

March 12-15, 1993 ("Superstorm of 1993," "Storm of the Century," or "Great Storm of 1993") (FEMA EM-3107): This storm was identified as both a Nor'Easter and a blizzard by many sources. It was a massive storm complex, affecting at least 26 states and much of eastern Canada. The March 1993 storm is listed among the NOAA Top Billion Dollar Weather Disasters, reportedly causing a total of $6.6 billion in damages along the eastern coast of the U.S. and resulting in over 270 fatalities (23 fatalities in New York State). According to the NYS HMP and NYSEMO, this blizzard resulted in total eligible damages of approximately $8.5 million through New York State.

Achieving a NESIS rating of 12.52, the "Storm Of The Century" ranks as an "Extreme" snow event. With a total area impacting, at its peak, from Maine to Florida, a final total of 5 to 50 inches of snowfall, along with hurricane force winds, this storm ground most of the Eastern seaboard to a halt for days. Total snowfall accumulations for Greene County were between 20 and 40 inches, with Prattsville receiving over 36 inches of snow. Cost estimates of property damage or losses in Greene County were unavailable in the materials reviewed to develop this plan.

This storm resulted in a FEMA Emergency Declaration (FEMA EM-3107) on March 17, 1993. Through this declaration, multiple counties were declared eligible for federal and State disaster public assistance funds. Disaster aid for Greene County has not been disclosed in the materials reviewed to develop this plan.

January 6-9, 1996 (FEMA DR-1083) ("Blizzard of '96"): Much of the eastern U.S. seaboard, from Tennessee to Maine, was affected by this blizzard. Many areas received between 1 and 3 feet of snow during this storm. This blizzard achieved a NESIS rating of 11.54, placing the storm in the "Extreme category." A total of 4 to 40 inches of snow fell along the storm's path, with the highest accumulations in the states of Pennsylvania, New Jersey, New York, Maryland, Virginia, and West Virginia.

The major effects from this storm in New York State were felt across the southeastern sections of the state, resulting in property damages ranging from $21.3 to $70 million. The Albany NWS forecast office reported that snowfalls ranged from half an inch at Albany to isolated amounts over 30 inches in Dutchess and Berkshire counties. Snowfalls ranged from 10 to 20 inches with 6- to 10-foot drifts in Berkshire County, Massachusetts; Litchfield County, Connecticut; and Greene, Columbia, Delaware, Ulster, Sullivan, and Dutchess counties in New York. States of Emergency were declared in Litchfield, Pittsfield, Berkshire, Dutchess, Columbia, and Ulster counties. Some sources indicate that Greene County experienced as much as 30 inches of snow during the blizzard. The county also experienced extreme cold temperatures during the blizzard, ranging from -2 to -20 degrees Fahrenheit, mostly in the Towns of Lexington and Prattsville. Greene County experienced approximately $160,000 in property damages during this event.

This storm resulted in a FEMA Disaster Declaration (FEMA DR-1083) on January 12, 1996. Through this declaration, 19 counties were declared eligible for federal and State disaster funds, including Greene County. Disaster aid for Greene County has not been disclosed in the materials reviewed to develop this plan.

March 31-April 1, 1997 ("April Fool's Nor'Easter"): An intensifying storm off the Mid-Atlantic coast brought record-setting snow to portions of the Northeast. Snowfall amounts of 12 inches and higher covered northeast Pennsylvania, northwestern New Jersey, eastern New York, and central New England. Snowfall amounts of 24 inches and higher covered the northern Catskill Mountain region of New York and central and eastern Massachusetts. The storm also brought high winds, with peak winds between 30 and 50 mph. The storm achieved a NESIS rating of 2.37, placing the storm in the 'Notable' category. The wet snow and strong winds brought down many trees and caused widespread power outages throughout the New York State counties affected. Overall, the affected counties of the state experienced over $7.8 million in property damages from this storm. Snow accumulations totaled 20 to 40 inches in Greene County, with East Jewett receiving 37 inches of snow; the highest accumulations recorded in the state. Additionally, Windham received 30 inches and Prattsville received 29 inches of snow. Over 30,000 customers within Greene County lost power during this event. A State of Emergency was declared in Greene, Schoharie, and Dutchess counties. Greene County experienced approximately $709,090 in property damages during this event.

March 4-7, 2001: A major snowstorm caused snow to fall at a rate of one inch per hour, respectively, throughout the northeastern U.S. over a 2-day period of time. High winds caused snowdrifts and whiteout conditions in many parts of southern and central New York State. Achieving a NESIS rating of 3.53, this event places itself in the 'Significant' category.

The heaviest snowfall from this event fell across Pennsylvania, New York State, and New England. Snowfall totals for Greene County ranged from 10 to 30 inches. Prattsville received 25 inches, Windham received 26 inches, and East Jewett received 21 inches of snow. Cost estimates of property damage or losses throughout the state, including Greene County, were unavailable in the materials reviewed to develop this plan.

December 24-26, 2002 and January 2-4, 2003 (FEMA EM-3173): Two major storm systems extending through the northeastern U.S. on December 25-26, 2002 and January 3-4, 2003. The first storm, December 25-26, 2002, began as light snow and later on, heavy snow began to fall across central NY. Snowfall rates were several inches an hour, resulting in snow amounts ranging from 8 inches to 3 feet. Many New York counties declared state of emergencies, including Greene County. Snowfall totals in Greene County ranged between 10 to 40 inches during the December event. Snowfall totals for certain locations in Greene County included: Prattsville (29 inches), Ashland (16 inches), Catskill (16 inches), Platte Cove (23.2 inches), Windham (20 inches), and Cairo (18.3 inches) (NOAA, 2002). Achieving a NESIS rating of 4.42, this event placed itself in the 'Major' category (Figure 5.4.3-13) (Kocin and Uccellini, 2004).

March 12, 2010 – A low pressure system developed over the mid-Atlantic region on Friday night, March 12, and then moved gradually northward to the Delmarva region over the weekend. A very strong low-level jet developed to the north of the low and trapped abundant moisture. Easterly winds of 20 to 30 mph occurred, with gusts of up to approximately 50 mph. The easterly winds enhanced the precipitation across the eastern Catskills and Taconics due to upslope effects. Complicating the event, colder air drained southward into the region, resulting in a heavy snowfall across the higher terrain of the central and southeastern Catskills Saturday night into Sunday morning.

The National Weather Service reports say that precipitation ranged from approximately 0.25 to 0.5 inch in the mid-Hudson Valley, with 6 to 12 inches of heavy wet snow accumulations above 1,000 feet. Greene County has records that go well beyond these estimates, approximately 4'-7' of snowfall across the County.

The strong and gusty winds led to numerous power outages, especially across the central and southeastern Catskills where the heavy wet snow fell. One man was found dead and another man was rescued from Blackhead Mountain in the eastern Catskills on Sunday night, March 14.

March 18, 2013 – During the afternoon of Monday, March 18, an area of low pressure moved towards the eastern Ohio Valley. Precipitation well ahead of the storm's warm front moved from southwest to northeast across the region. With enough cold air in place, the precipitation fell in the form of snow during the evening hours. By just after midnight on Tuesday, March 19, the steady precipitation ended or changed to patchy areas of freezing drizzle or sleet from the Mohawk River southward. Meanwhile, steady snowfall continued across the Adirondacks and the Lake George-Saratoga region for the rest of the overnight hours.

At the end of the storm, snowfall amounts ranged from 2 to 5 inches across parts of the mid-Hudson Valley and Taconics to 10 to 15 inches across the Sacandaga and Saratoga Regions. Most areas in the eastern Catskills and Capital Region received 5 to 9 inches of snow.

January 1, 2014 – A long-lasting snowstorm affected eastern upstate New York between the evening of New Year's Day and the morning of January 3, 2014.

A slow-moving frontal boundary situated over the mid-Atlantic Region was in place on Wednesday, January 1. An area of high pressure over southern Quebec allowed Arctic air to move down into the region. As a weak wave of low pressure developed along the front, moisture moved up and over the frontal boundary into the region. As a result, light snow broke out and gradually spread from south to north between the evening of Wednesday, January 1, and the early morning hours of Thursday, January 2. The snow evolved into a moderate snow over portions of the Mohawk Valley, Schoharie Valley, and Capital Region during the morning hours of January 2 and continued through much of the day. Farther south, there was a brief break in the steady snowfall during the daytime on January 2, but it remained quite cold, with temperatures in the single digits over much of the region.

On the evening of Thursday, January 2, a new area of low pressure began to form on the mid-Atlantic coast and brought moisture from the Atlantic Ocean into the region. A moderate snowfall developed over the entire area. The snow gradually tapered off to light snow and snow showers from west to east overnight as the low pressure area tracked east-northeast away from the region. By the morning hours of Friday, January 3, 6 to 12 inches of snow had fallen over much of the region, with lighter amounts across the far western Adirondacks and the mid-Hudson Valley. A few spots in the high terrain of the northern Catskills and Helderbergs had approximately 15 inches. Temperatures remained very cold, and with a cold northwest wind, wind chill values were 0 to –20°F.

February 15, 2015 – Behind a rapidly developing coastal storm, an extremely frigid Arctic air mass poured into the region from the north, beginning during the late morning hours on Sunday, February 15, 2015. With the developing storm just east of the region, a strong pressure gradient allowed for very strong winds. Northwest winds frequently gusted over 30 mph, with some gusts as high as 46 mph through the evening hours.

Temperatures fell quickly throughout the day and dropped below 0°F on Sunday night into the morning of Monday, February 16. The temperature dropped to as low as were as cold as –30°F. Wind gusts continued during the night and morning hours, and wind chill values dropped to as low as –15 to –45°F.

Because most of February had extreme cold temperatures, many towns and cities kept warming shelters open. There were many reports of bursts water mains and pipes due to the frigid temperatures penetrating deep into the ground, especially in areas with older infrastructure.

By the afternoon of Monday, February 16, wind chill values had risen to above dangerous levels, although it remained rather cold through the remainder of the day.

Potential Funding Sources for Mitigation Actions

Below is a list of local, state and federal funding sources that are available to aid communities in implementing mitigation actions.

Funding Source	Details	Agency	Project URL
Local Funding Sources			
Schoharie Watershed Program	Guided by stream stewardship principles, the Schoharie Watershed Program offers assistance to local communities, residents, and organizations to advance recommendations from Schoharie Basin Stream Management Plans. Categories of funding include: Recreation and Stream Habitat Improvements, Education on Watershed Protection, Highway and Infrastructure Improvement, Planning & Assessment, Landowner Stream Assistance, and Creative Stormwater Practices & Critical Area Seeding.	GCSWCD	https://www.gcswcd.com/swp/smp/smip
Catskill Streams Buffer Initiative (CSBI)	The overall goal of the Catskill Streams Buffer Initiative (CSBI) is to inform and assist landowners in better stewardship of their riparian (streamside) area through protection, enhancement, management, or restoration. The Department of Environmental Protection and its partners (County Soil & Water Conservation Districts and Cornell Cooperative Extension) will assist private, riparian landowners throughout the West of Hudson Watershed	Catskill Streams	http://www.catskillstreams.org/pdfs/CSBIguidelines.pdf

Funding Source	Details	Agency	Project URL
Catskill Watershed Corporation Grant Programs	The 1997 New York City Watershed Memorandum of Agreement required the development of 14 city-funded environmental protection and economic development programs in the Watershed West of the Hudson River as part of a pact that allowed the City to avoid filtering its Catskill-Delaware Water Supply. In November 2002, a renewed five-year Filtration Avoidance Determination was granted to the City by the US Environmental Protection Agency, permitting a continued exemption from building a filtration plant for the Catskill-Delaware Supply. The 2002 FAD was predicated on a long-term Watershed Protection Plan submitted by the City to the EPA outlining several water quality programs to be developed, continued or expanded by the CWC. In 2007, a new 10 year FAD was based on an updated Watershed Protection Plan.	Catskill Watershed Corp.	https://cwconline.org/
State Funding Sources			
NYSDEC NYC Watershed Protection Program	The New York City Watershed Protection Program provides financial assistance for projects as a part of the watershed program for protection and enhancement of the quality of source waters of the New York City water supply system. New York State (NYS) and the federal government provide funding grants for these projects. The funds are administered by the NYS DEC through the Water Quality Improvement Program (WQIP).	NYDEC	https://www.dec.ny.gov/lands/25599.html

Funding Source	Details	Agency	Project URL
BridgeNY	The BridgeNY program provides assistance for local governments to rehab and replace bridges and culverts. BridgeNY helps communities deliver safe, transformative, and innovative bridge/culvert rehabilitation and replacement projects	NYSDOT	https://www.govgrantshelp.com/grants/2822-bridge-ny-bridge-grant-program/
Climate Smart Communities	State Support for Local Climate Action Climate Smart Communities (CSC) is a New York State program that helps local governments take action to reduce greenhouse gas emissions and adapt to a changing climate. Registered communities have made a commitment to act by passing the CSC pledge. Certified communities are the foremost leaders in the state; they have gone beyond the CSC pledge by completing and documenting a suite of actions that mitigate and adapt to climate change at the local level. Program includes competitive grants program for which all NYS local governments are eligible.	NYSDEC	https://climatesmart.ny.gov/
DEC Grants	Competitive grants for environmental protection and improvement are available for municipalities, community organizations, not-for-profit organizations and others.	NYSDEC	https://www.dec.ny.gov/pubs/grants.html
Environmental Research Program-Climate	Environmental Research Program Topic: (1) Climate Adaptation Program - looks at the impacts of energy use on humans and the environment. (2) Air Quality and Health, (3) Ecosystems	NYSERDA	https://www.nyserda.ny.gov/All-Programs/Programs/Environmental-Research

Funding Source	Details	Agency	Project URL
Adaptation Program			
Flood Protection Program	DEC works with communities throughout the state to find ways to reduce or protect against loss of life and property damage caused by flooding. DEC has a flood protection program that focuses on structural and nonstructural flood damage reduction methods in coordination with the Army Corp of Engineers	NYSDEC	https://www.dec.ny.gov/chemical/92064.html
Local Government Efficiency (LGE) Program	The Local Government Efficiency (LGe) Grant Program provides technical assistance and competitive grants to local governments for the development of projects that will achieve savings and improve municipal efficiency through shared services, cooperative agreements, mergers, consolidations and dissolutions. With the creation of the LGe program, New York State is committed to working with local governments to control costs while maintaining the quality service delivery provided by New York's local governments. The Department of State continues to be well positioned to coordinate the joint provision of state services, promote state and local cost efficiencies.	NYSDOS	http://www.dos.ny.gov/LG/lge-grant.html.
Environmental Protection and	Technical assistance grants to community groups with significant threat sites of environmental concern;	NYSDEC	http://www.dec.ny.gov/regulations/2590.html

Funding Source	Details	Agency	Project URL
Improvement Grants	available for community organizations, not-for-profit organizations and others		
Green Innovation Grant Program (GIGP)	Competitive grant program supports projects that utilize unique stormwater infrastructure design and create cutting-edge green technologies, innovative stormwater management in such areas as preserving and restoration natural landscape features such as floodplains and wetlands for flood protection	NYSDEC	https://www.efc.ny.gov/Default.aspx?tabid=461
NYS Environmental Protection Fund; Water Resources Board	This is a source of funding for capital projects that protect the environment and enhance communities. Capital projects are usually large projects that purchase land or construct facilities. Most projects that receive grants of EPF money combine it with other funding sources that require matching funds.	NYSDEC	http://www.dec.ny.gov/about/92815.html
The New York State Emergency Services Revolving Loan	Repair of firefighting apparatus, ambulances, or rescue vehicles; renovation, rehabilitation, or repair of facilities that house firefighting equipment, ambulances, rescue vehicles, and related equipment	NYSDHSES	http://www.dhses.ny.gov/ofpc/services/loan/
Grant & Bid Opportunities	Grant, bid, and funding opportunities including Local Waterfront Revitalization Program, and Watershed Protection	NYSDOS	http://www.dos.ny.gov/funding

Funding Source	Details	Agency	Project URL
Local Government Records Management Improvement Fund (LGRMIF) Disaster Recovery Grant	Grants for disaster recovery projects related to damage caused by a sudden, unexpected event involving fire, water, man-made or natural phenomena where a timely response is necessary to prevent loss of vital or archival records, or to ensure timely access to vital records	NYSED	http://www.archives.nysed.gov/grants/grants_lgrmif.shtml
Environmental Protection Fund (EPF)	Matching grants for the acquisition, planning, development and improvement of parks, historic properties	NYSOPRHP	http://www.nysparks.com/grants
Recreational Trails Program (RTP)	Matching grants for the acquisition, development, rehabilitation and maintenance of trails and trail-related projects	NYSOPRHP	http://www.nysparks.com/grants
New York Land Protection Program & Conservation Finance Program	Direct acquisition and conservation easements; grants and short-term, low-cost bridge loans for land transactions in selected landscapes in the eastern United States	OSI	http://www.osiny.org/site/PageServer?pagename=Program_NYLand
DHSES Grant Programs	Centralized listing of various Homeland Security grants	DHSES	http://www.dhses.ny.gov/grants
Federal Funding Sources			

Funding Source	Details	Agency	Project URL
Homeland Security Grant Program	Supports efforts to build and sustain core capabilities across the five mission areas of Prevention, Protection, Mitigation, Response, and Recovery based on allowable costs.	DHS	https://www.fema.gov/homeland-security-grant-program
Emergency Management Performance Grant (EMPG) Program	Assists local, tribal, territorial, and state governments in enhancing and sustaining all-hazards emergency management capabilities	DHS	https://www.fema.gov/emergency-management-performance-grant-program
Beneficial Uses of Dredged Materials	Direct assistance for projects that protect, restore, and create aquatic and ecological habitats, including connection with dredging an authorized Federal wetlands, in navigation projects	EPA	https://www.epa.gov/cwa-404/beneficial-use-dredged-material
Water Grants	A variety of grants related to water and wastewater infrastructure projects, including a catalog of federal funding for watershed protection projects	EPA	https://www.epa.gov/nps/watershed-funding
Building Resilient Infrastructure and Communities (BRIC)	Building Resilient Infrastructure and Communities (BRIC) will support states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation;	FEMA	https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities

Funding Source	Details	Agency	Project URL
	promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.		
Federal Grant and Assistance Programs for Governments	Catalog of federal disaster assistance and hazard-related grants and assistance	FEMA	https://www.cfda.gov/index?s=program&mode=list&tab=list
Hazard Mitigation Assistance (HMA)	Grants to provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages â€“ [includes FMA, HMGP, PDM, below]	FEMA	http://www.fema.gov/hazard-mitigation-assistance
Flood Mitigation Assistance (FMA) Program	Grants to states and communities for pre-disaster mitigation planning and projects to help reduce or eliminate the long-term risk of flood damage to structures insurable under the National Flood Insurance Program	FEMA	http://www.fema.gov/flood-mitigation-assistance-program
Hazard Mitigation Grant Program (HMGP)	Grants to states and communities for planning and projects providing long-term hazard mitigation measures following a major disaster declaration	FEMA	http://www.fema.gov/hazard-mitigation-grant-program
Pre-Disaster Mitigation (PDM)	Grants to states and communities for planning and projects that provide long-term hazard pre-disaster mitigation measures	FEMA	http://www.fema.gov/pre-disaster-mitigation-grant-program

Funding Source	Details	Agency	Project URL
Competitive Grant Program			
Public Assistance: Hazard Mitigation Funding under Section 406	Hazard mitigation discretionary funding available under Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act following a federally-declared disaster	FEMA	https://www.fema.gov/95261-hazard-mitigation-funding-under-section-406-stafford-act
Assistance to Firefighters Grant Program	Assists in local funding for fire equipment, staffing, facility construction and emergency response costs	FEMA	https://www.fema.gov/welcome-assistance-firefighters-grant-program
Community Development Block Grant (CDBG)	Grants to states 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	HUD	http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs
Disaster Housing Assistance Program	Emergency assistance for housing, including minor repair of home to establish livable conditions, mortgage and rental assistance	HUD	https://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/publications/dhap

Funding Source	Details	Agency	Project URL
HUD Disaster Resources	Grants and a variety of disaster assistance related to housing, including mortgage assistance	HUD	https://portal.hud.gov/hudportal/HUD?src=/info/disasterresources
Emergency Watershed Protection (WP) Program	Provides assistance to relieve imminent hazards to life and property caused by floods, fires, drought, windstorms, and other natural occurrences	NRCS	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/ewp/
Economic Injury Disaster Loans	Low-interest disaster loans to businesses of all sizes, private non-profit organizations, homeowners, and renters. SBA disaster loans can be used to repair or replace the following damaged property, equipment, inventory or other business assets.	SBA	https://www.sba.gov/loans-grants/see-what-sba-offers/sba-loan-programs/disaster-loans
Aquatic Ecosystem Restoration	Direct support for carrying out aquatic ecosystem restoration projects, such as wetlands, repairing and other floodplain and aquatic systems, that will improve the quality of the environment; Regulatory and adaptation planning initiatives for Climate Change	USACE	http://www.nae.usace.army.mil/Missions/Public-Services/Ecosystem-Restoration-Authorities/
Missions and Appropriations	Federal budget and funding to support missions including research, feasibility studies, construction and disaster relief	USACE	http://www.usace.army.mil/Missions/Emergency-Operations/
Emergency Loan Program	USDA's Farm Service Agency (FSA) provides emergency loans to help producers recovery from production and physical losses due to drought, flooding, other natural disasters or quarantine	USDA	https://www.fsa.usda.gov/programs-and-services/farm-loan-programs/emergency-farm-loans/

Funding Source	Details	Agency	Project URL
Land & Water Conservation Fund	Funding allows 4 federal agencies to acquire and develop private lands for public outdoor recreation areas and facilities; and congressional appropriate for matching funds for state and local government land acquisition projects	USDOI	http://www.lwcfcoalition.org/
Partners for Fish and Wildlife	Financial and technical assistance to private landowners interested in pursuing restoration projects affecting wetlands and riparian habitats	USFWS	http://www.fws.gov/partners

GREENE COUNTY

EMERGENCY SHELTER PLAN
DRAFT

LAST UPDATED

July 21, 2014

GREENE COUNTY EMERGENCY SERVICES

25 VOLUNTEER DRIVE, CAIRO, NY 12413

TABLE OF CONTENTS

ATTACHMENTS TO THE PLAN

Att_chment #	Att_chment Name:
1	Record of Plan revisions .docx
2	Sheltering Contacts
3	Shelter Activation Procedure Flow Chart
4	Greene County Shelter List .xlxs
5	Facility/Shelter Opening & Closing Inspection .pdf
6	Shelter Inventory Form .pdf
7	Shelter Registration Form .pdf
8	Shelter Registration Form (Spanish) .pdf
9	Registration Intake Form .pdf
10	Shelter Intake Assessment form .pdf
11	Shelter Log .pdf
12	Shelter Resident Information Handout .pdf
13	Shelter Visitor Sign-in Sheet .pdf
14	Resource Record Form .pdf
15	Disaster Requisition Form (Form 6409) .pdf
16	Resource Record (Form 6455) .pdf
17	Safe and Well Registration Form .pdf
18	Safe and Well Registration Form (Spanish) .docx
19	Shelter Rules Multilingual .pdf

*The forms that will be utilized at the shelter site should be kept in a Red Cross Binder Kit. Additional forms included in that kit that are not included in the attachments are Red Cross signage and directions to the site.

EXECUTIVE SUMMARY

- The Greene County Emergency Shelter Plan is an Annex to the county's Comprehensive Emergency Management Plan (CEMP). It has been developed from the recognition that a comprehensive plan is needed to address Greene County's ability to shelter the public during an emergency or disaster. While the plan is designed to stand alone in an emergency setting, all laws, rules and coordinating factors are addressed in the CEMP.
- It is the county's intention to transition shelter operations to the American Red Cross as early as possible during an incident. This may mean that they initiate the shelter if the

situation warrants however the county is prepared to initiate and maintain shelter operations for up to 72 hours post impact.

- Greene County's Department of Social Services is charged with overseeing shelter operations and to have staff available to open and operate shelters in response to disaster for up to 72 hours. Additionally local schools and the Civil Air Patrol are positioned to assist the county with shelter operations.
- This plan will provide a guide on how to open and operate shelters and allow for a smooth transition into the American Red Cross Volunteers Taking over.
- This plan is a working document subject to changes based on community needs and experiences from exercises and emergencies.

PLAN STORAGE & DISTRIBUTION

- Up-to-date versions (electronic and hard copy) of this plan will be stored in locations as follow:
    - Greene County Emergency Services
    - Web EOC (All Greene County Responders will have access to the plan through the Web EOC system)
- The plan will be distributed to agencies that participate in emergency sheltering as necessary.

EVALUATION AND UPDATE CYCLE

- The plan will be revised and updated as new or additional information becomes available.
- A record of revisions will be kept using **Attachment 1** (Record of Revisions .docx)

LEGAL AUTHOURITY TO ADMINISTER THE PLAN

- New York State Executive Law Article 2-B states that it is each municipality's responsibility to conduct emergency sheltering.

- The local chief executive may declare a state of emergency and must provide for "the establishment or designation of emergency shelters, emergency medical shelters, and in consultation with the state commissioner of health, alternate medical care sites." This also includes having a plan for "coordinated evacuation procedures, including the establishment of temporary housing and other necessary facilities; utilization and coordination of programs to assist individuals with household pets and service animals following a disaster, with particular attention to means of evacuation, shelter and transportation options." (New York State Executive Law Article 2-B).

- The Pets Evacuation and Transportation Standards Act of 2006 requires that the State and local emergency preparedness officials include how they will accommodate households with pets or service animals when presenting shelter plans to FEMA (Federal Emergency Management Agency). This law is important because past disasters, like Hurricane Katrina, demonstrated that many people will choose to risk their own lives in order to remain with their pets.

- The following laws require emergency shelters to accommodate people with functional support service needs (these services to be explained further in the plan) and integrate those populations into general population shelters:
    - Americans with Disabilities Act (ADA)
    - The Rehabilitation Act of 1973
    - The Civil Rights Act of 1968
    - The Architectural Barriers Act of 1968
    - The Homeland Security Act of 2002
    - The Post-Katrina Emergency Management Reform Act
    - Older Americans Act (OAA), Sections 306(b)3, 306(a), 306(a)17, 307(a), 307(a)30
    - Pandemic and All-Hazards Preparedness Act (PAHPA), 2006

VULNERABILITIES

- There are various emergencies for which emergency shelters may be required, including but not limited to:
    - Prolonged power outages due to snow or ice storms
    - Flooding
    - Fires
    - Hurricanes/Severe Weather
    - Hazardous Materials Release
    - Contaminated Water Supply (Including Well Water)
    - Attacks using or potentially using chemical, biological, radiological, or nuclear weapons or explosives

ASSUMPTIONS

- Greene County is responsible for the opening and operation of the shelters for up to the first 72 hours of activation of this plan until American Red Cross Volunteers take over the shelter operations.

- The American Red Cross will provide a contact to work with the Greene County Emergency Services in time of Disaster in order to coordinate the collaboration of the agencies. This representative will maintain a presence in the Emergency Operations Center when one has been activated.
- In the immediate days after a major disaster, local organizations and congregations without MOUs may emerge and provide services to those affected by the disaster.
- Some degree of aid from Local, State, and Federal areas unaffected by the incident will be provided if available. These resources will be coordinated through the county Emergency Operations Center.
- Many evacuees will seek shelter with friends or relatives rather than go to a public shelter.

CONCEPT OF OPERATIONS

- Greene County will work with the American Red Cross to ensure proper shelter operations, paperwork and forms are filled out to allow for a smooth transition.
- Greene County Emergency Services will be the location of coordination for the emergency response in the county, including shelter operations. (Shelter Activation Procedure Flow Chart (**Attachment 3**) will guide how to activate the opening of shelters)
- At Red Cross operated shelters, the county will support and provide resources for medical/health personnel, communications personnel, and security staff as needed.
- Requests for additional shelter support will be made through the Emergency Operations Center.
- Public and private providers of institutions (medical and residential) remain responsible for having shelter plans for their populations
- Greene County assumes no responsibility for shelters opened that do not have a Memorandum of Agreement with Greene County.
- Within the first 72 hours, the Greene County Emergency Services Office, in cooperation with shelter managers, will devise a shelter demobilization plan. Shelters will not demobilize without the county's consent.

PARTNERSHIP WITH THE AMERICAN RED CROSS

Greene County will:

- Follow American Red Cross Operational Guidelines during shelter operations to allow for smooth transitions.
- Work with the American Red Cross to identify and update shelter facilities

- Ensure that Agreements (Memorandums of Understanding) are in place
- Train Staff to Operate Disaster Shelters; The Red Cross will provide shelter training to county employees and local volunteers who will staff (and especially manage) disaster shelters.
- Remain in contact with the American Red Cross throughout the duration of the disaster.

The American Red Cross will:

- Provide training and exercises to keep disaster response methods fresh
- Participate in county exercises
- Provide cots and blankets if available
- Make themselves available to representatives of the county
- Keep a representative in the Emergency Operations Center throughout the duration of an event

TYPES AND MODELS OF SHELTERS

There are two main types of shelters:

- **Post-Impact Shelters**, usually opened on more long term basis. Their capacity is approximately 40 square feet per person. See Red Cross handbook for all specifics on shelter sizing.
- **Evacuation Shelter,** utilized to remove people from immediate harm. Their capacity is approximately 20 square feet per person.

The American Red Cross has classified several types of emergency shelters. These include:

- **Red Cross Managed Shelters,** which are run, staffed, and supplied by the American Red Cross
- **Red Cross Partner Shelters,** at which staff specific to the site must open and run the shelter, but the American Red Cross fund, caries liability, and enters into an MOU with the shelter.
- **Red Cross Supported Shelters**, which are supported by American Red Cross resources such as supplies or staff.
- **Independent Shelters,** which have no affiliation with the American Red Cross.

***Greene County will be setting up Red Cross Supported Shelters and transferring to Red Cross Managed Shelters. ***

SETTING UP A SHELTER (QUICK GUIDE FOR EOC)

- Greene County in time of disaster or if in need of a shelter will contact The Red Cross in order to start the process. Contact either local shelter representative or Red Cross headquarters. See attachment 2 for a list of contact numbers.
- Discuss with contact whether or not a "Shelter in Place" response would applicable
- If shelter in place is not applicable, decide with the Red Cross Contact which shelter(s) to open.
- If The Red Cross cannot get staff to immediately open the shelter, contact the Department of Social Service to open up the Shelter.
    - In order to open up a shelter, you would need at least a supervisor and two workers/service associates. When contacting Red Cross or DSS staff, make sure there is at least the minimum amount of staff going to each shelter site.
- Contact the Shelter Site (**Attachment 4**) for their availability
    - If available, put in request for cots, blankets, and other supplied through the County Emergency Operations Center who will first attempt to gain the resources from the Red Cross.
- Locate the Red Cross Sheltering boxes or use print outs of the attached forms and opening instructions and provide to the assigned shelter supervisor in order to set up the shelter and start the registration.

OPENING THE SHELTER

After getting into contact with the shelter, utilize the provided forms to evaluate the safety and condition of the shelter.

- Check the Shelter's condition (**Attachment 5**)
- Check supplies and document them to make sure that all that is needed is there. (**Attachment 6**)Contact Emergency Services Contact if additional supplies are needed.
- Make sure signage is in place so residents will be aware of where the shelter is as well as different locations are within the facility (**Red Cross Shelter Opening Binder Kit)**
- Communication: update Shelter Command contact with the status of the shelter.

REGISTRATION

Register each person housed in the shelter, including both their dates of arrival and departure. This information is the only documentation for the jurisdiction of who is in the shelter. It also helps the jurisdiction to locate missing family members.

- Document all occupants. (This task can be done by volunteers if needed)
- Registration Data- Keep at least a simple record on a plain 3x5 note cards of every person, or use **Attachment 7**. Information needed on the note cards is as follows:

- Family Last Name (at the top of the card)
- First, and middle names for the family heads of household (include maiden names if applicable)
- Names and ages of all other family members
- Pre-disaster address
- Note any health concerns or special needs
- Date arrived in the shelter, date departed shelter
- Post disaster address

*These cards should be stored in alphabetical order in a file

Utilizing **Attachment 10** will addresses some liability issues such as: do the clients need to register with a government agency for any reason, and asks client to signify agreement to shelter rules. This will allow for the shelter managers to find a location for those who need to register with a government agency and will cover liability of the shelter if the person falsely reports the need to register.

- Special Needs- Use the registration as an opportunity to allow people to self-identify any medical, dietary, medication, or accommodation needs
- Sign-in/sign-out policy- Establish a policy that requires residents to sign in and out for any period. This helps to keep an accurate shelter population head count.
- RIMS Reporting Needs- Shelter personnel will provide the following registration information to the Shelter Command Contact, as per the Regional Information Management System (RIMS).
    - Number of Shelters open
    - Number of persons displaced
    - Number of persons in shelters
    - Number of persons not sheltered

FOOD SERVICES

There is a food provision and ordering system in place to feed shelter residents. The Shelter Manager shall coordinate food requests through the County Emergency Operations Center.

Option One - Catered or Fast Food. The simplest strategy for feeding the shelter population is to have food catered or brought in from the outside.

- Fast Food Outlets - Given the confusion immediately following the disaster (or until mass feeding operations can be organized), it may be easiest to initially use 24- hour restaurants or fast food outlets in obtaining meals for shelter residents. Later it will become easier to prepare hot meals.

  - Restaurant Caterers - Identify local commercial suppliers – restaurants, catering firms, hotels, etc. – and make pre-planned arrangements for suppliers to provide meals to persons in shelters.
  - Institutional Suppliers – Price Chopper and other Supermarkets can be a great help in time of disaster. Price Chopper has an agreement with the Red Cross currently to provide food and other supplies in time of Disaster.
- Option Two - Designate a Central Kitchen. An alternative strategy is to designate one large, central institutional kitchen within the local jurisdiction as the site to prepare and provide meals for each shelter operating within the jurisdiction.
  - Bulk Food Donations - Utilize the Logistics Section of the Red Cross to obtain large bulk food items from local sources and then direct supplies to the central kitchen.
  - Shelter Delivered Meals - Once meals are prepared, they can be delivered to local shelters (similar to a meals on wheels operation).
- Option Three - On Site Meal Preparation. A third strategy, assuming the shelter site contains kitchen or cafeteria facilities, is to prepare meals on site.
  - Cafeteria Staff - If a school is used for the shelter facility, shelter personnel may have the use of food services staff who normally operate the cafeteria.
  - Food Preparation and Cleanup Volunteers - Shelter residents can also assist as part of food preparation and cleanup crews. All Board of Health standards must be adhered to. The Red Cross will provide training for those who will be working with the food to make sure that they are meeting these standards.
  - Basic Menu Planning Tips - Plan menus in terms of foods available. Use perishable foods first. Prepare sufficient food to provide second servings, if possible.
- Meeting Special Diet Needs - Consider special dietary needs, including ethnic, vegetarian and infant considerations. Strive to meet as many special diet requests as possible, although resources to do so may be limited immediately following a disaster.
  - Low Salt/Sugar - If meals are prepared through an on-site or central kitchen, use low salt and low sugar guidelines in consideration of persons with restrictions.
  - Infant Nutrition - Determine the need for infant formulas or baby foods.
  - Hospital Dietary Departments - For other persons on special diets (such as a person with diabetes, heart, or kidney disease), shelter personnel

may need to consult with medical staff or have meals catered from local hospitals.

- NIMS Reporting Needs – shelter personnel are responsible for a daily count of people fed within each shelter and must report the following data to the Red Cross.
    - Number of fixed feeding sites
    - Number of mobile feeding sites
    - Number of persons fed in the past 24 hours
    - Number of persons projected to be fed in the next 24 hours.

HEALTH CARE SERVICES

A well-run shelter will protect the health of residents, prevent disease, and provide first aid as needed.

- First Aid - Shelter personnel must plan to have basic first aid assistance available at the shelter. People will come to the shelter with minor injuries.
    - Identify Staff with First Aid Training - Inventory employees as to disaster skills and have employees with first aid skills assigned to shelter teams.
    - Use Trained Shelter Residents - Residents within the shelter may include persons with first aid, nursing, or medical backgrounds.
    - Medical Emergencies – In case of a medical emergency in a shelter call 911 immediately and attempt to assist the patient as appropriate until help arrives. When time permits, make a report to the County Emergency Operations Center about the event.
- Role of the County Public Health Department – shelter personnel should plan to call upon County Public Health through the County Emergency Operations Center when needed to perform the following.
    - Health & Sanitation Inspections - To provide periodic health inspections of the shelter, including a sanitary inspection.
    - Public Health Nurses - To provide public health nursing services to shelter residents.
    - Prevent Communicable Disease - To monitor/evaluate the health status of the shelter population and prevent the spread of communicable disease.
    - Contagious Disease Concerns & Medically Fragile Persons
    - Separation to Reduce Spreading - Plan to provide for the separation of persons with suspected communicable diseases that can range from common colds to more severe influenza and intestinal infections.
    - Temporary Infirmary - If necessary, set aside a part of the shelter as a section for the privacy and isolation of ill persons. In addition, use this

area to provide a higher level of care for persons who are more medically fragile.

- Alternative Facilities - Setup an alternate shelter facility and coordinate support through the Op Area given the following. If a large number of persons have a communicable disease in the shelter, or if a large population needs ongoing medical assistance (such as an evacuation of residents from a medical care facility).

- Prescription Drug Management - Some persons within the shelter will have very individualized medication regimes that cannot be interrupted without consequences.
  - Storage of Medication - Plan for the storage of medications; refrigeration is required for some medications (e.g., insulin and some HIV antibiotics).
  - Prescription Refills - Plan to refill prescriptions; establish vendor agreements with local pharmacies and clarify how to obtain medications post-disaster (e.g., with a current prescription, with a prescription phoned in by a licensed physician, with a prescription validated by another pharmacy, or with a prescription bottle). Note that the Red Cross does have an agreement with a pharmacy to provide medications as necessary, utilize them whenever possible. In cases where Medication assistance cannot be conducted through the Red Cross, Greene County Public Health and the department of Social Services have mechanisms to get emergency medications.
- Other
  - Identifying Concerns - Plan to use the registration process as an opportunity for shelter residents to identify any medical problems or medication needs.
  - Documentation - Maintain records on all health incidents and related actions taken.

MENTAL HEALTH SERVICES

The mental health impact of disasters ranges from emotional stress and anger to severe trauma and depression. The potential for drug and alcohol abuse increases. Mental health support for shelter residents is very important in helping people to deal with their losses and begin the recovery process. It will also help people to manage feelings of post-traumatic stress.

- Enlist Mental Health Counselors - Work with the County Emergency Operations Center to obtain as many qualified personnel as possible to provide counseling, and to support disaster victims with their emotional needs.

- Community Counseling Resources - In addition to County Mental Health (see below), develop a resource list of community mental health providers or services to call upon if needed. These resources include:
    1. Community Based Organizations that provide crisis counseling
    2. Ecumenical or Pastoral Counseling Services (congregations and faith-based organizations often provide counseling services)
    3. Volunteers from the community who are trained as licensed therapists

- Role of County Mental Health Services
    - The County Mental Health department shall be the lead for all Mental Health related matters during an incident. Staff from that office will be part of the County Emergency Operations Center.
    - Assess Mental Health Needs - To assess and activate responses to mental health issues resulting from the disaster.
    - Provide Crisis Support - To provide crisis support services for shelter and community residents traumatized by the disaster.
- Organizing Additional Support
    - Debriefing- The county Mental Health staff may be utilized to engage in debriefing activities and they may coordinate for additional Mental Health support.
    - Children - Consider activities to help children express their feelings about the disaster and consider enlisting the assistance from the county Human Services office (Youth Bureau)

TRANSPORTATION

During the period in which the shelter is in operation, some persons will require transportation to the shelter, as wells as door-to-door transportation from the shelter to medical and other appointments. In addition, people with mobility disabilities will need para-transit assistance.

- Coordination through the Shelter Manager–County government agencies and local volunteers may be asked to assist in locating those in need of transportation. (When the Red Cross takes over control of the shelter, they will still look to the County to make transportation arrangements).
    - Transportation Resources - Aside from local government and county resources, other transportation resources for moving people may include school buses and commercial shuttle vans.

  - Para-transit Resources - Identify local para-transit resources for the transport of persons using wheelchairs. In addition, identify local taxi service to support the transportation needs of frail elderly persons.
- Transportation in an Evacuation - Consider plans for moving large numbers of people if there is a need for a mass evacuation of community residents to disaster shelters
- Transporting Supplies & Resources - The movement of shelter supplies and resources will also require transportation resources.

INFORMATION SERVICES

The collection, communication and distribution of shelter information is vital. This includes information about the disaster, about relief services available to shelter residents, as well as information to help reunite separated family members.

- Public Shelter Messages - As the jurisdiction puts out public messages about shelter locations, stress that residents going to disaster shelters bring a go-kit with blanket or sleeping bag, change of clothes, personal hygiene items and prescription medications.
- Bulletin Boards - Set-up bulletin boards near the shelter registration area as a means for disseminating information to the shelter population.
  - News Postings - Post daily updated news on the response to the disaster, along with news and information about shelter activities for the day.
  - Recovery Services - Provide information on recovery services available through disaster relief organizations such as the American Red Cross, Salvation Army, and FEMA, along with other government disaster assistance programs.
  - CBO Relief Assistance - In addition, include information on any active community-based or faith-based relief and assistance programs.
  - Special Needs Communications - Consider the information needs of persons who are deaf, or blind, or non-English speaking [see Section 5: Assisting Persons with Special Needs in Disasters for further information].
- Shelter Meetings - Hold daily shelter meetings as another way to share information and dispel false rumors that may be circulating within the shelter population.
- Disaster Welfare Inquiries - Respond to disaster welfare inquiries (seeking to locate persons who are presently unaccounted) by referring to shelter registrations. Please be aware that residents should contact the person making the inquiry. Due to confidentiality, shelter workers are **not** allowed to share the whereabouts of a resident. An example response of a shelter worker to a person inquiring if someone is in the shelter would include saying that they cannot confirm or deny if the person they are looking for is present. The shelter fundamental training provides training on how to approach this situation.

  - Central Shelter Registration Log – Consider implementing a central shelter registration log to combine registrations from all shelter locations.
  - Coordination with Red Cross - Coordinate family reunification support with the American Red Cross, which operates a regional Disaster Welfare Inquiry system.
- Communication - Telephones are the primary communication link between shelter facilities and the County Emergency Operations Center. If telephones are not functional, amateur radio operators for ham radio communications. As a last resort, use runners to relay messages.
- Additional Telephone Resources - Plan for additional telephones to facilitate communication between shelter residents and family members outside the area.

SOCIAL AND PERSONAL NEEDS

Given a significant disaster event, residents will begin to work toward recovery while in the shelter. Shelter personnel should plan to coordinate with external agencies and services through the County Emergency Operations Center to help meet the personal recovery needs of shelter residents.

- Child Care - If a shelter remains open for more than a day or two, plans should be initiated to provide child care services to support parents with child supervision and care needs.
  - Staff Support – All child care services will be provided through Red Cross approved staff even if the county has not yet turned shelter operations over to the Red Cross. In extreme circumstances where no Red Cross staff is available, anyone wishing to work with Children must undergo a full background check conducted through the Sheriff's Office or State Police before being allowed to care for children.
- Clothing - Emergency clothing becomes a need when possessions are lost in a disaster.
  - Community Action of Greene County coordinates Donations as well as maintains a supply of clothing and other basic resources.
- Comfort Kits - Shelter residents will need basic hygienic items such as soap, a washcloth, toothbrush, toothpaste, a razor, and a comb. The Red Cross can supply comfort kits for the shelters. If a shelter is in need of the comfort kits, make a request through the County Emergency Operations Center.
  - Local Suppliers - Plan to obtain these items either through commercial vendors, or through donations from local businesses.
- Long Term Housing Assistance

  - Greene County Department of Social Services coordinates long term housing assistance. Shelter Managers can request that a DSS staff member be assigned to the shelter to assist residents with the process.
  - Transitional Support Needs - Collaborate with family services providers and county social workers to support shelter residents in their transition from the shelter into temporary or longer-term housing.
- Language Translation - Consider the following options for bilingual support.
  - Bilingual Shelter Residents - Ask bilingual shelter occupants to volunteer and assist non-English speaking shelter occupants.
  - Bilingual Volunteers - Seek out disaster volunteers with bilingual skills.
  - Language Line- The county departments of Public Heath as well as the department of Human Services have access to a commercial "language line" which can be utilized in times of disaster.
  - Community Based Organizations with Ethnic Specific Services - Coordinate with CBOs that specialize in serving specific ethnic communities and have bilingual staff.
- Recovery Services - Shelter residents will need assistance in identifying where to go for services to meet their specific disaster recovery needs. Disaster relief organizations such as the Salvation Army, Red Cross and FEMA, along with other government, faith and community-based relief programs, may all initiate recovery services for disaster victims.
  - Distribute Resource Lists - Develop resource lists with contact information and a description of available relief and recovery services for disaster victims.
  - Information and Referral Services – shelter personnel can work in coordination with community-based Information and Referral service programs that are in turn linked with hundreds of human service providers. (local Libraries are an additional Information and Referral resource)
  - In most cases Disaster Recovery Centers (DRC's) will be established following a disaster. Shelter staff may need to coordinate transportation to and from the DRC's
- Replacement Equipment - Elderly persons and people with disabilities will need help to replace personal supplies and equipment, if lost or damaged in the disaster (e.g., items like orthopedic braces, wheelchairs, or hearing aids).
  - Local Vendors – Local pharmacies and home care service companies
  - Loan Closet- The county Public Health has access to a stockpile of various medical devices.

- Recreation - If large numbers of persons are housed in the shelter, and if the shelter operation is prolonged, provide recreation opportunities for shelter residents.
    - Recreational Supplies - Recreational supplies include videos, newspapers, books, games, and TV sets. Consider engaging the services of local youth and/or elderly activities staff from local establishments.

ANIMAL SERVICES

Other than service animals, which legally must remain with their owner at all times, shelter personnel are advised not to allow animals inside due to health and safety concerns for other shelter occupants. Unless given prior notification, pet owners who evacuate to disaster shelters will likely arrive at the shelter with their pet and the options on how to respond to that are as follows:

- Option One – Offsite Care – Greene County has a pet sheltering plan with pre-identified potential pet shelter locations. Wherever possible, these shelters are located near an evacuation or long term shelter.
    - Communicate the Pet Policy - Clearly state and post the pet policy. “Pets are not able to be housed with their owners in a shelter out of safety concerns for everyone in the shelter. While we understand that this is a traumatic time for both you and your pet(s), this anxiety can manifest as an unintended outburst from your pet(s) which could result in harm to others. Your pets will be housed and cared for by compassionate people and you are encouraged to visit and assist with pet care as the situation warrants”.
    - Reassurance - Pet owners may need constant reassurance that their pet will be safely cared for - issues are sure to arise of pet owners refusing to evacuate or go to a shelter if it means separating from their animal.

- Option Two – Onsite Holding Area – If a permanent Pet Shelter has not been established, contact the EOC to create a makeshift pet holding area outside the shelter facility. This requires the provision of food, water, and exercise for pets, and if necessary, supplies to create a pet holding area (e.g., cages or fencing).

It is the goal of both the Sheltering Plan and the Pet Sheltering Plan to keep an open line of communications between both types of shelters to ease anxiety on the part of both humans and pets.

VOLUNTEERS

Volunteers (either from the community or from the shelter population) may help to staff shelter functions.

- Sources for Volunteer Recruitment
    - Shelter Residents - Use volunteers from within the shelter population.
    - Community Residents - Use volunteers from the community which will be coordinated through a Volunteer Reception Center.
    - Voluntary Organizations - CBOs, faith-based organizations and local congregations are another source for voluntary support.
    - Maintain a Volunteer List - The jurisdiction may want to train a cadre of local volunteers, in advance of a disaster, to provide support at disaster shelters.
- Areas for Volunteer Involvement. The following are some of the roles for volunteers within the shelter.
    - Reception - Meet and greet arriving shelter residents and provide comfort.
    - Registration - Help newly arrived shelter residents to fill out registration forms.
    - Runners - Help in obtaining goods and services or acting as “runners”.
    - General Operations - Support with shelter operations such as shelter set up, food services, shelter maintenance, etc.
    - Health and Human Services - Support with more specialized services such as first aid, mental health, child care, recreation and personal assistance services from support to seniors and people with disabilities, to help with language translation.

SAFETY AND SECURITY

To operate shelter facilities in a manner that promotes the safety and security of each resident within the shelter, the shelter manager must establish and post clearly understood rules so all shelter occupants understand what is expected of them.

- Shelter Rules
    - Provide Rules at Registration - Shelter residents must understand the rules upon registration. Plan to have rules prominently posted (or passed

out as an information sheet) and then reinforced at shelter orientation sessions. (Attached is a sheet of shelter rules)

- Translation of Rules - For non-English speaking persons have shelter rules and regulations translated into other languages (e.g., Spanish and Chinese).
- Enforcement of Rules - Use rules as a cause for dismissal if broken. Depending on the circumstances, employ a shelter committee to oversee disputes and call on local law enforcement to assist with serious disputes or rules violations.

- Policing Functions
  - Security/Safety Inspections - Plan to regularly inspect the facility (and the surrounding grounds) to ensure compliance with shelter rules, fire regulations and to spot any potential problems. Coordinate with local Law Enforcement and Fire Services for assistance when needed.
  - Private Security - Given a large shelter population, the county may contract with a commercial security agency to provide shelter security services.
  - Monitoring Occupant Flow - Establish one entrance and exit to the shelter and secure all other entrances and exits. This is to prevent theft from people outside the facility and to facilitate sign-in/sign-out procedures.

SHELTER MAINTENANCE AND EQUIPEMENT

Operating a shelter for a sustained period requires plans for the daily upkeep of the facility and for the ongoing acquisition of equipment and supplies. Since it is their "temporary home," ask shelter residents to assist with housekeeping and cleaning activities. Staff normally responsible for the facility (e.g., school janitorial services) may be available to support operations. County Health Services can address food, water safety and sanitation issues in shelters.

- Shelter Supplies – The Shelter Manager will coordinate with the county EOC to obtain additional supplies and equipment such as cots, blankets, first aid supplies, cleaning equipment, and tools.
  - Initial Inventory - Conduct a pre-occupancy inventory of potential shelter sites to determine what operational supplies may already be in place.
  - On-Site Cache of Supplies - Consider pre-positioning critical shelter supplies (e.g., water, nonperishable food, cots, blankets, first aid kits, tools and other supplies) in trailers or shipping containers on the grounds of, or near, potential shelter sites.

  - Vendor Agreements - Form as many agreements or vendor relationships as necessary with local businesses now, to supply goods later during shelter operations.
  - Donated Goods/Services - During operations, work with Logistics to obtain donated goods and services to support shelter operations.
- Waste Management – Plan to arrange for daily garbage/waste removal.
- Portable Toilets - As necessary, arrange for the installation of additional toilets and possibly shower facilities.

TRANSITIONING FROM COUNTY RUN TO RED CROSS RUN SHELTER

As soon as the Red Cross has adequate staff to take over shelter operations, the county will transfer shelter management and staffing roles to them. In order to ensure an orderly transfer the following activities must occur.

- The Shelter Manager will fully brief the on-coming Red Cross staff of the situation.
- The Shelter Manager and staff will review all paperwork to ensure that all appropriate information is available.
- The on-coming Red Cross staff will assign a new Shelter Manager who will assume command of the shelter.
- All staff will be advised of the transfer of command.
- The Red Cross Shelter manager may request some or all county staff to stay on at the shelter as needed.
- The Red Cross Shelter Manager will coordinate all resource requests through the county Emergency Operations Center unless directed otherwise by the EOC.

Proj . #	Project Name	Mitigation Action Worksheet added to Annex?	Goal being met	Hazard to be Mitigated	Description of Problem	Descripton of Solution	CF?	EHP Issues	Est. Timeframe	Lead Agency	Estimated Costs	Est. Benefits	Potential Funding Sources	Priority
ıt Actions														
GC 1 Old #4	County Road 2 Relocation, Town of Lexington, Greene County	No	1, 2, 3	Flood	County Route 2 between the Falke Quarry (privately owned soil mining operation) and the Mosquito Point Bridge (connecting CR 2 to State Route 23A) is located within the 100 year flood plain of the Schoharie Creek. It is the only practical access to the primary source for soil materials for the construction industry in the western section of Greene County. The highway has been damaged in a number of storms including Hurricane Irene.	Relocate 2900 feet of two lane County highway section to current County standards. This will include replacement of a 12 foot box culvert carrying a small tributary to the Schoharie creek, storm water detention or retention practices, new subgrade, full depth asphaltic road surface and guiderail as warranted. This project will remove this often damaged highway section outside the 100 year flood plain thus avoiding future effort and cost to repair it.	No	No	Culvert to be replaced in Spring 2023 rest of project is ongoing	Greene County Highway Department	$2.5 million	Replacing culvert will reduce flooding	PDM/HMGP	High
GC 2 Old #6	Relocate Building 3 in Ashland	No	1, 2	Flood	Building 3 is a maintenance sub residency quarters for the Greene County Highway Department. It is located in the Town of Ashland within the 100 year flood plain of the Batavia Kill a major tributary of the Schoharie Creek. The building was severely damaged during Hurricane Irene. It is cost effective to relocating the building to a less vulnerable location than elevating it more than four feet. In addition, the opportunity exists to co- create a facility to provide emergency community sheltering for an area comprising over 4000 residents in four townships. This would augment two other shelters and become the prime public shelter.	Provide new building above 500 year flood plain using an abandoned soil mine area currently privately owned, proximate to County Route 17. Building will contain garaging, vehicle mechanical repair space, parts storage and a small office area. Make existing County property available to the New York City Watershed. Make unused quarry property available to the Watershed as well. Provide additional storage facilities to support the use of the structure as a community shelter in the event of severe weather or other emergencies. Provide backup power and communications, hardened for severe events. Use FEMA 361 guidelines for building design. Town completed a local flood analysis (LFA) in 2016 funded by GCSWCD Stream Management Implementation Program. That will make them eligible for flood hazard mitigation funds through NYCDEP.	Yes	No	2024-2025	Greene County Highway Department	TBD	Remove structure from 100 year flood and create an emergency shelter for residents	HMGP, CWC, NYCDEP	High
GC 3 Old #7	Relocate garage in Ashland	Yes	2, 3	Flood	County Highway garage in Ashland is vulnerable to flood risk.	Relocate the Ashland County Highway garage out of the 500-year floodplain. This project has been expanded to include the Hunter-Tannersville Central School District (HTCSD) bus system as well.	Yes	No	2024-2025	Greene County Highway Department	TBD	Remove the CF from the 500 year floodplain	HMGP, CWC, NYCDEP	High
GC 4 Old #8	Replacement of temporary Bailey Bridge	No	1, 2, 3	Flood, Severe Storm/Wind Event, Severe Winter Storm/Ice Storm	The current bridge is a single lane structure with limited capacity, difficult ingress/egress, and a risk of failure which would result in an extended loss of a significant transportation corridor.	Upgrade bridge by removing the temporary structure currently in place and install a new bridge capable of carrying the traffic load, offer bi-directional travel and whose footing design will retard deterioration.	No	No	2025-2026	Greene County Highway Department	TBD	Prevent failure of the bridge which would create a loss of a significant transportation corridor.	NYSDOT	Medium
GC 5 Old #9	Replace Timber Lake Bridge over the Broad Street Hollow Creek, Greene County	No	1, 2, 3	Flood, Severe Storm/Wind Event, Severe Winter Storm/Ice Storm	This one span bridge structure, BIN 3201240, carries Timber Lake Road over the Broad Street Hollow Brook Kill in the Town of Lexington. Timber Lake Road is the sole access to several dozen properties, including residents and a major private sports recreation camp. There is no other feasible alternative access to these properties in the event of emergency bridge closure. Built in 1987, the bridge is rated structurally deficient by NYSDOT and FHWA. The bridge often traps debris during storms. Given the importance of maintaining access to properties with no alternatives, replacement of the bridge and its immediate approaches to current hydraulic and structural requirements is highly desirable.	Upgrade bridge and approaches to current standards in accordance with NYSDOT Bridge Design Standards. This would include establishing a temporary crossing for the construction period, providing a pile or rock -keyed foundation and new approaches. This project will ensure that emergency access can be maintained to this area under the most difficult conditions.	No	No	2023	Greene County Highway Department	High	This project will ensure that emergency access can be maintained to this area under the most difficult conditions.	DOT	Medium
GC 6 Old #10	Culvert Replacements	No	1, 2, 3	Flood	Undersized culverts contributes to flooding on roadways during high flows.	•County Route 2 over Unnamed Tributary to Schoharie Creek Bridge Design (Prattsville) •County Route 2 over Unnamed Tributary to Schoharie Creek Culvert Replacement (Prattsville or Lexington?) •Construct Rappleyea Road Culvert Replacement Project slated for 2022 (Lexington) •Replace three culverts in Village of Hunter on Mad Brook at Main St., Mad Brook at Glen Ave., and Ski Bowl Rd. at Shanty Hollow following full hydraulic analysis •Replace culverts in Jewett at CR 23C next to town hall and Beaches Corner Rd.(town road). Installing 16 ft wide x 4 ft. high culvert at 23C is recommended. •When due for replacement conduct thorough hydraulic and hydrologic (H & H) analysis for crossing under 23A at Wright's Creek (Jewett) •Replace Main St. bridge on Rt 23, at Mitchell Hollow Creek and implement floodplain bench (requires acquisition of three structures), Windham •Replace Bridge St. bridge in Village of Hunter (county bridge) and implement floodplain reclamation above bridge	No	No	2022-2026	Greene County Soil & Water Conservation District/Highway Department	Various	Reduce flooding and keep roadways open at all times.	HMGP, SMIP (NYCDEP/GCSWCD), NYSDOT, GC Highway Capital Improvement, CWC	High
GC 7 Old #11	Catskill Streams Buffer Initiative	No	4	Flood, Severe Storm/Wind Event	Protect, enhance, manage and restore riparian buffers within the west of Hudson NYC watershed area of Greene County.	The GCSWCD and NYCDEP will work with landowners in the NYC watershed to protect, enhance, manage and restore riparian buffers within the WOH watershed. GCSWCD staff will conduct site visits to determine eligibility for funding through the CSBI. In addition to site visits, recruitment may also include outreach mechanisms such as press releases, targeted mailings, presentations to organizations, and Riparian Corridor Management Plan development.	No	No	Ongoing	Greene County Soil & Water Conservation District	Various	Protect the watershed from future disturbance or encroachment	Contract with NYCDEP	High

Serial No.	Lead	Project Title	Description of Problem
3	Greene County Emergency Services	Hazardous Cargo Plan	Concern about hazardous cargo and potential for spills on CSX line
5	Greene County Highway Department	Bridge replacement	Town water supply wells are at risk. A previous mitigation project was implemented with NRCS
12	Greene County Soil & Water Conservation District	Creative Stormwater Practices and Critical Area Seeding	In order to reduce runoff and protect groundwater resources in the basin, the GCSWCD and NYCDEP support promoting the infiltration of stormwater through erosion and sediment control techniques such as hydroseeding of open ditches, stormwater techniques to infiltrate water into the ground, wetland enhancement, filter strips, and creation of rain gardens and bioswales to manage stormwater.
17	Emergency Services and Health Dept	Natural Disaster Preparedness Training	Residents need additional training on sheltering in place.
18	GCSWCD	Local Flood Analyses (LFAs) for Valley Towns/Villages	Use the latest flood information and modeling techniques to evaluate flooding issues in population centers, and provide a scientifically-driven process to develop and implement solutions.
22	Greene County Emergency Services	Temporary Housing sites	Need to identify temporary housing sites for post-disaster

1	All County Departments and All Towns and Villages	Integrate with Existing Planning	Hazard mitigation principles and projects need to be integrated into existing planning for 1) implementation, 2) to ensure future development is located out of hazard prone areas, and 3) to plan for increased frequency and severity of hazards as more information becomes available.
1	Town of Ashland	Local Flood Analysis	Need Local Flood Analysis
2	Town of Ashland	Backup Power	Support the implementation of a Back up Power Source for EMS/Fire local NIMS structure
3	Town of Ashland	Emergency Center in Town Hall	Need a community center for help, supplies and shelter during an emergency
5	Town of Athens	Emergency Communications Upgrade	The Town of Athens lacks full communications interoperability during emergency situation as existing radio units cannot always communicate with one another and outside agencies.
6	Town of Athens	Box culvert replacement	The existing culvert on Schoharie Turnpike is undersized -- leading to localized flooding and sometimes, some road damage during heavy rain/spring runoff events.
7	Town of Athens	Automatic standby generator	The Town of Athens highway garage -- a facility that must remain operable during emergency situations -- has insufficient back up power supply capabilities. Presently, the shop only has a pto driven portable generator that currently runs when the powers out after we hook it up. The Town Garage experiences 1-2 outages per year with duration last from several minutes to, in the case of a 12/2009 ice storm, several days. Generators have been rented in the past at a unknown cost.

8	Town of Cairo	Moorehouse Road Elevation Program	Low lying basin area that floods during heavy rain events. Road becomes impassable to 17 residential properties restricting ingress and egress for but not limite to residents, emergency vehicles, etc.
10	Town of Catskill	Game Farm Road	Game Farm Road – undersized bridge, flooding damage to road.
11	Town of Catskill	Snake Road	Snake Road- Undersized culverts, erosion endangering a house.
12	Town of Catskill	Bogart Road	Bogart Road- Undersized 4’ diameter culvert, flood damage to road.
18	Town of Durham	Culvert Replacement	Replace current double culvert with a single arched bottomless culvert. Current Culvert: two (2) 8’ X 40’
19	Town of Greenville	WWTP & Sewer District Improvements, Sewer District Extension	The Town of Greenville, located in the north eastern corner of the Catskill Mountains, is proceeding with a plan to 'harden' its waste water infrastructure in the face of recent severe weather events, most notably Hurricane Irene. The Town, located on the Basic Creek which is a tributary to the Catskill Creek Watershed, is peppered with dozens of failed septic systems from the last century. The inflow and infiltration issues in the existing waste water treatment facility have resulted in a DEC negotiated Order on Consent. Retaining walls associated with storm water management are failing and have been partially stabilized with FEMA PA support. New culverts are required for increased storm water management in three sections of the Town's road infrastructure. From FEMA Narrative: The Town of Greenville in Greene County, New York maintains an existing waste water treatment system that was originally built to serve subdivision development in the 1980's.

21	Town of Halcott	Retrofit Halcott Town Recycle Station	Tropical Storm Irene was only the latest in a series of serious rainstorms that have flooded our recycling center in ever-increasing intensity, washing tin cans, plastic milk jugs, broken glass downstream in the torrent. Paper goods, if left behind, are waterlogged beyond saving. The cost of restoring the recycle center from this storm alone was $9472.00. Former storm damage costs have been absorbed by the Town. The Town of Halcott is small, with only 258 residents. It is located on the edge of Greene County and is at least 45 minutes away from our County transfer station, making it virtually inaccessible to the homeowner with no truck or time to make the journey. Townspeople who do not use a hauler or who find our small recycle center full, "stockpile" their solid waste and recyclables until they can take the time to drive them to a dump.
29	Town of Jewett	Mitigate Town Hall	Needs shower, Red Cross Shelter, Generator
36	Town of Lexington	Building Elevations on Spruceton Road and Route 42 in 500-yr Flood Zone	Elevate buildings in 500-yr Flood Zone
40	Town of New Baltimore	Staff Training	Staff training needing in hazard mitigation.
41	Town of New Baltimore	Medway Grapeville Fire Station Backup Power	The current standby generator is unrepairable if it should go down again due to its age. This is a very high priority as this generator provides electrical power to the fire station during power outages which is part of our critical infrastructure and is used as an emergency shelter for the western portion of the Town.
42	Town of New Baltimore	Replacement of Wastewater Treatment Plant	Upgrade of wastewater treatment plant needed.

43	Town of Prattsville	Made in Prattsville Business Recovery Park	The Town of Prattsville experienced unprecedented flood damage from Hurricane Irene on August 28, 2011. The Town sustained millions of dollars of worth of damage to its Main Street business and residential district. A flood study was conducted addressing the watershed hydrology, exisiting riverine morphology, existing channel hydraulics and floodwater elevations along a one mile stretch of the Schoharie Creek that parallels Prattsville's business district. A detailed hydraulic engineering study was done after the flood to identify options for reducing floodwater elevations and subsequent damage to infrastructure. One recommendation is to allow more floodway capacity by reclaiming land in the floodway and floodplain. The largest parcel in the study area is a twelve-acre anchor business that is considering a FEMA buyout (HMGP disaster # 4020). The business was substantially damaged by Irene. The buyout in itself however is not enough for the owner to relocate.
44	Town of Prattsville	Made in Prattsville Business Recovery Park	A relocation strategy needs to include purchasing a large enough parcel to relocate to, infrastructure investment (water, sewage, utilities), highway access, permitting, and design, and possible site remediation of the existing parcel if hazardous material is found (due to past usage this is a possibility). Prior to the flood, the business, Dimensional Hardwoods, was manufacturing furniture parts and some of the highest grade baseball bat billets in the country. In fact, 20 – 30% of the professional grade billets that left the bat factory made their way to the major leagues. The factory produced rough split and lathed wooden dowels that were then vacuum dry kilned. The state-of-the-art kilns were developed with grants and research from SUNY Environmental Science and Forestry and Watershed Agricultural Council (WAC). The company's product was packaged and shipped to baseball bat factories in 15 states and six countries.

45	Town of Prattsville	Made in Prattsville Business Recovery Park	The flooding from Tropical Storm Irene wiped out the factory, equipment, and the kilns. Looking ahead, the bat factory is cultivating a "Made in Prattsville" strategy that will capture the heart of baseball fans while at the same time drive energy independence and help to jump start Prattsville's community recovery. The company's focus is to produce wood products and promote the local and regional forestry industry throughout the state of New York. By utilizing all of the waste products to convert into useable cellulosic ethanol and wood pellets, the "Made in Prattsville" concept would provide discounted energy and fuel to the entire community and add lesser dependence on foreign petroleum. Additionally, the project will include a wood crafts open market and retail shop, river walk overlook, river walk trail, and ice cream stand.
46	Town of Prattsville	Berm and Floodplain Alteration	Flooding of homes near Route 23
48	Town of Prattsville	Route 23 Bridge Replacement	Replace the Route 23 Bridge with a larger span to pass higher flood flows
49	Town of Windham	Culvert Replacement	This culvert four-foot undersized corrugated metal pipe culvert needs to be replaced to provide additional capacity to reduce local flooding impacts.
50	Town of Windham	Back-up Power	Provide for emergency generators at Town of Windham emergency shelters. These shelters will be used in the event of evacuation of people within the inundation zone, associated with a flash flooding event resulting from a dam failure.
51	Town of Windham	WWTP and Water Systems	Protect WWTP & Water systems

54	Town of Windham	Mad (Pratt) Brook stream bank restoration alternatives	Stream bank restoration needed.
56	Village of Athens	Culvert Replacement	Culvert replacement needed.
61	Village of Athens	Relocate Department of Public Works Building	Consider relocation of Public Works Building. The Department of Public works Building is on the Hudson River and houses the Department of Public Works and their equipment. The building is in a flood zone and all equipment needs to be removed during a heavy rain event because of flooding (the machinery shed is a particular concern). However, the problem of cost for this project remains an issue.
62	Village of Catskill	Wastewater Treatment Plant Flood Mitigation	Flooding of the Wastewater Treatment Plant Control and pump facility due to storm surge or heavy rain. When flooded the building and the motors and pumps that pump raw sewage into the treatment process are at risk. We have experienced flooding at the plant during Hurricane Irene and Storm Surge Sandy. We suffered approximately $62,000.00 of damage to the plant during Storm Surge Sandy.
63	Village of Catskill	Implementation of Resilient Catskill Plan	
64	Village of Coxsackie	Rt 385/CSX underpass	Repetitive flooding of the NYS Route 385/CSX underpass. Repetitive flooding frequently results in closure of the main route into and out of the village.
65	Village of Coxsackie	Wastewater Treatment Plant for Infrastructure	Wastewater Treatment Plant built in 1973
66	Village of Coxsackie	West Coxsackie Sewer Trunk Line	Eliminate repetitive flooding problems and overloading to the West Coxsackie sewer pump station

67	Village of Coxsackie	Drainage from Apple Blossom Lane and east to Matthew Lane and Luke Ave.	Complete drainage assessment and design/implementation of drainage improvements to remedy a repetitive flooding problem at the development known as Flach Development on Apple Blossom Lane, and the avenues of Matthew, Mark, and Luke and Howard Drive.
68	Village of Coxsackie	Flood attenuation basins	Reduce flooding along the Coxsackie creek.
69	Village of Coxsackie	Riverside Avenue retaining wall to address slope failure	17 - 27 Riverside Avenue: The two houses and road are vulnerable to ground failure by river.
70	Village of Coxsackie	Stabilize Kings Road	Slope failure has occurred and southbound lane is collapsing.
71	Village of Coxsackie	Retaining wall and drainage on New Street	Rebuild retaining wall and install drainage to prevent wall failure and avoid danger of collapse of the four houses that are 14' below the wall on New Street between 44 and 52 on northbound lane.
72	Village of Coxsackie	Drainage on lower Church St., Franklin St. and South River St.	Complete drainage assessment and design/implementation of drainage improvements to remedy a repetitive flooding problem.
73	Village of Coxsackie	Church Street stabilization	North side of road has been collapsing for 30 years and is sliding down embankment.
74	Village of Coxsackie	Mansion Street drainage	Improve drainage between Getty station and rescue squad on Mansion street to avoid mosquito breeding and flooding in local cellars.

75	Village of Coxsackie	Drainage Assessment and Improvements for Noble Street	Need to remedy drainage and sliding problems to prevent road failure and avoid danger of collapse on north side of Noble Street.
78	Village of Coxsackie	Pipe connecting the two reservoirs	The Village monitors and maintains the creek between the two reservoirs. Contaminents currently enter the water system as water flows between them, requiring more chemicals to provide safe drinking levels
80	Village of Coxsackie	Water Line Replacement	Aging water distributuion system and sewer lines consisting of mains, valves, hydrants, etc.
82	Village of Hunter	LFA	Local Flood Analysis is needed to assess feasiblity of flood mitigation projects.
83	Village of Tannersville	LFA	Local Flood Analysis is needed to assess feasiblity of flood mitigation projects.
85	Village of Tannersville	Reservoir #3 Mitigation	It would also destroy our water plant which would effect all of our water customers inside the Village and approximately 200 outside the Village. While the Reservoir has withstood Hurricane Irene and Tropical Storm Sandy, the Village would want to prevent an unfortunate disaster with the current issues at hand. In the event of failure, the dam may damage isolated homes, highways, public utilities and/or cause economic loss to the community as well as cause serious environmental damage. Recently we have spent approximately $25,000 for the Inspection & Maintenance plan, Hydrologic/Hydraulic analysis, and Emergency Action Plan including a dam break analysis. The Village needs to retain professional engineers to perform an engineering assessment of the dam and complete remedial measures. The DEC would like the Village to have this rectified by the fall of 2014.

Proposed Mitigation Measure	Status	Priority	Timeframe	Cost Estimate
There's a County Steering Committee working with a State Steering Committee on a plan (with 20 other counties) on a plan which will go into effect in early January. The State will then provide supplies and training to assist with the implementation of the plan.		High	Plan in effect from March, 2016	Staff time
Keep access road clear, improve access, bridge replacement	Remove	High	2017	Medium
The GCSWCD will work with multiple partners to implement stormwater projects within the Schoharie Watershed.	Remove	Medium	Various	Various
Provide training and informational materials about sheltering in place to everyone in the county.		Medium	2017	Staff time
Secure funding for LFAs in valley towns/villages (outside of NYC Watershed area)	Remove	Medium	2017-2020 (Long term)	$50k/community
Protect and enhance streamside buffers within the west of Hudson NYC watershed area of Greene County for floodplain protection		High	Medium	Low

There are 3 pieces to this action: 1) Specific hazard mitigation projects will be integrated into existing planning done by County departments , 2) Each town and village will consider adding a step of considering hazards when conducting stormwater management planning, adopting codes, etc. AND 3) Each town and village will consider increased frequency and severity of the hazards due to the effects of climate change		High	Medium	Low
Town will be conducting a local flood analysis in 2016 to identify flood vulnerabilities and potential mitigation measures (GCSWCD facilitating).	Remove	High	2016	$50k/community
Install backup power	Remove	High	2016	Low
Enhance function of Town Hall to serve as a community center in emergencies	Remove	Medium	2017	Low
The Town of Athens seeks to update to the P25 compliance and expanded our radio communications system. Enhancing the towns public safety communications would help during a town wide emergency such as any natural disaster; for example (tornado, server storms, flooding, snow storms, etc.).	Remove	High	Medium	Medium
Replacement of covert with 6' X 5' X 35' box culvert structure will eliminate localized flooding.	Remove	High	Medium	Low
The Town seeks automatic standby generator that would power shop when needed all for 24/7/365 functionality.Esstimated cost to be around $35,000.	Remove	High	Medium	Low

To install a larger culvert pipe as per hydrology study and raise elevation of the road.	High	Medium	Medium	Medium
Replace with precast box culvert.	Remove	Medium	Medium	$200k
Upsize culverts, and install 2 plunge pools to stop erosion.	Remove	Medium	Medium	$350k
Replace with box culvert.	Remove	Medium	Medium	$150k
New Culvert : one (1) 24' X 40' Regrade, re-set and re-establish road.	Completed	High	2016-2017	$40K
The Town of Greenville is proposing: 1) Extension of the sewer district to remove the commercial hamlet and denser residential areas from septic use, particularly those in the Basic Creek's floodplain and the Catskill Creek Watershed as a whole. 2) Slip lining the existing sewer lines to eliminate inflow and infiltration. Usually, the plant processes 18,000 gallons of effluent per day. During Superstorm Sandy, the groundwater infiltration peaked at 50,000 gallons per day. The plant's permitting only allows for 55,000 gallons per day. 3) Stabilization and replacement of stormwater management infrastructure, including fieldstone retaining walls (with steel girder walls), culverts and improved drainage. The project has been listed with the state's CWSRF and is currently being considered for federal interest-rate subsidy. From FEMA Narrative: 1) Increase of capacity at the waste water treatment plant to handle increased storm water inflows to the system, 2) Fortify existing retaining walls along the Catskill Creek Watershed areas in the Town to support related waste water collections infrastructure,	Completed	High	Short	Medium

We propose to retrofit our current recyclable center and expand it to include a solid waste collection option. As per the recommendations of our Code Enforcement Officer and Flood Plain Manager, we would lift the floor of the recycle center 10" off its concrete platform, allowing flood waters to pass underneath, harmless and unimpeded. Collection bins will be designed specifically to hold objects securely, employing steel netting as opposed to the current metal barrels that tip over easily. The platform would be surrounded with heavy lattice in frames to further protect the containers. The recycle center site would be enlarged to include a garbage disposal option with a bear-proof dumpster provided by Greene County, and placed beyond the flood plain, and an "E" shed, a disposal site for recyclable electronics. These three options would form a mini transfer-station (MTS) for the Town. Greene County Solid Waste will transport the full dumpster to the transfer station according to a negotiated agreement with the Town. This program would allow our people to easily, quickly and legally rid themselves of their personal waste. The site will be protected from further flooding. The new center will employ one part-time worker to oversee collection and proper disposal.	Remove	High	Medium	Medium
	Remove	High	Long term	$20k
Elevate buildings in 500-yr Flood Zone on Spruceton Road (3 including Community Hall) and 1 on Route 42	Remove	High	Medium	Low
Train all staff including code enforcement and building department regarding hazard mitigation.	Remove	High	2016-2017 (TBD based on funding)	Low
Replacement of emergency standy generator	Remove	High	2016-2017	$30k
Replacement of wastewater treatment plant.	Remove	High	2017	$2.5 million

Reclaiming 12 acres of floodplain on the Schoharie Creek in Prattsville's Business District, relocating the Huntersfield Creek outlet (a tributary to Schoharie), removing berms, and select channel dredging are preliminary recommendations in the local flood analysis conducted for Prattsville (April 2012, Malone & MacBroom). In order to successfully relocate Dimensional Hardwoods, the anchor business, out of the floodplain and remain a viable business for the town, a relocation strategy needs to be developed drawing on many different funding sources – NY Rising, Community Reconstruction Zone program (Prattsville is a target community), FEMA HMGP Acquisition (disaster # 4020), Community Development Block Grant, and this round of Hazard Mitigation Grant Funding. This application will add leverage to the other programs, and vice versa, and allow each to contribute to a rebuilding strategy starting with this core anchor business and developing other businesses that have the potential to create local jobs and add value-added economic activity that would complement the emergence of a bio-fuels crop industry and support sustainable agriculture in the Prattsville region.	Remove	High	Short term	Medium
	Remove			

	Remove			
Survey lowering berm below State 23 bridge to determine flood reduction to nearby homes. This should be done in combination with floodplain vegetation clearing.	Remove	High	Medium	Low
Replacement of the Route 23 bridge based on modeling performed for the local flood analysis (2014).	Remove	High	Long term	Medium
Upgrade drainage infrastructure along CR 56 in the area of CR 56 to improve stormwater runoff with a six foot by six foot box culvert. This project will expand capacity, improve mobility, ensure access to the dam, and reduce localized flooding impacts. This is a NYCR project, consultant (MMI), expected to complete summer 2016.	Remove	Medium	2016 (summer)	300,000
Emergency generators at Town of Windham emergency shelters needed. These shelters will be used in the event of evacuation of people within the inundation zone, associated with a flash flooding event resulting from a dam failure. This is a NYCR project, CT Male consultant	Remove	Medium	2016	100,000
Consolidation with Ski Windham complete	Remove	High	Medium	Medium

Continue to support the study of Mad (Pratt) Brook stream bank restoration alternatives. Part of MMI scope of work, NYCR - 2016 project	Remove	High	2016-2017	Medium
Replace culvert and widen roadway on Union Street.	Remove	Medium	2016	$150,000
The Department of Public Works should have a new building erected outside of the flood zone near the fire department building.	Remove	High	2016-2018	$1.5 Million
Extend the height of the concrete wall surrounding the entrance to the wet well and pump gallery. This will enable the building to sustain higher flood levels. Install aluminum plates on all the glass doors and windows of the building to prevent a breech at any of those locations during a flood event. Install outward opening doors on the wetwell and drywell outside entrances to prevent a breech of those doors during a flood event.	Remove	High	Medium	Medium
	Remove			Various
Complete drainage assessment and design/implement improvements to remedy repetitive flooding of the NYS Route 385/CSX underpass. Remedies would include improvements to conveyance system and reconfiguration of SW outfall to eliminate back water effect when Coxsackie creek is at flood stage	Remove	High	2016-2017	2 Million
Replace Wastewater Treatment Plant	Remove	High	2017-2019	10 million
Relocation of West Coxsackie sewer trunk line along the Coxsackie Creek to eliminate repetitive flooding problems and overloading to the West Coxsackie sewer pump station	Remove	High	2017-2020	$500k - $750k

Design and install drain piping. Replace approximately 70 water meters with remote read models	Remove	High (4)	2016-2017	$500k - $700k
Work cooperatively with the Town of Coxsackie to undertake the design and implementation of a series of shallow flood attenuation basins to reduce flooding along the Coxsackie creek. Initial assessments indicate that 4-6 structures placed on strategic waterways feeding the Coxsackie creek would have an immediate benefit. Such structures would be similar to an existing structure already constructed by the Greene IDA on an unnamed tributary located east of NYS Route 81. Basins would be designed as wetland cells and would provide secondary benefits due to wetland creation as well as habitat value for endangered species known to be in this area. Potential sites include former farm land located on the grounds of Coxsackie and Greene Correctional facilities	Remove	Medium (7)	2017-2020	$500k
Install retaining wall or sheet pilings to stop slope failure.	Remove	Medium (8)	2017-2020	
Stabilize west side of Kings Road.	Remove	Medium (9)	2017-2020	$500k - $700k
Rebuild retaining wall and provide drainage in wall to prevent wall failure and avoid danger of collapse of the four houses that are 14’ below the wall on New Street between 44 and 52 on northbound lane.	Remove	High (1)	2017-2020	$300k - $500k
Design and install corrective measures.	Remove	Low (14)	2016-2017	$300k - $600k
Stabilize Church Street (from 56-58 Church Street).	Remove	High (5)	2017-2020	$500k - $750k
Design and install corrective measures.	Remove	Medium (10)	2016-2017	$300k - $500k

Complete drainage assessment and design/implement improvements to remedy drainage and sliding problems to prevent road failure and avoid danger of collapse on north side of Noble Street.	Remove	Medium (11)	2017-2020	$300k - $500k
Install pipe between Climax and Medway Reservoirs	Remove	Low (12)	2017-2020	$2 million
Replace nearly 40 miles of distribution system	Remove	Low (13)	2017-2020	$40 M ($1Million/mi)
The Village will be conducting a local flood analysis in 2016 to identify flood vulnerabilities and potential mitigation measures (GCSWCD facilitating).	Remove	High	2016	$50k/community
The Village will be conducting a local flood analysis in 2016 to identify flood vulnerabilities and potential mitigation measures (GCSWCD facilitating).	Remove	High	2016	$50k/community
	Remove	High	Long term	HIgh

Funding Source	Project Status: Completed; Canceled (explain why); On Schedule (est. completion date) or Delayed	What was accomplished for this project if still in progress?	What obstacles, problems or delays did the project encounter?	Will this project be included as a Mitigation Action in the 2022 update? If so, please complete a new Mitigation Action Worksheet
NYSDEC	Completed.			no
NSYDOT	Cancelled due to change in priorities			No
NYCDEP	Cancelled - Stormwater projects are referred to the CWC SW Retrofit program			No
Emergency Services and Health Dept	Cancelled			No
FEMA/DHSES	Delay		no funding, inadequate staffing	No
Staff time	Completed			

Staff time	Completed	All communities on the mountaintop have conducted a Local Flood Analysis and implement projects as they deem appropriate. The goal of these LFAs is to identify and mitigate the flood hazards posed to public safety, private property, infrastructure, and the natural environment		
PDM Planning, SMIP (NYCDEP)	Town completed LFA in 2018 with funding from GCSWCD. Woidt Engineering and Consulting, PC conducted the analysis			Recommendations from the LFA are summarized in Mitigation Actions for 2022 update
PDM/HMGP	Complete			
CDBG/EMPG	Complete			
DHS Homeland security grant/EMPG	Completed 2018			
PDM/HMGP	Completed 2016			
PDM/HMGP	Completed 2018			

PDM/HMGP	**Town did not participate in plan update process**			
PDM/HMGP	On Schedule.	Awarded BridgeNY grant		No
PDM/HMGP	Unknown status			
PDM/HMGP	Completed			No
DOT/Local	Completed			No
PDM/HMGP/EPA - Application submitted, deadline was Sep 2015. Clean Water SRF grant	Completed	All work was completed		No, projects have been completed

PDM/HMGP	Project complete:	The project has become less of a priority as the method of collection now involves a County-provided dumpster that collects recycles and replaces the dumpster when full with another. Solid waste is collected weekly and placed in another lockable dumpster which is also replaced by the County when full.		No
May be generator can be funded under HMGP	Partially completed	Generator was installed. Shower not implemented	other priorities	No
FHMIP	Ongoing			Yes, ongoing, combined with #35
Staff time	Completed			
Possibly HMGP	Completed			
0% Loan through CWSRF	Completed in 2021			

PDM/CDBG/HMGP/EDA	Cancelled	Some projects implemented (bridge enlargements, berm removal) and some no longer relevant. Dimensional Hardwoods is no longer operational, landowner moved out of town, did not have interest in pursuing relocation strategy		
	Cancelled			

	Cancelled			
HMGP	Completed			
PDM/DOT/Local	Completed			
NY Community Rising PDM/HMGP	Completed			
NY Community Rising (CDBG) PDM/HMGP/CDBG, Capital Improvement Budget, HMA grant if project is part of a larger mitigation project	Completed			
Staff time	Completed			

NYRCR, Catskill Watershed Corp, Town	Completed			
Private materials donation, HMGP, PDM, NYSCWSRF	Completed: Spring 2022		Had to plan for funding overt the course of approx. three years. Then materials (pipe) were delayed due	
PDM/HMGP, NYSCWSRF	Completed: Feb. 2021		Project went smoothly despite minor Covid-related supply chain delays. Didn't set us back too far.	
PDM/HMGP	Completed Nov. 2020		all listed work was installed as well as a new mechanical bar screen	
Various	Unknown status			
PDM/HMGP, NYSDOT, CSX Rail, Village of Coxsackie	State DOT project now - remove			
PDM/HMGP	Completed May 2021			
PDM/HMGP	No plan to address at this time - remove			

HMGP/other	No plans to address untill $$ available - remove			
PDM/HMGP	No plan to address at this time - remove			
PDM/HMGP	No plan to address at this time - remove			
PDM/HMGP	No plan to address at this time - remove			
PDM/HMGP - Note: Retaining wall is difficult to be funded under FEMA	No plan to address at this time - remove			
HMGP/other	Working fine - remove			
Local or DOT	No plan to address at this time - remove			
HMGP/PDM/CDBG	No plan to address at this time - remove			

HMGP/other grants	No plan to address at this time - remove			
PDM/HMGP/NYS DEC	Long term plan - on hold for now - remove			
NY Rural Water Assoc.	No plan to address at this time - remove			
HMGP/PDM/GCS WCD/NYCDEP	Completed in 2018			
HMGP/PDM/GCS WCD/NYCDEP	Local Floodplain Analysis Completed in February 2018	Study Completed and some projects in-progress	Lack of funding or low BCA score to be competitive for FEMA money	No, new projects are noted below
	part of number 84			