Sullivan County, New York

Hazard Mitigation Plan

Volume I—Base Plan



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TETRA TECH

Sullivan County Hazard Mitigation Plan

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EXECUTIVE SUMMARY

Hazard Mitigation Overview

Hazard mitigation is the use of long-term and short-term policies, programs, projects, and other activities to minimize the loss of life, injury, and property damage that can result from a disaster. Communities, residents, and businesses across the United States have been faced with continually increasing costs associated with natural and human-caused hazards. Hazard mitigation is the first step in reducing risk and is the most effective way to reduce costs associated with hazards.

Sullivan County has developed a hazard mitigation plan (HMP) to reduce risks from disasters to the people, property, economy, and environment within the County. Developed by the County and seven participating local jurisdictions (the Planning Partners), this HMP updates the 2021 Sullivan County HMP. It includes countywide assessment of hazards, risk, and capabilities. The HMP complies with federal and state hazard mitigation planning requirements to establish the Planning Partners' eligibility for funding under Federal Emergency Management Agency (FEMA) grant programs.

The following are the jurisdictions in Sullivan County that participated as Planning Partners:

- Sullivan County
- Village of Ateres
- Town of Bethel
- Village of Bloomingburg
- Town of Callicoon
- Town of Cochecton
- Town of Delaware
- Town of Fallsburg
- Town of Forestburgh
- Town of Fremont
- Town of Highland
- Village of Jeffersonville
- Town of Liberty
- Village of Liberty
- Town of Lumberland
- Town of Mamakating
- Village of Monticello
- Town of Neversink
- Town of Rockland
- Town of Thompson
- Town of Tusten
- Village of Woodridge
- Village of Wurtsboro

The Planning Process

Overall Approach

To support the planning process, the Planning Partners accomplished the following:

- Developed a Steering Committee consisting of key stakeholders and a countywide Planning Partnership made up of the Steering Committee members, the Planning Partners, and other regional stakeholders
- Reviewed the 2021 Sullivan County Hazard Mitigation Plan
- Identified hazards of concern to the County to be included in the update
- Profiled the hazards of concern
- Estimated the inventory at risk and potential losses associated with these hazards
- Reviewed and updated the mitigation goals and objectives
- Reviewed mitigation strategy and actions outlined in the 2021 HMP to indicate progress

- Developed new mitigation actions to reduce the vulnerability of assets from hazards of concern
- Involved a wide range of stakeholders and the public in the HMP update process
- Developed mitigation plan maintenance procedures to be executed after obtaining approval of the HMP from the New York State Division of Homeland Security and Emergency Services (DHSES) and FEMA

Multiple Agency Support for Hazard Mitigation

Primary responsibility for hazard mitigation lies with local governments. Agencies at the regional, state, and federal levels are available to assist local communities with their mitigation strategies. FEMA provides grants, tools, guidance, and training to support mitigation planning. In New York, DHSES is the lead agency providing hazard mitigation planning assistance to local jurisdictions.

The Planning Partners provided significant input into the preparation of this HMP, in particular the preparation of jurisdiction-specific annexes included in Volume II. Coordination between county and local governments, relevant organizations and groups, state and federal agencies, and the general public ensured that stakeholders had communication channels and relationships to support mitigation planning.

Under the project management of the Sullivan County Division of Planning, Community Development and Environmental Management, the Sullivan County Hazard Mitigation Steering Committee provided oversight for the preparation of this plan. The Steering Committee includes representatives from the following:

- Sullivan County Division of Planning, Community Development and Environmental Management
- Sullivan County Department of Grants Administration
- Sullivan County Office of Sustainable Energy
- Sullivan County Sheriff's Office
- Sullivan County Division of Public Works
- Sullivan County Division of Public Safety
- Sullivan County Real Property Tax Services
- Sullivan County Division of Health and Human Services
- Sullivan County Division of Community Resources
- Sullivan County Office of the County Manager
- Cornell Cooperative Extension Sullivan County
- Sullivan County Soil and Water Conservation District

Risk Assessment for Local Hazards of Concern

The Planning Partners evaluated each jurisdiction's risk and vulnerability due to each of the hazards of concern, based on past events, past and predicted future losses, and the expected probability of future occurrence. From these evaluations, hazards were ranked as high, medium, or low risk to each jurisdiction. The hazard rankings were used to focus and prioritize individual jurisdictional mitigation strategies. Summary overall hazard rankings for all of Sullivan County are as follows:

- Dam Failure—Low
- Drought—Medium
- Earthquake—Low
- Flood—High
- Landslide—Low
- Pandemic—Medium
- Severe Storm—Medium
- Severe Winter Storm—High
- Wildfire—Medium

Capability Assessment and Plan Integration into Other Local Mechanisms

Effective mitigation is achieved when hazard awareness and risk management become integral parts of public activities and decision-making. Sullivan County has many plans and programs that support hazard risk management. This HMP integrates, complements, and references those plans and programs to the extent practical in order for it to be a comprehensive resource for hazard mitigation.

The HMP includes a capability assessment to review relevant local mechanisms for each Planning Partner. This assessment identifies where each jurisdiction is currently able to implement hazard mitigation measures and where each would benefit from improved capabilities for such measures. The capability assessment also provides a summary and description of the existing plans, programs, and regulatory mechanisms at all levels of government (federal, state, county and local) that support hazard mitigation in the County. In the jurisdictional annexes, each Planning Partner identifies how it has integrated hazard risk management into its existing planning, regulatory and operational/administrative framework, and how it intends to continue to promote this integration.

Mitigation Strategy

Hazard Mitigation Plan Goals and Objectives

The HMP includes mitigation goals for reducing or avoiding long-term vulnerabilities to the identified hazards of concern. The planning process included a review and update of previous mitigation goals and objectives developed to guide the selection of mitigation actions. The goals and objectives were updated based on the updated risk assessment, discussions, research, and input from plan participants and stakeholders. The goal development process considered the goals expressed in the New York State Hazard Mitigation Plan, as well as other relevant county and local planning documents.

Implementation of the 2021 Plan

The status of the mitigation projects identified in the 2021 HMP was reviewed for this HMP. Numerous projects and programs have been implemented that have reduced hazard vulnerability to assets in the planning area. Uncompleted projects have been evaluated, modified as necessary, and incorporated into this plan. The Planning Partners' annexes describe these mitigation activities in more detail, and plan maintenance procedures have been developed to encourage thorough integration with local decisions and processes and regular review of implementation progress.

2026 Sullivan County HMP Goals

Goal 1: Promote a comprehensive countywide hazard mitigation program that includes coordination among County departments, jurisdictions, and federal, state, and local organizations.

Goal 2: Protect lives and existing property, including all populations at risk from hazards and vulnerable public, historic, and private structures, and critical facilities and infrastructure.

Goal 3: Increase awareness of hazard risk and mitigation capabilities among stakeholders, citizens, elected officials, and property owners to enable the successful implementation of mitigation strategies.

Goal 4: Encourage the development and implementation of long-term, cost effective, and resilient mitigation projects to preserve or restore the functions of natural systems.

Goal 5: Build stronger by promoting mitigation actions that emphasize sustainable construction and design measures to reduce or eliminate the impacts of natural hazards now and in the future.

Goal 6: Address long-term vulnerabilities from high hazard potential dams and at-risk dams.

2026 Mitigation Strategy

Jurisdictional actions included in the mitigation strategy had a focus on the training and education of municipal officials, including the Floodplain Administrators; ensuring continuity of operations for critical facilities through the installation of emergency backup generators; the reduction of flood risk through the increase in capacity of stormwater infrastructure, including culverts, drainage systems, and catch basins; and working to identify safety measures and procedures of dams within the various jurisdictions.

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PART 1: THE PLANNING PROCESS AND PLANNING AREA

1. INTRODUCTION

Sullivan County has developed a hazard mitigation plan (HMP) to reduce risks from disasters to the people, property, economy, and environment within the County. Developed by the County and 22 participating local jurisdictions (the Planning Partners), this HMP updates the 2021 Sullivan County HMP. The updated 2026 HMP includes countywide analysis and assessment of hazards, risk, and capabilities.

1.1 OVERVIEW TO HAZARD MITIGATION PLANNING

1.1.1 What Is Hazard Mitigation?

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk and effects that can result from hazards. The Federal Emergency Management Agency (FEMA) defines a hazard mitigation plan as the documentation of a state or local government's evaluation of natural hazards and strategies to mitigate them.

Effective mitigation planning helps people, organizations, and government agencies to better prepare for and respond when disasters occur. It also allows local governments to remain eligible for FEMA grant funding for mitigation projects that will reduce the impact of future disaster events. The long-term benefits of mitigation planning and implementation include the following:

- An increased understanding of hazards faced by local communities
- A more sustainable and disaster-resistant community
- Financial savings through partnerships that support planning and mitigation efforts
- Focused use of limited resources on hazards that have the biggest impact on the community
- Reduced long-term impacts and damage to human health and structures
- Reduced costs associated with response and recovery efforts, including repairs

The **Federal Emergency Management Agency** (FEMA) estimates that for every dollar spent on damage prevention (mitigation), twice that amount is saved by not having to perform post-disaster repairs.

1.1.2 Regulatory Framework

Federal policy encourages communities to assess their vulnerability to hazards before disaster strikes and then take actions to reduce potential risks. A disaster-resistant community can rebound more quickly and cost-effectively from a natural disaster, with less human injury or loss of property. This minimizes other losses associated with disasters, such as the time lost from productive activity by businesses and industries.

The federal Disaster Mitigation Act of 2000 (DMA) encourages hazard mitigation planning by states, tribes, and local governments. Under the DMA, communities seeking certain hazard-related federal funding must identify potential natural hazards and identify and prioritize actions that can be taken by the community to mitigate those hazards before disaster strikes.

Regulations implementing the DMA are included in Title 44 of the Code of Federal Regulations, Section 201 (44 CFR 201). To be eligible for hazard mitigation assistance from the federal government, communities must have

an approved hazard mitigation plan and must update it on a 5-year basis. Table 1-1 summarizes the 44 CFR 201 requirements and where each is addressed in this hazard mitigation plan.

Table 1-1. FEMA Local Mitigation Plan Review Crosswalk

Plan Criteria	Primary Location in Plan
Prerequisites	
Adoption by the Local Governing Body: §201.6(c)(5)	Section 2.8, Appendix A
Planning Process	
Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)	Chapter 2
Risk Assessment	
Identifying Hazards: §201.6(c)(2)(i)	Chapter 5
Profiling Hazards: §201.6(c)(2)(i)	Chapters 6 – 14
Assessing Vulnerability: Overview: §201.6(c)(2)(ii)	Chapter 3; Chapter 4; Chapters 6 – 14
Assessing Vulnerability: Identifying Structures: §201.6(c)(2)(ii)(A)	Chapter 3; Chapters 6 – 14
Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)	Chapter 3; Chapters 6 – 14
Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)	Chapter 3; Chapters 6 – 14; Volume II Annexes
Mitigation Strategy	
Local Hazard Mitigation Goals: §201.6(c)(3)(i)	Chapter 17; Volume II Annexes
Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)	Chapter 17; Volume II Annexes
Implementation of Mitigation Actions: §201.6(c)(3)(iii)	Chapter 17; Volume II Annexes
Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)	Chapter 17; Volume II Annexes
Plan Maintenance Process	
Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(i)	Chapter 18
Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)	Chapter 18; Volume II Annexes
Continued Public Involvement: §201.6(c)(4)(iii)	Chapter 18

One goal of the federal regulations is to facilitate cooperation between state and local authorities, prompting them to work together. This enhanced planning process enables local and state governments to better articulate accurate needs for mitigation, resulting in faster allocation of funding and more effective risk reduction projects. In New York, responsibility for fulfilling the requirements of the DMA and 44 CFR 201 has been delegated to the New York State Division of Homeland Security and Emergency Services (DHSES).

1.1.3 Specialized Terms and Concepts

Hazard mitigation has developed over the years its own set of terms and concepts with particular meanings within the hazard mitigation practice. A full glossary and list of acronyms is provided at the end of this volume of the HMP. The list below provides a quick reference for specialized terms whose use is especially prominent in this hazard mitigation plan (FEMA 2022e, FEMA 2023b, EPA 2023a, National Academies of Sciences, Engineering, and Medicine 2022):

- **Asset—**anything that is important to the character and function of a community (e.g., people, structures, community lifelines, the economy, and natural, historic, and cultural resources)

- **At-risk population—**the potential for loss within an individual or social group, as affected by traits that influence an individual's or group's resilience, which is their ability to prepare, respond, cope or recover from an event
- **Capability assessment—**an evaluation of which authorities, policies, programs, funding and resources a participant has to accomplish hazard mitigation
- **Cascading hazards—**a primary event, such as heavy rainfall, seismic activity, or rapid snowmelt, followed by a chain of consequences that may range from modest (lesser than the original event) to substantial
- **Community lifelines—**the most fundamental services in a community that, when stabilized, enable all other aspects of society to function
- **Extent—**the range of anticipated intensities of the identified hazards within a community, most commonly expressed using various scientific scales
- **Hazard profile—**a description of a hazard's location, extent, previous occurrences and probability of future events within a community
- **Hazard ranking—**the process of identifying the hazards that pose the greatest risk to a community, based on how likely the hazard is to occur, the potential consequences if the hazard does occur, and other relevant local factors
- **Impact—**the consequences or effects of a hazard on a community's assets identified in the vulnerability assessment.
- **Integration—**the inclusion of hazard mitigation principles, vulnerability information and mitigation actions into other existing community planning to leverage activities that have co-benefits, reduce risk and increase resilience
- **Mitigation action—**measures, projects, plans or activities proposed to reduce the current and future vulnerabilities identified in the risk assessment
- **Mitigation strategy—** the long-term blueprint for reducing the potential hazard-related losses identified in the risk assessment; the strategy consists of mitigation goals, mitigation actions, and a plan for implementing the actions
- **Natural hazard—**a source of harm or difficulty created by a meteorological, environmental or geological event
- **Plan maintenance—**monitoring and updating a hazard mitigation plan as warranted by changing conditions, availability of new information, and progress on the proposed mitigation actions
- **Planning process—**the procedures used to develop a hazard mitigation plan with broad acceptance across the community
- **Risk—**the potential for damage or loss when natural hazards interact with people or assets
- **Risk assessment—**a data-driven analysis to find where a local jurisdiction is vulnerable to hazards
- **Stakeholder—**individuals or groups that a mitigation action or policy affects, including businesses, private organizations and residents
- **Vulnerability—**a description of which assets within locations identified to be hazard prone are at risk from the effects of the hazard

1.2 HISTORY OF HAZARD MITIGATION PLANNING IN SULLIVAN COUNTY

1.2.1 Previous Sullivan County HMPs

Sullivan County has been included in 35 federal disaster declarations (major disaster, fire management, and emergency) since 1954. The County prepared and adopted its first hazard mitigation plan in 2005. The HMP has been regularly updated since then, with updates adopted in 2010, 2012, and 2021.

1.2.2 Past Mitigation Accomplishments

Sullivan County, through previous and ongoing hazard mitigation activities, has demonstrated that it is proactive in protecting its physical assets and citizens against losses from natural hazards. Examples of previous and ongoing actions and projects include the following:

- The County facilitated the development of the original Sullivan County HMP. The current planning process represents the regulatory five-year plan update process, which includes the participation of 22 jurisdictions in the County, along with key County and regional stakeholders.
- All municipalities, with the exception of the newly formed Village of Ateres, participating in this HMP update participate in the National Flood Insurance Program (NFIP), which requires the adoption of FEMA floodplain mapping and certain minimum standards for building within the floodplain.
- Reports, plans, and studies relating to or including information on natural hazards or natural hazard policies affecting Sullivan County have been reviewed and incorporated into this HMP update as appropriate, as discussed in Chapter 2.

1.2.3 Key Changes in the Current Update

The following are the most significant changes made between the previous County HMP (2021) and the current (2026) update:

- The 2021 Sullivan County HMP was created only in a digital format. The 2026 HMP is being developed in both written and digital formats.
- The 2021 HMP did not identify pandemic as a hazard of concern. Members of the Steering Committee and Planning Partnership identified this as a hazard of concern for the 2026 HMP Update.
- The 2021 HMP did not identify earthquake as a hazard of concern. Members of the Steering Committee and Planning Partnership identified this as a hazard of concern for the 2026 HMP Update.
- The 2021 HMP evaluated several hazards of concern individually. The 2026 HMP placed the Coldwave, Ice Storms, and Snowstorms hazards into one Severe Winter Storms hazard profile.
- The 2021 HMP evaluated several hazards of concern individually. The 2026 HMP placed the Hail, Heatwave, Hurricanes, Lightning, Tornado, and Wind hazards into one Severe Storms hazard profile.

1.3 PLAN ORGANIZATION

The Sullivan County HMP provides a detailed review and analysis of each hazard of concern, resources, and relevant statistical information for the Planning Partners. The HMP is organized into three volumes: Volume I

includes all information that applies to the entire planning area (Sullivan County); Volume II includes specific information for each Planning Partner; and Volume III includes appendices.

Volume I is a resource for ongoing mitigation analysis. It includes a description of the County and its jurisdictions as well as information on mitigation planning and how the risk assessment and capability assessment were performed. Volume I of the HMP includes the following chapters:

- Part 1, The Planning Process and Planning Area
  - Chapter 1, Introduction
  - Chapter 2, Planning Process—A description of the plan methodology and development process, committee and stakeholder roles and activities, and how the HMP will be incorporated into existing programs. Information regarding the adoption of the HMP by each Planning Partner.
  - Chapter 3, County Profile—An overview of Sullivan County, including general information and physical conditions, land use patterns and trends, population and demographics, economy, general building stock inventory, community lifelines, and natural, historic, and cultural resources
- Part 2, Risk Assessment
  - Chapter 4, Methodology—Description of the methodology used to assess hazard risk and the status of local data.
  - Chapter 5, Hazards of Concern Identification—Documentation of the process of identifying the natural hazards of concern for further profiling and evaluation.
  - Chapters 6 – 14—Hazard profiles and findings of the risk assessment (estimates of the impact of hazard events on life, safety, and health; general building stock; critical facilities; the economy, and natural, historic, and cultural resources).
  - Chapter 15, Hazard Ranking—Description and summary of the hazard ranking process.
- Part 3, Capability Assessment
  - Chapter 16, Capability Assessment—A summary and description of the existing plans, programs, and regulatory mechanisms at all levels of government (federal, state, county, local) that support hazard mitigation within the County.
- Part 4, Mitigation Strategy
  - Chapter 17, Mitigation Strategy—Information regarding the mitigation goals and objectives identified in response to priority hazards of concern, and the process by which mitigation strategies were developed for each Planning Partner.
- Part 5, Plan Maintenance
  - Chapter 18, Plan Maintenance Procedures—A system to continue to monitor, evaluate, maintain, and update the plan.

Volume II consists of annexes for each Planning Partner. Each annex summarizes the jurisdiction's planning, regulatory, and fiscal capabilities; evaluates vulnerabilities to hazards; describes the status of past mitigation actions; and provides a specific mitigation strategy. The annexes provide each jurisdiction with an expedient resource for implementing mitigation projects and maximizing future grant opportunities.

Appendices provided in Volume III include the following:

- Appendix A, Sample Resolution of Plan Adoption—Documentation of formal HMP approval.

- Appendix B, Meeting Documentation—Agendas, attendance sheets, minutes, and other documentation (as available and applicable) of planning meetings convened during the development of the plan.
- Appendix C, Public and Stakeholder Outreach Documentation—Documentation of the public and stakeholder outreach effort including webpages, informational materials, public and stakeholder meetings and presentations, surveys, and other methods used to receive and incorporate public and stakeholder comment and input to the HMP update process.
- Appendix D, Participation Matrix
- Appendix E, Action Worksheet Template and Instructions
- Appendix F, Plan Maintenance Tools—Examples of plan review templates available to support annual plan review and example FEMA Guidance Worksheets (FEMA 386-4).
- Appendix G, Critical Facility Inventory
- Appendix H, Linkage Procedures
- Appendix I, NYS DHSES Planning Standards—Includes planning standards and guidelines for hazard mitigation planning.

2. PLANNING PROCESS

This chapter describes the planning process used to update the Sullivan County HMP, including how it was prepared, who was involved in the process, and how the public was involved. The planning approach aimed to achieve the following results:

- The HMP will be multi-jurisdictional, including all municipalities in the County. Sullivan County invited all jurisdictions in the County to join in the planning process. All of the 22 local municipal governments in the County (the Planning Partnership) participated in the 2026 plan update process:
  - Sullivan County
  - Village of Ateres
  - Town of Bethel
  - Village of Bloomingburg
  - Town of Callicoon
  - Town of Cochecton
  - Town of Delaware
  - Town of Fallsburg
  - Town of Forestburgh
  - Town of Fremont
  - Town of Highland
  - Village of Jeffersonville
  - Town of Liberty
  - Village of Liberty
  - Town of Lumberland
  - Town of Mamakating
  - Village of Monticello
  - Town of Neversink
  - Town of Rockland
  - Town of Thompson
  - Town of Tusten
  - Village of Woodridge
  - Village of Wurtsboro
- The format of this HMP is such that other entities can easily join at a later date as part of the regulatory 5-year plan update process.
- The HMP considers all natural hazards that pose a risk to the area, as required by 44 CFR 201. Non-natural hazards that pose significant risk were considered as well.
- The HMP was developed following FEMA regulations and prevailing FEMA and state guidance. This ensures that all the requirements are met and supports plan review. In addition, this HMP will meet criteria for the National Flood Insurance Program (NFIP) Community Rating System (CRS) and the Flood Mitigation Assistance (FMA) programs.

2.1 GENERAL MITIGATION PLANNING APPROACH

FEMA provides hazard mitigation planning support to local communities through guidance, resources, and plan reviews. This hazard mitigation plan was prepared in accordance with the following regulations and guidance:

- Mitigation Planning How-to Series (FEMA 386-1 through 4, 2002)
- Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (FEMA January 2013)
- Integrating Hazard Mitigation into Local Planning (FEMA March 1, 2013)
- Plan Integration: Linking Local Planning Efforts (FEMA July 2015)
- Local Mitigation Planning Policy Guide (FEMA April 19, 2022)
- Local Mitigation Planning Handbook (FEMA May 2023)
- DMA (Public Law 106-390) (October 30, 2000)
- 44 CFR 201 and 206 Interim Final Rules (Feb. 26, 2002, Oct. 1, 2002, Oct. 28, 2003, Sept. 13, 2004)
- Hazard Mitigation Planning Standard (NYS DHSES 2022)
- Hazard Mitigation Plan (NYS DHSES 2023)

2.2 PLANNING PROCESS PARTICIPANTS

2.2.1 Project Management and Planning Consultant

Project management was the responsibility of the Sullivan County Division of Planning, Community Development and Environmental Management. A contract planning consultant (Tetra Tech) assisted with the following:

- Organization of Steering Committee and Planning Partnership
- Development and implementation of a public and stakeholder outreach program
- Data collection
- Facilitation of meetings (Steering Committee, municipal, stakeholder, public and other)
- Update of the hazards of concern, and hazard profiling and risk assessment
- Update of mitigation planning goals and objectives
- Review of past mitigation strategy progress
- Screening, selection, and prioritization of mitigation actions
- Preparation of the draft and final plan documents

2.2.2 Planning Partnership

In October 2025, the County notified all municipalities in the County of the pending planning process and invited them to formally participate. Jurisdictions were asked to notify the County of their intent to participate. Each participating jurisdiction is recognized as a Planning Partner.

Designated Representatives

Each Planning Partner appointed representatives to serve on the Planning Partnership for this HMP. Table 2-1 lists the representatives at time of publication of this HMP update. Appendix D (Participation Matrix) identifies how each of these individuals contributed to the planning process. Planning Partnership representatives were charged with the following:

- Representing their jurisdiction throughout the planning process
- Ensuring participation of all departments and functions within their jurisdiction that have a stake in mitigation (e.g., planning, engineering, code enforcement, police and emergency services, public works)
- Assisting in gathering information for inclusion in the HMP update, including previous reports and data
- Promoting the public involvement process
- Reporting on progress of mitigation actions identified in prior or existing HMPs, as applicable
- Identifying, developing, and prioritizing appropriate mitigation actions
- Reporting on progress of integrating prior HMPs into other planning processes and municipal operations
- Supporting and developing a jurisdictional annex
- Reviewing, amending, and approving all sections of the HMP update
- Adopting, implementing, and maintaining the HMP update

Table 2-1. Sullivan County Hazard Mitigation Planning Partnership Members

Jurisdiction	Primary Point of Contact	Title	Alternate Point of Contact	Title
Ateres (V)	Zisha Berger	Village Clerk	S Lebovitz	Village Secretary
Bethel (T)	Daniel Sturm	Town Supervisor	Rita Sheehan	Town Clerk
Bloomingburg (V)	Debra Beuerman	Village Clerk	Eziel Fleischman	Village Mayor
Callicoon (T)	Tom Bose	Town Supervisor	Kim Klein	Town Clerk
Cochecton (T)	Gary Maas	Town Supervisor	Maryann Oumrim	Town Clerk
Delaware (T)	Scott Dubois	Town Supervisor	Leila McCullough	Town Clerk
Fallsburg (T)	Nathan Steingart	Town Supervisor	Paula Grogan	Town Clerk
Forestburgh (T)	Daniel S. Hogue, Jr.	Town Supervisor	Teresa Collins	Town Clerk
Fremont (T)	Brian Brustman	Town Supervisor	Jody Schanil	Town Clerk
Highland (T)	Frank Monteleone	Planning Board Vice Chairman	John Pizzolato	Town Supervisor
Jeffersonville (V)	William Chellis	Village Mayor	Colleen Freitas	Village Clerk
Liberty (T)	Frank DeMayo	Town Supervisor	Laurie Dutcher	Town Clerk
Liberty (V)	Joan Stoddard	Village Mayor	Judy Zurawski	Village Clerk
Lumberland (T)	Suzanne Edzenga	Town Supervisor	Laurie Terry	Town Clerk
Mamakating (T)	Peter Goodman	Town Supervisor	Karen Barclay	Town Clerk
Monticello (V)	Rochelle Massey	Village Mayor	Janine Gandy-McKinney	Village Clerk
Neversink (T)	Chris Mathews	Town Supervisor	Staci Conjura	Town Clerk
Rockland (T)	Robert Eggleton	Town Supervisor	Marinella Di Vita	Town Clerk
Thompson (T)	Scott Mace	Town Supervisor	Marilee Calhoun	Town Clerk
Tusten (T)	Ben Johnson	Town Supervisor	Crystal Weston	Town Clerk
Woodridge (V)	David Schlesinger	Village Mayor	Gloria Sanders	Village Clerk
Wurtsboro (V)	Frank Cisco	Village Mayor	Gina Langowsky	Village Clerk
Sullivan County	Heather Brown	Commissioner	Justin Rocque	Planner

All municipalities in the County, other than the newly formed Village of Ateres, actively participate in the National Flood Insurance Program and have a designated NFIP floodplain administrator. All floodplain administrators were informed of the planning process, reviewed the HMP documents, and provided direct input to the HMP update. Local floodplain administrators are identified as part of each jurisdiction's hazard mitigation planning team, as presented in the jurisdictional annexes in Volume II, as well as in Appendix D (Participation Matrix).

Planning Process Participation

The various jurisdictions in Sullivan County have differing levels of capabilities and resources available to apply to the HMP update process, as well as differing levels of vulnerability to and impacts from the natural hazards being considered in this plan. It was Sullivan County's intent to encourage participation by all jurisdictions, and to accommodate their specific needs and limitations while still meeting the intent and purpose of plan update participation. Such accommodations included establishing a Steering Committee, engaging a contract consultant to assume certain elements of the HMP update process on behalf of the jurisdictions, and providing alternative mechanisms for planning participation.

Ultimately, jurisdictional participation is evidenced by a completed annex of the HMP, wherein jurisdictions individually identify their planning points of contact, evaluate their risk from the hazards of concern, identify their capabilities to effect mitigation in their community, identify and prioritize a suite of actions to mitigate their hazard risk, and adopt the updated plan via resolution. Annexes are included in Volume II of this HMP.

After completion of the plan, implementation and ongoing maintenance will become a function of the Planning Partnership as described in Chapter 18. The Planning Partnership will be responsible for reviewing the draft plan and soliciting public comment as part of an annual review and as part of the five-year mitigation plan updates.

2.2.3 Steering Committee

Sullivan County developed a Steering Committee to guide the HMP update effort so that the resulting document will be accepted by local government leaders and by all who live and work within the planning area. The Steering Committee provided guidance, leadership, and oversight of the planning process and acted as the point of contact for all Planning Partners and various interest groups in the planning area. Table 2-2 lists the members of the Steering Committee.

Table 2-2. Sullivan County Hazard Mitigation Steering Committee Members

Affiliation	Name	Title
Sullivan County Division of Planning	Heather Brown	Commissioner
Sullivan County Division of Planning	Justin Rocque	Planner
Sullivan County Department of Grants Administration	Arthur Hussey	Supervisor
Sullivan County Office of Sustainable Energy	Stephen Stuart	Sustainability Analyst
Sullivan County Sheriff's Office	Mike Schiff	Sheriff
Sullivan County Sheriff's Office	Eric Chaboty	Undersheriff
Sullivan County Division of Public Works	Ed McAndrew	Commissioner
Sullivan County Division of Public Safety	Scott Schulte	Commissioner
Sullivan County Division of Public Safety	John Hauschild	Deputy Commissioner, Fire Coordinator
Sullivan County Division of Public Safety	Alex Rau	EMS/911 Coordinator
Sullivan County Division of Public Safety	Erin O'Brien	Confidential Secretary
Sullivan County Real Property Tax Services	Christopher Knapp	Director
Sullivan County Division of Health and Human Services	John Liddle	Commissioner
Sullivan County Division of Community Resources	Laura Quigley	Commissioner
Sullivan County Office of the County Manager	Dan Hust	Director of Communications
Cornell Cooperative Extension Sullivan County	Melinda Meddaugh	Agriculture & Food Systems Senior Issue Leader
Sullivan County Soil and Water Conservation District	Brian Brustman	District Manager

Steering Committee members were charged with the following:

- Providing guidance and oversight of the planning process on behalf of the general Planning Partnership
- Attending and participating in Steering Committee meetings
- Assisting with the development and completion of certain planning elements, including:

- Reviewing and updating the hazards of concern
- Developing a public and stakeholder outreach program
- Ensuring that the data and information used in the HMP update process is the best available
- Reviewing and updating the hazard mitigation goals
- Identifying and screening appropriate mitigation strategies and activities

- Reviewing and commenting on plan documents prior to submission to DHSES and FEMA.

2.3 PLANNING ACTIVITIES

Members of the Planning Partnership, as well as key stakeholders, met and communicated as needed to share information. This included workshops to identify hazards, assess risks, update inventories of critical facilities, and assist in updating mitigation goals and strategies. All members of the Planning Partnership had the opportunity to review the draft plan, supported interaction with other stakeholders, and assisted with public involvement efforts. These activities provided continuity through the process to ensure that natural hazard vulnerability information and appropriate mitigation strategies were incorporated.

Table 2-3 summarizes meetings and other planning activities conducted during the development of the plan. It also identifies which 44 CFR 201 requirements each activity satisfies. Documentation of meetings (agendas, sign-in sheets, minutes, etc.) may be found in Appendix C (Public and Stakeholder Outreach). In addition to the activities listed in the table, there was a great deal of communication between Planning Partnership members and the consultant through individual local meetings, phone, and email.

Table 2-3. Summary of Mitigation Planning Activities

Date	44 CFR 201 Requirement[a]	Description of Activity	Participants
September 30, 2025	2	Project Startup Meeting: Discuss proposed planning process and scope of work including documenting participation, schedule, and public and stakeholder outreach and involvement.	Sullivan County, Tetra Tech
October 29, 2025	2, 3c	GIS data collection meeting	Sullivan County, Tetra Tech
October 2025	2	All jurisdictions were invited to participate in the planning process.	-
Bi-weekly	-	Bi-weekly project status meeting to discuss action items in support of the planning process	Sullivan County, Tetra Tech
November 13, 2025	2	Steering Committee Kick-Off Meeting: Welcome and Introductions, Plan Timing and Administration, Data Collection and Sharing, Hazards of Concern, Public and Stakeholder Outreach, Goals, Next Steps, and Schedule	See Appendix D
November 13, 2025	2, 3c, 4a	Planning Partnership Kick-Off Meeting: Welcome and Introductions, Overview of Hazard Mitigation, Project Scope Review, Project Schedule Review, Next Steps, and Schedule	See Appendix D
November 17, 2025	2, 3e, 4d, 4e	Pre-populated jurisdictional annexes distributed.	Steering Committee, Planning Partnership

Date	44 CFR 201 Requirement[a]	Description of Activity	Participants
November 2025	1b, 2	Public project website developed: https://www.sullivanny.gov/Departments/Planning Environmental/PlansandStudies/HazardMitigationPlan	Sullivan County, Tetra Tech
November 2025	1b, 2	Online Public Hazard Preparedness and Mitigation survey developed and deployed	Sullivan County, Tetra Tech
November 2025	1b, 2	Online Stakeholder Hazard Mitigation surveys developed and deployed	Sullivan County, Tetra Tech
November 2025	1b, 2	Online Neighboring County Mitigation survey developed and deployed	Sullivan County, Tetra Tech
January 27, 2026	3b, 3c, 3d, 3e	Steering Committee Risk Assessment Meeting: Welcome and Introductions, Project Report and Status Review, Risk Assessment Overview, Risk Assessment Results, Hazard Rankings, Next Steps	See Appendix D
February 18-19, 2026	2, 3b, 3c, 3d, 3e, 4a, 4b	Planning Partnership Jurisdictional Annexes Meetings: Risk Assessment Results, Hazard Rankings, Identifying and Developing Mitigation Strategies, Developing New Potential Actions, Workshop, Next Steps	See Appendix D
May 6, 2026	1b, 2	Draft Plan Review Meeting: Overview of entire plan and sections; confirmed plan maintenance schedule; public invited to attend.	See Appendix D
May 6, 2026	1b, 2	Draft Plan posted to public project website and MitigateNY	Public and Stakeholders
May 6, 2026	All requirements	Plan submitted to NYS DHSES	NYS DHSES
July 10, 2026	1b, 2	Public, stakeholder, and DHSES comments to Draft Plan received and incorporated into Final Plan.	Public, Stakeholders, NYS DHSES, Tetra Tech
October 5, 2026	All requirements	Plan submitted to FEMA Region II	FEMA Region II
Upon plan approval by FEMA	1a	Plan adoption by resolution by the governing bodies of all participating municipalities	All plan participants

Note: TBD = to be determined.

a. Numbers in column 2 identify specific requirements of 44 CFR 201.6, as follows:

1a – Prerequisite – Adoption by the Local Governing Body (201.6.a.1)
1b – Public Participation (201.6.b)
2 – Planning Process – Documentation of the Planning Process (201.6.c.1)
3a – Risk Assessment – Identifying Hazards (201.6.c.2.i)
3b – Risk Assessment – Profiling Hazard Events (201.6.c.2.i)
3c – Risk Assessment – Assessing Vulnerability: Identifying Assets (201.6.c.2.ii.A)
3d – Risk Assessment – Assessing Vulnerability: Estimating Potential Losses (201.6.c.2.ii.B)
3e – Risk Assessment – Assessing Vulnerability: Analyzing Development Trends (201.6.c.2.ii.C)
4a – Mitigation Strategy – Local Hazard Mitigation Goals (201.6.c.3.i)
4b – Mitigation Strategy – Identification and Analysis of Mitigation Measures (201.6.c.3.ii)
4c – Mitigation Strategy – Implementation of Mitigation Measures (201.6.c.3.iii)
5a – Plan Maintenance Procedures – Monitoring, Evaluating, and Updating the Plan (201.6.c.4.i)
5b – Plan Maintenance Procedures – Implementation through Existing Programs (201.6.c.4.ii)
5c – Plan Maintenance Procedures – Continued Public Involvement (201.6.c.4.iii)

2.4 STAKEHOLDER OUTREACH AND INVOLVEMENT

Stakeholders are the individuals and entities that have a stake in managing hazard risk and mitigation. The Sullivan County HMP update was written using the best available information from stakeholders with specific knowledge of natural hazards and local capabilities. Information was obtained from municipal and regional agencies, as well as federal and state agencies, non-governmental organizations, and County residents. Their information and input has been included throughout the HMP.

Stakeholder outreach throughout the planning process ensured broad regional, county, and local participation in the plan's development. Identified stakeholders were invited to attend the Planning Partnership risk assessment meeting, and key stakeholders were requested to participate on the Steering Committee and/or Planning Partnership. Stakeholders also were invited to complete surveys about their association with hazards and mitigation. Survey results were reviewed by the Steering Committee and integrated where appropriate in the plan.

2.4.1 Stakeholders Contacted

The following sections list stakeholders who contributed to the planning process and how they participated. Many stakeholders in addition to those listed were aware of or contributed to the HMP through formal and informal communication with Planning Partners throughout plan development.

Federal and State Agencies

The federal and state agencies listed in Table 2-4 were contacted during the planning process. The table describes how each participated.

Table 2-4. Participation of Federal and State Agencies

Agency	Participation
FEMA Region 2	Provided updated planning guidance; provided NFIP data; presented regulatory flood products to municipalities and the public; attended meetings; participated in mitigation strategy workshop; reviewed plan
• **National Centers for Environmental Information (NCEI)** • **National Hurricane Center** • **National Oceanic and Atmospheric Administration (NOAA)** • **National Weather Service (NWS)** • **Storm Prediction Center (SPC)** • **U.S. Army Corps of Engineers (USACE)** • **U.S. Census Bureau** • **U.S. Geological Survey (USGS)**	Information regarding hazard identification and the risk assessment for this HMP update was requested and received or incorporated by reference
New York State Department of Homeland Security and Emergency Services (NYS DHSES: Headquarters and Region II)	Administered planning grant and facilitated FEMA review; provided updated planning guidance; attended meetings; participated in the Mitigation Strategy Workshop, provided review of Draft and Final Plan. Assisted with development of MitigateNY platform for digital HMP.
New York State Department of Environmental Conservation (NYSDEC)	Provided data and information on the number and locations of dams.
New York State Department of State	Attended meetings; assisted with development of MitigateNY platform for digital HMP.

County and Regional Agencies

The county and regional agencies listed in Table 2-5 were invited to participate during the planning process. The table describes how each participated.

Table 2-5. County and Regional Agencies

Agency	Participation
• **Sullivan County Division of Planning** • **Sullivan County Division of Health and Human Services**	Served on steering committee, attended meetings, completed hazard of concern exercise, goals and objectives exercise, and reviewed draft plan.
• **Sullivan County Department of Grants Administration** • **Sullivan County Office of Sustainable Energy** • **Sullivan County Sheriff's Office** • **Sullivan County Division of Public Works** • **Sullivan County Division of Public Safety** • **Sullivan County Real Property Tax Services** • **Sullivan County Division of Community Resources** • **Sullivan County Office of the County Manager** • **Cornell Cooperative Extension Sullivan County** • **Sullivan County Soil and Water Conservation District**	Served on steering committee, attended meetings, provided input, and reviewed draft plan.
• **Sullivan County Office for the Aging** • **Sullivan County Care Center at Sunset Lake** • **Sullivan County Department of Social Services** • **Sullivan County Veterans Service Agency** • **Sullivan County Youth Bureau** • **Sullivan County Child Advocacy Center** • **Sullivan County Department of Community Services** • **Sullivan County Human Resources** • **Sullivan County Human Rights Commission** • **Sullivan 180 Inc.** • **Sullivan County Chamber of Commerce** • **Sullivan County Partnership for Economic Development** • **Sullivan County Visitors' Association** • **Sullivan County Solid Waste & Recycling** • **Sullivan County International Airport** • **Sullivan County Transportation Department** • **Sullivan County Public Health** • **Sullivan County Bureau of EMS** • **Sullivan County Bureau of Fire** • **Sullivan County Office of Emergency Management/ Homeland Security** • **Sullivan County Office of Audit & Control** • **Sullivan County Center for Workforce Development** • **Sullivan County Clerk's Office** • **Sullivan County Office of the County Historian** • **Sullivan County Geographic Information Systems (GIS)** • **Sullivan County Information Technology Services** • **Sullivan County Office of Management and Budget** • **Sullivan County Parks & Recreation** • **Sullivan County Purchasing Department**	Invited to take the stakeholder survey and review the draft plan.

Stakeholders by Community Lifeline Category

FEMA defines community lifelines as fundamental services in a community that, when stabilized, enable all other aspects of society. Following a disaster event, intervention is required to stabilize community lifelines. All Planning Partners were asked to invite their internal agencies associated with community lifeline categories to complete a stakeholder survey. Sullivan also directly involved representatives of these agencies in the planning process, as identified in Table 2-2. This section describes outreach to and participation by other stakeholders in the planning process associated with FEMA's designated community lifeline categories. More detailed information about community lifelines in the planning area is provided in Chapter 3.

Safety and Security

Fire Districts and Fire Departments

Jurisdictions were asked to invite their fire departments to complete a stakeholder survey. The following fire districts or departments, hazardous materials response teams, and rescue teams were invited to complete a stakeholder survey and review the draft plan:

- Sullivan County Bureau of Fire
- Beaverkill Valley Fire Department
- Bloomingburg Fire Company
- Callicoon Volunteer Fire Department
- Callicoon Center Fire Department
- Claryville Volunteer Fire Department
- Fallsburg Fire Department
- Forestburgh Fire Company #1
- Grahamsville Fire Department
- Hankins/Fremont Fire Department
- Highland Lake Fire Department
- Hortonville Fire Company
- Hurleyville Fire Company
- Jeffersonville Fire Department
- Kauneonga Lake E&H
- Kenoza Lake Fire Department
- Lake Huntington Fire Company
- Lava Volunteer Fire Department
- Liberty Fire Department
- Livingston Manor Fire Department
- Long Eddy Fire Department
- Loch Sheldrake Fire Department
- Lumberland Fire Department Inc.
- Monticello Fire Department
- Mountaindale Fire Company
- Narrowsburg Fire Company
- Neversink Fire Company
- North Branch Fire Department
- Rock Hill Fire Department
- Roscoe/Rockland Fire Department
- Smallwood/Mongaup Valley Fire Department
- Summitville Fire Company
- Swan Lake Fire Department
- Westbrookville Volunteer Fire Department
- White Lake Fire Company
- White Sulphur Springs Fire Department
- Woodbourne Fire Department
- Woodridge Fire Department
- Wurtsboro Fire Department
- Youngsville Fire Department
- Yulan Fire Department

Law Enforcement

Municipalities were asked to invite their law enforcement agencies to complete a stakeholder survey. Further, the following police departments and law enforcement agencies were invited to complete a stakeholder survey and review the draft plan:

- Fallsburg Town Police Department
- Liberty Village Police Department
- Monticello Village Police Department
- New York State Police Troop F Zone 1 - Liberty
- New York State Police Troop F Zone 1 - Narrowsburg
- New York State Police Troop F Zone 1 - Roscoe
- New York State Police Troop F Zone 1 - Wurtsboro

Dams

In order to address high hazard potential dams, outreach was conducted with the following dam owners and/or the dam safety agency.

- Wanaksink Lake Club, Inc.
- Sullivan County
- Fallsburg Fish and Boat Club, Inc.
- NYCDEP Dams West of the Hudson River
- Yankee Lake Preservation Assc.
- Eagle Creek Hydro Power, LLC
- Barbara and Kevin Gref
- James A. Grundy - Irrevocable Trust
- Emerald Green Property Owners Assc.
- Lake Joseph Homeowners Assc.

The following information was requested:

- Information, data, or resources regarding the risk to dam failure as a result of deficiencies or exposure to hazards such as flooding, geologic impacts, and severe storms
- Concerns with dam safety due to changing future conditions
- Concerns with emergency action plan deficiencies including warning time, evacuation needs, etc.
- Completed or in progress repairs/improvements to dams
- Potential new mitigation actions that should be considered for inclusion in the HMP mitigation strategy

Sullivan County provided emergency actions plans for the following dams:

- Lake Jeff Dam
- Lake Louise Marie Dam
- Treasure Lake Dam
- Davies Lake Dam
- Mongaup River System Hydroelectric Projects
- Neversink Dam
- Pleasure Lake Dam
- Toasperns Pond Dam
- Toronto Lake Dam
- Wanaksink Lake Dam

Food, Hydration, Shelter

The following stakeholders that provide food, hydration, shelter, and agricultural activities in the County were invited to complete a stakeholder survey and review the draft plan:

- Sullivan County Department of Community Services
- Sullivan County Human Resources
- Sullivan County Social Services
- Sullivan County Health and Human Services

Health and Medical

Hospitals and Health-Care Facilities

The following hospitals and health-care facilities were invited to complete a stakeholder survey and review the draft plan:

- Sullivan County Public Health
- Sullivan County Health and Human Services

Ambulance/Emergency Medical Services

In addition, the following ambulance and emergency medical service providers in the County were invited to complete a stakeholder survey and review the draft plan:

- Sullivan County Bureau of EMS
- Bethel Volunteer Ambulance Corps, Inc.
- Catskills Hatzalah
- Cochecton Vol Ambulance Corps, Inc.
- Grahamsville First Aid Squad, Inc.
- Highland Ambulance Service Inc.
- Jeffersonville Volunteer First Aid Corps, Inc
- Mamakating First Aid Squad, Inc.
- Mountaindale Fire Department First Aid Squad
- Neversink Fire Department, Inc.
- Roscoe & Rockland Volunteer Ambulance Corp
- Rock Hill Volunteer Ambulance Corps, Inc
- Tusten Volunteer Ambulance Service, Inc.
- Upper Delaware Ambulance Corps, Inc.
- Volunteer Ambulance Corps of Livingston Manor Inc.

Energy

In addition to municipal utilities, the following electrical, natural gas, and fuel companies were invited to complete a stakeholder survey and review the draft plan:

- Sullivan County Office of Sustainable Energy
- New York State Electric & Gas

Communications

Each jurisdiction was asked to provide information on emergency communication and warning systems. In addition, the following communications companies were invited to complete a stakeholder survey and review the draft plan:

- Sullivan County 911 Center

Hazardous Materials

The following hazardous material facilities were invited to complete a stakeholder survey and review the draft plan:

- Sullivan County Division of Public Safety

Transportation

The following transportation agencies were invited to complete a stakeholder survey and review the draft plan:

- Sullivan County International Airport
- Sullivan County Transportation Department
- Sullivan County Division of Public Works
- Bethel Highway Department
- Callicoon Highway Department
- Cochecton Highway Department
- Delaware Highway Department
- Fallsburg Highway Department
- Fremont Highway Department
- Highland Highway Department
- Jeffersonville Highway Department
- Liberty Highway Department
- Liberty Public Works
- Lumberland Highway Department
- Mamakating Highway Department
- Monticello Highway Department
- Neversink Highway Department
- Rockland Highway Department
- Thompson Highway Department
- Tusten Highway Department

Water Systems

In addition to municipal utilities, the following water utility companies were invited to complete a stakeholder survey and review the draft plan:

- Sullivan County Solid Waste & Recycling
- Liberty Water and Wastewater Department
- Monticello Water Department
- Monticello Sewer Department
- Rockland Water and Sewer Department
- Rockland Water and Sewer Department
- Woodridge Water Department
- Kauneonga Lake Sewer Department
- Delaware Water Department
- Fallsburg Water Department
- Fallsburg Sewer Department
- Jeffersonville Water and Highway
- Liberty Water Department
- Liberty Sewer Department
- Thompson Water & Sewer Department
- Narrowsburg Water and Sewer District

School Districts and Other Academic Institutions

The following school districts, colleges, and academic organizations were invited to complete a stakeholder survey and review the draft plan:

- SUNY Sullivan (main campus)
- Sullivan West Central School District
- Sullivan BOCES District
- Yeshiva Gedolah Zichron Moshe
- Fallsburg Central School District
- Monticello Central School District
- Hebrew Day School of Sullivan County
- Liberty Central School District
- Homestead Primary School Campus
- Homestead Secondary School Campus
- Tri-Valley Central School District
- Rockland Central School District

Groups Supporting At Risk Populations

The following groups and agencies that provide support to and work with at-risk populations were invited to complete a stakeholder survey and review the draft plan:

- Sullivan County Office for the Aging
- Sullivan County Care Center at Sunset Lake
- Sullivan County Social Services
- Sullivan County Veterans Service Agency
- Sullivan County Youth Bureau
- Sullivan County Child Advocacy Center
- Sullivan County Department of Community Services
- Sullivan County Human Resources
- Sullivan County Human Rights Commission
- Sullivan 180 Inc.

Adjacent Jurisdictions

County and municipal governments that border Sullivan County were apprised of the HMP update because the effects of hazard events that impact Sullivan County would be similar to that of their neighbors. The County invited them to complete a neighboring community survey and requested their review of the draft plan. The following adjoining county and jurisdictional representatives were contacted in November 2025 to inform them about the availability of the project website, draft plan documents, and surveys, and to invite them to provide input to the planning process:

- Delaware County (NY) Emergency Services
- Delaware County (NY) Planning
- Delaware County (NY) Public Works
- Ulster County (NY) Emergency Services
- Ulster County (NY) Planning
- Ulster County (NY) Public Works Department
- Orange County (NY) Emergency Services
- Orange County (NY) Planning
- Orange County (NY) Public Works
- Pike County (PA) Planning & Mapping
- Pike County (PA) Emergency Management
- Pike County (PA) Transportation
- Wayne County (PA) Emergency Management
- Wayne County (PA) Planning & GIS
- Wayne County (PA) Transportation
- Colchester (Town) - Delaware County (NY)
- Hancock (Town) - Delaware County (NY)
- Hardenburgh (Town) - Ulster County (NY)
- Denning (Town) - Ulster County (NY)
- Wawarsing (Town) - Ulster County (NY)
- Shawangunk (Town) - Ulster County (NY)
- Deerpark (Town) - Orange County (NY)
- Wallkill (Town) - Orange County (NY)
- Manchester (Township) – Wayne County (PA)
- Berlin (Township) – Wayne County (PA)
- Damascus (Township) – Wayne County (PA)
- Lackawaxen (Township) – Pike County (PA)
- Shohola (Township) – Pike County (PA)
- Westfall (Township) – Pike County (PA)

2.4.2 Stakeholder Survey Summary

The stakeholder survey was designed to identify general needs for hazard mitigation and resilience within Sullivan County from the perspective of stakeholders, as well as to identify specific projects that may be included in the mitigation plan. It was distributed to identified stakeholders, including county and municipal departments and agencies. As of February 3, 2026, five stakeholders completed the survey. Respondents were from the education sector, emergency services sector, or public works. Most represented groups that serve Sullivan County as a whole.

Hazard and Damage Identification

Respondents were mainly concerned with the severe storm (extreme heat, hail, lightning, high wind, thunderstorm, tornado) and severe winter storm (blizzard, extreme cold, heavy snow, ice storm) hazard events.

Four of the five respondents indicated that their organization does not have fixed or mobile assets that are located in the floodplain; the other was unsure. One respondent reported that their organization has flood insurance.

Community Preparedness

Respondents were asked about vulnerable groups in the community that are at risk before, during, or after a hazard event and respondents stated that they would be concerned about the following:

- Older adults and low-income housing residents because they may need extra assistance in an emergency to ensure accessibility
- Students being able to get to campus safely
- Farmers that may have their crop yield impacted by hazard events

Respondents listed the following as the most effective ways to communicate with at-risk populations:

- Face to face communication
- Print media and public airwaves
- Radio and text messaging alert system

Project Identification

Respondents identified the following projects or programs that could reduce their organization's vulnerability to damage:

- Retrofit and strengthen essential facilities and infrastructure
- Strengthening codes, ordinances, and plans to require higher hazard risk management standards
- Enhance stream maintenance programs/projects
- Work on improving the damage resistance of utilities

2.4.3 Neighboring Community Survey Summary

The neighboring community survey was sent to the county and municipal governments that border Sullivan County. As of February 3, 2026, three counties (Pike County, Wayne County and Ulster County) and three local jurisdictions submitted survey responses (Town of Shawangunk, Township of Damascus, and Township of Westfall).

Emergency Operations and Continuity of Operations Planning

Wayne County and Ulster County answered survey questions regarding whether any shared service or mutual aid agreements are in place between their county and Sullivan County. Wayne County and Ulster County stated that they provide backup fire services as needed. Shawangunk, located in Ulster County, also stated that they participate in Sullivan County's comprehensive emergency operations planning through mutual aid response. Damascus Township, located in Wayne County, stated that Sullivan County participated in their comprehensive operations by providing mutual aid response. Pike County, Wayne County and Ulster County noted that they communicate emergency operations with Sullivan County via 911 centers.

Risk and Vulnerability

Wayne County and Pike County noted that they share risk and vulnerability assessments regarding flooding along the Delaware River with Sullivan County. Ulster County noted that it shares brush fire issues with Sullivan County.

Evacuation and Sheltering

Pike County noted that there is collaboration with Sullivan County on establishing evacuation routes or alternative evacuation routes. Both Pike County and Ulster County noted they would consult with Sullivan County before making evacuation decisions if the need arose and that the evacuation routes are maintained to the same level of protection across jurisdictional lines.

None of the respondents noted that they would consult Sullivan County if making sheltering decisions that may impact Sullivan. Pike County noted that it shares spaces suitable for temporary housing but did not elaborate.

Information Sharing

Westfall Township, located in Pike County, states that more direct contacts would be beneficial in information sharing.

Projects, Grants, Education, and Outreach

Pike County and Wayne County noted that flooding along the Delaware River is a mutual issue. Pike County shares information on potential shared mitigation projects with emergency management contacts and county planning contacts.

Respondents identified a potential for cross-collaboration between county boundaries on training opportunities for first responders and local governments. Respondents also identified that working together to mitigate flood risks in relation to the Delaware River would be a good opportunity.

2.5 PUBLIC OUTREACH

2.5.1 Outreach Activities

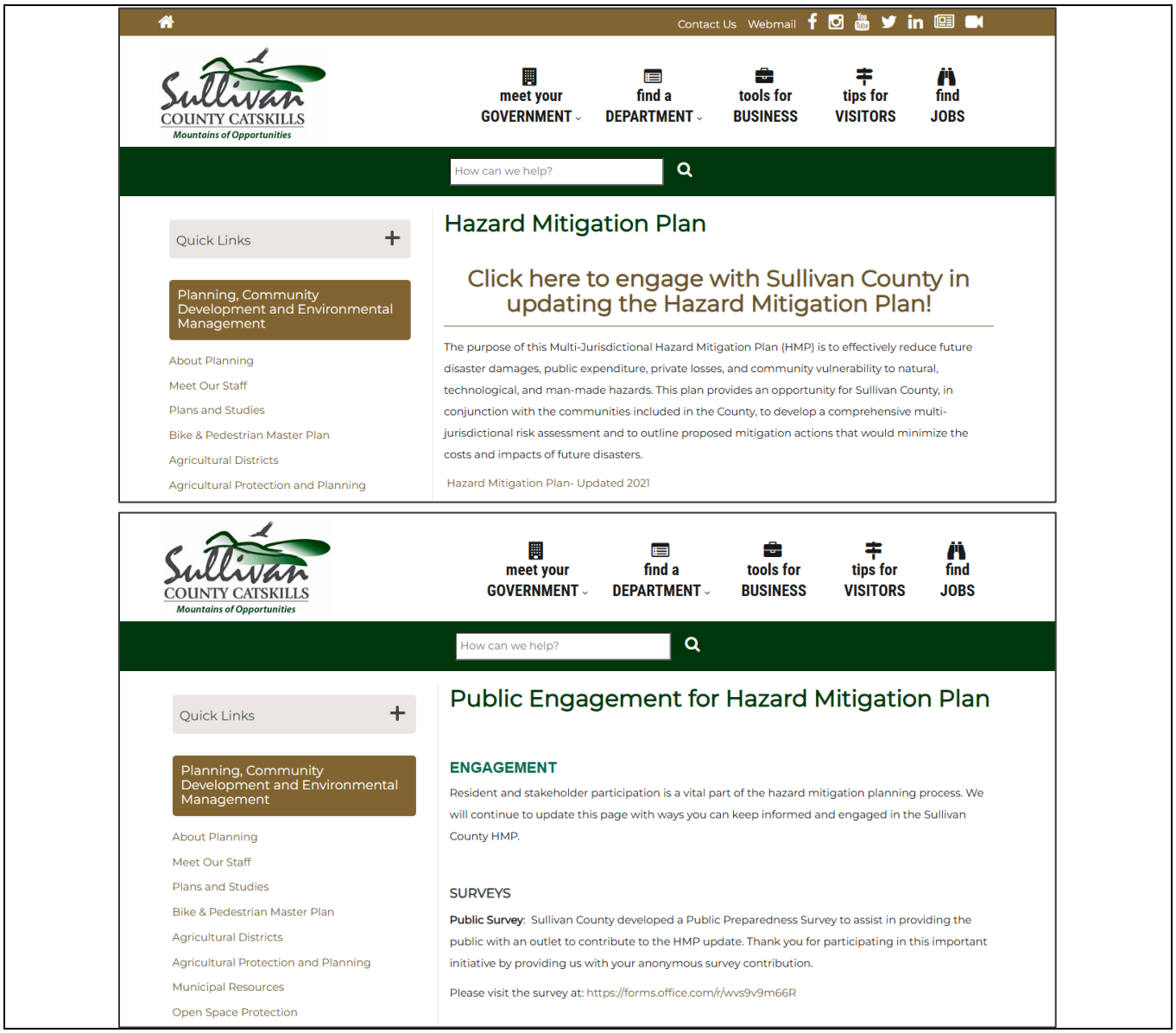
The Steering Committee and Planning Partnership made the following efforts toward public participation in the development and review of the HMP update:

- The public was informed of the hazard mitigation planning effort commencement at the kickoff meeting and through press releases, social media, and public service announcements released throughout the planning process. Copies of these announcements may be found in Appendix C.
- Media releases were issued by the County.
- The Sullivan County website (https://www.sullivanny.gov/Departments/PlanningEnvironmental/PlansandStudies/HazardMitigationPlan) and MitigateNY platform (sullivan.hazardmitigation.ny.gov) were utilized to contain a project overview, contact information, access to the public survey, and chapters of the HMP for review and comment
- All Planning Partners were encouraged to distribute press releases on the project, including links to the project webpage and public surveys.

- Surveys were distributed to the public. A summary of survey results is provided later in this section. An example survey and full results are included in Appendix C.
- A public information meeting on the HMP update process was held on November 13, 2025.
- The digital plan was accessible through the Sullivan County library system, with librarians available to assist those who wished to review the plan.
- The draft plan was posted to the public website as of May 6, 2026, for public review and comment. All public comments were directed to the Sullivan County Division of Planning, Community Development and Environmental Management for collection and review by the Steering Committee. Only one public comment was received during the Sullivan County Hazard Mitigation Plan's draft plan review period. The comment received praised the thoroughness of the plan and did not require any changes to the plan.
- Once submitted to NYS DHSES and FEMA, the final plan will be available for public review and comment in the same manner and format as the draft plan, as well as in hard-copy format at the locations identified in Chapter 18.

Examples of virtual outreach are provided in Figure 2-1.

Figure 2-1. Sullivan County Online Outreach



2.5.2 Public Survey Summary

An online survey was developed to gauge household preparedness for hazards that may impact Sullivan County and to assess the level of knowledge of tools to assist in reducing risk from those hazards. The survey asks quantifiable questions about citizen perception of risk, knowledge of mitigation, and support of community programs. The survey also asks several demographic questions to help analyze trends.

The survey was posted on the County website on November 25, 2025, and was available through February 3, 2026 for public input. All Planning Partners were requested to advertise the availability of the survey via local homepage links, and other available public announcement methods (Facebook, X, email blasts, etc.). As of February 3, 2026, the survey received 186 responses. A summary of survey results follows; full results are provided in Appendix C of this plan.

Survey respondents were from 19 municipalities within Sullivan County, with 52.2 percent having lived in the County for 20 years or more. The most self-selected jurisdictions respondents indicated that they live in were the Town of Bethel, the Town of Liberty and the Town of Thompson. The most common age of respondents was between the ages of 45 and 54 (23.7 percent).

Survey respondents identified the following as the top 5 most frequently occurring natural hazard events within Sullivan County in the past five years:

- Severe winter storms—blizzard, extreme cold, heavy snow, ice storm (76.3 percent)
- Severe storms—extreme heat, hail, lightning, high wind, thunderstorm, tornado (73.1 percent)
- Pandemic (58.1 percent)
- Flood (33.9 percent)
- Drought (29.6 percent)

The majority (56.5 percent) of residents receive information concerning a natural hazard through online news sources. Less than half receive information through TV news (36.6 percent) or radio news (42.5 percent). Respondents identified the following as desired projects to implement to reduce the damage due to natural hazards:

- Emergency plans for drought considering many municipalities are on private well water
- Strengthening the communication system, including improved internet and cellular coverage
- More training and public safety outreach to residents to reduce risk
- Improved firefighting capabilities

Respondents were given the opportunity to propose their own projects they would like to see implemented in Sullivan County. Suggestions included improving capabilities, communication, and mitigation of flood-prone infrastructure.

Respondents were asked about their property's location within the floodplain and if they have flood insurance. Of the 184 respondents who answered this question, only 11 (5.98 percent) indicated that their property is located in a designated floodplain. However, 18 residents (9.9 percent) indicated their home is covered by flood insurance.

Jurisdiction-specific responses can be found in Volume II. Appendix C (Public and Stakeholder Outreach) includes the full survey and list of survey responses.

2.6 INCORPORATION OF EXISTING PLANS, STUDIES, REPORTS AND TECHNICAL INFORMATION

The Sullivan County HMP uses the best available information to support hazard profiling, risk assessment, review and evaluation of mitigation capabilities, and the development and prioritization of County and local mitigation strategies. Plans, reports, and other technical information were identified and accessed online through independent research by the planning consultant or provided directly by the Planning Partners and stakeholders involved in the planning effort. Detailed sources of technical data and information used are listed in the References section.

The Planning Partners provided relevant jurisdiction-specific planning and regulatory documents, which were reviewed to identify:

- Existing jurisdictional capabilities

- Needs and opportunities to develop or enhance capabilities, which may be identified in the County or local mitigation strategies
- Mitigation-related goals or objectives, considered in the review and update of the overall Goals and Objectives (see Section 17.2)
- Proposed, in-progress, or potential mitigation actions to be incorporated into the updated County and local mitigation strategies

The following regulations, codes, ordinances, and plans were reviewed to develop mitigation planning goals and objectives and mitigation strategies that are consistent across local and regional planning and regulatory mechanisms:

- Comprehensive/master plans
- Building codes
- Zoning and subdivision ordinances
- Flood insurance studies
- Flood insurance rate maps
- NFIP flood damage prevention ordinances
- Site plan requirements
- Local waterfront revitalization plans
- Stormwater management plans
- Emergency management and response plans
- Land use and open space plans
- Capital plans
- Climate Smart Communities program
- Community Rating System
- 2023 New York State Hazard Mitigation Plan

The Planning Partners were tasked with updating the assessment of their planning and regulatory capabilities (see capability assessment section of each jurisdictional annex in Volume II). They reviewed relevant plans contributing to the capability of the County and each jurisdiction to integrate effective mitigation efforts into their daily activities. This review is reflected in the capability assessment table in each of the municipal annexes. These tables list plan types, names, and dates, as well as a summary of how each plan supports mitigation and resilience.

2.7 INTEGRATION WITH EXISTING PLANNING MECHANISMS AND PROGRAMS

Effective mitigation is achieved when hazard awareness and risk management approaches and strategies become an integral part of public activities and decision-making. Many existing plans and programs support hazard mitigation in the County. It is critical that this HMP integrate, coordinate with, and complement, those existing plans and programs.

The capability assessment presented in Chapter 16 provides a summary and description of the existing plans, programs, and regulatory mechanisms at all levels of government (federal, state, county and local) that support

hazard mitigation in the County. In the jurisdictional annexes in Volume II, each Planning Partner identifies how it has already integrated hazard mitigation into its planning, regulatory and administrative framework ("integration capabilities") and how it intends to promote this integration ("integration actions").

A description of continued efforts toward a holistic approach to hazard mitigation is presented in Chapter 18.

2.8 PLAN ADOPTION

Adoption by the local governing bodies of each Planning Partner demonstrates the commitment of the Planning Partners to fulfill the mitigation goals and strategies outlined in this HMP. Adoption via a municipal resolution legitimizes the HMP and authorizes responsible agencies to execute their responsibilities.

Adoption of the HMP provides the following advantages:

- It lends authority to the plan to serve as a guiding document for all local and state government officials.
- It gives legal status to the plan in the event it is challenged in court.
- It certifies to program and grant administrators that the plan's recommendations have been properly considered and approved by the jurisdictions' governing authority and citizens.
- It helps to ensure the continuity of mitigation programs and policies over time because elected officials, staff, and other community decision-makers can refer to the official document when making decisions about the community's future.

Source: FEMA. 2003. How to Series: Bringing the Plan to Life (FEMA 386-4).

All Planning Partners will proceed with formal adoption proceedings. Each jurisdiction must submit a copy of its formal adoption resolution or other legal instrument to the Sullivan County HMP Coordinator in the Sullivan County Division of Planning, Community Development and Environmental Management. Sullivan County will forward the executed resolutions to DHSES, after which they will be forwarded to FEMA for the record. FEMA allows two options for submitting adoption resolutions:

- **Submittal of adoption resolutions with plan**—All Planning Partners provide documentation of plan adoption when the HMP is initially submitted to the state for review. After receiving the draft plan from the state, FEMA conducts its review and will approve the HMP if it meets all requirements.
- **Approvable pending adoption**—A draft HMP is submitted to the state and FEMA for approval prior to adoption by the jurisdictions. When FEMA determines that the HMP as a whole and each Planning Partner have met all the requirements except adoption, FEMA will inform the state that the HMP is "approvable pending adoption" (APA). After that, once FEMA receives documentation of adoption resolutions from at least one jurisdiction, the status is changed from APA to approved for the entire plan and for that jurisdiction. Other jurisdictions that participated in the planning process then receive approval once they pass their own adoption resolutions. A jurisdiction with a plan in APA status does not meet the requirement for an approved mitigation plan to apply for and receive funding assistance.

FEMA will transmit acknowledgement of verification of formal plan adoption and the official approval of the HMP to the Sullivan County HMP Coordinator. The HMP approval date begins the five-year approval period and sets the expiration date for the plan. All Planning Partners will have the same expiration date regardless of their own jurisdiction's adoption date. The date indicated on FEMA's approval letter is the official approval date.

The resolutions issued by each jurisdiction to support adoption of this HMP are included in Appendix A.

2.9 CONTINUED PUBLIC INVOLVEMENT

The Planning Partners are committed to the continued involvement of the public in the hazard mitigation process. This HMP update will be posted online at the locations listed below, and jurisdictions will be encouraged to maintain links to the HMP website. Further, the County will make the HMP available for review on the County website and via MitigateNY.

- Sullivan County Website: https://www.sullivanny.gov/Departments/PlanningEnvironmental/PlansandStudies/HazardMitigationPlan
- MitigateNY: sullivan.hazardmitigation.ny.gov

A notice regarding annual updates of the HMP will be publicized annually after the Planning Partnership's annual evaluation and posted on the public websites listed above.

Each jurisdiction's governing body will be responsible for receiving, tracking, and filing public comments regarding this plan.

The public will have an opportunity to comment on the HMP as a part of the annual mitigation planning evaluation process and the next five-year mitigation plan update. The HMP Coordinator is responsible for coordinating the plan evaluation portion of the meeting, soliciting feedback, collecting, and reviewing the comments, and ensuring their incorporation in the 5-year plan update as appropriate; however, members of the Planning Partnership will assist the HMP Coordinator. Additional meetings may also be held as deemed necessary by the Planning Partnership. The purpose of these meetings would be to provide the public an opportunity to express concerns, opinions, and ideas about the plan.

After completion of this plan, implementation and ongoing maintenance will continue to be a function of the Planning Partnership. The Planning Partnership will review the HMP and accept public comment as part of an annual review and as part of five-year mitigation plan updates.

A notice regarding annual updates of the HMP and the location of plan copies will be publicized annually after the HMP Committee's annual evaluation and posted on the public web site.

Heather Brown of the Sullivan County Division of Planning, Community Development and Environmental Management has been identified as the ongoing County HMP Coordinator (see Chapter 18), and is responsible for receiving, tracking, and filing public comments regarding this HMP update. Contact information is:

Mailing Address:	Sullivan County Division of Planning, Community Development and Environmental Management 100 North Street, PO Box 5012 Monticello, NY 12701
Contact Name:	Heather Brown
Email Address:	Heather.Brown@sullivanny.gov
Telephone:	(845) 807-0527

Further details regarding continued public involvement are provided in Chapter 18.

3. COUNTY PROFILE

The planning area for this HMP is the entirety of Sullivan County. This chapter presents general information about the land, people, and assets of Sullivan County. This information provides a baseline for understanding the economic, structural, and population assets at risk from the hazards addressed in this HMP.

3.1 LOCATION

Sullivan County is in southern New York State along the Delaware River, where the river is the border between New York and Pennsylvania. The county is southeast of the City of Binghamton and southwest of the City of Albany. Sullivan County has a total area of 949.5 square miles. Figure 3-1 shows Sullivan County and its municipalities.

3.2 JURISDICTIONS WITHIN THE COUNTY

Sullivan County includes 15 towns and 7 villages, as listed in Table 3-1. The Sullivan County seat is the Village of Monticello. The Town of Rockland is the largest municipality in Sullivan County, at 93.1 square miles. The Village of Jeffersonville is the smallest, at 0.4 square miles.

Table 3-1. Sullivan County Local Jurisdictions

Towns		
Town of Bethel Town of Callicoon Town of Cochecton Town of Delaware Town of Fallsburg	Town of Forestburgh Town of Fremont Town of Highland Town of Liberty Town of Lumberland	Town of Mamakating Town of Neversink Town of Rockland Town of Thompson Town of Tusten
Villages		
Village of Ateres Village of Bloomingburg Village of Jeffersonville	Village of Liberty Village of Monticello	Village of Woodridge Village of Wurtsboro

3.3 PHYSICAL SETTING

3.3.1 Water Resources

The County is home to several rivers, including the Delaware, Ten Mile, Mongaup, and Neversink Rivers, as well as various reservoirs such as the Neversink and Swinging Bridge reservoirs. In addition, the County's landscape features several lakes, ponds, brooks, and creeks. The Delaware River, which forms the County's border with Pennsylvania, is an important aesthetic, economic, environmental, and cultural resource. The Delaware and Hudson Canal is also significant, as it was a crucial transportation route for anthracite coal from Pennsylvania to New York City, significantly impacting the region's economy and development. While much of the canal has been drained and filled, various sections are preserved and protected for historical value.

New York State consists of 17 major watersheds. Sullivan County is mostly located in the Delaware River Watershed, with smaller portions located in the Lower Hudson Watershed. Figure 3-2 shows the location of watersheds in New York State, with the approximate location of Sullivan County circled.

Figure 3-1. Sullivan County Hazard Mitigation Plan Area

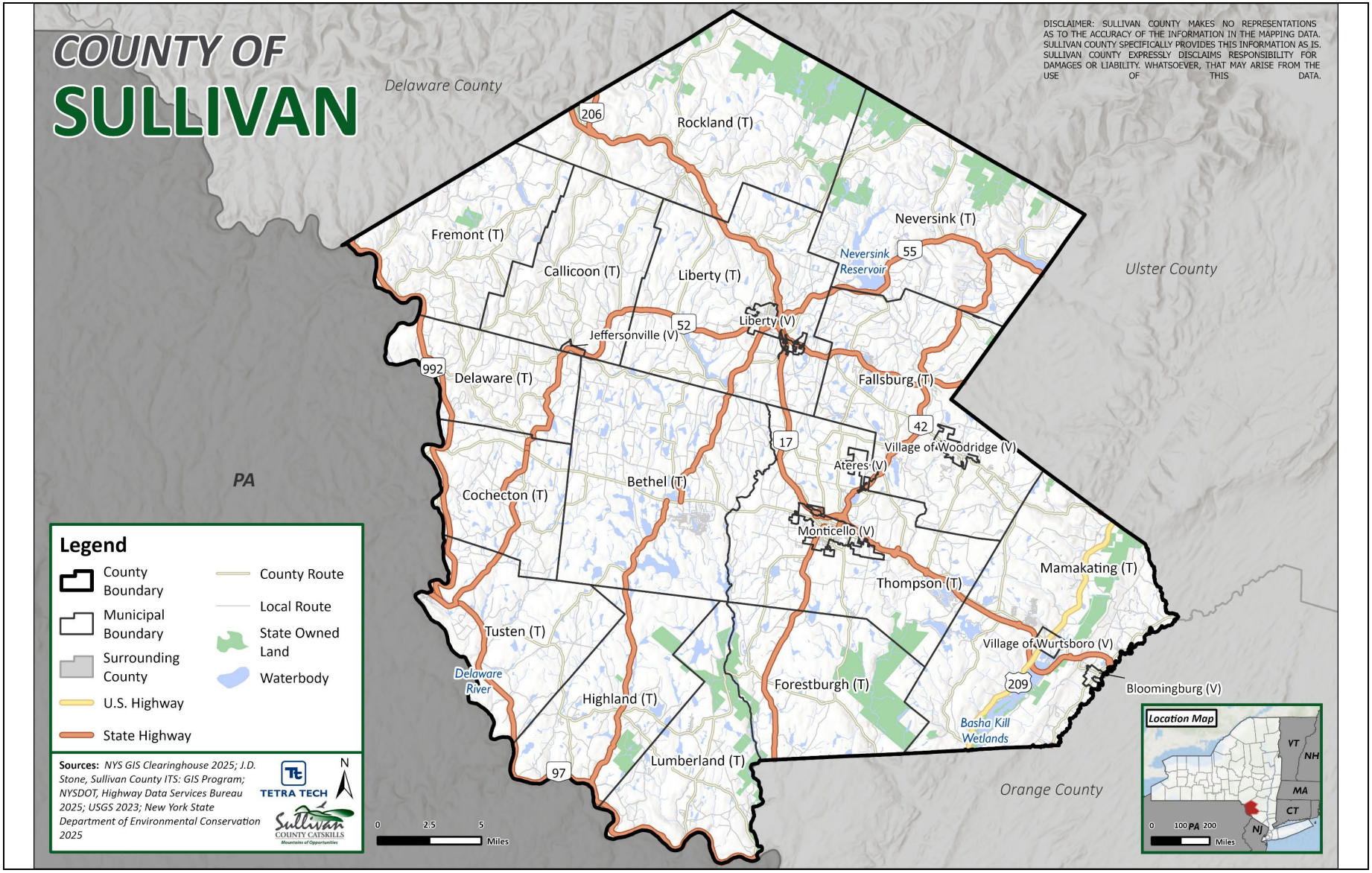
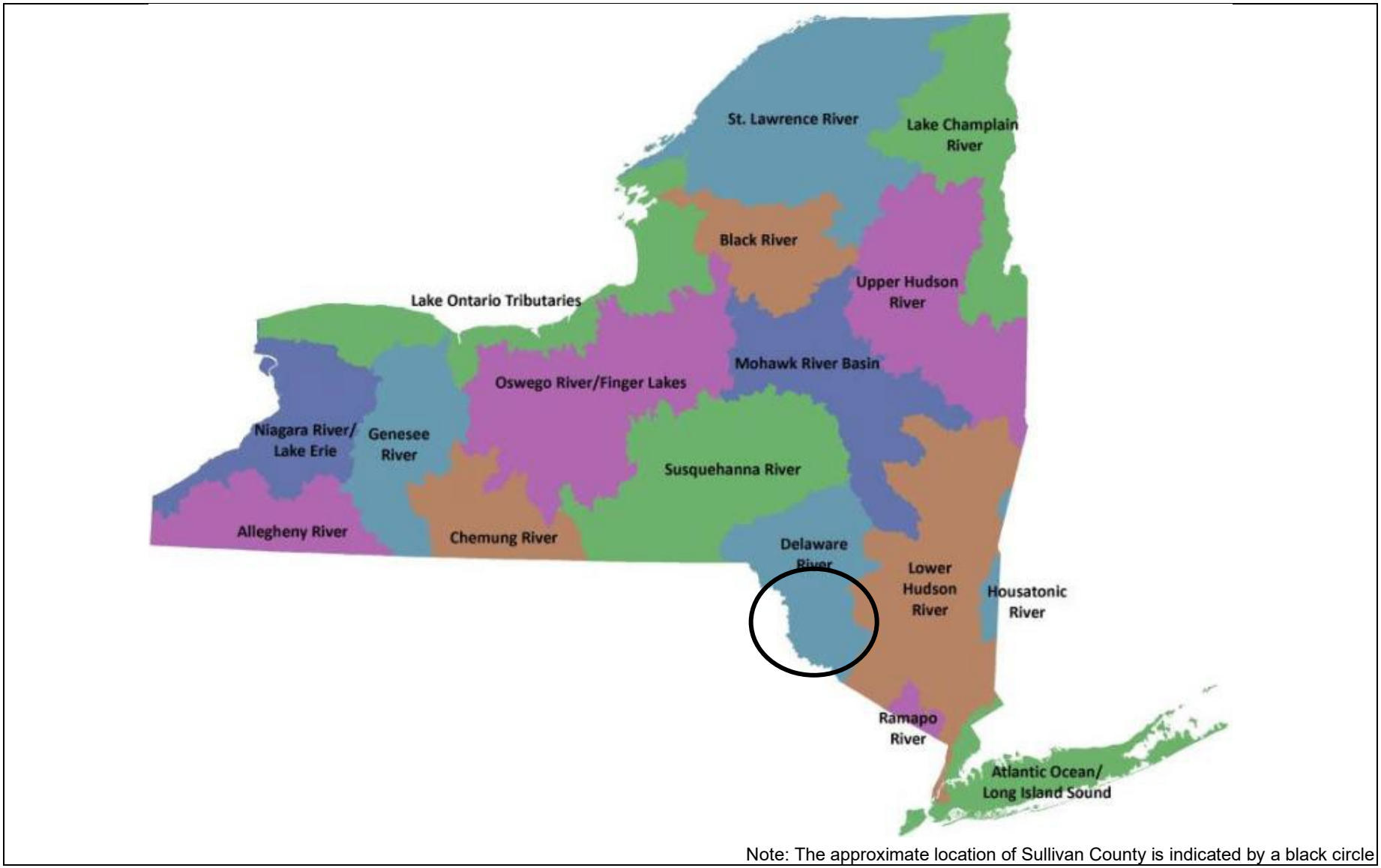


Figure 3-2. Watersheds in New York State



Note: The approximate location of Sullivan County is indicated by a black circle

Source: (NYSDEC 2024c)

3.3.2 Topography and Geology

Sullivan County is characterized by rolling hills in the southwest, which rise to the Catskill Mountains in the north and the Shawangunk Mountains to the southeast. The northeastern portion of the County is located in the Catskill Park. The terrain is generally hilly, with higher elevations in the northern portion of the County, ranging from 460 to over 3,000 feet above sea level. The highest point in the County, unofficially named Beech Mountain, near Hodge Pond in the Town of Rockland, is located in the Catskill Park at an elevation of 3,118 feet above sea level.

3.3.3 Climate

The climate of Sullivan County is of the humid continental type, with warm summers and cold winters. Humid continental climates are known for their variable weather conditions, due to their location between the polar and tropic air masses. Polar air masses collide with tropical air masses, causing uplift of the moist tropical air and resulting in precipitation.

Since Sullivan County is far removed from the moderating effects of the ocean, the climate experiences great swings in seasonal temperature. Temperatures average 80 °F in July with lows of about 10 °F in January, and the year-round average temperature is about 45 °F. The freeze-free season between the last spring and first fall freeze is about 100 to 120 days in the Catskills, with longer seasons of 120 to 150 days in the lower elevations of the County (NYSERDA 2024).

Rainfall is well distributed throughout the year and averages 47 inches annually. Annual snowfall exceeds 70 inches and provides snow cover in the Catskill Mountains for most of the winter. Upland portions of the Catskills in northern Sullivan County receive up to 120 inches of snowfall.

3.3.4 Land Cover

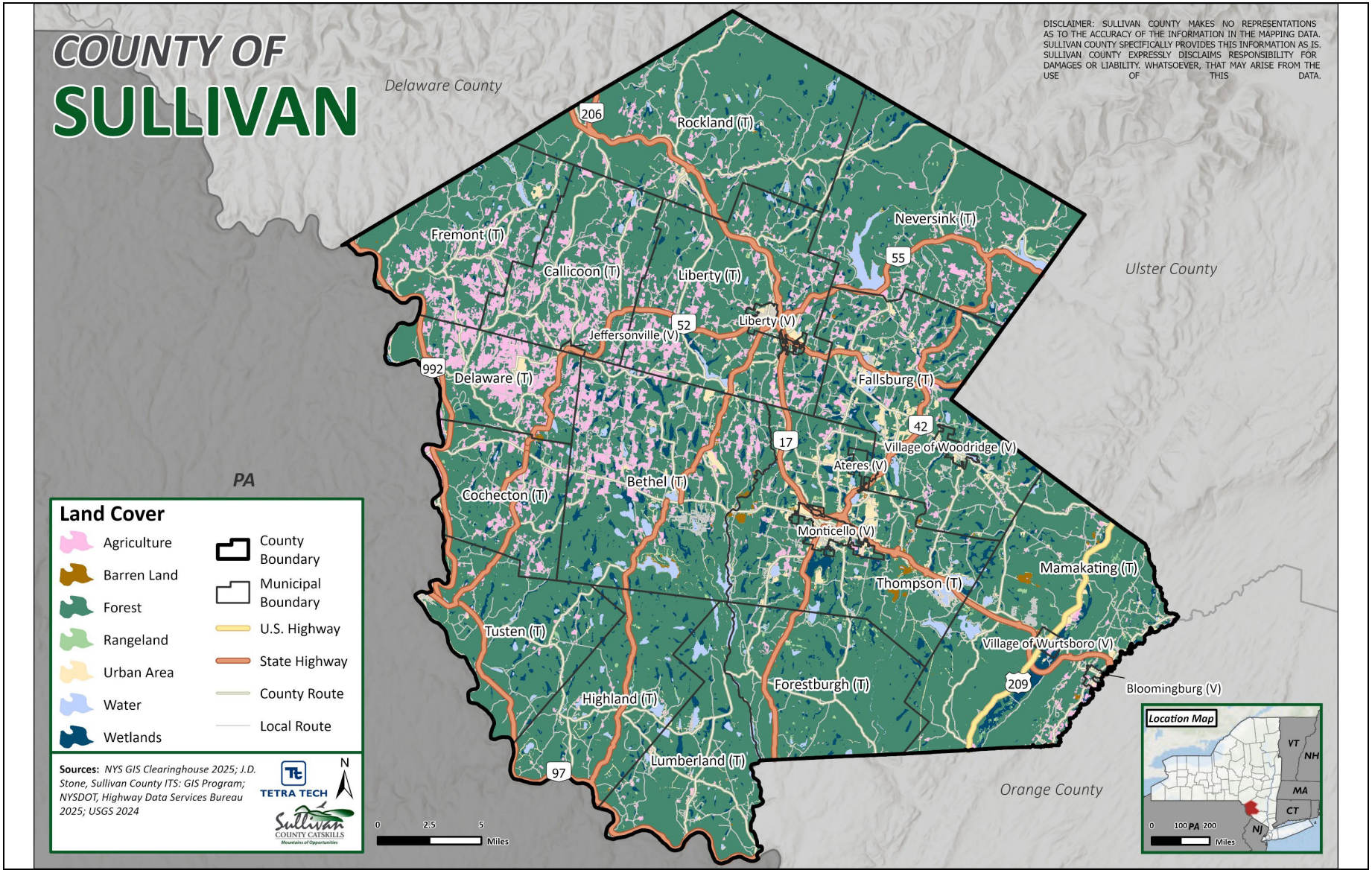
Large portions of Sullivan County remain undeveloped, creating large areas of open space. The County is 75.3 percent forested, placing it among the more forested counties in New York State. Table 3-2 and Figure 3-3 summarize the county's land cover.

Table 3-2. Sullivan County 2020 Land Cover Classification

Category Description	Total Area in Category	
	Acres	% of Total
Agriculture	48,333.0	7.6%
Barren Land	1,810.3	0.3%
Forest	480,022.4	75.3%
Rangeland	4,246.3	0.7%
Urban Area	60,137.0	9.4%
Water	15,129.1	2.4%
Wetland	27,911.5	4.4%
Sullivan County	**637,589.7**	**100.0%**

Source: USGS 2024, NLCD 2024

Figure 3-3. Sullivan County Land Use and Land Cover



3.4 LAND USE

Hazard mitigation planning considers land use trends, which can impact the need for, and priority of, mitigation options over time. Land use trends can also significantly affect vulnerability to hazards and the potential impacts from hazard events. For example, significant development in a hazard area increases the building stock and population exposed to that hazard.

Local jurisdictions in Sullivan County develop their own planning and zoning regulations, often fashioned to meet the County's goals. Development decisions made at the local level influence land use patterns and affect the County as a whole. Opportunities to encourage growth in areas that support a diversified economy while retaining the unique qualities of Sullivan County are achievable if the municipalities support and share a unified vision and have the tools to accomplish them (Sullivan County 2010).

Current land use in the County ranges from densely populated areas and farming communities to open spaces that include the Catskill Park, the Upper Delaware Scenic and Recreational River, Basha Kill Wildlife Management Area (WMA), and Shawangunk Ridge. Active agriculture uses include livestock, poultry, and their products, orchards, and row cropping. Other land uses include commercial, industrial, recreational, conservation, and vacant land.

3.4.1 Residential and Commercial

Residential patterns have been largely respectful to the land, focusing on dense main streets or low-density, low impact uses like camping and farming. These uses have allowed 30,000 acres of Sullivan County's forests to remain in the top 1 percent of forests in the Hudson Valley Region, due to their size, connectedness, habitat diversity, and ability to sequester carbon (Sullivan County 2024).

3.4.2 Agriculture

According to the 2022 Census of Agriculture, the number of farms in Sullivan County increased by one farm in the five years since the previous census. Total farmland and the average size of each farm dropped 2 percent over that period. Despite the decrease in acreage, the market value of products sold in the Sullivan County agricultural economies increased by 32 percent (USDA 2024).

The County has a well-developed poultry and eggs sector and is ranked sixth in the state in value of sales for that commodity group. Additionally, Sullivan County ranks 20th in the state and 52nd in the nation for the value of its sales in cut Christmas trees and short rotation woody crops (USDA 2024).

Article 25AA of the New York State Agriculture and Markets Law allows counties to create agricultural districts to protect and promote the agriculture industry. Each district must be reviewed on an 8-, 10-, or 12-year basis to see if it is still achieving its intended purpose. In Sullivan County, districts are reviewed every eight years. The first agricultural district in Sullivan County was established in 1975. The County currently has two agricultural districts, which cover approximately 250,000 acres (Sullivan County n.d.). Agricultural District #1 consists of the Towns of Bethel, Callicoon, Cochecton, Delaware, Fremont, Liberty, Thompson, and Tusten. Agricultural District #4 includes lands in the Towns of Bethel, Highland, Fallsburg, Forestburgh, Liberty, Lumberland, Mamakating, Neversink, Rockland, Thompson, and Tusten and the Villages of Ateres, Bloomingburg, and Wurtsboro (Sullivan County 2023).

3.4.3 Natural and Recreational Areas

The Catskill New York Forest Preserve is comprised of state-owned land within the Catskill Park and is designated as "forever wild," to serve as a watershed, recreation area, and ecologic and scenic reserve. The remainder of the Catskill Park is privately owned (NYSDEC 2014). The Basha Kill WMA, with over 3,000 acres of wetlands, upland areas, and other wildlife habitat, is the largest freshwater wetland in southeastern New York State (NYSDEC 2024a).

The Shawangunk Ridge State Forest is located in the southeast corner of the County, adjacent to Basha Kill WMA. The Ridge contains many rare plant and animal species and provides a pristine watershed for public drinking water supplies. The Ridge contains many large tracts of undisturbed forestland, due to the thousands of acres purchased by the Open Space Institute and The Nature Conservancy. The area also includes the Wurtsboro Ridge State Forest, which protects Basha Kill WMA and the Shawangunk Ridge watershed (NYSDEC 2017).

The Delaware River provides numerous recreational opportunities while supporting a healthy ecosystem for wildlife and providing water for over 17 million people. The Delaware River corridor along the state boundary between New York State and Pennsylvania is designated as the Upper Delaware Scenic and Recreational River (S&RR). The Upper Delaware S&RR provides sightseeing, boating, camping, hunting, fishing, hiking, and bird watching opportunities (NPS 2025b).

3.5 POPULATION AND DEMOGRAPHICS

3.5.1 Current Population

According to the U.S. Census Bureau's 2023 American Community Survey (ACS) 5-year estimates, Sullivan County has a population of 79,147 people. Of this total 16.8 percent resides in the Town of Fallsburg. Figure 3-4 depicts the distribution of the County's population density.

3.5.2 Population Trends

Population trend information was evaluated to estimate future shifts that could significantly change the character of the area. Population trends can provide a basis for making decisions on the type of mitigation approaches to consider and the locations in which these approaches should be applied. This information can also be used to support planning decisions regarding future development in vulnerable areas.

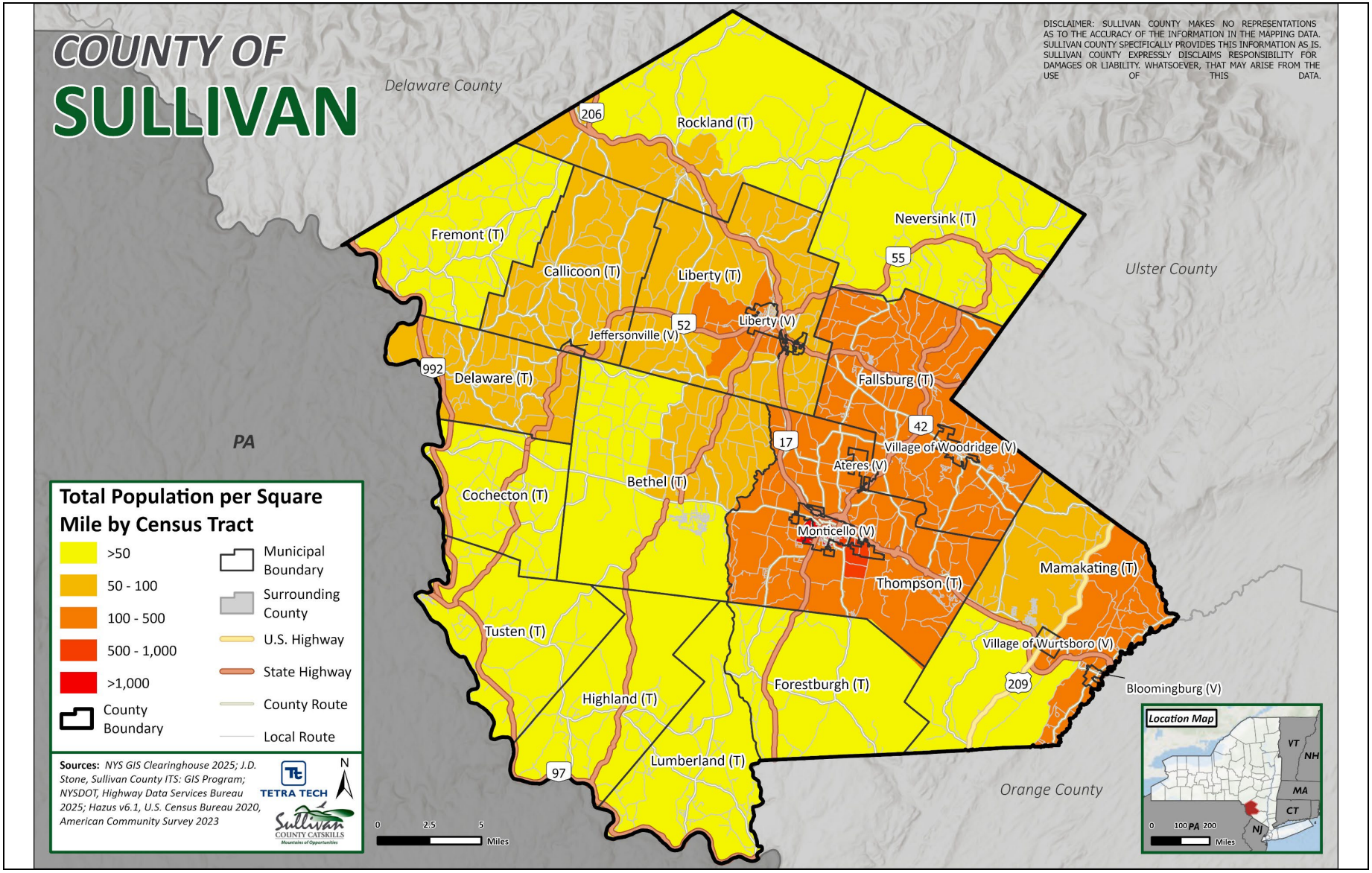
As seen in Table 3-3, Sullivan County's population has increased over each decade since 1960. The population projections for Sullivan County from Cornell University for the next two decades anticipate a peak in population in 2030, followed by a drop in population.

Table 3-3. Historical and Projected Population Change in Sullivan County

Historical Sullivan County Population							Projected Sullivan County Population	
1960	1970	1980	1990	2000	2010	2020	2030	2040
45,272	53,161	65,155	69,277	73,966	77,547	78,643	79,082	77,165

Source: (Cornell University 2017)

Figure 3-4. Population Density Distribution in Sullivan County



3.5.3 At-Risk Populations

At-risk populations can be more susceptible to hazard events based on their physical or financial ability to react or respond during a hazard, as well as the location and construction quality of their housing. This HMP considers several at-risk population groups: persons over the age of 65, persons under the age of 5, non-English-speaking persons, persons with disabilities, and persons living below the poverty level (as defined by the U.S. Census Bureau). Additional at-risk populations important to Sullivan County, but not included in the vulnerability assessment due to data restraints include:

- Unsheltered homeless –Sullivan County counted 14 individuals in January 2026 who were living in cars or outside, on top of the 25-30 who use the Warming Centers in the Town of Liberty and Village of Monticello
- Orthodox neighborhoods – both from the standpoint of vulnerability to antisemitic hate crime, limited English proficiency among the young people in their community, and the large numbers of young children who live in these neighborhoods.
- Large portions of the population in the Town of Fallsburg, Town of Liberty, and Village of Monticello speak Spanish as their primary language. The County is concerned with the families who reside near or on agricultural production facilities because there are frequent concerns with the safety and quality of housing.

Table 3-4 provides 2023 ACS 5-Year population estimates for these at-risk populations for each municipality in the County. The distributions of the general population density (persons per square mile) for these metrics are shown in Figure 3-5.

In Sullivan County, 19 percent of the population is over the age of 65 and 5.9 percent of the population is under the age of 5. Persons living below the poverty line account for 14.6 percent of the total County population, person with a disability account for 14.7 percent, and non-English-speaking persons account for 4.1 percent (U.S. Census 2023b).

3.6 ECONOMY

3.6.1 Major Institutions

Major businesses in Sullivan County's include Kohl's Northeast Regional Distribution Center and Crystal Run Healthcare. The Center for Discovery has expanded its operations to become the largest employer in the County, providing jobs to over 1,600 persons. Table 3-5 shows the County's top employers list, as of 2024 (Sullivan County Partnership for Economic Development n.d.).

With a rich Catskills history and natural beauty, Sullivan County is a premier tourist destination. The openings of Resorts World Casino, YO1 Health Resort, and the Kartrite Water Park that began in 2018 have resulted in the growth of new small businesses and the creation of over 2,000 new jobs (Sullivan County 2021).

3.6.2 Employment

The 2023 Economic Surveys Business Patterns data identified 2,061 business establishments employing 22,087 people in Sullivan County. The construction industry has the greatest number of establishments in the County, with 277. This is followed by the retail trade industry with 273 establishments, and the accommodation and food services industry with 255 establishments (U.S. Census 2023a).

The 2023 ACS 5-year estimates indicate there are 415 individuals in the County's agriculture, forestry, fishing, or hunting industry. Farms are important to the county's history and identity, and agriculture bolsters other sectors such as hospitality and tourism. However, farms are not large employers, with an average of fewer than 2 employees per venture and contributing only 0.1 percent to the County's $3.98 billion gross domestic product in 2022 (Sullivan County 2024).

Table 3-4. Sullivan County Population and Demographic Statistics from the 2023 ACS

	Total Population	65 and Older		5 and Younger		Non-English-Speaking		Disability		Below Poverty Level	
		Population	% of Total	Population	% of Total	Population	% of Total	Population	% of Total	Population	% of Total
Ateres (V)	834	-	-	-	-	-	-	-	-	-	-
Bethel (T)	3,997	1,105	27.6%	147	3.7%	200	5.0%	633	15.8%	604	15.1%
Bloomingburg (V)	1,022	59	5.8%	288	28.2%	200	19.6%	83	8.1%	596	58.3%
Callicoon (T)	2,594	566	21.8%	72	2.8%	15	0.6%	400	15.4%	142	5.5%
Cochecton (T)	1,392	405	29.1%	91	6.5%	10	0.7%	192	13.8%	117	8.4%
Delaware (T)	2,301	537	23.3%	63	2.7%	7	0.3%	296	12.9%	247	10.7%
Fallsburg (T)	13,292	1,989	15.0%	608	4.6%	573	4.3%	1,812	13.6%	2,511	18.9%
Forestburgh (T)	829	270	32.6%	24	2.9%	5	0.6%	106	12.8%	39	4.7%
Fremont (T)	1,204	327	27.2%	56	4.7%	0	0.0%	226	18.8%	85	7.1%
Highland (T)	2,007	589	29.3%	26	1.3%	0	0.0%	565	28.2%	173	8.6%
Jeffersonville (V)	417	80	19.2%	9	2.2%	0	0.0%	85	20.4%	88	21.1%
Liberty (T)	5,196	863	16.6%	454	8.7%	200	3.9%	950	18.3%	416	8.0%
Liberty (V)	5,083	689	13.6%	528	10.4%	314	6.2%	967	19.0%	880	17.3%
Lumberland (T)	2,276	310	13.6%	128	5.6%	32	1.4%	173	7.6%	231	10.1%
Mamakating (T)	10,456	1,532	14.7%	839	8.0%	217	2.1%	1,493	14.3%	898	8.6%
Monticello (V)	7,252	974	13.4%	497	6.9%	664	9.2%	1,100	15.2%	2,088	28.8%
Neversink (T)	3,381	680	20.1%	105	3.1%	338	10.0%	662	19.6%	235	7.0%
Rockland (T)	3,323	914	27.5%	112	3.4%	133	4.0%	655	19.7%	535	16.1%
Thompson (T)	8,628	2,451	28.4%	481	5.6%	289	3.3%	1,492	17.3%	1,221	14.2%
Tusten (T)	1,528	293	19.2%	31	2.0%	0	0.0%	231	15.1%	134	8.8%
Woodridge (V)	954	165	17.3%	55	5.8%	37	3.9%	190	19.9%	182	19.1%
Wurtsboro (V)	1,181	260	22.0%	42	3.6%	32	2.7%	148	12.5%	125	10.6%
Sullivan County (Total)	**79,147**	**15,058**	**19.0%**	**4,656**	**5.9%**	**3,268**	**4.1%**	**12,459**	**15.7%**	**11,547**	**14.6%**

Source: U.S. Census Bureau 2023 ACS Vulnerable Population

Note: Bloomingburg (V) is 100% located within Mamakating (T); Jeffersonville (V) is 100% located within Callicoon (T); Liberty (V) is 100% located within Liberty (T); Monticello (V) is 100% located within Thompson (T); Woodridge (V) is 100% located within Fallsburg (T); Wurtsboro (V) is 100% located within Mamakating (T).

Note: Ateres (V) is not listed on the U.S. Census Bureau's website, given its newly formed development. Vulnerable Populations were not analyzed due to lack of data.

Figure 3-5. At-Risk Populations In Sullivan County

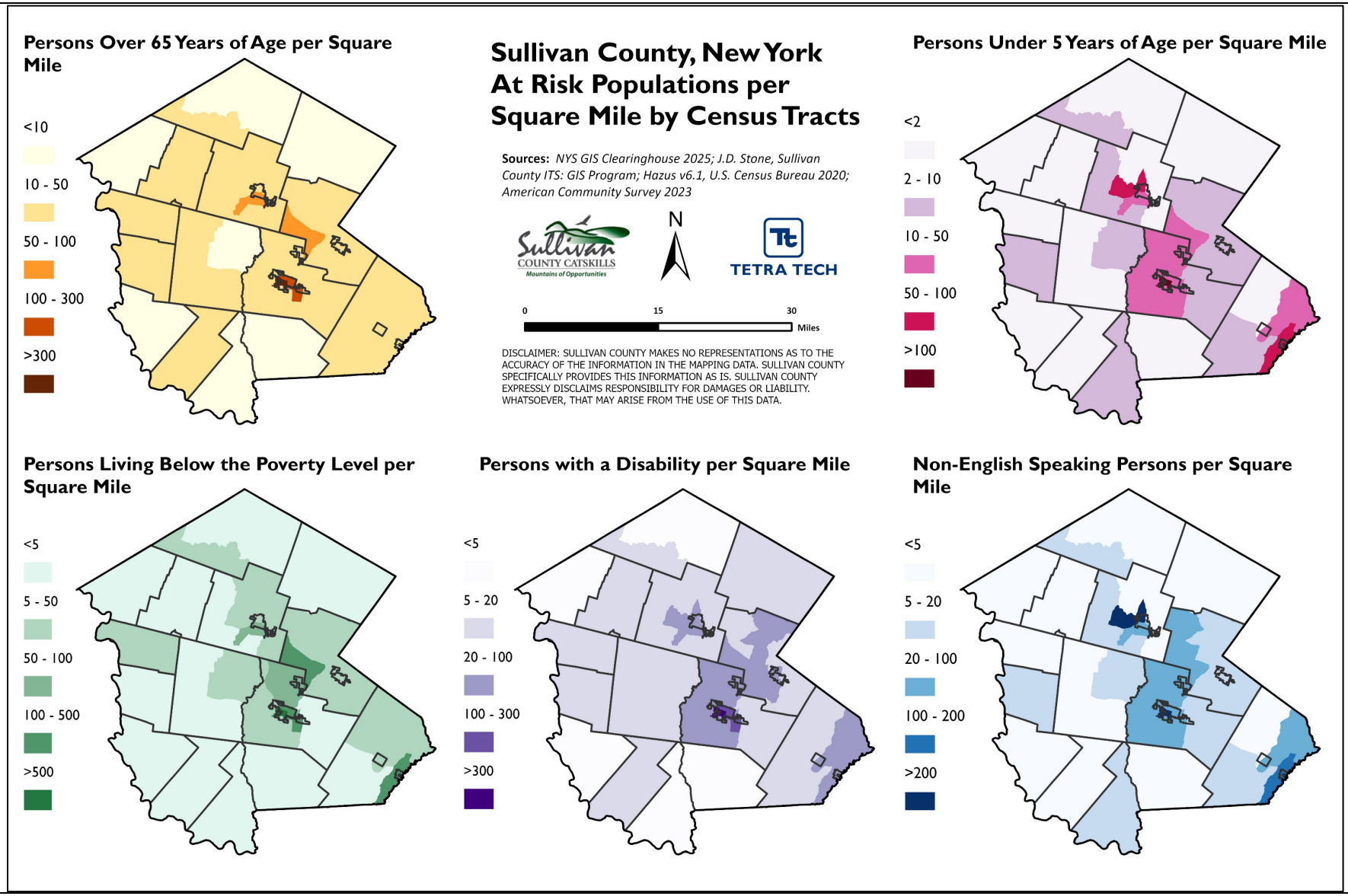


Table 3-5. Sullivan County Top Employers List, 2024

Company/Agency	Number of Employees
The Center for Discovery	1,723
Resorts World Catskills	1,090
Sullivan County Government Center	937
The Arc New York (formerly NYSARC, Inc)	756
Monticello Central School District	728
New Hope Community Inc.	654
Garnet Health Medical Center- Catskills	611
Woodbourne Correctional Facility	425
Kohls Corporation	421
Rolling V Bus Corporation	408
Liberty Central School District	351
Hudson Valley Foie Gras	337
Murray Bresky Consultants	326
ShopRite Supermarket – Liberty & Monticello	322
Sullivan County Board of Cooperative Educational Services	289
Villa Roma Resort	273
The Kartrite Resort & Indoor Waterpark	224

Source: (Sullivan County Partnership for Economic Development n.d.)

3.6.3 Income

The average salary in the County according to the 2023 ACS 5-year estimates was $69,826, which is below the state ($84,578) and national ($78,538) figures (U.S. Census 2023b).

3.6.4 Economic Trends

For the 12-month period ending August 2025, the private sector jobs count in the Hudson Valley Region rose by 11,300, or 1.4 percent, to 843,100. Gains were largest in private education and health services (+7,500), leisure and hospitality (+1,900), other services (+800), trade, transportation and utilities (+800), financial activities (+600), professional and business services (+400) and manufacturing (+300). Employment losses were greatest in information (-800) and mining, logging and construction (-200). Private sector job growth was spread throughout the region; the second fastest growth was recorded in Sullivan County (+1.9 percent) (NYSDOL 2025).

3.7 GENERAL BUILDING STOCK

3.7.1 Existing Development

For this HMP update, 51,804 structures were identified from available tax data and spatial data. These structures account for a replacement cost value of approximately $47.7 billion. Estimated content value was calculated by

using 50 percent of the residential replacement cost value, and 100 percent of the non-residential replacement values. Using this methodology, approximately $19.3 billion in contents exist within these properties. Residential buildings account for 88.9 percent of the total buildings in the County and 61.9 percent of the total building stock value. Table 3-6 presents building stock statistics by occupancy class for Sullivan County.

Figure 3-6 through Figure 3-9 show the distribution and value density of residential, commercial, industrial, and other (government, religion, agricultural, and education) buildings in Sullivan County based on the New York State Department of Taxation and Finance Property Class Code. Value density is the dollar value of structures per unit area, including building content value. The densities are shown in units of $1,000 per square mile. Value distribution maps can assist communities in visualizing areas of high loss potential and in evaluating aspects of the planning area in relation to the specific hazard risks.

A housing unit is a house, apartment, mobile home or trailer, a group of rooms, or a single room intended for occupancy as separate living quarters. A household is defined as all the people who occupy a single housing unit as their usual residence. Census data identified 49,667 housing units in Sullivan County in 2023 and 30,215 households. This indicates that there are 19,452 vacant housing units in the County (U.S. Census 2023c). In Sullivan County, more than 17,000 vacant housing units are seasonal homes that are maintained for vacation and occasional use (Sullivan County 2024).

3.7.2 New Development

The County intends to discourage development in hazard-vulnerable areas, areas with high population density, and the Special Flood Hazard Area; and encourage higher regulatory standards at the local level. In order to avoid potential exposure of development to hazard events where possible, Sullivan County uses best available data to identify planned new development. New development over the previous five years and known or anticipated development within the next five years is discussed in the jurisdictional annexes in Volume II.

An assessment was performed to identify land viable for new development or available for future construction. Sullivan County has 143,341 acres available, most of it in the Town of Forestburgh (20,844.2 acres), the Town of Bethel (16,066.9 acres), and the Town of Mamakating (14,533.7 acres), as shown in Table 3-7.

Table 3-6. Building Stock Count and Replacement Cost Value (RCV) by Occupancy Class

Jurisdiction	Residential		Commercial		Industrial		Other	
	Count	Total Replacement Cost Value	Count	Total Replacement Cost Value	Count	Total Replacement Cost Value	Count	Total Replacement Cost Value
Ateres (V)	92	$71,125,877	5	$24,905,260	1	$1,068,336	1	$7,402,144
Bethel (T)	4,001	$2,016,055,231	316	$773,930,264	27	$147,969,030	327	$1,055,408,837
Bloomingburg (V)	127	$70,219,701	32	$68,261,608	4	$33,770,628	9	$51,622,555
Callicoon (T)	1,761	$1,183,465,152	75	$144,622,934	2	$1,499,798	104	$249,777,895
Cochecton (T)	1,096	$829,363,769	60	$114,996,440	4	$15,373,889	29	$91,731,691
Delaware (T)	1,388	$986,574,031	168	$480,144,189	22	$110,140,808	85	$290,290,315
Fallsburg (T)	7,601	$6,649,631,241	351	$961,312,113	81	$513,215,822	81	$484,589,325
Forestburgh (T)	617	$482,071,046	50	$74,930,060	6	$25,493,347	7	$44,529,528
Fremont (T)	1,188	$744,259,268	62	$159,179,246	7	$36,885,645	65	$215,801,620
Highland (T)	1,694	$943,932,037	129	$363,075,252	5	$12,849,940	25	$130,041,504
Jeffersonville (V)	152	$137,817,411	39	$107,178,748	0	$0	10	$30,538,573
Liberty (T)	3,358	$2,053,059,198	369	$883,578,884	33	$204,162,321	281	$847,325,026
Liberty (V)	1,215	$812,841,146	224	$805,139,324	28	$200,260,395	73	$367,265,867
Lumberland (T)	1,558	$728,364,825	206	$520,488,752	11	$90,935,070	21	$89,693,275
Mamakating (T)	5,188	$2,468,231,202	237	$637,762,538	21	$244,948,471	62	$165,324,040
Monticello (V)	1,827	$1,510,507,739	273	$957,592,136	14	$71,105,976	50	$433,585,897
Neversink (T)	1,940	$913,963,951	292	$436,167,570	14	$40,323,452	46	$302,823,184
Rockland (T)	2,279	$1,205,600,222	306	$577,840,799	20	$113,370,240	54	$209,630,590
Thompson (T)	6,886	$4,666,711,818	461	$1,443,428,492	80	$434,479,263	99	$473,428,139
Tusten (T)	1,085	$528,438,717	117	$187,590,573	18	$68,824,797	34	$123,847,590
Woodridge (V)	540	$400,599,965	46	$120,288,383	8	$86,177,850	7	$17,604,320
Wurtsboro (V)	433	$209,110,112	63	$156,694,840	5	$17,756,805	16	$30,779,701
Sullivan County (Total)	**46,026**	**$29,611,943,658**	**3,881**	**$9,999,108,405**	**411**	**$2,470,611,883**	**1,486**	**$5,713,041,615**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; RSMeans 2024
Note: Other = Government, Religion, Agricultural, and Education

Figure 3-6. Distribution of Residential Building Stock Value Density in Sullivan County

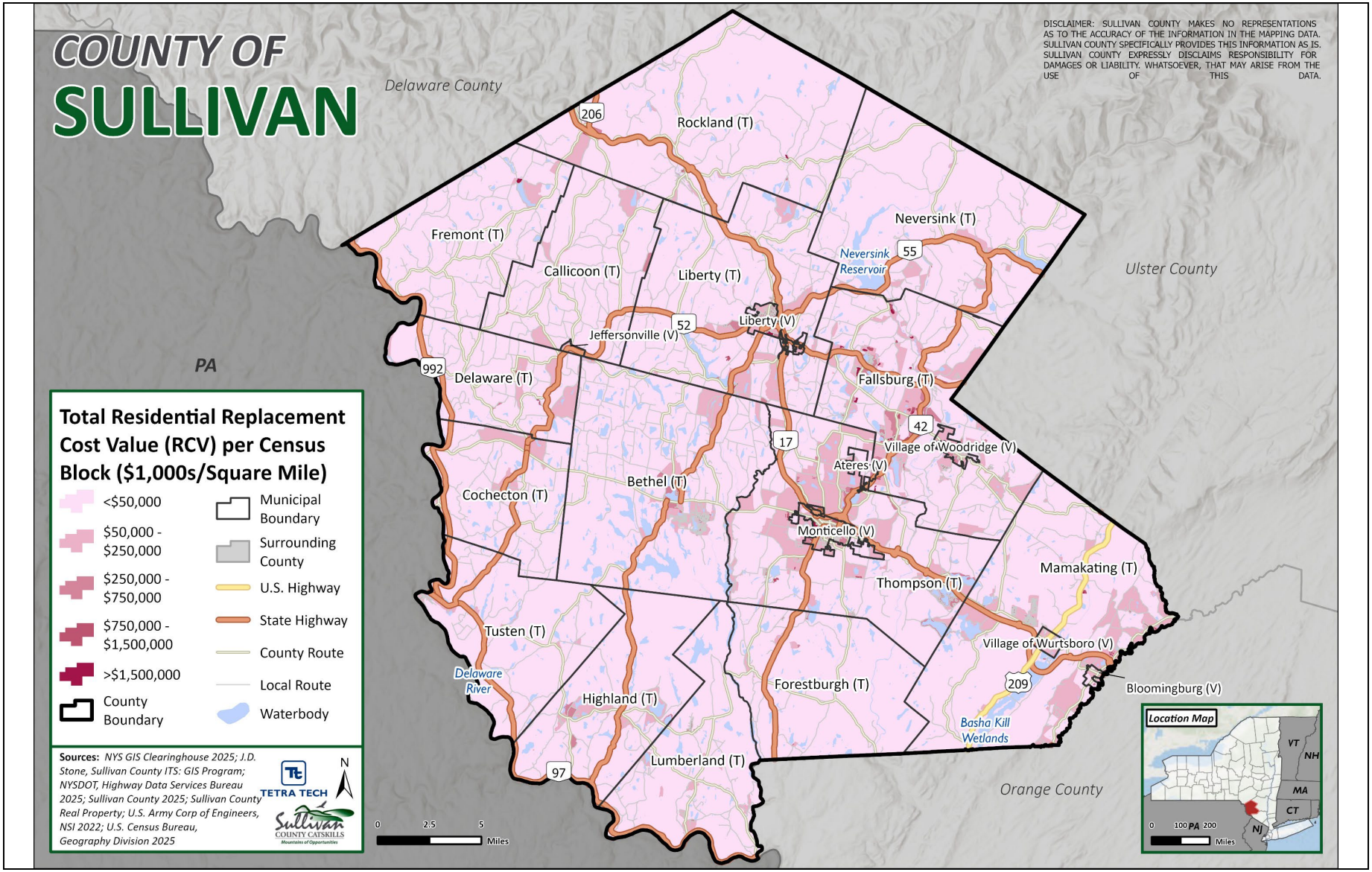


Figure 3-7. Distribution of Commercial Building Stock Value Density in Sullivan County

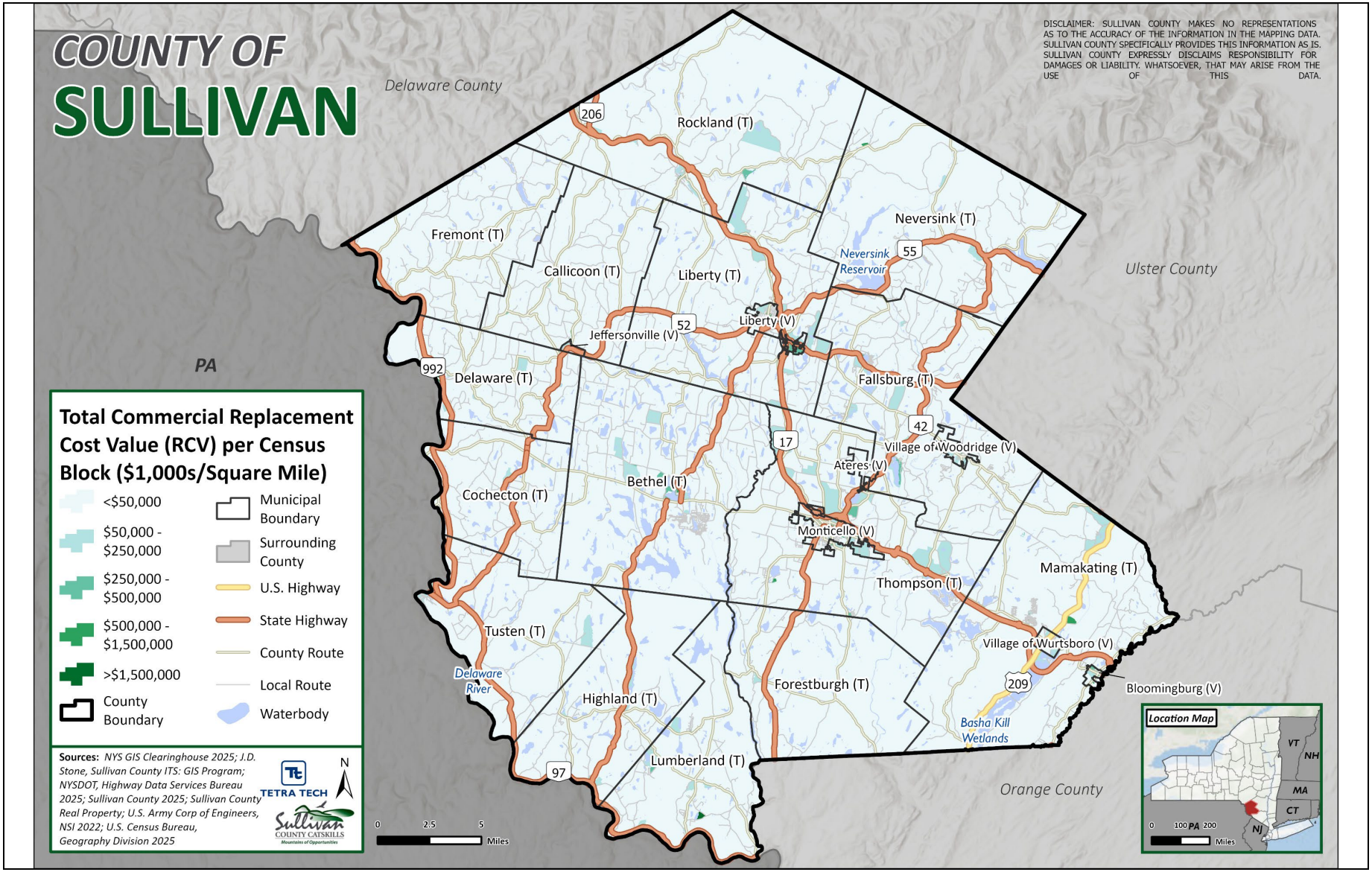


Figure 3-8. Distribution of Industrial Building Stock Value Density in Sullivan County

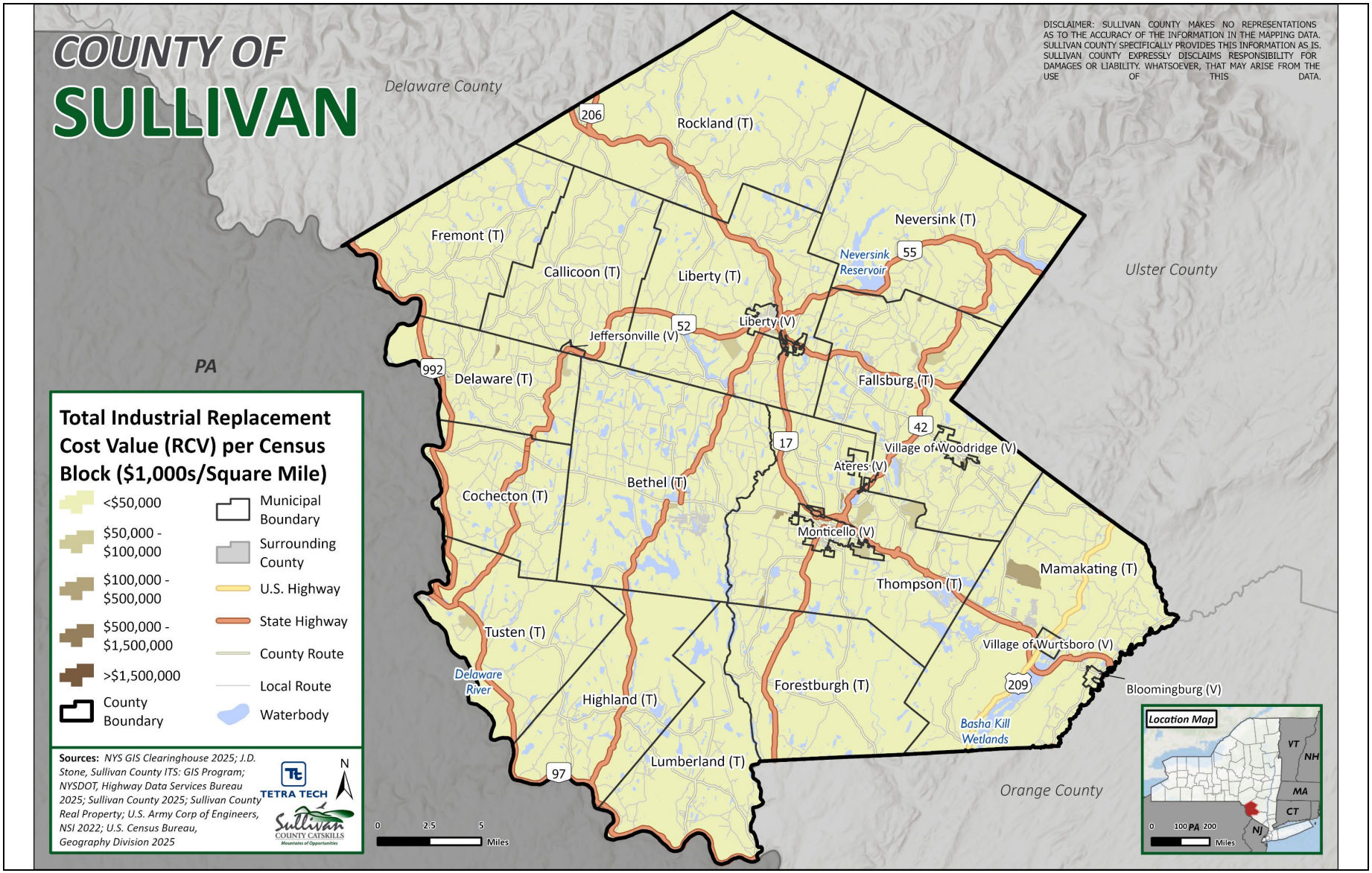


Figure 3-9. Distribution of Other Building Stock Value Density in Sullivan County

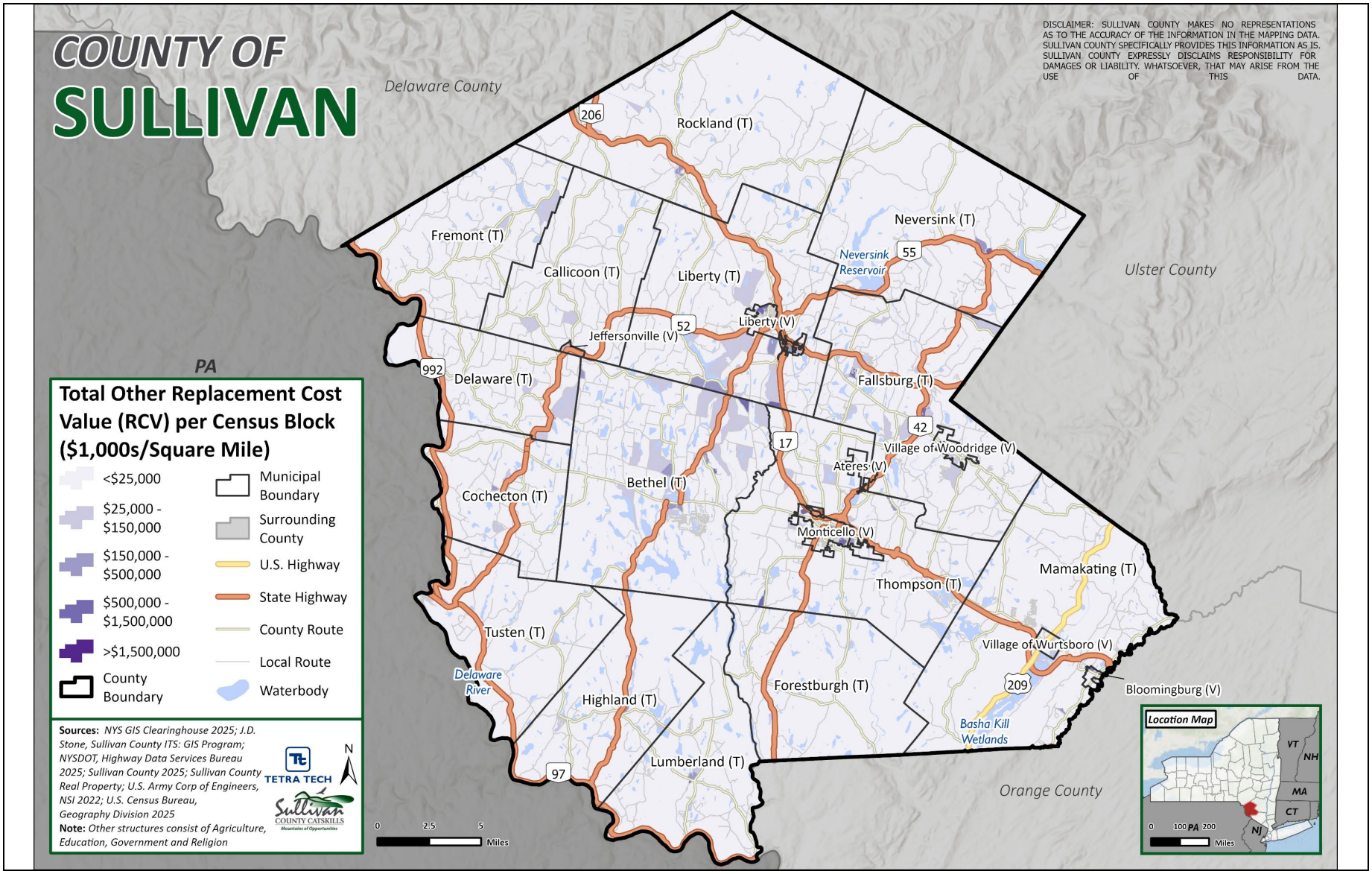


Table 3-7. Sullivan County Buildable Lands

Jurisdiction	Buildable Lands Total Area (acres)	Jurisdiction	Buildable Lands Total Area (acres)
Ateres (V)	238.0	**Liberty (V)**	5.5
Bethel (T)	16,066.9	**Lumberland (T)**	9,503.6
Bloomingburg (V)	122.1	**Mamakating (T)**	14,533.7
Callicoon (T)	3,987.5	**Monticello (V)**	111.5
Cochecton (T)	7,203.9	**Neversink (T)**	2,772.7
Delaware (T)	3,002.1	**Rockland (T)**	2,910.6
Fallsburg (T)	7,307.4	**Thompson (T)**	8,749.6
Forestburgh (T)	20,844.2	**Tusten (T)**	13,771.0
Fremont (T)	8,632.3	**Woodridge (V)**	37.3
Highland (T)	13,840.4	**Wurtsboro (V)**	4.6
Jeffersonville (V)	0.0	**Sullivan County (Total)**	**637,589.7**
Liberty (T)	9,696.3		

Source: J.D. Stone, Sullivan County ITS: GIS Program; FEMA 2015, 2025; NYS, n.d.; NYS GIS Clearinghouse 2025; National Park Service 2025; USGS 2024; USGS NWIS 2025; USFS 2023; University of Wisconsin-Madison 2023, MRLC Consortium 2021, U.S. Census Bureau 2020

Note: Buildable lands excludes areas designated as water, wetlands, water bodies and hazard boundary delineations utilized for quantitative analyses. Land use data was used to determine urban areas, and this was removed from the buildable lands. Additionally, state, federal and scenic areas were removed from the building lands. Best available data was leveraged for this analysis to identify remaining buildable lands in Sullivan County.

3.8 COMMUNITY LIFELINES

Facilities that are essential to the health and welfare of the population and that maintain essential and emergency functions are designated as critical facilities. These typically include police and fire stations, schools, emergency operations centers, and infrastructure such as roads, bridges and utilities that provide water, electricity, and communications. Facilities that use or store hazardous materials are designated as critical facilities as well. All of these facilities are especially important after any hazard event (FEMA 1997b).

FEMA defines some types of critical facilities, as well as public services or activities, as “community lifelines.” Community lifelines provide the fundamental services in a community that, when stabilized, enable all other aspects of society. Following an emergency event, intervention is required to stabilize lifelines. FEMA defines eight categories of community lifelines as summarized in Table 3-8.

A comprehensive inventory of community lifelines in Sullivan County was developed from various sources, including input from the Steering Committee and Planning Partnership. The following sections describe the inventory of community lifelines that was used for the risk assessment in this HMP. Although many lifeline facilities could fall within numerous categories, each lifeline facility identified for this planning effort was categorized according to its primary function.

Table 3-8. FEMA-Defined Categories of Community Lifelines

Community Lifeline Category	Types of Facilities and Services Included
Safety and security	Law enforcement/security, fire service, search and rescue, government service, community safety
Food, hydration, shelter	Food, hydration, shelter, agriculture
Health and medical	Medical care, public health, patient movement, medical supply chain, fatality management
Energy	Power grid, fuel
Communications	Infrastructure, responder communications, alerts warnings and messages, finance, 911 and dispatch
Transportation	Highway/roadway/motor vehicle, mass transit, railway, aviation, maritime
Hazardous materials	Facilities, hazmat, pollutants, contaminants
Water systems	Potable water infrastructure, wastewater management

Source: FEMA 2023

3.8.1 Safety and Security

Figure 3-10 shows the location of facilities included in the safety and security lifelines inventory. Key facilities and services considered for the inventory under this category are as follows:

- The Sullivan County Office of Emergency Management (OEM) exists within the Division of Public Safety to monitor and assist in emergency and security situations, both natural and manmade. There is one EOC located at the Richard A. Martinkovic Public Safety Training Center.
- There are 21 fire department facilities in Sullivan County.
- Police enforcement and public safety is maintained by the New York State Police Department, Sullivan County Sheriff's Office, and local departments. The Sullivan County Sheriff's Office operates one correctional institution in Monticello.
- New York State data lists 304 dams in Sullivan County, with 14 listed as high hazard, 33 listed as intermediate hazard, and 246 listed as low hazard; 11 were not assigned a hazard classification.
- According to the National Levee Database maintained by the U.S. Army Corps of Engineers, there are no levees in Sullivan County (USACE n.d.-a).
- There is one college, one post-secondary education facility, 7 secondary education facilities, and 18 primary education facilities in Sullivan County, along with 11 other facilities identified as educational.
- There is a DMV facility, 50 post offices, 22 municipal halls, and 17 municipal highway departments in Sullivan County, along with 15 other facilities identified as governmental.

3.8.2 Food, Hydration, Shelter

Figure 3-11 shows the location of food, facilities included in the hydration, and shelter lifelines inventory. Key facilities and services considered for the inventory under this category are as follows:

- The County has six emergency shelters and two warming centers.
- The seven identified hotels and motels can function as emergency temporary sheltering facilities, with the proper agreements in place.
- The County has three animal rescues and one animal shelter.
- There are 36 identified food pantries in Sullivan County.

College, post-secondary education, secondary education, and primary education facilities are listed as safety and security facilities, but they can function as shelters during emergencies.

Figure 3-10. Safety and Security Facilities in Sullivan County

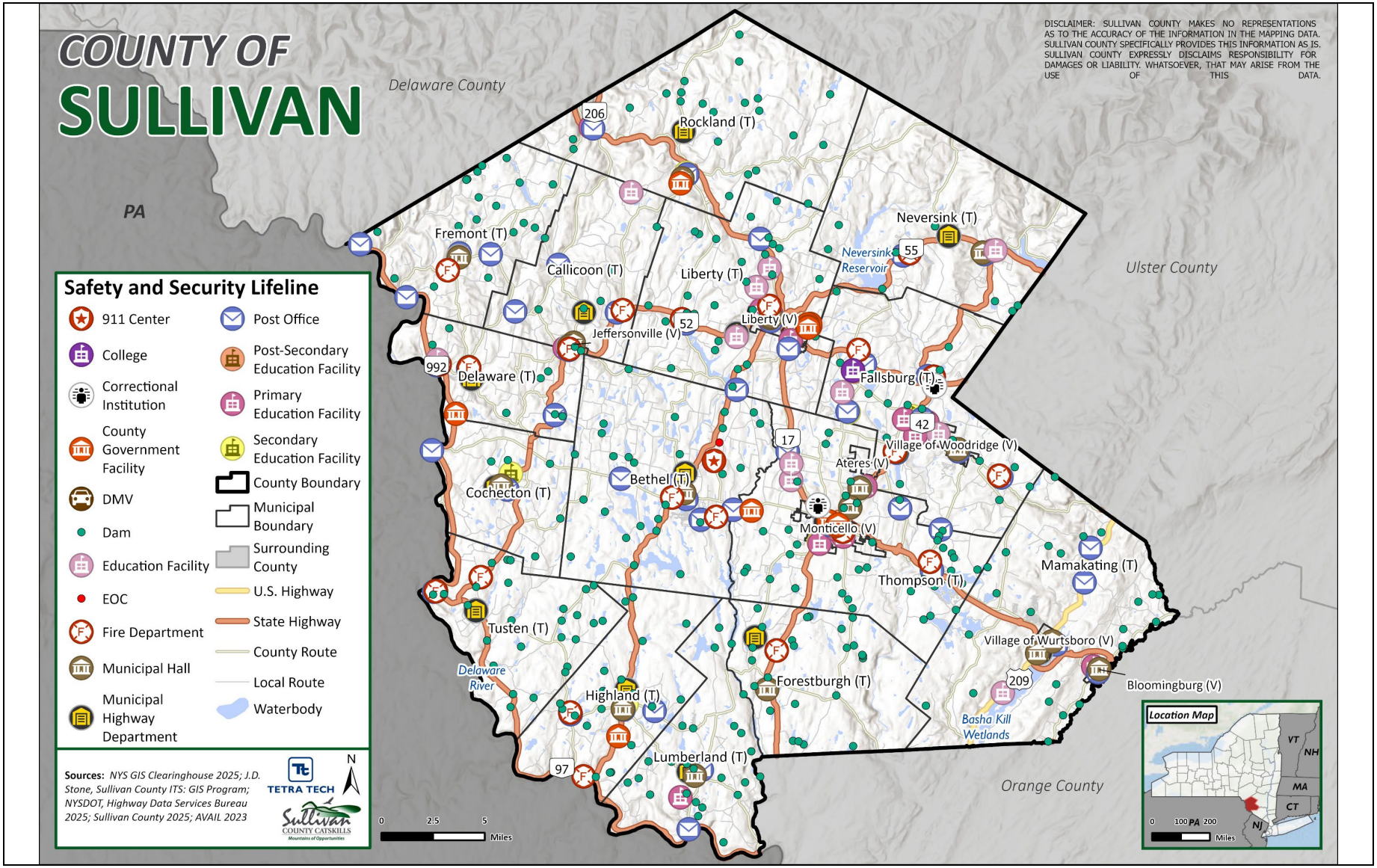
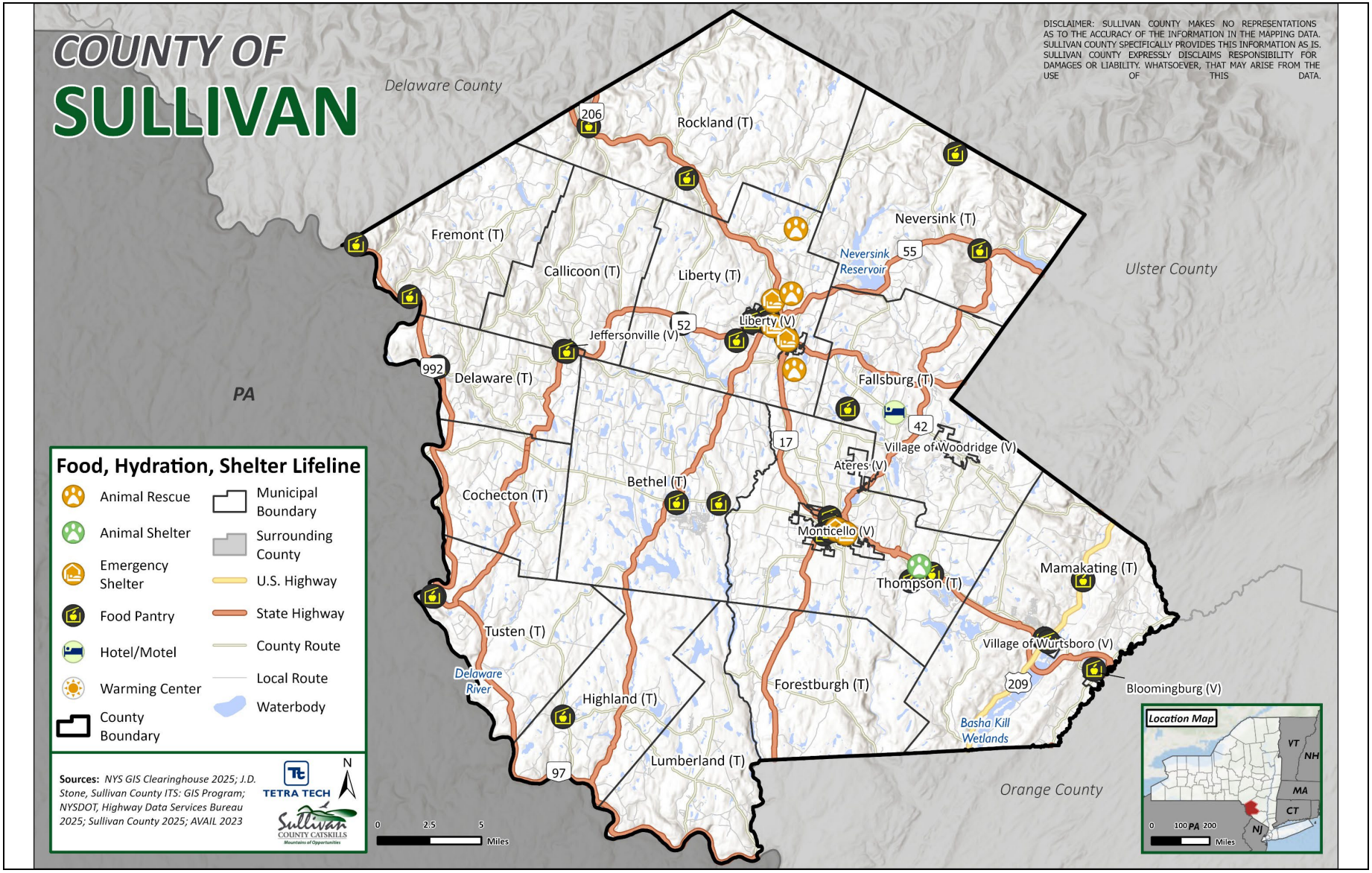


Figure 3-11. Food, Hydration, and Shelter Facilities in Sullivan County



3.8.3 Health and Medical

Figure 3-12 shows the location of facilities included in the health and medical lifelines inventory. Key facilities and services considered for the inventory under this category are as follows:

- Sullivan County is served by the Garnet Health Medical Center, five urgent care facilities, and three outpatient clinics.
- There are three nursing homes and one care facility identified as critical facilities in Sullivan County.
- 19 EMS facilities serve Sullivan County.

3.8.4 Energy

Figure 3-13 shows the location of facilities included in the energy lifelines inventory. Key facilities and services considered for the inventory under this category are as follows:

- Gas and electric power in Sullivan County are transmitted and distributed by three companies: New York State Electric and Gas (NYSEG); Orange and Rockland (O&R); and Central Hudson, as shown in Figure 3-14.

3.8.5 Communications

Figure 3-15 shows the location of facilities included in the communications lifelines inventory. There are 27 facilities in Sullivan County identified as communications lifeline facilities. The following are additional key facilities and services related to this category:

- The Division of Public Safety operates a 24-hour 9-1-1 Center and oversees the operation of the Emergency Communications, 911 Department.
- Sullivan County has a radio communications network that is utilized by emergency services agencies, hospitals, law enforcement, public works, transportation, and other supporting organizations.
- Communications systems in Sullivan County include traditional land line, fiber optic, and cellular service provided by multiple companies, such as Verizon, AT&T, Sprint, and T-Mobile. Each carrier has individual plans for emergency situations during hazard events and post-disaster recovery efforts.
- The main internet providers in Sullivan County are Spectrum, ViaSat, HughesNet, and Verizon, with Spectrum providing the most coverage and highest internet speed throughout the County.
  - As of 2026, Sullivan County is working with its partner, Archtop Fiber, to deploy additional countywide broadband infrastructure.
- Sullivan County OEM operates an Emergency Operations Center in Swan Lake, where public organizations and private-sector agencies meet to decide and coordinate emergency response to community-wide disasters. The EOC is categorized as a safety and security lifeline facility.

Figure 3-12. Health and Medical Facilities in Sullivan County

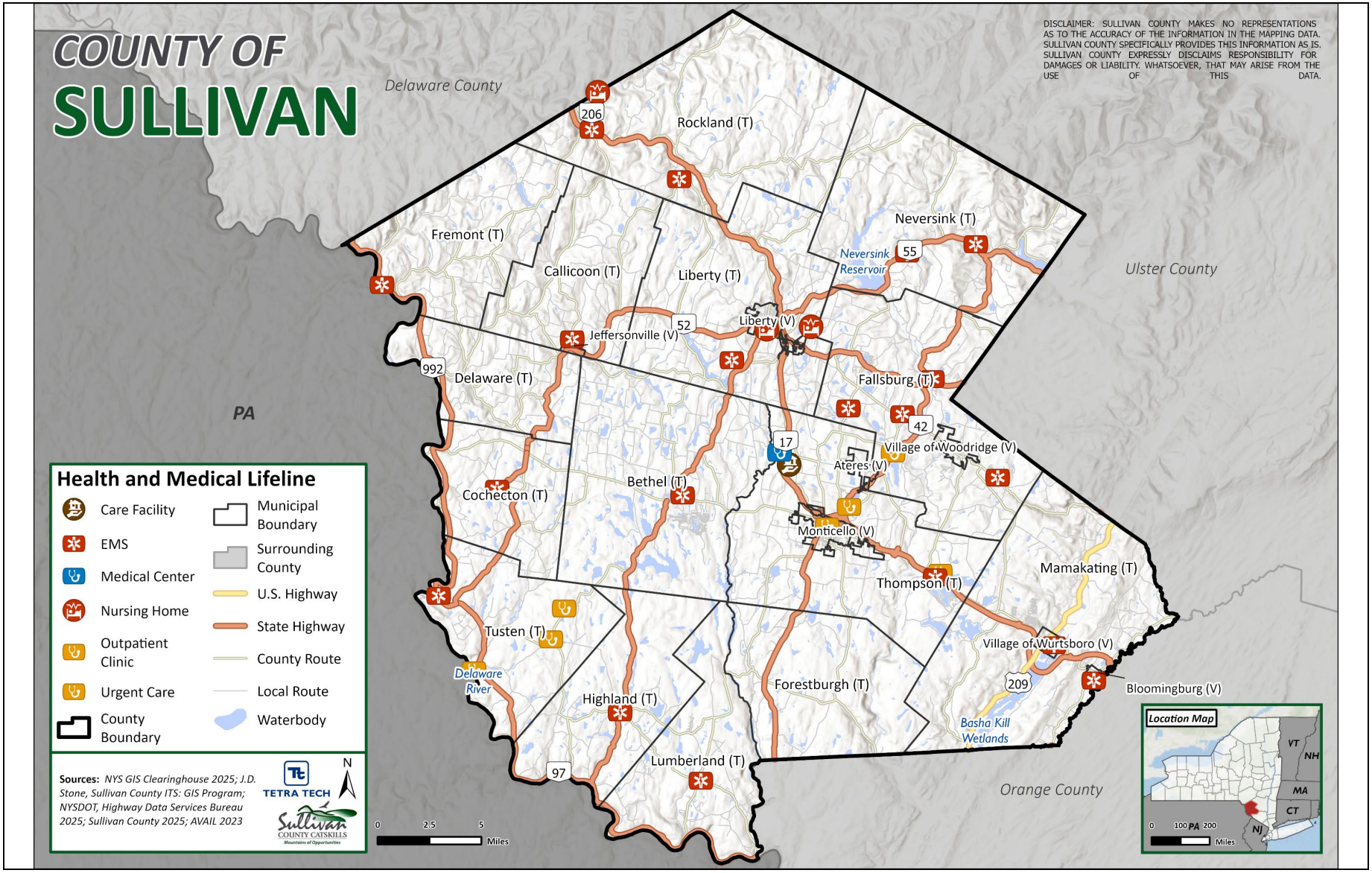


Figure 3-13. Energy Facilities in Sullivan County

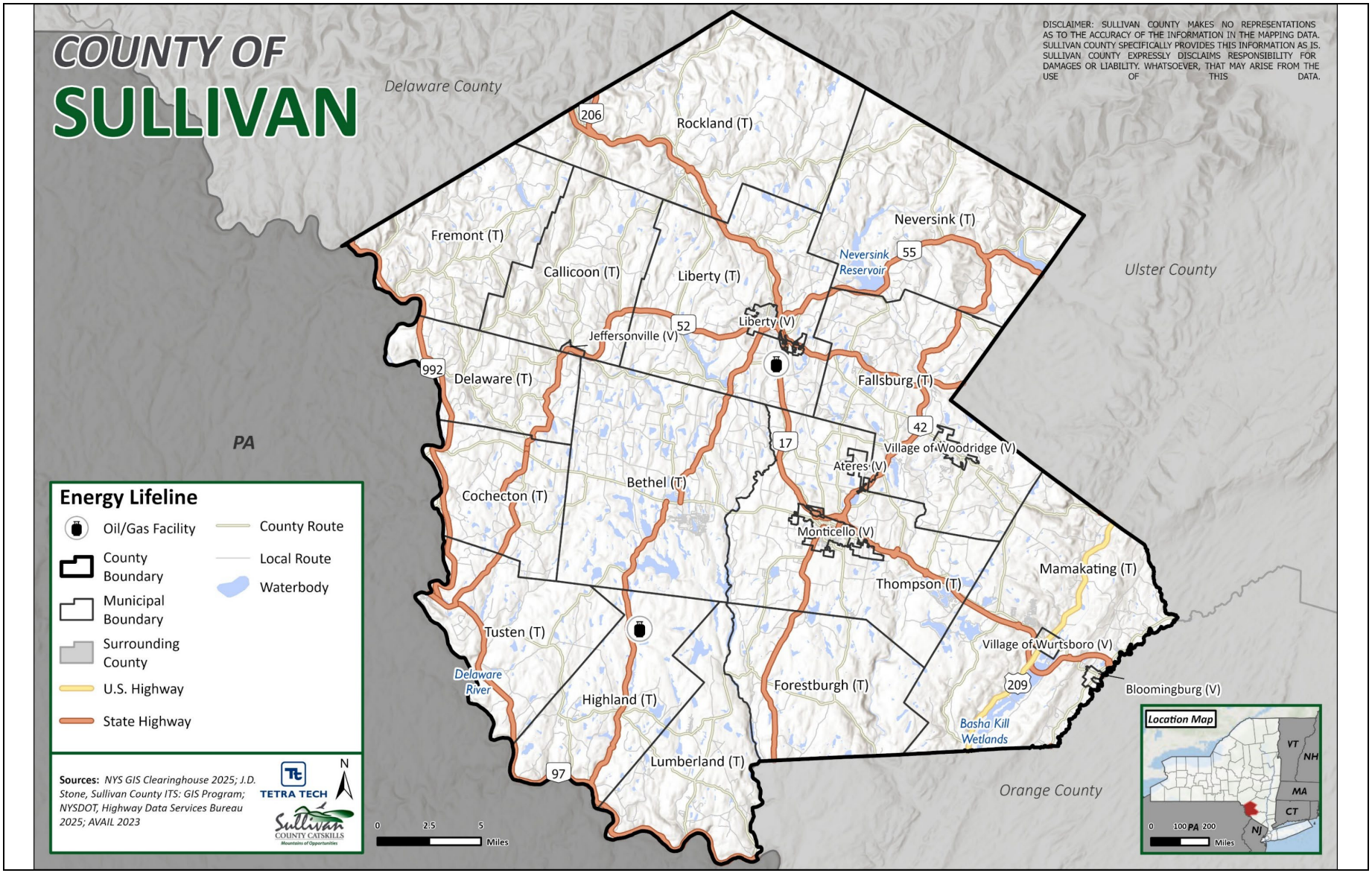
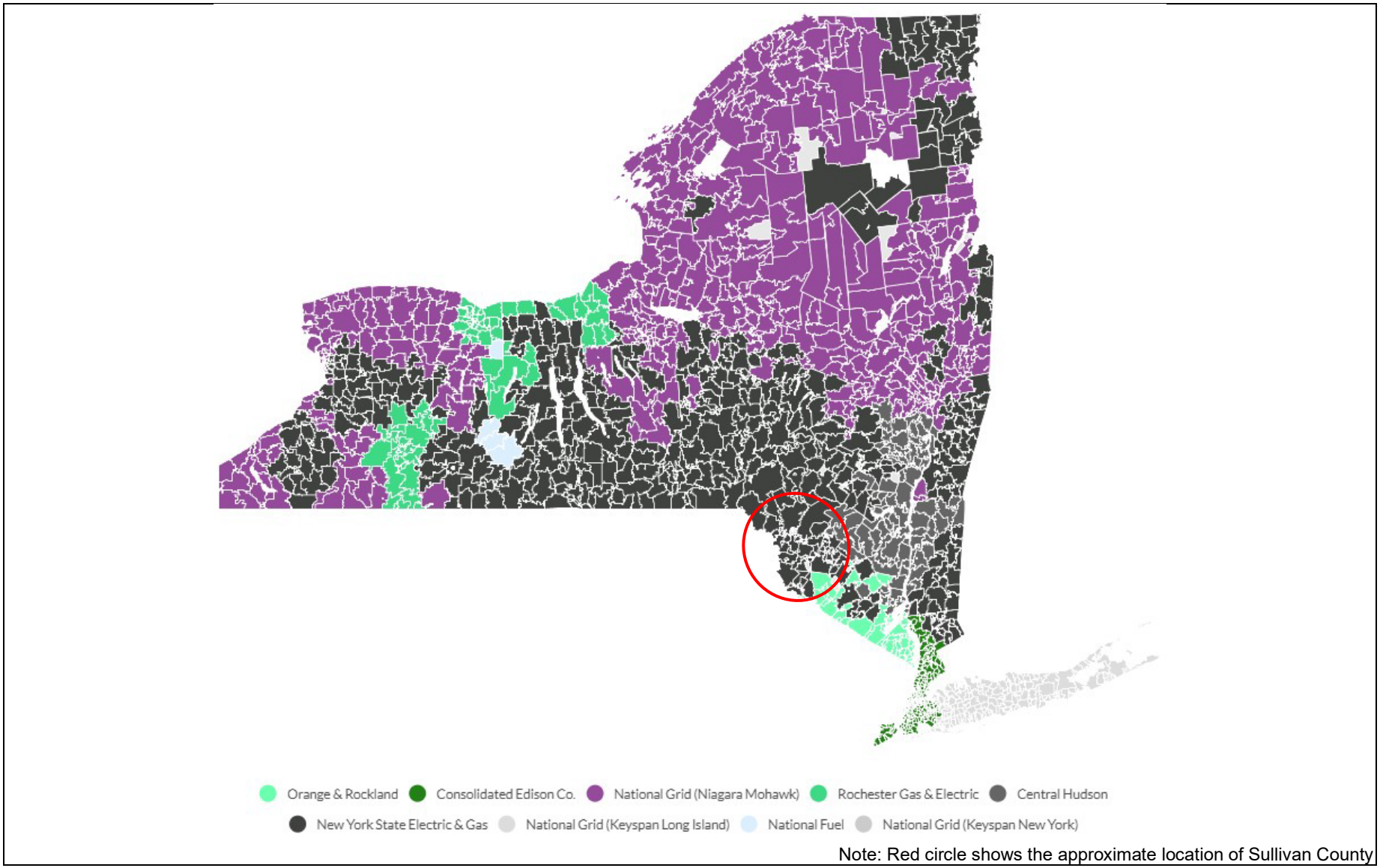


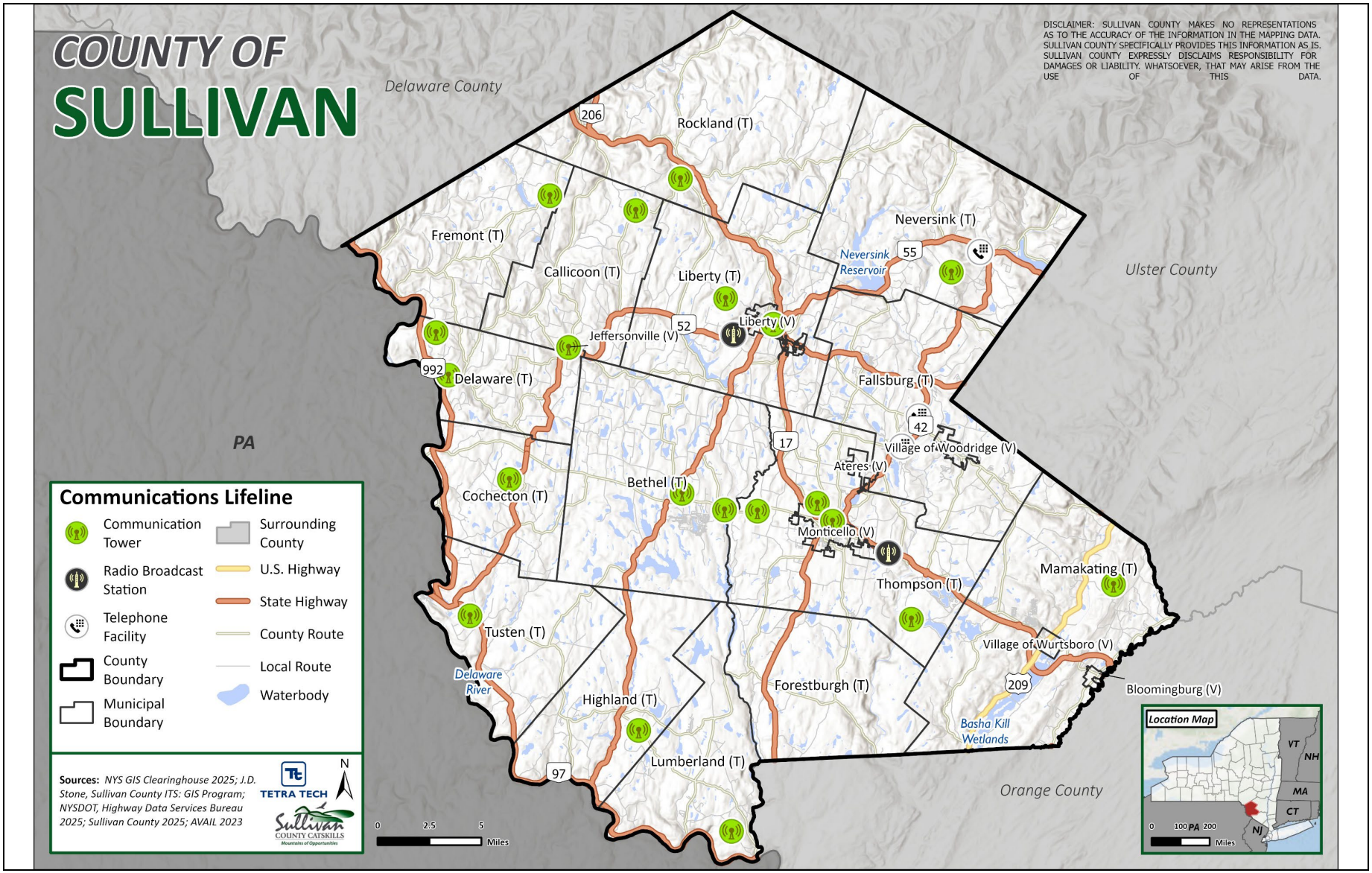
Figure 3-14. Electric Service Delivery Companies in New York State



Note: Red circle shows the approximate location of Sullivan County

Source: (Garrison and Ritchie n.d.)

Figure 3-15. Communications Facilities in Sullivan County



3.8.6 Transportation

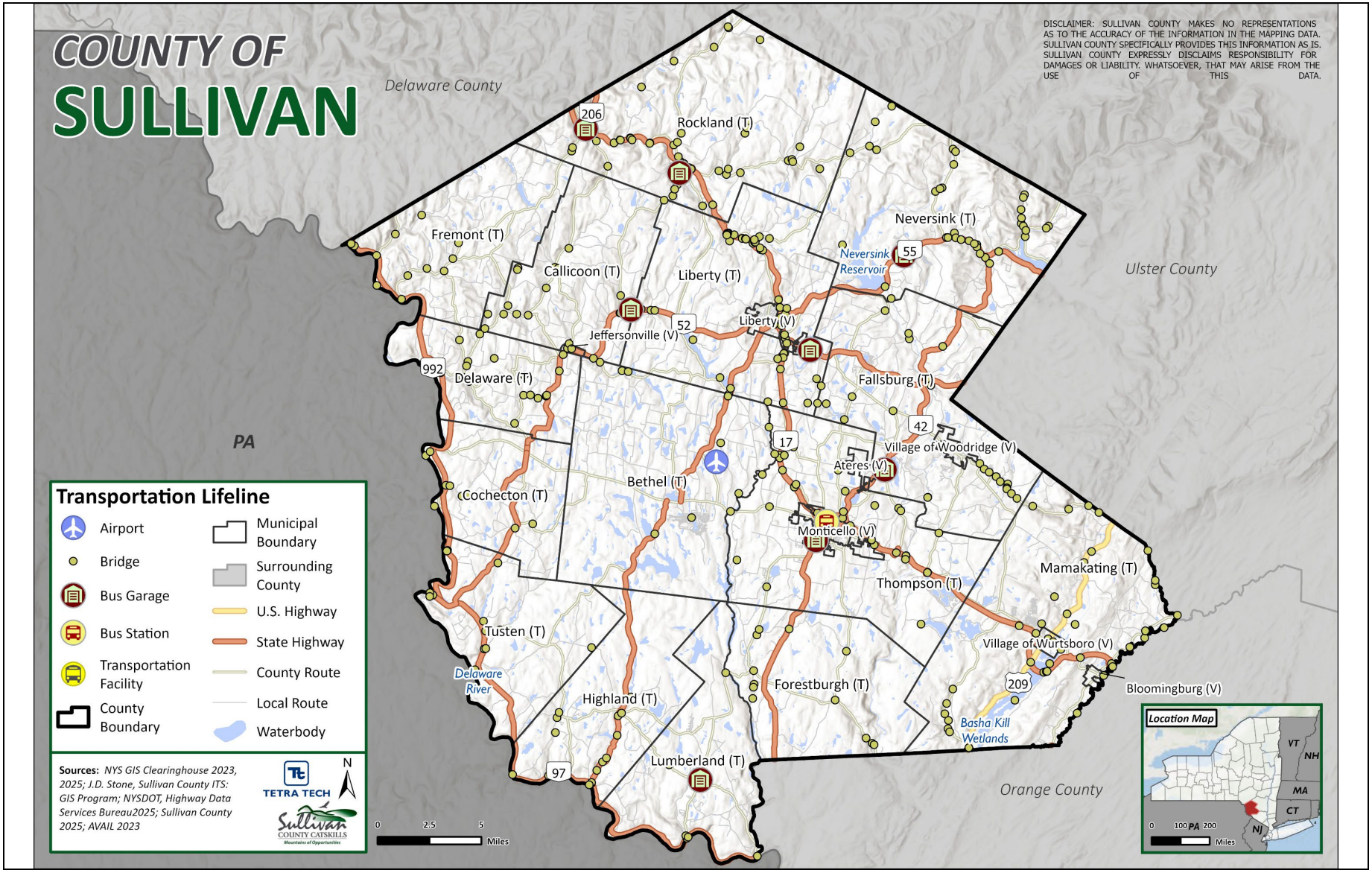
Figure 3-16 shows the location of facilities included in the transportation lifelines inventory. There are 397 identified transportation lifeline critical facilities. The following are additional key facilities and services related to this category:

- Roadways:
  - U.S. Route 209 runs in a southerly direction across the southeast portion of the County; no other Interstate Routes or U.S. routes are located within Sullivan County.
  - Sullivan County contains nine state routes (17, 17B, 42, 52, 52A, 55, 55A, 97, and 206). State Route 17 travels through the heart of Sullivan County, stretching from the northwest corner at the border with Delaware County to the southeast corner at the border with Orange County. State Route 17 passes through the following jurisdictions in Sullivan County: Town of Rockland, Town of Liberty, Village of Liberty, Town of Bethel, Town of Thompson, Village of Monticello, and Town of Mamakating. This is the main access route to reach Sullivan County from the north and south, and the main evacuation route to exit the County in the event of a disaster.
  - The Sullivan County Division of Public Works (DPW) maintains more than 400 miles of County roads and more than 100 bridges. The County highway system is composed of roughly 140 routes. Many county routes overlap with portions of state routes.
- Railroads:
  - Only one active railroad remains in Sullivan County. The Norfolk Southern Railway Company operates a freight-only line that runs along the western boundary of Sullivan County, parallel to the Delaware River. The remaining historical railroad segments have been abandoned and the tracks removed.
- Air Transportation:
  - The DPW operates the Sullivan County International Airport (MSV), which has 43 hanger bay spaces, 18 tiedown locations, and open apron space for parking aircrafts. The airport provides services to general and business aviation, with self and full fueling services and an airport rescue and firefighting team and truck onsite during hours of operation.
- Transit:
  - The Sullivan County Transportation Department offers free transportation to registered residents aged 60 years or older. Buses carry up to 14 people, are fully accessible to wheelchairs and other mobility devices, and run door-to-door.
  - Move Sullivan is a free public transit option for all Sullivan County residents, operating seven routes in the County.

3.8.7 Hazardous Materials

There were no facilities identified in the hazardous materials lifelines inventory.

Figure 3-16. Transportation Facilities in Sullivan County



3.8.8 Water Systems

Figure 3-17 shows the location of facilities included in the water system lifelines inventory. Due to security concerns, water system lifeline data was only partially obtained. Key facilities and services considered for the inventory under this category are as follows:

- As of 2015, public water systems in Sullivan County served 44,516 users, accounting for 59.5 percent of the county population. Of these users, 36,289 (81.5 percent) received service from groundwater facilities, while 8,227 (18.5 percent) received service from surface water facilities (Sullivan County 2024).
- Sullivan County is a major supplier of drinking water for New York City via the Delaware Aqueduct, with the Neversink and Rondout Reservoirs capable of holding 84.5 billion gallons of water. Sullivan County's surface water facilities supply 86.07 million gallons of water daily. As of 2022, there are 83 community water systems in Sullivan County, defined by New York State as a "public water system that serves the same people year-round (Sullivan County 2024)."
- Sullivan County has more than 500 non-community water systems serving schools, government buildings, businesses, industry, and seasonal residences. Many of these systems are well water systems (Sullivan County 2024).
- Sullivan County has 25 public sewer systems feeding 12 secondary wastewater treatment plants handling 6.9 million gallons per day, and 10 tertiary wastewater treatment plants handling 8.9 million gallons per day. Secondary treatment plants use wastewater treatment strategies such as lagoons, trickling, biological or intermittent sand filters and chemical coagulation. Tertiary treatment plants use wastewater treatment strategies such as polishing ponds, microscreens, activated carbon columns and nitrification. Most households in Sullivan County are not on these wastewater systems and use septic systems (Sullivan County 2024).
- Stormwater infrastructure is primarily managed at the municipal level in Sullivan County, with the county managing stormwater infrastructure surrounding county roads (Sullivan County 2024).
- Legacy stormwater infrastructure in the county focuses on the impacts of severe weather and flooding on the populated areas of the county, aiming to move runoff away from these areas as quickly as possible. Modern stormwater infrastructure incorporates "green infrastructure" techniques such as rain gardens to slow the redistribution of stormwater to mitigate potential damage to aquatic habitats and to allow for soil percolation to recharge the county's groundwater supply (Sullivan County 2024).
- Sullivan County has 21 industrial facilities that have been issued Multi-Sector General Permits (MSGP), allowing for direct discharge of stormwater to the county's surface waters. This permit ensures the management of stormwater pollutants at each facility and requires inspection of the facilities to determine compliance with the permit (Sullivan County 2024).

3.9 OTHER CRITICAL FACILITIES

Some facilities that are identified as critical for hazard mitigation in Sullivan County do not fit in any of FEMA's community lifeline categories. These include community centers, entertainment venues, polling sites, daycare facilities, summer camps, libraries, major employers, and houses of worship. Figure 3-18 shows the location in Sullivan County of these other critical facilities.

3.9.1 At Risk Populations

The following facilities are available to assist at risk populations within Sullivan County, but may not be noted within the critical facilities list created for this plan update:

- Senior Apartments, Assisted Living, and Adult Home Facilities – Swan Lake Adult Home, Arcadia, Barkley Gardens, Golden Park (all in the Village/Town of Liberty), Regency Manor and Crawford Housing (Village of Monticello), Horizons Senior Living (Village of Wurtsboro).
- Physically and Intellectually/Developmentally Disabled (I/DD) Residences – There are two campus settings (New Hope Community and The Center for Discovery), and numerous community residences operated by New Hope and American Red Cross.
- Persons with supportive housing – Sullivan County has three sober living residences in the county, nine "housing first" apartments for persons who have been chronically homeless, and numerous residences for persons with long term mental health diagnoses (separate from I/DD residences).
- Homeless Emergency Placements (Catskill Motel, Liberty Motel, Budget Motel, Knights Inn (Town of Liberty), Sullivan Inn and Liberty Suites (Village of Monticello).

Figure 3-17. Water Systems Lifelines in Sullivan County

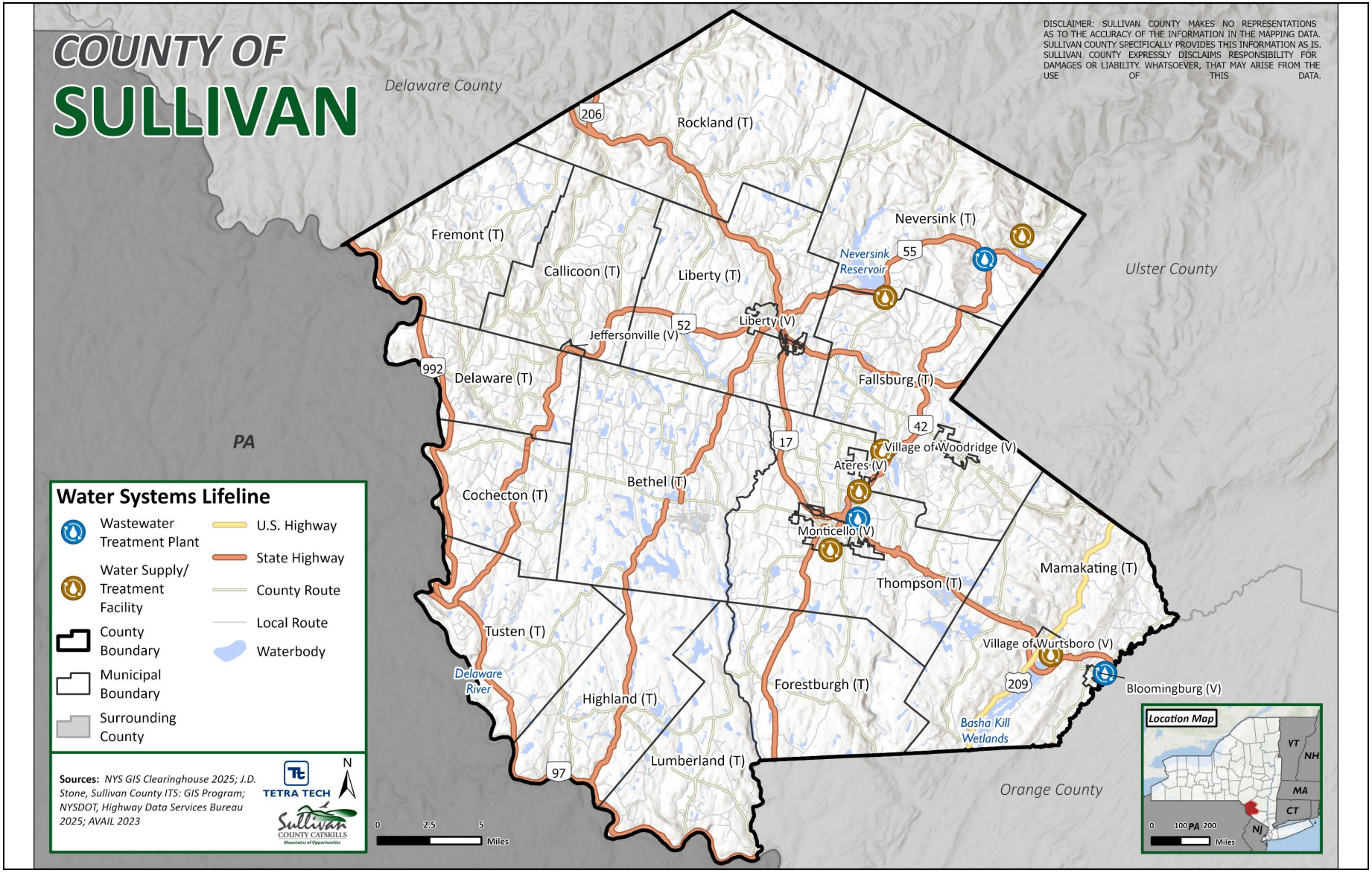
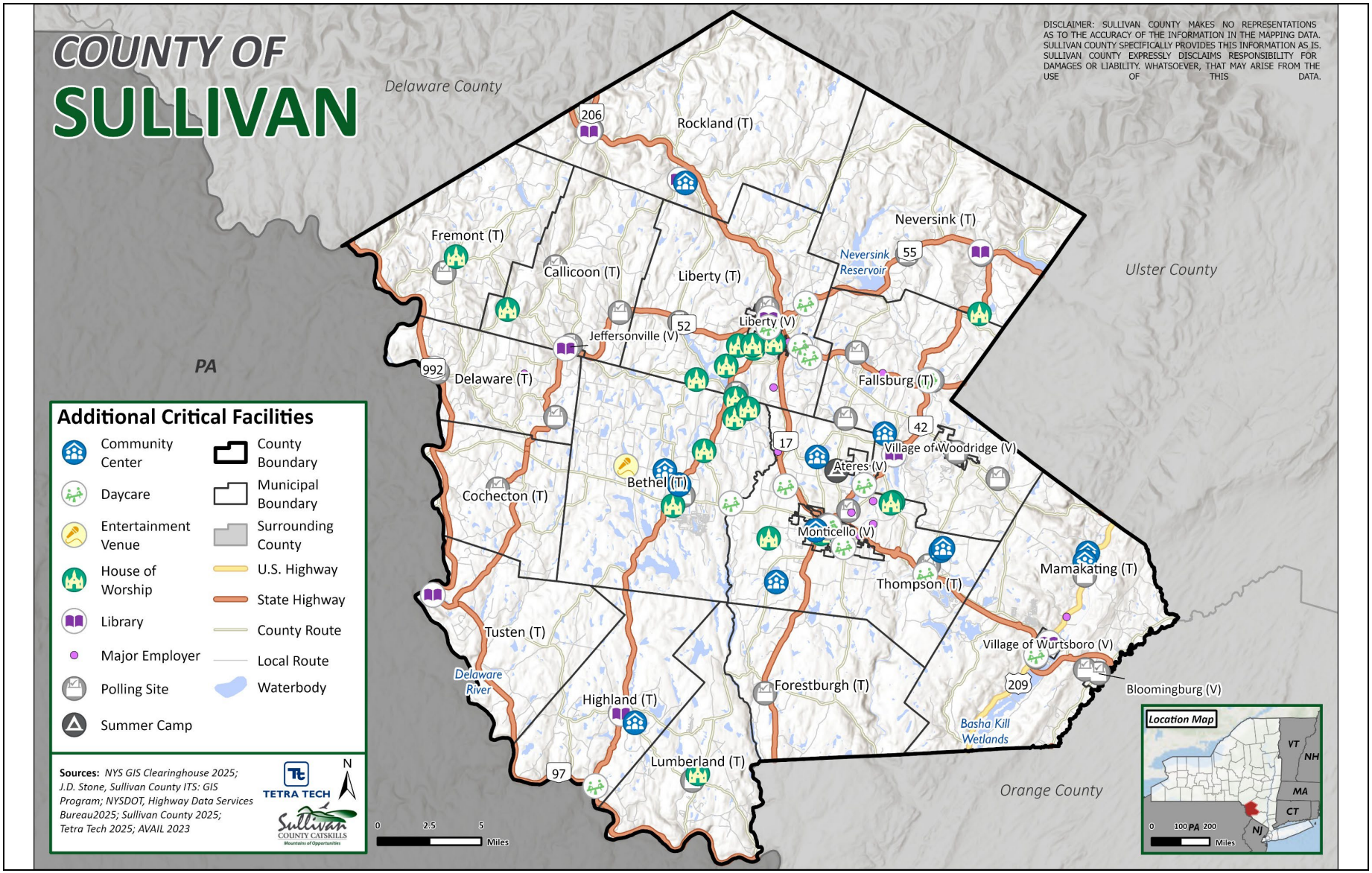


Figure 3-18. Other Critical Facilities in Sullivan County



PART 2: RISK ASSESSMENT

4. RISK ASSESSMENT METHODOLOGY AND TOOLS

A risk assessment is the process of evaluating the potential loss of life, personal injury, and economic and property damage that could result from identified hazards. Identifying potential hazards and vulnerable assets allows planning personnel to address and reduce hazard impacts and allows emergency management personnel to establish early response priorities. Results of the risk assessment are used in subsequent mitigation planning processes, including determining and prioritizing mitigation actions that reduce each jurisdiction's risk from each hazard. The process focuses on the following elements:

- **Identify Hazards of Concern**—Use all available information to determine what types of hazards may affect a jurisdiction.
- **Profile Each Hazard**—Understand each hazard in terms of:
  - Location—Geographic area most likely to be affected by the hazard
  - Extent—The potential severity of each hazard
  - Previous occurrences and losses
  - Probability of future hazard events
- **Assess Vulnerability and Impacts**—Use all available information to estimate to what extent populations and assets may be adversely affected by a hazard now and in the future:
  - Determine vulnerability—Estimate the total number of assets in the jurisdiction that are likely to experience a hazard event if it occurs by overlaying hazard maps with the asset inventories.
  - Estimate potential impacts/losses—Assess the impact of hazard events on the people, property, economy, and lands of the region, including estimates of the losses associated with potential damage or cost that can be avoided by mitigation.
  - Evaluate future changes that may affect vulnerability and impacts—Analyze how demographic changes, projected development, and future projected conditions impacts can alter current vulnerability and potential impacts.

4.1 PREVIOUS EVENTS AND PROBABILITY OF FUTURE OCCURRENCE

Based on records of previous hazard events and consideration of potential future changes that could affect the frequency of future events, the risk assessment for each hazard assigns a rating for the probability of occurrence of that hazard in the future. The following were the primary sources for identifying previous occurrences:

- **FEMA disaster declarations**—The President of the United States has the authority to issue disaster declarations for hazard events that cause more damage than state and local governments can manage without assistance from the federal government. The declaration triggers funding for emergency and recovery efforts led by FEMA. The first federal disaster declaration was issued in 1953. Initially, declarations applied to entire states. Beginning in 1969, the process was refined to specify the individual counties affected by each declaration. Federally disaster declarations are classified as major disaster (DR), emergency declaration (EM), or fire management assistance (FM).
- **U.S. Department of Agriculture disaster declarations**—The U.S. Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in contiguous counties.

- **Hazard-specific databases**—Sources that provide records of specific types of hazard events include the National Centers for Environmental Information's Storm Events Database, the National Integrated Drought Information System's U.S. Drought Monitor, and the U.S. Geological Survey's Earthquake Catalog.
- **News reports and previously published planning documents** such as the New York State Hazard Mitigation Plan and the previous Sullivan County HMP.

The probability of future occurrence ratings were assigned as follows based on the collected records of previous occurrences:

- Unlikely—less than 1 percent annual chance of occurring
- Possible—between 1 and 49.9 percent annual chance of occurring
- Likely—between 50 and 90 percent annual chance of occurring
- Highly Likely—greater than 90 percent chance occurring; occurs multiple times a year

4.2 ASSET INVENTORIES

Sullivan County assets were identified to assess potential vulnerability and impacts associated with the hazards of concern. The risk assessment included the development and use of an enhanced asset inventory. The HMP update assesses vulnerability and potential hazard impacts for the following types of assets: population, buildings, critical facilities/community lifelines, the environment (as determined by land cover), and new development. Each asset type is described below. To protect individual privacy and the security of critical facilities, information on properties assessed is presented in aggregate, without details about specific individual properties.

4.2.1 Population

Statistics from the U.S. Census Bureau's 2020 Decennial Census and 2023 ACS 5-year estimates were used to assess risk to the County's population. Jurisdiction-specific populations (total and at-risk) were determined based on the following assumptions and calculations:

- To determine population statistics for villages and towns, village population totals were subtracted from their respective total town population.
- For all jurisdictions, population counts at the jurisdictional level were averaged among the residential structures in the county to estimate the population at the structure level. This estimate provides a more precise distribution of population across the county compared to only using the census block or census tract boundaries.
- Given that the Village of Ateres is a newly founded jurisdiction, population statistics were not available from the U.S. Census Bureau. It is assumed that the decennial statistics are irrelevant for this analysis, due to the recent formation of the village, so population for Ateres was based on 2023 ACS 5-year estimates. The Sullivan County Planning Department determined that 12 percent of parcels in the Village are in the Town of Fallsburg and 88 percent are in the Town of Thompson. These percentages were applied when subtracting village totals from town totals. At-risk population statistics for the Village of Ateres are not known by the Sullivan County Planning Department, so this category of statistics is not provided for this jurisdiction.

4.2.2 Buildings

The general building stock was updated with a custom inventory based on tax assessor and parcel data provided by Sullivan County (2024) and Sullivan County Real Property (2025), National Structure Inventory building point data from the U.S. Army Corp of Engineers (2022) and 2024 RSMeans cost adjustment values.

Location and Structure Characteristics

The National Structure Inventory point data was used to estimate the building location. The parcel layer was joined to the building point locations layer to preserve attributes from the National Structure Inventory such as year built, number of stories, basement type, square footage and occupancy class where such information could not be determined by the parcel property class code.

Occupancy Class

Buildings were assigned occupancy classes that are compatible with Hazus. To facilitate analysis and presentation of results, the Hazus classes were condensed into the categories of residential (including multi-family and single-family), commercial, industrial, and other (agricultural, religious, governmental, and educational).

Replacement Cost Value

Replacement cost values (RCV) were calculated for each building using the available parcel data, building points, and RSMeans 2024 values. RCV is the current cost of returning a destroyed asset to its pre-damaged condition using present-day cost of labor and materials. The analysis used the following location factors associated with zip codes:

- Zip Codes Beginning With 109—Residential Factor = 1.19; Non-Residential Factor = 1.11
- Zip Codes Beginning With 124—Residential Factor = 1.14; Non-Residential Factor = 1.14
- Zip Codes Beginning With 125—Residential Factor = 1.18; Non-Residential Factor = 1.15
- Zip Codes Beginning With 127—Residential Factor = 1.15; Non-Residential Factor = 1.15

Total RCV consists of both the structural cost to replace a building and the estimated value of building contents. Content value was estimated as 50, 100 or 150 percent of the structure value, depending on occupancy class assignments.

4.2.3 Critical Facilities and Community Lifelines

Data to create a critical facility inventory was provided by the Planning Partners. The data was reviewed for accuracy, additions or deletions of new or moved critical assets, identification of backup power for each asset (if known), and whether the critical facility is considered a lifeline in accordance with FEMA's definition (see Section 3.8).

4.2.4 Land Cover

National land cover data created by the U.S. Geological Survey (USGS) in 2024 was converted from a raster to a vector polygon, which informed spatial areas of built and natural land use areas. The built land use areas were defined as urban areas and include developed open space, and low, medium, and high intensity locations. Non-

urban areas were extracted into agricultural, barren land, forest, rangeland, water, and wetlands land use categories.

4.2.5 New Development

New development in the planning area was defined as development that occurred over the last 5 years and development that is expected to occur over the next 5 years. Each jurisdiction was asked to provide a list by address of major development that has taken place within these timeframes.

Only one response was submitted via e-mail (for the Town of Bethel). A geographic information system (GIS) analysis was conducted to determine hazard exposure of the development site. Where the structure intersected with a spatial hazard layer, the structure was considered vulnerable to the hazard area of concern.

Buildable Lands

A quantitative buildable lands analysis was conducted to determine the land area in Sullivan County that remains undeveloped. The analysis used the county's total land area and subtracted the following areas considered to be unsuitable for new development:

- Areas designated as water or wetland
- Areas exposed to spatially defined hazards of concern that are the focus of this HMP
- Urban areas identified as already built upon, based on land use data from USGS (2024)
- State, federal and scenic land areas assumed to be protected and unable to be built upon (NYS GIS Clearinghouse 2025; New York State Department of Environmental Conservation 2025)

4.3 VULNERABILITY AND IMPACT ASSESSMENT METHODOLOGY

Sullivan County used standardized tools, combined with local, state, and federal data and expertise to assess potential vulnerability and losses associated with hazards of concern. Three levels of analysis were used, depending upon the data available for each hazard:

- **Qualitative Review—**This analysis includes an examination of historical impacts to understand potential impacts of future events of similar size. Potential impacts and losses are discussed qualitatively using best-available data and professional judgment.
- **Vulnerability Analysis—**This analysis involves overlaying available spatial hazard layers, for hazards with defined locations, on asset mapping in GIS to determine which assets are located in the hazard area.
- **Loss Estimation**—The FEMA Hazus modeling software was used to estimate impact in terms of potential losses for the following hazards: flood, earthquake, and hurricane.

Table 4-1 summarizes the type of analysis conducted by hazard of concern.

4.3.1 Hazus

FEMA's Hazus model is a GIS-based software tool that uses engineering and scientific risk calculations to estimate damage and loss. Its use is accepted by FEMA and provides a consistent framework for assessing risk across a variety of hazards. Hazus uses GIS technology to produce detailed maps and analytical reports that estimate direct harm to people and physical damage to building stock, critical facilities, transportation systems and utility systems.

Table 4-1. Summary of Risk Assessment Analyses

Hazard	Population	General Building Stock	Critical Facilities	New Development
Dam Failure	V	V	V	V
Drought	Q	Q	Q	Q
Earthquake	V, L	V, L	V, L	V
Flood	V, L	V, L	V, L	V
Landslide	V	V	V	V
Pandemic	Q	Q	Q	Q
Severe Storm	L	L	L	Q
Severe Winter Storm	Q	Q	Q	Q
Wildfire	V	V	V	V

Note: V = vulnerability analysis; L = loss estimation; Q = qualitative review

Hazus provides default data for inventory, vulnerability, and hazards; this default data can be supplemented with local data to provide a more refined analysis. Custom critical facility and building inventories are formatted to be compatible with the Hazus Comprehensive Data Management System. Analyses that use the default Hazus data are called basic analyses, and those that update the Hazus default with current local data are called advanced analyses.

For this HMP, losses were estimated in Hazus using depth grids for the flood hazard and probabilistic modeling of the 500-year mean return period (MRP) for the hurricane wind and earthquake hazards.

4.3.2 Hazard-Specific Sources and Approaches

Dam Failure

To estimate vulnerability to the dam failure hazard, an aggregated dam-failure inundation boundary was developed using the U.S. Department of Homeland Security's DSS-WISE software. Dams included in this analysis are Cliff Lake, Lake Jefferson, Lake Louise Marie, Neversink Reservoir, Rio, Swinging Bridge, Toronto Lake Reservoir, White Crane Lake, Mongaup Falls, Pleasure Lake, St. Josephs Lake, Toasperns Pond, Wanaksink, and Yankee Lake.

The aggregated dam-failure inundation boundaries for these dams were overlaid on the centroids of updated assets (population, building stock, critical facilities, and new development). Centroids that intersected the dam-failure inundation boundaries were totaled to estimate the buildings, facilities, and population vulnerable to the dam failure hazard.

Drought

All of Sullivan County is at risk from the impacts of drought events. A qualitative analysis was conducted to assess the County's risk from this hazard of concern.

Earthquake

Vulnerability Analysis

Ground shaking is the primary cause of earthquake damage to structures, and soft soils amplify ground shaking. The National Earthquake Hazard Reductions Program (NEHRP) defines five soil classifications (A to E) based on the soil's effect on ground shaking—"A" represents hard rock that reduces ground motions from an earthquake and "E" represents soft soils that amplify ground shaking. NEHRP Class D and E soils are the soils most susceptible to ground shaking during an earthquake.

A vulnerability analysis was conducted for the county's assets (population, building stock, critical facilities, and new development) using NEHRP soil data from New York State. The vulnerability analysis defined the hazard area as all areas with Class D or E soil types. Assets with their centroid in the hazard areas were totaled to estimate the numbers and values vulnerable to the earthquake hazard.

Loss Estimation

A probabilistic assessment was conducted for the 500-year MRP earthquake event through an advanced analysis in Hazus. The probabilistic method uses information from historical earthquakes and inferred faults, locations, and magnitudes to compute probable ground shaking levels, by census tract, for a seismic event of a selected a recurrence period.

Default Hazus soil data and groundwater depth (5 feet) were used. The default assumption is a magnitude 7.0 earthquake. Although damage is estimated at the census tract level, results were presented at the municipal level. An area analysis was used to extract the percent of each census tract that falls within individual jurisdictions. The percentage was multiplied against the results calculated for each tract and summed for each jurisdiction.

Hazus considers building construction and age of building as part of the analysis. Building ages and building types from the custom general building stock inventory were incorporated into the Hazus model. Damage estimates were calculated for losses to buildings (structural and non-structural) and contents. Structural losses include load carrying components of the structure. Non-structural losses include those to architectural, mechanical, and electrical components of the structure, such as nonbearing walls, veneer and finishes, HVAC systems, boilers, etc.

Flood

The 1 and 0.2 percent annual chance flood events were examined to evaluate the county's risk from the flood hazard. The following data were used:

- The Sullivan County FEMA Effective Digital Flood Insurance Rate Map (DFIRM) dated August 17, 2015, with a latest revision date of September 30, 2025.
- A depth grid created using the 2015/2025 effective DFIRM and a 1-meter digital elevation model from New York State's GIS Clearinghouse (2019).

Vulnerability Analysis

To estimate vulnerability to the 1 and 0.2 percent annual chance flood events, the 2015/2025 effective DFIRM flood boundaries were overlaid on the centroids of updated assets (population, building stock, critical facilities, and new development). Assets with their centroid in the hazard areas were totaled to estimate the numbers and values vulnerable to the flood hazard.

Loss Estimation

The depth grid generated using the DFIRM and 1-meter digital elevation model was integrated into the Hazus riverine flood model and used to estimate potential losses for the 1 percent annual chance flood event based on default Hazus damage functions. An advanced analysis was performed to estimate potential impacts on the population (displacement and shelter needs) using default 2020 U.S. Census data, potential damage to the general building stock, and potential damage to critical facilities.

Landslide

An analysis was conducted using USGS landslide susceptibility data to determine the county's vulnerability to the landslide hazard. The county's assets (population, buildings, critical facilities, and new development) were examined to determine if they are in areas of moderate, high, or very high landslide susceptibility. Assets with their centroid in the hazard area were totaled to estimate the number and value at risk from landslides.

Pandemic

All of Sullivan County is at risk from the impacts of pandemics. A qualitative analysis was conducted to assess the County's risk from this hazard of concern.

Severe Storm

A Hazus probabilistic advanced analysis was performed to analyze the wind-related losses in Sullivan County for a 500-year MRP hurricane-wind event. The probabilistic Hazus hurricane model activates a database of thousands of storms that have tracks and intensities reflecting the full spectrum of Atlantic hurricanes observed since 1886 and identifies those with tracks associated with Sullivan County. Hazus includes surface roughness and vegetation (tree coverage) maps for the area to support the modeling of wind force across various types of land surfaces.

Default demographic and updated building and critical facility inventories in Hazus were used for the analysis. Although damage is estimated at the census tract level, results were presented at the municipal level. A density analysis was used to extract the percent of building structures in each tract and jurisdiction. The percentage was multiplied against the results calculated for each tract and summed for each jurisdiction.

Severe Winter Storm

All of Sullivan County is exposed and vulnerable to the winter storm hazard. In general, structural impacts include damage to roofs and building frames, rather than building content. Current modeling tools are not available to estimate specific losses for this hazard. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

Wildfire

Maps of wildland-urban interface (WUI) areas (interface and intermix) were referenced to delineate wildfire hazard areas. The maps were obtained through the U.S. Forest Service from the SILVIS Laboratory at the University of Wisconsin – Madison. The SILVIS hazard areas are based on the 2020 Census and 2023 National Land Cover Dataset and the Protected Areas Database. Separate hazard areas were assessed for the interface WUI and intermix WUI. GIS asset data were overlaid with the hazard areas, and assets with their centroids located in the hazard areas were totaled to estimate the numbers and values at risk from the impacts of a wildfire event.

4.4 DATA SOURCE SUMMARY

Table 4-2 summarizes the data sources used for the risk assessment for this plan.

Table 4-2. Risk Assessment Data Documentation

Data	Source	Date[a]	Format
Population data	U.S. Census Bureau	2020	Comma-Separated Value
	ACS 5-Year Estimates	2023	
Building Inventory	Sullivan County	2024	Digital (GIS)
	Sullivan County Real Property	2025	
	U.S. Army Corp of Engineers, NSI	2022	
	RSMeans	2024	
Critical Facilities and Lifelines	Sullivan County	2025	Digital (GIS)
	AVAIL	2023	
	New York State Clearinghouse	2023, 2025	
	Tetra Tech	2025	
New Development	Town of Bethel	2026	E-mail
Land Cover	USGS	2024	Digital (GIS)
Digitized Effective FIRM maps	FEMA	2015, 2025	Digital (GIS)
1-Meter Digital Elevation Model	New York State Office of Information Technology Services Geospatial Services, FEMA	2019	TIFF
Dam-Failure Inundation Data	DSS-WISE	2025	Digital (GIS)
NEHRP Soils	New York State	n.d.	Digital (GIS)
Landslide Susceptibility Data	USGS	2024	Digital (GIS)
Wildfire Hazard Data	USFS; University of Wisconsin-Madison, MRLC Consortium, U.S. Census Bureau	2023; 2023, 2021, 2020	Digital (GIS)

Note: AVAIL = Albany Visualization and Informatics Labs; DSS-WISE = Decision Support System for Water Infrastructure Security; MRLC = Multi-Resolution Land Characteristics; NSI = National Structure Inventory; USFS = U.S. Forest Service

a. Multiple dates indicate multiple references to provide complete resource coverage

4.5 LIMITATIONS

Loss estimates, vulnerability analyses, and hazard-specific impact evaluations rely on the best-available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from the following:

- Approximations and simplifications necessary to conduct such a study
- Incomplete or dated inventory, demographic, or economic parameter data, including the lack of population statistics for the Village of Ateres
- The unique nature, geographic extent, and severity of each hazard

- Mitigation measures already employed by the Planning Partners
- The amount of advance notice residents have to prepare for a specific hazard event
- Uncertainty of future conditions

These factors can result in a range of uncertainty in loss estimates, possibly by a factor of two or more. Therefore, potential vulnerability and loss estimates are approximate. These results do not predict precise results and should be used to understand relative risk. Over the long term, Sullivan County will collect additional data and update and refine existing inventories to assist in estimating potential losses.

Potential economic loss is based on the present value of the general building stock using best-available data. The county acknowledges significant impacts may occur to critical facilities and infrastructure as a result of these hazard events causing great economic loss. However, monetized damage estimates to critical facilities and infrastructure, and economic impacts were not quantified and require more detailed loss analyses. In addition, economic impacts to industry such as tourism and the real-estate market were not analyzed.

4.6 CONSIDERATIONS FOR MITIGATION AND NEXT STEPS

The following items are to be discussed for considerations for the next plan update to enhance the risk assessment:

- All Hazards
  - Create an updated user-defined general building stock dataset using up-to-date parcels, footprints, and RSMeans values.
  - Utilize updated and current demographic data, specifically in regard to the Village of Ateres to ensure inclusion.
- Dam Failure
  - Obtain the most current dam-failure inundation hazard areas in order to support vulnerability and loss estimation analyses.
- Earthquake
  - Identify unreinforced masonry in critical facilities and privately owned buildings (i.e., residences) by accessing local knowledge, tax assessor information, and/or pictometry/orthophotos. These buildings may not withstand earthquakes of certain magnitudes and plans to provide emergency response or recovery efforts at these properties can be developed.
- Flood
  - The general building stock inventory can be updated to include attributes regarding first floor elevation and foundation type (basement, slab on grade, etc.) to enhance loss estimates.
  - Conduct a Hazus loss analysis for more frequent flood events (e.g., 10- and 50-year flood events).
  - Conduct a repetitive loss area analysis.
  - Continue to expand and update urban flood areas to further inform mitigation.
  - As more current FEMA floodplain data become available (i.e., DFIRMs), update the vulnerability analysis and generate a more detailed flood depth grid that can be integrated into the current Hazus version.
  - Develop a detailed depth grid for Hazus modeling, utilizing base flood elevations, cross sections and FEMA Flood Insurance Study reports

- Landslide
  - A pilot study conducted in Schenectady County, NY (Landslide Susceptibility – A Pilot Study of Schenectady County, NY) provided a detailed methodology for delineating high-risk landslide areas. This study looked at a variety of environmental characteristics including slope and soil conditions to determine areas at risk from landslide. To coincide with the methodology of that study, the generated slopes were categorized into five classes: 0 to 2 percent; 3 to 7 percent; 8 to 15 percent; 16 to 25 percent; Greater than 25 percent. Should the county determine the need for a more detailed assessment of risk, it could determine steep slope by other percentage categorizations. Additional environmental and soil characteristics used in the Schenectady County plan can be collected and used to follow the methodology used to further delineate the county's most at-risk areas.
- Severe Storm
  - The general building stock inventory can be updated to include attributes regarding protection against strong winds, such as hurricane straps, to enhance loss estimates.
- Wildfire
  - General building stock inventory can be updated to include attributes such as roofing material, fire detection equipment, or distance to fuels as another measure of vulnerability.

5. IDENTIFICATION OF HAZARDS OF CONCERN

5.1 REVIEW OF POTENTIAL HAZARDS

To provide a strong foundation for mitigation actions in this plan, Sullivan County considered a full range of hazards that could impact the area and then identified and ranked those that present the greatest concern. These hazards of concern were identified based on the following:

- Input from all Planning Partners
- Review of the New York State Hazard Mitigation Plan
- Review of the 2021 Sullivan County HMP
- Research on the frequency, magnitude, and costs associated with hazards that have previously or could feasibly impact the region
- Qualitative information regarding natural (not human-caused) hazards and the perceived vulnerability of the planning area's assets to them.

Hazards of Concern are hazards that are most likely to impact a community. These are identified using available data and local knowledge.

Natural Hazards are a source of harm or difficultly created by a meteorological, environmental, or geological event.

Table 5-1 documents the process of identifying the hazards of concern for further profiling and evaluation.

Based on the review of potential hazards of concern, nine hazards of concern were identified as significant hazards affecting the entire County, to be addressed at the County level in this HMP (shown here in alphabetical order):

- Dam failure
- Drought
- Earthquake
- Flood
- Landslide
- Pandemic
- Severe storm
- Severe winter storm
- Wildfire

Other natural and human-caused hazards of concern have occurred within Sullivan County but have a low potential to occur, are addressed by other planning mechanisms, and/or do not result in significant impacts within the County. Therefore, these hazards are not addressed in this update. If deemed necessary by the County, these hazards may be considered in future plan updates.

Table 5-1. Identification of Hazards of Concern for Sullivan County

Hazard	May Occur in the County?	Significant Threat to the County?	Why was this determination made?	Sources
Avalanche	No	No	The 2023 New York State HMP identifies avalanche as a hazard of concern. Avalanche was identified as a hazard in the New York State HMP, and there have been occurrences in the state; however, there were no occurrences in Sullivan County. The topography and climate of Sullivan County do not support the occurrence of an avalanche. The Steering Committee and Planning Partnership do not consider the hazard to be a significant concern.	NYS DHSES Input from Steering Committee and Planning Partnership
Coastal Hazards	Yes	No	The New York State HMP identifies coastal hazards as a hazard of concern for New York State. Coastal hazards can impact all the state's coastal counties along Lake Erie and the Niagara River, Lake Ontario and the St. Lawrence River, Atlantic Ocean and Long Island Sound, Hudson River south of the federal dam in Troy, the East River, the Harlem River, the Kill van Kull, and Arthur Kill, and all connecting waterbodies, bays, harbors, shallows, and wetlands. Coastal hazards may also impact inland counties and communities. Sullivan County does not have coastline. The Steering Committee and Planning Partnership did not identify coastal hazards as a hazard of concern.	NYS DHSES Input from Steering Committee and Planning Partnership
Dam Failure	Yes	Yes	The 2023 New York State HMP does not identify dam failure as a hazard of concern for New York State, though it is included in the Flood hazard profile. According to the NYSDEC, there are 306 dams in Sullivan County: 247 low hazard, 33 intermediate hazard, 14 high hazard, and 12 with no hazard classification code (NYSDEC 2025). Dam failure was given an individual hazard profile.	NYS DHSES NYSDEC NYS GIS Input from Steering Committee and Planning Partnership

Hazard	May Occur in the County?	Significant Threat to the County?	Why was this determination made?	Sources
Drought	Yes	Yes	The New York State HMP identifies drought as a hazard of concern for the state. Sullivan County has been impacted by several drought events that have occurred in New York State. Agriculture is a substantial industry in Sullivan County. Drought conditions would severely impact the County's economy. Sullivan County was included in seven drought-related USDA disaster declarations: S3427—2012 Drought, Excessive Heat S3441—2012 Drought S3759 —2014 Drought S4114 —2016 Drought S5306—2022 Drought S5313—2022 Drought S5342—2022 Drought The Steering Committee and Planning Partnership identified drought as a hazard of concern for Sullivan County.	NYS DHSES FEMA USDA NOAA-NCEI NRCC Input from Steering Committee and Planning Partnership
Earthquake	Yes	Yes	The New York State HMP identified earthquake as a hazard of concern for New York State. New York State was included in one FEMA earthquake-related disaster declaration (DR-1415); Sullivan County was not included in this declaration. From 2015 to 2024, there have been no significant earthquakes with epicenters in Sullivan County. Based on input from the Steering Committee and Planning Partnership, earthquake was identified as a hazard of concern for Sullivan County.	NYS DHSES (USGS) Earthquake Hazards Program, USGS Seismic Maps Input from Steering Committee and Planning Partnership
Extreme Temperature	Yes	Yes	Please see Severe Storm and Severe Winter Storm Profiles	
Flood (riverine, lakeshore, ice jam, urban flooding, and flash flooding)	Yes	Yes	The New York State HMP identifies flooding as a hazard of concern for New York State. Between 1956 and 2024, Sullivan County was included in four flood-related declarations. DR-275; August 26, 1969; Heavy Rains and Flooding DR-401; July 20, 1973; Severe Storms and Flooding DR-702; March 28-April 8, 1984 DR-1095; January 19–30, 1996; New York Severe Storms and Flooding Based on the history of flooding and its impacts on Sullivan County and input from the Steering Committee and Planning Partnership, flooding has been identified as a hazard of concern for the County.	NYS DHSES NOAA-NCEI USACE Ice Jam Database FEMA Input from Steering Committee and Planning Partnership
Hail	Yes	Yes	Please see Severe Storm Profile	
Hurricane	Yes	No	Severe Storm Profile addresses high wind and heavy rain events.	

Hazard	May Occur in the County?	Significant Threat to the County?	Why was this determination made?	Sources
Ice Jams	Yes	Yes	Please see Flood Profile	
Ice Storm	Yes	Yes	Please see Severe Winter Storm Profile	
Land Subsidence	Yes	No	The 2023 New York State HMP does not identify land subsidence as a hazard of concern. The Steering Committee and Planning Partnership did not identify land subsidence as a hazard of concern for Sullivan County.	NYS DHSES USGS Input from Steering Committee and Planning Partnership
Landslide	Yes	Yes	The 2023 New York State HMP includes landslide as a hazard of concern for New York State. Between 1954 and 2024, New York State was not included in any landslide-related disaster declarations. Based on previous occurrences and input from the Steering Committee and Planning Partnership, the landslide hazard was identified as a hazard of concern for Sullivan County.	NYS DHSES NOAA NCEI FEMA Input from Steering Committee and Planning Partnership
Levee Failure	Yes	Yes	The 2023 New York State HMP does not identify levee failure as a hazard of concern for New York State, though it is included in the flood hazard profile. According to the NYSDEC, there are no levee systems in Sullivan County (USACE 2025). The Steering Committee and Planning Partnership did not identify levee failure as a hazard of concern for Sullivan County.	NYS DHSES USACE Input from Steering Committee and Planning Partnership
Lightning	Yes	Yes	Please see Severe Storm Profile	
Pandemic	Yes	Yes	The 2023 New York State HMP does not identify pandemic as a hazard of concern for New York State. Sullivan County was included in three pandemic-related disaster declarations: EM-3155; May 22–November 1, 2000; New York Virus Threat EM-3434; January 20, 2020–May 11, 2023; New York COVID-19 DR-4480; January 20, 2020–May 11, 2023; New York COVID-19 Pandemic The Steering Committee and Planning Partnership identified pandemic as a hazard of concern for Sullivan County.	NYS DHSES FEMA Input from Steering Committee and Planning Partnership

Hazard	May Occur in the County?	Significant Threat to the County?	Why was this determination made?	Sources
Severe Storm (wind, extreme temperature, thunderstorms, hail, lightning, hurricanes, and tornadoes)	Yes	Yes	The New York State HMP identifies severe storm as a hazard of concern for New York State; however, for the state HMP, the hazards were profiled in individual sections hail, lightning, tornado, high winds, and extreme heat. For the Sullivan County HMP, the hazards were combined into one profile. Between 1954 and 2024, Sullivan County was included in 19 severe storm-related declarations: DR-1233; June 25-July 10, 1998; Severe Storms and Flooding DR-1335; May 3-August 12, 2000; Severe Storms and Flooding DR-1486; July 21-August 13, 2003; Severe Storms, Flooding and Tornadoes DR-1534; May 13-June 17, 2004; Severe Storms and Flooding DR-1565; September 16-24, 2004; Tropical Depression Ivan DR-1564; August 13-September 16, 2004; Severe Storms and Flooding DR-1589; April 2-4, 2005; Severe Storms and Flooding EM-3262; August 29-October 1, 2005; Hurricane Katrina Evacuation DR-1650; June 26-July 10, 2006; Severe Storms and Flooding DR-1670; November 16-17, 2006; Severe Storms and Flooding DR-1710; June 19, 2007; Severe Storms and Flooding EM-3328; August 25-September 5, 2011; Hurricane Irene DR-4020; August 26-September 5, 2011; Hurricane Irene EM-3341; September 7-September 11, 2011; Remnants of Tropical Storm Lee EM-3351; October 27-November 8, 2012; Hurricane Sandy DR-4085; October 27-November 8, 2012; Hurricane Sandy EM-3565; August 21-24, 2021; Hurricane Henri EM-3572; September 1-3, 2021; Remnants of Hurricane Ida DR-4615; September 1-3, 2021; Remnants of Hurricane Ida Based on previous occurrences and input from the Steering Committee and Planning Partnership, severe storm is identified as a hazard of concern for Sullivan County.	NYS DHSES FEMA NOAA-NCEI SPC Input from Steering Committee and Planning Partnership

Hazard	May Occur in the County?	Significant Threat to the County?	Why was this determination made?	Sources
Severe Winter Storm (heavy snow, blizzards, ice storms)	Yes	Yes	The New York State HMP identifies ice storms and snowstorms as hazards of concern for New York State. According to the New York State HMP, Sullivan County experienced nine ice storm events with losses of $15,000 and 83 snowstorm events with losses of over $800,000. Sullivan County was included in six severe winter storm-related disaster declarations: EM-3107; March 13–16, 1993; New York Severe Blizzard DR-1083; January 6-12, 1996; Blizzard of '96 (Severe Snow Storm) EM-3173; December 25, 2002- January 4, 2003; Snowstorms EM-3184; February 17-18, 2003; Snow EM-3299; December 11-31, 2008; Severe Winter Storm DR-4322; March 14-15, 2017; Severe Winter Storm and Snowstorms Based on previous occurrences and input from the Steering Committee and Planning Partnership, severe winter storm is identified as a hazard of concern for Sullivan County.	NYS DHSES FEMA NOAA-NCEI Input from Steering Committee and Planning Partnership
Snowstorm	Yes	Yes	Please see Severe Winter Storm	
Tornado	Yes	Yes	Please see Severe Storm	
Utility Failure	Yes	Yes	The 2023 New York State HMP does not identify utility failure as a hazard of concern for the state. Sullivan County experiences utility failures (generally power outages) several times each year. These failures are usually due to severe storms or severe winter storms that affect the County. Sullivan County was included in one utility failure-related disaster declaration: EM-3186; August 14–16, 2003; New York Power Outage. The Steering Committee and Planning Partnership consider utility failure to be a cascading impact of severe storm and severe winter storm events, and it is therefore incorporated in the vulnerability assessment of those profiles.	NYS DHSES NOAA NCEI Input from Steering Committee and Planning Partnership
Wildfire	Yes	Yes	The New York State HMP identifies wildfire as a hazard of concern for New York State. Sullivan County was not included in any FEMA wildfire-related disaster declarations. Wildfires have occurred within Sullivan County. The County's agriculture industry could be severely impacted by a large wildfire. Based on previous occurrences and input from the Steering Committee and Planning Partnership, wildfire is identified as a hazard of concern for Sullivan County.	NYS DHSES FEMA Input from Steering Committee and Planning Partnership
Wind	Yes	Yes	Please see Severe Storm	

Note: DR = Presidential Disaster Declaration Number; EM = Presidential Disaster Emergency Number; NCEI = National Centers for Environmental Information; NYSDEC = New York State Department of Environmental Conservation; NYS DHSES = New York State Division of Homeland Security and Emergency Services; NYS HMP = New York State Hazard Mitigation Plan; USDA = U.S. Department of Agriculture; USGS = U.S. Geologic Survey

5.2 HAZARD DEFINITIONS AND GROUPINGS

The Steering Committee approved use of the following hazard event definitions and groupings:

- The dam failure hazard profile addresses dam failures that may impact Sullivan County.
- A drought is a period characterized by long durations of below normal precipitation.
- An earthquake is the sudden movement of the earth's surface caused by the release of stress accumulated within or along the edge of the earth's tectonic plates, a volcanic eruption, or a man-made activities that cause geologic stresses.
- The flood hazard includes riverine flooding, lakeshore flooding, flash flooding, shallow flooding, ice jam flooding, urban drainage flooding, and dam failure flooding. Inclusion of the various forms of flooding under a general flood hazard is consistent with that used in FEMA's Multi-Hazard Identification and Risk Assessment guidance and the NYS HMP.
- The landslide hazard includes rock falls, rock topples, rotational slump, transitional slide, earth flows, creep, block slides, debris avalanche, and debris flows.
- The pandemic hazard exists when there are more cases of a particular disease than expected in a given area, or among a specific group of people, over a particular period of time. In an outbreak or epidemic, it is presumed that the cases are related to one another or that they have a common cause.
- The severe storm hazard includes windstorms that often entail a variety of other weather conditions. For this HMP update, severe storm includes thunderstorms, hail, lightning, tornadoes, high wind, and extreme heat.
- For this HMP update, the severe winter storm hazard includes blizzards, ice storms, snowstorms, sleet, freezing rain, and extreme cold.
- Wildfire is any non-structural fire that occurs in the wildland. Wildfires result in the disturbance of forest and brush and destruction of real estate and personal property and have secondary impacts on other hazards, such as flooding, by removing vegetation and disturbing watersheds.

6. DAM FAILURE

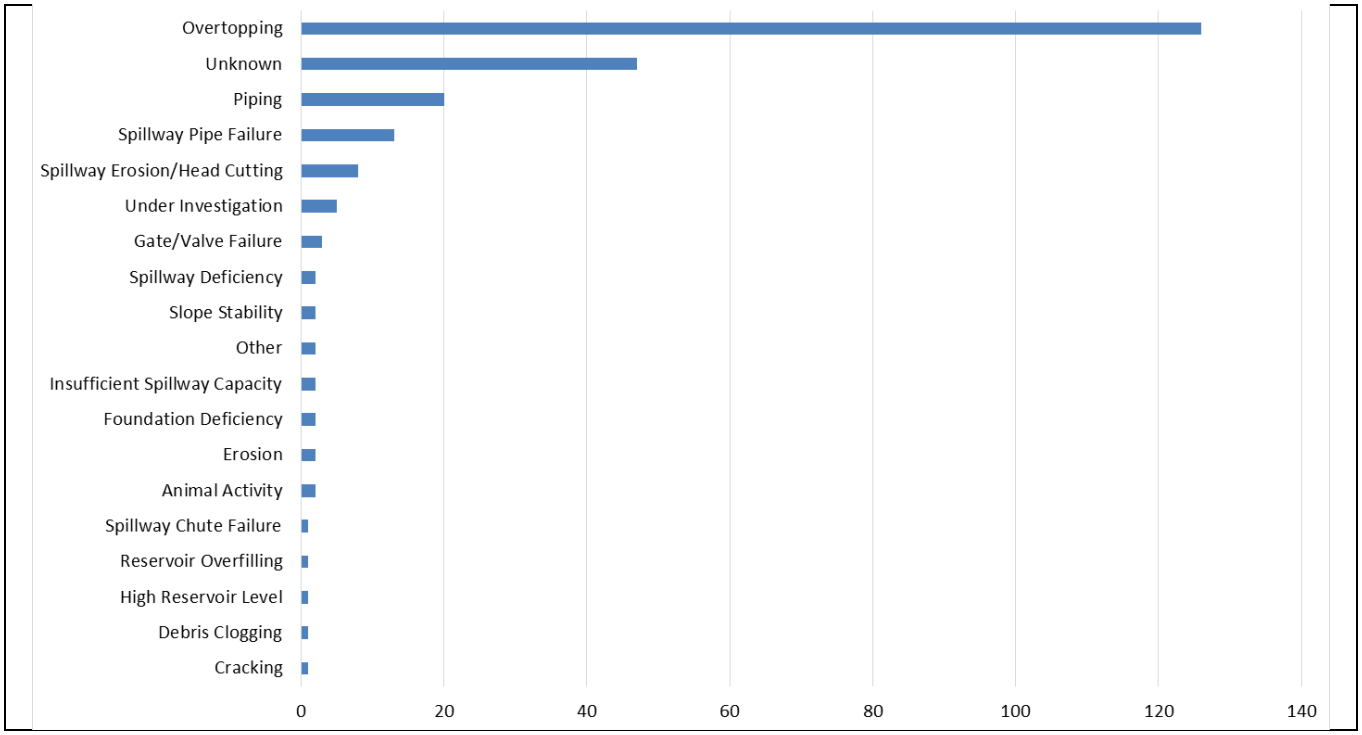
6.1 HAZARD PROFILE

6.1.1 Hazard Description

A dam is an artificial barrier allowing storage of water, wastewater, or liquid-borne materials (Association of State Dam Safety Officials 2025). Dam failure is any malfunction or abnormality outside of a dam's design that leads to a sudden, rapid, and uncontrolled release of water (USSD 2023). The water stored behind a dam represents potential energy that can endanger downstream life and property if released suddenly. Dam failures may occur during a large storm event when significant rainfall quickly inundates an area and causes floodwaters to overwhelm the dam's reservoir. Dam failures also can occur suddenly, without warning, and under normal operating conditions (referred to as a "sunny-day" failure).

Dams typically fail when spillway capacity is inadequate and excess flow overtops the dam or when internal erosion (piping) through the dam or foundation occurs. Complete failure occurs if internal erosion or overtopping results in a complete structural breach, releasing a high-velocity wall of debris-filled water that rushes downstream, damaging or destroying anything in its path (FEMA 2016a). Figure 6-1 visualizes the primary causes of dam failures nationally.

Figure 6-1. Dam Failure Causes, 2010-2019



Source: (Association of State Dam Safety Officials 2025)

Dam failures can result from one or a combination of the following (Association of State Dam Safety Officials 2025):

- Overtopping caused by floods that exceed the capacity of the dam
- Deliberate acts of sabotage
- Structural failure of materials used in dam construction
- Movement or failure of the foundation supporting the dam
- Settling and cracking of concrete or embankment dams
- Piping and internal erosion of soil in embankment dams
- Inadequate maintenance and upkeep

All dams have a residual risk of failure. Residual risk is the remote risk associated with a condition that was judged to not be a credible dam safety issue during the planning and design of the dam. It is the risk that remains after all reasonable steps to mitigate risk have been completed (FEMA 2018).

Regulatory Oversight of Dams

The risks associated with dams must be minimized at all times, which requires proper maintenance, safety inspections, technical review of proposed new dams, enforcement of dam safety criteria, and emergency preparedness planning, which is tracked by New York State Department of Environmental Conservation (NYSDEC) (NYSDEC n.d.-a). More than a third of the country's dams are 50 or more years old. Approximately 15,000 of those dams pose a significant hazard to life and property if failure occurs. About 2,000 unsafe dams are dispersed throughout the United States in almost every state.

Dam safety emergency action plans (EAPs) are formal, site-specific procedures written by the dam owner/operator for preventing or mitigating the occurrence of a catastrophic dam failure. NYSDEC regulates dam safety and EAPs for all dams in New York State. USACE is responsible for submitting an EAP for each dam it owns, operates, and maintains. EAPs for hydroelectric dams fall under the purview of the Federal Energy Regulatory Commission (FERC) (USACE 2014).

Grant assistance from FEMA provides support for the improvement of dam safety programs that regulate most dams in the United States. The National Dam Safety Program is a partnership among states, federal agencies, and other stakeholders that encourages individual and community responsibility for dam safety. Program funds have allowed participating states to improve their programs through increased inspections, emergency action planning, and purchase of needed equipment. FEMA has also expanded existing training programs and initiated new training programs (FEMA 2023b).

New York State Department of Environmental Conservation

The NYSDEC Dam Safety Section is responsible for safety inspection of dams, technical review of proposed dam construction or modification, monitoring of remedial work for compliance with dam safety criteria, and emergency preparedness for all dams in the state. NYSDEC is responsible for more than 100 flood control projects throughout the state, most of which were constructed by the USACE and are operated and maintained by NYSDEC.

The state generally inspects high-hazard (Class C) dams every two years and moderate-hazard (Class B) dams every four years. To support emergency planning efforts and raise awareness among local officials and emergency managers, a copy of each inspection report is sent to the chief executive of the community in which the dam is located. Municipal officials or emergency managers from any municipality in the dam's inundation area may receive a copy of the inspection report upon request (NYSDEC n.d.-g).

According to the NYSDEC, the hazard classification of a dam is assigned according to the potential impacts of a dam failure as follows (Title 6 of New York Codes Rules and Regulations (NYCRR) Part 673.3) (NYSDEC n.d.-f):

- *Low Hazard (Class A)*—A dam in an area where failure will damage nothing more than isolated buildings, undeveloped lands, or township or county roads; and/or will cause no significant economic loss or serious environmental damage. Failure or misoperation will result in no probable loss of human life. Losses will be principally limited to the owner's property.
- *Intermediate Hazard (Class B)*—A dam in an area where failure may damage isolated homes, main highways, or minor railroads; interrupt the use of relatively important public utilities; and/or cause significant economic loss or serious environmental damage. Failure or misoperation will result in no probable loss of human life but may cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Dams classified as intermediate hazard dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.
- *High Hazard (Class C)*—A dam in an area where failure may cause loss of human life, serious damage to homes, industrial or commercial buildings, important public utilities, main highways or railroads, and/or will cause extensive economic loss. This is a downstream hazard classification for dams in which excessive economic loss (urban area including extensive community, industry, agriculture, or outstanding natural resources) will occur as a direct result of dam failure.
- *Negligible or No Hazard (Class D)*—A dam that has been breached or removed, has failed, no longer materially impounds waters, or was planned but never constructed. Class “D” dams are defunct dams posing negligible or no hazard. NYSDEC may retain pertinent records regarding such dams.

U.S. Army Corps of Engineers Dam Safety Program

USACE is responsible for safety inspections of dams in the United States that meet size and storage limitations specified in the National Dam Safety Act. USACE has inventoried dams and has surveyed each state and federal agency's capabilities, practices, and regulations regarding the design, construction, operation, and maintenance of dams. USACE has also developed guidelines for inspection and evaluation of dam safety (USACE 2014). Table 6-1 outlines the level of impact that a dam failure would have based upon the hazard potential classification as rated by USACE (USACE n.d.-b).

Federal Energy Regulatory Commission Dam Safety Program

FERC has the largest dam safety program in the United States. FERC cooperates with many federal and state agencies to ensure and promote dam safety. FERC staff inspect hydroelectric projects on an unscheduled basis to investigate the following (FERC 2023):

- Potential dam safety problems
- Complaints about constructing and operating a project
- Safety concerns related to natural disasters
- Issues concerning compliance with terms and conditions of a license

Every five years, an independent consulting engineer, approved by FERC, must inspect and evaluate projects with dams higher than 32.8 feet (10 meters) or with a total storage capacity of more than 2,000 acre-feet (FERC 2023).

Table 6-1. U.S. Army Corps of Engineers Hazard Potential Classification

Hazard Category[a]	Direct Loss of Life[b]	Lifeline Losses[c]	Property Losses[d]	Environmental Losses[e]
Low	None (rural location, no permanent structures for human habitation)	No disruption of services (cosmetic or rapidly repairable damage)	Private agricultural lands, equipment, and isolated buildings	Minimal incremental damage
Significant	Rural location, only transient or day-use facilities	Disruption of essential facilities and access	Major public and private facilities	Major mitigation required
High	Certain (one or more) extensive residential, commercial, or industrial development	Disruption of essential facilities and access	Extensive public and private facilities	Extensive mitigation cost or impossible to mitigate

Source: (USACE n.d.-b)

a. Categories are assigned to overall projects, not individual structures at a project.

b. Loss-of-life potential is based on inundation mapping of area downstream of the project. Analyses of loss-of-life potential should take into account the population at risk, time of flood wave travel, and warning time.

c. Lifeline losses include indirect threats to life caused by the interruption of lifeline services from project failure or operational disruption; for example, loss of critical medical facilities or access to them.

d. Property losses include damage to project facilities and downstream property and indirect impact from loss of project services, such as impact from loss of a dam and navigation pool, or impact from loss of water or power supply.

e. Environmental impact downstream caused by the incremental flood wave produced by the project failure, beyond what would normally be expected for the magnitude flood event under which the failure occurs.

FERC monitors and evaluates seismic research in geographic areas where seismic activity is a concern. This information is applied to investigate and analyze structures of hydroelectric projects within these areas. FERC staff also evaluate the effects of potential and actual large floods on the safety of dams. FERC staff visit dams and licensed projects during and after floods, assess the extent of damage, and direct any studies or remedial measures the licensee must undertake. FERC's *Engineering Guidelines for the Evaluation of Hydropower Projects* guides FERC engineering staff and licensees in evaluations of dam safety. The publication is frequently revised to reflect current information and methodologies (FERC 2023).

FERC requires licensees to prepare EAPs and conducts training sessions on developing and testing these plans. The plans outline an early warning system in the event of an actual or potential sudden release of water from a dam failure. The plans include operational procedures that may be implemented during regulatory measures, such as reducing reservoir levels and downstream flows, as well as procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that all applicable parties are informed of the proper procedures in emergencies (FERC 2023).

6.1.2 Location

According to New York State data, 306 dams are present throughout Sullivan County, as shown in Figure 6-2. Most of these dams pose little risk; however, there are 14 high hazard potential dams in the County (NYSDEC 2024b):

- Cliff Lake Dam, Town of Lumberland
- Lake Jefferson Dam, Town of Callicoon
- Lake Louise Marie Dam, Town of Thompson
- Mongaup Falls Dam, Town of Forestburgh
- Neversink Reservoir Dam, Town of Neversink
- Pleasure Lake Dam, Town of Fallsburg
- Rio Dam, Town of Deerpark, Town of Lumberland
- St Josephs Lake Dam, Town of Forestburgh
- Swinging Bridge Dam, Town of Forestburgh
- Toasperns Pond Dam, Town of Highland
- Toronto Lake Reservoir Dam, Town of Bethel
- Wanaksink Lake Dam, Town of Thompson
- White Crane Lake Dam, Town of Highland
- Yankee Lake Dam, Town of Mamakating

The dam failure hazard area for this HMP is the aggregated dam-failure inundation area for the high hazard potential dams, developed through DSS-WISE. The dam-failure inundation hazard area is shown in Figure 6-3.

6.1.3 Extent

New York State has undergone significant property damage as a result of dam failures. With 14 high-hazard dams in Sullivan County, the potential extent of damage from a dam failure is as described in the NYSDEC definition of the high-hazard rating; i.e., the failure could cause loss of human life, serious damage to homes, industrial or commercial buildings, important public utilities, main highways or railroads, and/or extensive economic loss.

6.1.4 Previous Occurrences

FEMA Disaster Declarations

Between 1954 and 2025, Sullivan County was not included in any major disaster (DR) or emergency (EM) declarations for dam failure-related events (FEMA 2025a).

USDA Declarations

Since the 2021 HMP, Sullivan County has not been included in any dam failure-related USDA agricultural disaster declarations (USDA 2025).

All Recent Events

There were no reported dam failure hazard events that have impacted Sullivan County between January 2020 and May 2025 (Stanford University 2023, Association of State Dam Safety Officials 2025). For events prior to 2020, refer to the 2021 Sullivan County HMP.

Figure 6-2. Dams Located in Sullivan County

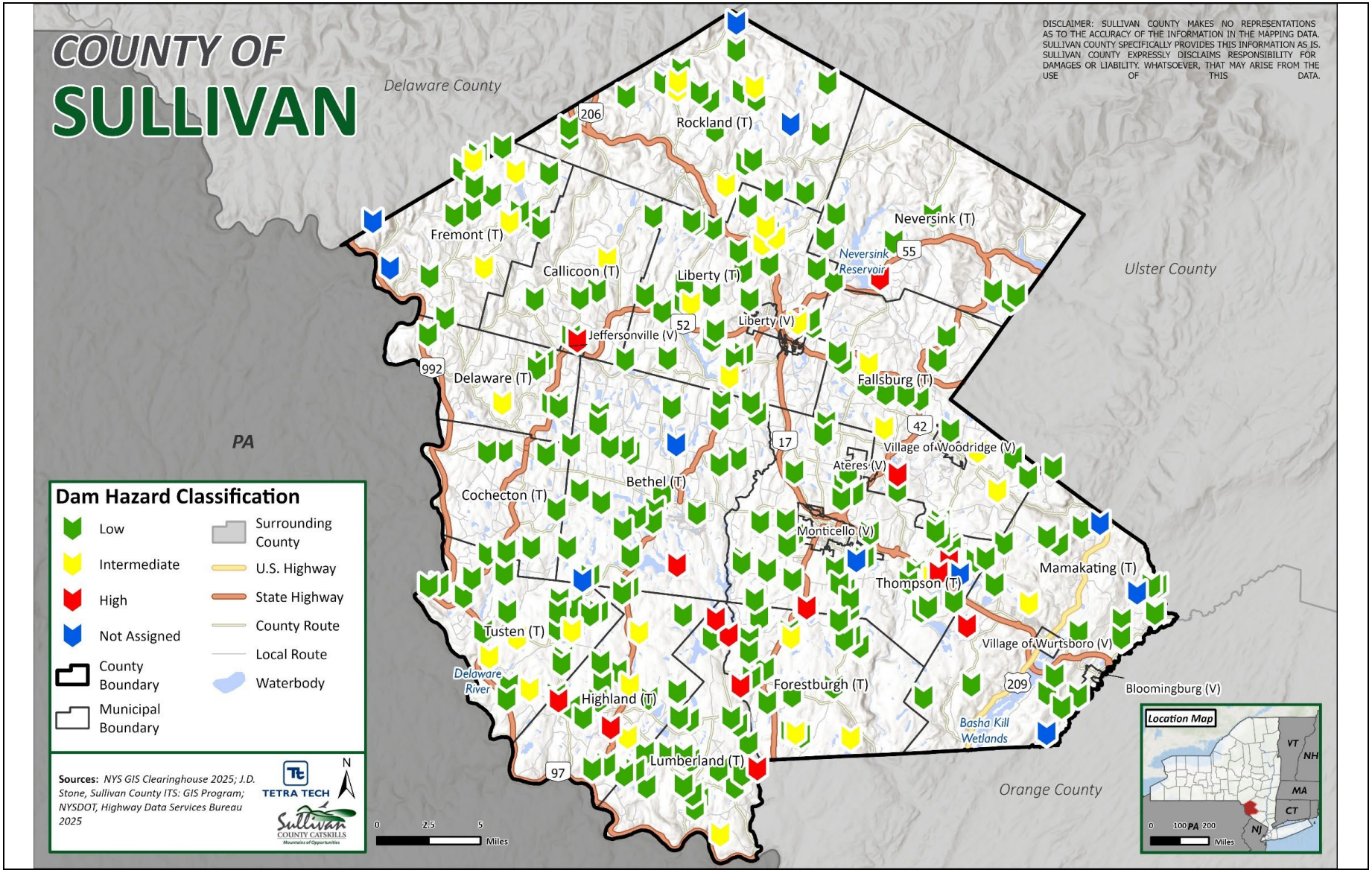
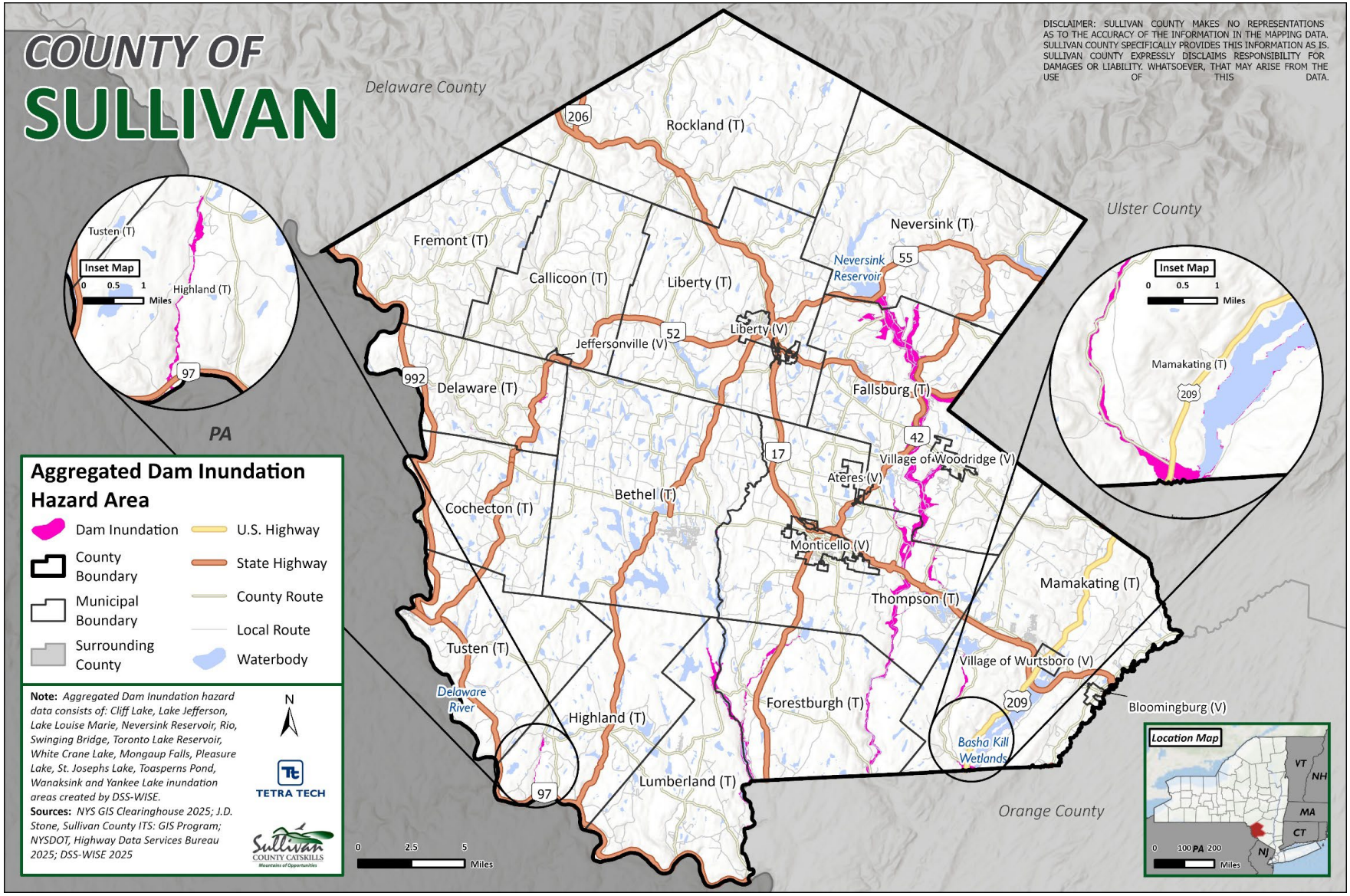


Figure 6-3. Dam-Failure Inundation Hazard Area in Sullivan County



6.1.5 Probability of Future Occurrences

Information on previous dam failures in the County was used to calculate the probability of future occurrence of such events. Table 6-2 lists the number of events from various sources over the 157-year period from 1868 to 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for dam failure in the County is considered "unlikely."

Table 6-2. Probability of Future Dam Failure Events in Sullivan County

Hazard Type	Number of Occurrences Between 1868 and 2025	Hazard Type
Dam Failure	2	1.27%

Source: (Association of State Dam Safety Officials 2025); (Stanford University 2023)
Note: The time period presented in this table is the most complete period of record for the various data sources reviewed.

6.1.6 Cascading Impacts Associated with the Hazard

Dam failures can create cascading effects that raise overall risk to communities. A sudden release of water may trigger landslides or erosion, threatening infrastructure and homes. In areas with saturated soils, rapid inundation can heighten the risk of soil liquefaction during earthquakes. If a dam fails during extreme storms, emergency response systems already strained by flooding may become overwhelmed, complicating evacuation and recovery.

6.2 VULNERABILITY AND IMPACT ASSESSMENT

Vulnerability and impact associated with the dam failure hazard were assessed based on the aggregated dam-failure inundation area shown in Figure 6-3.

6.2.1 Life, Health, and Safety

Overall Population

Dam failure impacts on people depend on the severity of the event and whether adequate warning time is provided to residents. People living in dam-failure inundation areas are exposed to the hazard. Table 6-3 summarizes the population living in the aggregated dam-failure inundation hazard by jurisdiction. An estimated 2,619 residents, or 3.3 percent of the County's total population, live within the hazard area. The Town of Fallsburg contains the greatest number of residents exposed to this hazard, with 2,178 residents living in the inundation area.

Vulnerability to the dam-failure hazard is not limited to those who reside within the hazard zone. Individuals may also be affected while traveling through flooded areas or if access to emergency services is disrupted during a dam failure event. The degree of these impacts can vary widely and is not directly measurable.

Flooding resulting from dam failure and its aftermath presents numerous threats to public health and safety. These include exposure to unsafe food, contaminated drinking and washing water, mosquitoes, animals, mold, and mildew. Detailed descriptions of these and other public health concerns are provided in the flood hazard profile in Chapter 9.

Table 6-3. Population in the Aggregated Dam-Failure Inundation Hazard Area

Jurisdiction	Total Population	Population in the Aggregated Dam Failure Hazard Area	
		Number of Persons	% of Jurisdiction Total
Ateres (V)	834	0	0.0%
Bethel (T)	3,997	0	0.0%
Bloomingburg (V)	1,022	0	0.0%
Callicoon (T)	2,594	0	0.0%
Cochecton (T)	1,392	0	0.0%
Delaware (T)	2,301	13	0.6%
Fallsburg (T)	13,292	2,178	16.4%
Forestburgh (T)	829	42	5.1%
Fremont (T)	1,204	0	0.0%
Highland (T)	2,007	37	1.8%
Jeffersonville (V)	417	54	12.9%
Liberty (T)	5,196	0	0.0%
Liberty (V)	5,083	0	0.0%
Lumberland (T)	2,276	2	0.1%
Mamakating (T)	10,456	161	1.5%
Monticello (V)	7,252	0	0.0%
Neversink (T)	3,381	0	0.0%
Rockland (T)	3,323	0	0.0%
Thompson (T)	8,628	88	1.0%
Tusten (T)	1,528	0	0.0%
Woodridge (V)	954	44	4.6%
Wurtsboro (V)	1,181	0	0.0%
Sullivan County (Total)	**79,147**	**2,619**	**3.3%**

Source: U.S. Census Bureau, American Community Survey 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; DSS-WISE 2025

At-Risk Populations

Using 2023 ACS data, Table 6-4 presents the estimated number of at-risk persons living in the aggregated dam-failure inundation hazard area. Economically disadvantaged populations may be more at risk from dam failure if they lack the financial resources to evacuate. The population over age 65 is at risk because they are more likely to need medical attention that may not be available due to isolation during a dam failure event. They also may have more difficulty evacuating.

Table 6-4. At-Risk Persons Living in the Aggregated Dam-Failure Inundation Hazard Area

Jurisdiction	At-Risk Persons Living in the Aggregated Dam-Failure Inundation Hazard Area									
	Population Over 65		Population Under 5		Non-English-Speaking Population		Population with Disability		Population Below Poverty Level	
	Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total
Ateres (V)	-	-	-	-	-	-	-	-	-	-
Bethel (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Bloomingburg (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Callicoon (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Cochecton (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Delaware (T)	3	0.6%	0	0.0%	0	0.0%	1	0.3%	1	0.4%
Fallsburg (T)	326	16.4%	99	16.3%	93	16.2%	297	16.4%	411	16.4%
Forestburgh (T)	14	5.2%	1	4.2%	0	0.0%	5	4.7%	2	5.1%
Fremont (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Highland (T)	11	1.9%	0	0.0%	0	0.0%	10	1.8%	3	1.7%
Jeffersonville (V)	10	12.5%	1	11.1%	0	0.0%	11	12.9%	11	12.5%
Liberty (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Liberty (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Lumberland (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mamakating (T)	23	1.5%	12	1.4%	3	1.4%	23	1.5%	13	1.4%
Monticello (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Neversink (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Rockland (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Thompson (T)	25	1.0%	4	0.8%	2	0.7%	15	1.0%	12	1.0%
Tusten (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Woodridge (V)	7	4.2%	2	3.6%	1	2.7%	8	4.2%	8	4.4%
Wurtsboro (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Sullivan County (Total)	**419**	**2.8%**	**119**	**2.6%**	**99**	**3.0%**	**370**	**3.0%**	**461**	**4.0%**

Source: U.S. Census Bureau ACS 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; DSS-WISE 2025

6.2.2 General Building Stock

Vulnerable properties are those closest to the dam-failure inundation area. These properties would experience the largest, most destructive surge of water. Low-lying areas are also vulnerable since they are where the dam waters would collect. Dam failure flooding may transport large volumes of sediment and debris, depending on the magnitude of the event.

Table 6-5 provides a summary of buildings in the aggregated dam-failure inundation hazard area by jurisdiction. An estimated 1,670 buildings are located in the aggregated dam-failure inundation hazard area. This represents 3.6 percent of the County's total general building stock in terms of inventory replacement cost value (approximately $1.7 billion).

Table 6-6 presents buildings in the aggregated dam-failure inundation hazard area by occupancy class. Residential structures account for the largest number of buildings exposed to this hazard, with the majority (1,246 buildings) located in the Town of Fallsburg.

6.2.3 Community Lifelines and Other Critical Facilities

Dam failures may impact critical facilities and infrastructure in the downstream inundation zone. Transportation routes are vulnerable to dam-failure inundation and have the potential to be wiped out. This includes all roads, railroads and bridges in the path of the dam-failure inundation. Those that are most vulnerable are those that are already in poor condition and would not be able to withstand a large water surge. The floodwaters can cut off evacuation routes and create isolation issues. Emergency response would be hindered due to the loss of transportation routes as well as some protective-function facilities in the inundation zone.

Utilities such as overhead power lines, cable and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation areas. Recovery time to restore critical functions after an event may be lengthy, as wastewater, potable water, and other community facilities can be affected by dam failure inundation. Water supplies and wastewater treatment could be off-line for weeks.

Table 6-7 presents the number of facilities by lifeline category and jurisdiction. A total of 90 facilities are located within this hazard area, with the transportation lifeline accounting for the largest number (56 facilities).

6.2.4 Economy

Dam failure events can significantly impact the local and regional economy. Potential losses include damage to buildings and infrastructure, agricultural losses, business interruption, and impacts on the tax base. Loss of power and communications may occur, and drinking water and wastewater treatment facilities may be temporarily out of operation.

Table 6-5. Buildings in the Aggregated Dam-Failure Inundation Hazard Area

Jurisdiction	Jurisdiction Total Buildings		Buildings in the Aggregated Dam-Failure Inundation Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Ateres (V)	99	$104,501,618	0	0.0%	$0	0.0%
Bethel (T)	4,671	$3,993,363,362	0	0.0%	$0	0.0%
Bloomingburg (V)	172	$223,874,493	0	0.0%	$0	0.0%
Callicoon (T)	1,942	$1,579,365,779	0	0.0%	$0	0.0%
Cochecton (T)	1,189	$1,051,465,789	0	0.0%	$0	0.0%
Delaware (T)	1,663	$1,867,149,344	9	0.5%	$4,192,008	0.2%
Fallsburg (T)	8,114	$8,608,748,500	1,340	16.5%	$1,399,171,471	16.3%
Forestburgh (T)	680	$627,023,982	38	5.6%	$41,341,063	6.6%
Fremont (T)	1,322	$1,156,125,779	0	0.0%	$0	0.0%
Highland (T)	1,853	$1,449,898,732	44	2.4%	$57,416,182	4.0%
Jeffersonville (V)	201	$275,534,732	32	15.9%	$48,232,702	17.5%
Liberty (T)	4,041	$3,988,125,428	0	0.0%	$0	0.0%
Liberty (V)	1,540	$2,185,506,732	0	0.0%	$0	0.0%
Lumberland (T)	1,796	$1,429,481,922	6	0.3%	$43,721,769	3.1%
Mamakating (T)	5,508	$3,516,266,251	92	1.7%	$58,542,189	1.7%
Monticello (V)	2,164	$2,972,791,748	0	0.0%	$0	0.0%
Neversink (T)	2,292	$1,693,278,156	1	<0.1%	$1,025,602	0.1%
Rockland (T)	2,659	$2,106,441,850	0	0.0%	$0	0.0%
Thompson (T)	7,526	$7,018,047,712	83	1.1%	$53,836,380	0.8%
Tusten (T)	1,254	$908,701,677	0	0.0%	$0	0.0%
Woodridge (V)	601	$624,670,518	25	4.2%	$33,728,037	5.4%
Wurtsboro (V)	517	$414,341,458	0	0.0%	$0	0.0%
Sullivan County (Total)	**51,804**	**$47,794,705,561**	**1,670**	**3.2%**	**$1,741,207,403**	**3.6%**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; RSMeans 2024; DSS-WISE 2025

Table 6-6. Buildings in the Aggregated Dam-Failure Inundation Hazard Area, by General Occupancy Class

Jurisdiction	Buildings in the Aggregated Dam-Failure Inundation Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Other
Ateres (V)	0	0	0	0
Bethel (T)	0	0	0	0
Bloomingburg (V)	0	0	0	0
Callicoon (T)	0	0	0	0
Cochecton (T)	0	0	0	0
Delaware (T)	8	1	0	0
Fallsburg (T)	1,246	64	12	18
Forestburgh (T)	32	3	3	0
Fremont (T)	0	0	0	0
Highland (T)	32	11	0	1
Jeffersonville (V)	20	11	0	1
Liberty (T)	0	0	0	0
Liberty (V)	0	0	0	0
Lumberland (T)	2	0	4	0
Mamakating (T)	80	7	2	3
Monticello (V)	0	0	0	0
Neversink (T)	0	0	1	0
Rockland (T)	0	0	0	0
Thompson (T)	71	1	10	1
Tusten (T)	0	0	0	0
Woodridge (V)	25	0	0	0
Wurtsboro (V)	0	0	0	0
Sullivan County (Total)	**1,516**	**98**	**32**	**24**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; DSS-WISE 2025
Note: Other = Government, Religion, Agricultural, and Education

Table 6-7. Number of Facilities in the Aggregated Dam-Failure Inundation Hazard Area, by Lifeline

Jurisdiction	Facilities in the Dam-Failure Hazard Area, by Lifeline Category									Total	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Ateres (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Bethel (T)	0	0	0	0	0	1	0	0	0	1	1.6%
Bloomingburg (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Callicoon (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Cochecton (T)	0	0	0	0	0	0	2	0	0	2	9.1%
Delaware (T)	0	0	0	0	0	0	9	0	0	9	20.0%
Fallsburg (T)	1	0	0	0	1	7	9	0	3	21	25.3%
Forestburgh (T)	0	0	0	0	0	4	8	0	0	12	27.9%
Fremont (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Highland (T)	0	0	0	0	0	1	10	0	0	11	20.4%
Jeffersonville (V)	0	0	1	0	0	1	2	0	0	4	25.0%
Liberty (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Liberty (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Lumberland (T)	0	0	0	0	0	2	0	0	0	2	5.0%
Mamakating (T)	0	0	0	0	0	1	7	0	0	8	10.4%
Monticello (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Neversink (T)	0	0	0	0	0	1	2	1	0	4	5.8%
Rockland (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Thompson (T)	0	0	0	0	1	8	7	0	0	16	12.8%
Tusten (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Woodridge (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Wurtsboro (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Sullivan County (Total)	**1**	**0**	**1**	**0**	**2**	**26**	**56**	**1**	**3**	**90**	**8.2%**

Source: Sullivan County 2025; AVAIL 2023; NYS GIS Clearinghouse 2023, 2025; Tetra Tech 2025; DSS-WISE 2025

Note: High Hazard dams included in this analysis are: Cliff Lake, Lake Jefferson, Lake Louise Marie, Neversink Reservoir, Rio, Swinging Bridge, Toronto Lake Reservoir, White Crane Lake, Mongaup Falls, Pleasure Lake, St. Joseph's Lake, Toasperns Pond, Wanaksink and Yankee Lake

6.2.5 Natural Resources

The environment is vulnerable to several risks in the event of a dam failure. The inundation may introduce foreign elements into local waterways, resulting in destruction of downstream habitat and impacting many animal and plant species, especially endangered species. The rush of water downstream can rapidly increase flow rate and turbidity of streams and rivers or overwhelm terrestrial habitat.

Dam failures can often result in the release of hazardous materials swept up in floodwaters or in sediment that is contained behind the dam as is often the case in areas that have had mining activities take place upstream. The contents of unsecured containers of oil, fertilizers, pesticides, and other chemicals get added to floodwaters. Floodwaters can back up sanitary sewer systems and inundate wastewater treatment plants, causing raw sewage to contaminate waterways. After the floodwaters subside, contaminated and flood-damaged building materials and contents must be properly disposed of.

6.2.6 Historic and Cultural Resources

Historic buildings and structures, sites, monuments, districts, and historic documents may become damaged or destroyed in the floodwaters following a dam failure. Cultural resources include collections of artifacts, statuary, artwork, and important documents or repositories. These resources are housed in libraries, museums, archives, historical repositories, or historic properties. Floodwaters following a dam or levee failure pose the largest risk to these resources.

6.3 FUTURE CHANGES THAT MAY AFFECT RISK

6.3.1 Potential or Planned Development

Any areas of growth could be impacted by a dam failure event if the structures are located in the dam-failure inundation area and mitigation measures are not considered. Therefore, it is the intention of Sullivan County to discourage development in vulnerable areas and to pursue higher regulatory standards.

6.3.2 Projected Changes in Population

Sullivan County has experienced population growth since 2010, with projections indicating an increase to 79,082 by 2030 before a slight decline to 77,165 by 2040 (Cornell University 2018). Higher population density can create issues for local residents during evacuation from a dam failure event and can have an effect on commuters who travel into and out of Sullivan County.

6.3.3 Future Conditions

Future conditions may see increased rainfall, which could impact stored water systems and cause dams to be overtopped. Dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. Increased future precipitation may result in overtopping, as the hydrographs are based on historical events and may not properly account for the increase (USBR 2014).

7. DROUGHT

7.1 HAZARD PROFILE

7.1.1 Hazard Description

A drought is a period of unusually dry weather that persists long enough to cause deficiencies in surface or underground water supply. It can last for a short period or many years. High temperatures, high winds, and low humidity can worsen drought. Human activities and demands for water resources can accelerate drought impacts.

Droughts are slow-onset hazards but over time they can severely affect crops, wildlife, municipal water supplies and recreational resources. If drought conditions extend for long periods, the direct and indirect economic impacts can be significant. Droughts can be classified as one or more of the following types (NDMC 2023):

- **Meteorological** drought is a departure of precipitation from normal. It is defined solely by the relative degree of dryness. Due to climatic differences, rainfall amounts that represent a drought in one location of the country may not be a drought in another location.
- **Agricultural** drought is when there is not enough water available for a particular crop to grow at a particular time due to precipitation shortages, soil water deficits, reduced groundwater or reservoir levels, and other parameters. Agricultural drought is defined in terms of soil moisture deficiencies relative to water demands of plant life.
- **Hydrological** drought is when water supply is below normal because precipitation shortfalls (including snowfall) have lowered stream flows and reservoir, lake, and groundwater levels.
- **Socioeconomic** drought occurs when the water needed to produce an economic good exceeds the supply as a result of a weather-related shortfall in the water supply. Economic goods that depend on the weather include commercial and domestic water, forage, food grains, fish, and hydroelectric power.
- **Ecological** drought is a prolonged and widespread deficit in naturally available water supplies that creates multiple stresses across ecosystems.

7.1.2 Location

Drought is a regional phenomenon that has the potential to impact the entire planning area. A drought affects all aspects of the environment and the community simultaneously and has the potential to impact every person in the planning area directly or indirectly as well as adversely affecting the local economy. Since water shortage happens on a regional scale, the entirety of the County is at risk.

New York State is divided into nine-drought management regions based loosely on drainage basins and county lines and monitored by the NYSDEC. Sullivan County is part of Drought Region II.

7.1.3 Extent

Data generated by NYSDEC is used to assess each drought management region's conditions and is classified by four levels of state drought advisories: watch, warning, emergency and disaster. The State Drought Index helps New York assess the impact on water supply, the regional economy, and the environment. New York also tracks other drought measurements as described in the sections below.

U.S. Drought Monitor

The U.S. Drought Monitor (USDM) is a map that shows the location and intensity of drought across the United States. The data is updated weekly. The USDM rates drought in a five-category system (Table 7-1): Abnormally Dry (D0; a precursor to drought, not actually drought), Moderate (D1), Severe (D2), Extreme (D3) and Exceptional (D4). Drought categories show experts' assessments of conditions related to dryness, including observations of how much water is available in streams, lakes, and soils compared to usual for the same time of year. USDM data goes back to 2000 (NIDIS n.d.) The USDM measures variables including temperature, soil moisture, water levels in streams and lakes, snow cover, and meltwater runoff.

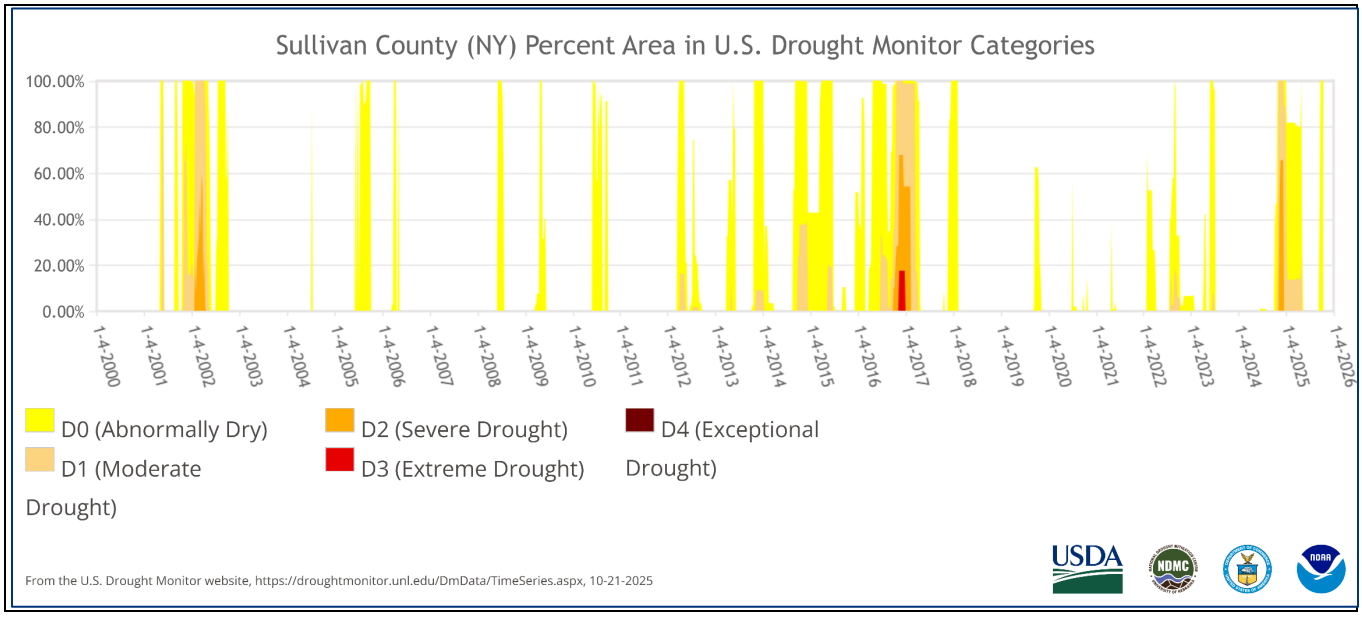
Table 7-1. Drought Classification

Category	Description	Example Percentile Range for Most Indicators	Values for Standard Precipitation Index and Standardized Precipitation-Evapotranspiration Index
None	Normal or wet conditions	30.01 or Above	-0.49 or above
D0	Abnormally Dry	20.01 to 30.00	-0.5 to -0.79
D1	Moderate Drought	10.01 to 20.00	-0.8 to -1.29
D2	Severe Drought	5.01 to 10.00	-1.3 to -1.59
D3	Extreme Drought	2.01 to 5.00	-1.6 to -1.99
D4	Exceptional Drought	0.00 to 2.00	-2.0 or less

Source: (NDMC 2025)

Sullivan County has experienced periods of drought with an intensity primarily rating at a D0-D1. 2017 was a dry year, with drought reaching a D3. Similar ranges are expected in the future. A snapshot of drought conditions in the county can be found in Figure 7-1.

Figure 7-1. Sullivan County USDM Periods of Drought (2000 to 2025)



Source: (NDMC 2025)

Palmer Drought Severity Index

The Palmer Drought Severity Index (PDSI) is primarily based on soil conditions. Soil with decreased moisture content is the first indicator of an overall moisture deficit. PDSI values range from negative 5 to positive 5, where positive values indicate wetter conditions and negative values represent drier conditions; 0 is used as normal and drought is indicated by negative numbers as shown in Table 7-2. For example, -2 is moderate drought, -3 is severe drought, and -4 is extreme drought (NDMC n.d.).

Table 7-2. Palmer Drought Category and Palmer Drought Index Descriptions

Category	Possible Impacts	Palmer Drought Index
D0 Abnormally Dry	• Producers begin supplemental feeding for livestock • Planting is postponed; forage germination is stunted; hay cutting is reduced • Grass fires increase • Surface water levels decline	-1.0 to -1.99
D1 Moderate Drought	• Dryland crops are stunted • Early cattle sales begin • Wildfire frequency increases • Stock tanks, creeks, streams are low; voluntary water restrictions are requested	-2.0 to -2.99
D2 Severe Drought	• Pasture conditions are very poor • Soil is hard, hindering planting; crop yields decrease • Wildfire danger is severe; burn bans are implemented • Wildlife moves into populated areas • Hydroelectric power is compromised; well water use increases; mandatory water restrictions are implemented	-3.0 to -3.99
D3 Extreme Drought	• Soil has large cracks; soil moisture is very low; dust and sandstorms occur • Row and forage crops fail to germinate; decreased yields for irrigated crops and very large yield reduction for dryland crops are reported • Need for supplemental feed, nutrients, protein, and water for livestock increases; herds are sold • Increased risk of large wildfires is noted • Many sectors experience financial burden • Severe fish, plant, and wildlife loss reported • Water sanitation is a concern; reservoir levels drop significantly; surface water is nearly dry; river flow is very low; salinity increases in bays and estuaries	-4.0 to -4.99
D4 Exceptional Drought	• Exceptional and widespread crop loss is reported; rangeland is dead; producers are not planting fields • Culling continues; producers wean calves early and liquidate herds due to importation of hay and water expenses • Seafood, forestry, tourism, and agriculture sectors report significant financial loss • Extreme sensitivity to fire danger; firework restrictions are implemented • Widespread tree mortality is reported; most wildlife species' health and population are suffering • Devastating algae blooms occur; water quality is very poor • Exceptional water shortages are noted across surface water sources; water table is declining • Boat ramps are closed; obstacles are exposed in water bodies; water levels are at or near historic lows	-5.0 or less

Source: (NDMC n.d.)

7.1.4 Previous Occurrences

FEMA Disaster Declarations

There has been one FEMA disaster declaration in Sullivan County for drought, shown in Table 7-3.

Table 7-3. FEMA Disaster Declarations for Severe Storm Events in Sullivan County

Event Date	Declaration Date	Declaration Number	Description
August 18, 1965	August 18, 1965	DR-204-NY	Water Shortage

Source: (FEMA 2025e)

USDA Declarations

Table 7-4 lists drought-related USDA agricultural disaster declarations that have included Sullivan County since the County's previous HMP was developed. For earlier events, refer to the previous HMP.

Table 7-4. USDA Declarations for Severe Winter Storm Events in Sullivan County Since Previous HMP

Event Date	USDA Declaration Number	Description
August 9 – October 3, 2022	S5306	Drought
August 16 – October 11, 2022	S5313	Drought
July 1 – December 20, 2022	S5342	Drought

Source: (USDA 2025)

All Recent Events

Table 7-5 lists known drought events between 2021 and 2025 that affected Sullivan County, as reported by NCEI, USDA, and U.S. Drought Monitor. For earlier events, refer to the previous HMP.

Table 7-5. Drought Events in Sullivan County (2021 to 2025)

Event Dates	Declarations	Location Impacted	Event Details
May 4 – June 1, 2021	N/A	Countywide	Abnormally dry conditions
February 1 – April 5, 2022	N/A	Countywide	Abnormally dry conditions
July 26, 2022 – January 24, 2023	S5306, S5313, S5342	Countywide	Abnormally dry to moderate drought conditions
April 11-25, 2023	N/A	Countywide	Abnormally dry conditions
May 30 – July 4, 2023	N/A	Countywide	Abnormally dry to moderate drought conditions
June 18 – July 30, 2024	N/A	Countywide	Abnormally dry conditions
October 8, 2024 – May 6, 2025	N/A	Countywide	Abnormally dry to severe drought conditions
November 12 – December 10, 2024	N/A	Eastern half of County	Warm temperatures, insufficient rainfall, below average stream flows, and dried out soil led to severe drought over the eastern half of the county.

Source: (USDA 2025); (NOAA; NASA; NDMC; USDA 2025c); (NOAA NCEI 2025a)

7.1.5 Probability of Future Occurrences

Information on previous drought occurrences in the County was used to calculate the probability of future occurrence of such events. Table 7-6 lists the number of events from various sources from 2000 to 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for drought in the County is considered "likely."

Table 7-6. Probability of Future Drought Events in Sullivan County

Hazard Type	Number of Occurrences Between 2000 and 2025	Percent Chance of Occurring in Any Given Year
Abnormally Dry	31	100.00%
Moderate Drought	14	56.00%
Severe Drought	3	12.00%
Extreme Drought	1	4.00%
Exceptional Drought	0	0.00%
Total	**49**	**100.00%**

Source: (USDA 2025); (NOAA; NASA; NDMC; USDA 2025c); (NOAA NCEI 2025a); (FEMA 2025e)
Note: The time period presented in this table is the most complete period of record for the various data sources reviewed. 100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

7.1.6 Cascading Impacts Associated with the Hazard

Drought has a strong connection with wildfire risk. With low humidity and dry vegetation, any ignition is more likely to spread fire. Dry periods, especially multi-year dry periods, can increase tree mortality. This is due in part to the lack of water, and in part because thirsty trees are less able to fend off invasive pests and diseases. Dead trees become further fuel for wildfires. Living tree roots help to hold soil, so loss of trees destabilizes slopes, increasing the chance of landslides. The dead trees can then become debris in the landslide. Switching back and forth between wet and dry times can cause stress to earthen levees, increasing the chance of failure and resulting flooding.

During extended periods of drought, agricultural producers may have difficulty sustaining their operations, which can have its own cascading social and economic effects on other sectors and on local communities.

7.2 VULNERABILITY AND IMPACT ASSESSMENT

This section provides a qualitative discussion of Sullivan County's vulnerability to the drought hazard.

7.2.1 Life, Health, and Safety

Overall Population

The entire population of Sullivan County is vulnerable to drought. Drought conditions can causes health problems related to low water flows, poor water quality, and dust. Other possible impacts include diminished living conditions

related to energy, air quality, sanitation and hygiene; compromised food and nutrition; and increased incidence of illness. Some drought-related health effects are short-term, others are long-term (CDC 2012a, NDMC 2023).

At-Risk Populations

Some populations are more susceptible to drought events based on their physical and financial ability to respond to drought impacts. At-risk populations include homeless persons, persons over 65 years old, low income or linguistically isolated populations, people with life-threatening illnesses, and those whose access to water is limited even during non-drought conditions. These groups may require extra water supplies or need assistance to obtain water and are more likely to need medical attention. A breakdown of Sullivan County's at-risk population can be found in Section 3.5.3.

7.2.2 General Building Stock

The most immediate impact of drought on buildings is its contribution to the shrink/swell cycle of expansive soils (primarily clay soils), which swell when water enters the soil and shrink when the soil dries out. When foundations are not designed to withstand these movements, buildings can experience cracking. This can lead to reduced service life of the structure, reduction of energy efficiency, and loss of durability (Tabassum and Bulut 2023).

Droughts also contribute to conditions conducive to wildfires and reduce fire-fighting capabilities, presenting a secondary risk to the general building stock from drought impacts. Chapter 14 provides more information on the wildfire risk.

7.2.3 Community Lifelines and Other Critical Facilities

Drought events generally do not impact buildings; however, droughts have the potential to impact agriculture-related facilities and critical facilities that are associated with water supplies such as potable water used with fire-fighting services.

Drought affects groundwater sources, but generally not as quickly as surface water supplies. Groundwater supplies generally take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Shallow wells are more susceptible than deep wells.

7.2.4 Economy

Drought can produce a range of impacts that span many economic sectors and can reach beyond an area experiencing physical drought.

One impact of drought is its impact on water supply. Water withdrawals are used for potable water, for power generation, and in the commercial/industrial/mining sectors. When drought conditions persist with little to no relief, water restrictions may be put into place that limit recreational or commercial outdoor uses of water (NC State University 2013).

Shortages of water and water-generated electricity can also result in higher costs for these resources. Industries that rely on water for business could be impacted the most (e.g., landscaping businesses). Some business may remain operational but be impacted aesthetically, particularly within the recreation and tourism industry. Moreover, droughts within another area could impact the food supply and price of food for residents within the County.

7.2.5 Natural Resources

Drought can impact the environment because it can trigger wildfires, increase insect infestations, and exacerbate the spread of disease (NOAA 2000). Droughts also impact water resources that are relied upon by aquatic and terrestrial species. Ecologically sensitive areas, such as wetlands, can be particularly vulnerable to drought periods because they are dependent on steady water levels and soil moisture availability to sustain growth. Reduced replenishment of groundwater affects streams. Much of the flow in streams comes from groundwater, especially during the summer when there is less precipitation and after snowmelt ends. Reduced groundwater levels mean that even less water will enter streams when steam flows are lowest.

7.2.6 Historic and Cultural Resources

The primary impacts on historic and cultural resources from drought would be an increased risk of wildfires and impacts on structure foundations from the shrink-swell cycle of expansive soils. Drought and its secondary impacts on watersheds and nearshore waters may impact the traditional and customary practices of Indigenous persons, including the collection of plants, animals, minerals and other practices.

7.3 FUTURE CHANGES THAT MAY AFFECT RISK

7.3.1 Potential or Planned Development

Areas targeted for future growth and development have been identified across the County. Any new development in the County could be susceptible to drought. Specific areas of recent and new development are indicated in the jurisdictional annexes included in Volume II of this HMP.

7.3.2 Projected Changes in Population

Cornell University's Program on Applied Demographics projects Sullivan County will increase in population to 79,082 by 2030 but decrease to 77,165 by 2040 (Cornell University 2018). Changes in the density of the population can impact the number of persons exposed to drought and the draw upon water resources.

7.3.3 Future Conditions

The State of New York is expected to see a rise in average annual temperatures, fostering a heightened frequency of drought. Future conditions anticipate an increased likelihood and severity of drought events, prolonging their duration and intensifying their impact. Over the past five decades, there has been a notable increase in average annual temperatures within the state, with an increment of 0.6°F per decade since 1970 (NYSERDA 2014).

8. EARTHQUAKE

8.1 HAZARD PROFILE

8.1.1 Hazard Description

An earthquake is a sudden, rapid shaking of the earth usually caused by the movement of tectonic plates beneath the earth's surface or a volcanic eruption (FEMA 2023a). Most earthquakes occur at the boundaries where tectonic plates meet (faults), although New York State is in an area where earthquakes occur on plate interiors. As plates continue to move and plate boundaries change over geologic time, weakened boundary regions become part of the interiors of the plates. Earthquakes come without warning and can last up to several minutes. Aftershocks, which are normally smaller than the initial earthquake, can continue for weeks.

Earthquake Hazards

According to the U.S. Geological Society (USGS) Earthquake Hazards Program, an earthquake hazard is anything associated with an earthquake that may affect resident's normal activities. The following are common earthquake hazards (USGS 2012):

- Surface faulting—Displacement that reaches the earth's surface during slip along a fault. Commonly occurs with shallow earthquakes (those with an epicenter less than 12 miles below the ground surface).
- Ground motion (shaking)—The movement of the earth's surface produced by energy waves that are generated by the earthquake and travel through the earth and along its surface. The intensity of ground shaking at any given location depends on the amount of energy released at the site of the earthquake, the depth of the earthquake beneath the earth's surface, the given location's distance from the earthquake, and the type of underlying soil or bedrock at that location.
- Liquefaction—A process by which shaking causes water-saturated sediment to temporarily lose strength and act as a fluid. This effect can damage foundations built on the liquefied soils.

Earthquakes in New York

As noted in the New York State Hazard Mitigation Plan (NYS HMP), the importance of the earthquake hazard in New York State is often underestimated because other natural hazards occur more frequently and major hurricanes and floods have occurred more recently (NYS DHSES 2023). However, the potential for earthquakes exists across the northeastern United States. The New York City Area Consortium for Earthquake Loss Mitigation (NYCEM) ranks New York State as having the third highest earthquake activity level east of the Mississippi River (Tantala 2003).

Since the first recorded earthquake on December 19, 1737, New York has had over 550 earthquakes within its state boundaries. The state has also experienced strong ground shaking from earthquakes in nearby U.S. states and Canadian provinces. Three general regions in New York State have a higher seismic risk than other parts of the state (NYS DHSES 2023):

- The north and northeast third of the state, which includes the North Country/Adirondack region and a portion of the greater Albany-Saratoga region
- The southeast corner, which includes the greater New York City area and western Long Island
- The northwest corner, which includes Buffalo and its surrounding area.

Of these regions, the north-northeast portion has the higher seismic risk, and the northwest corner of the state has the lower seismic risk (NYS DHSES 2023).

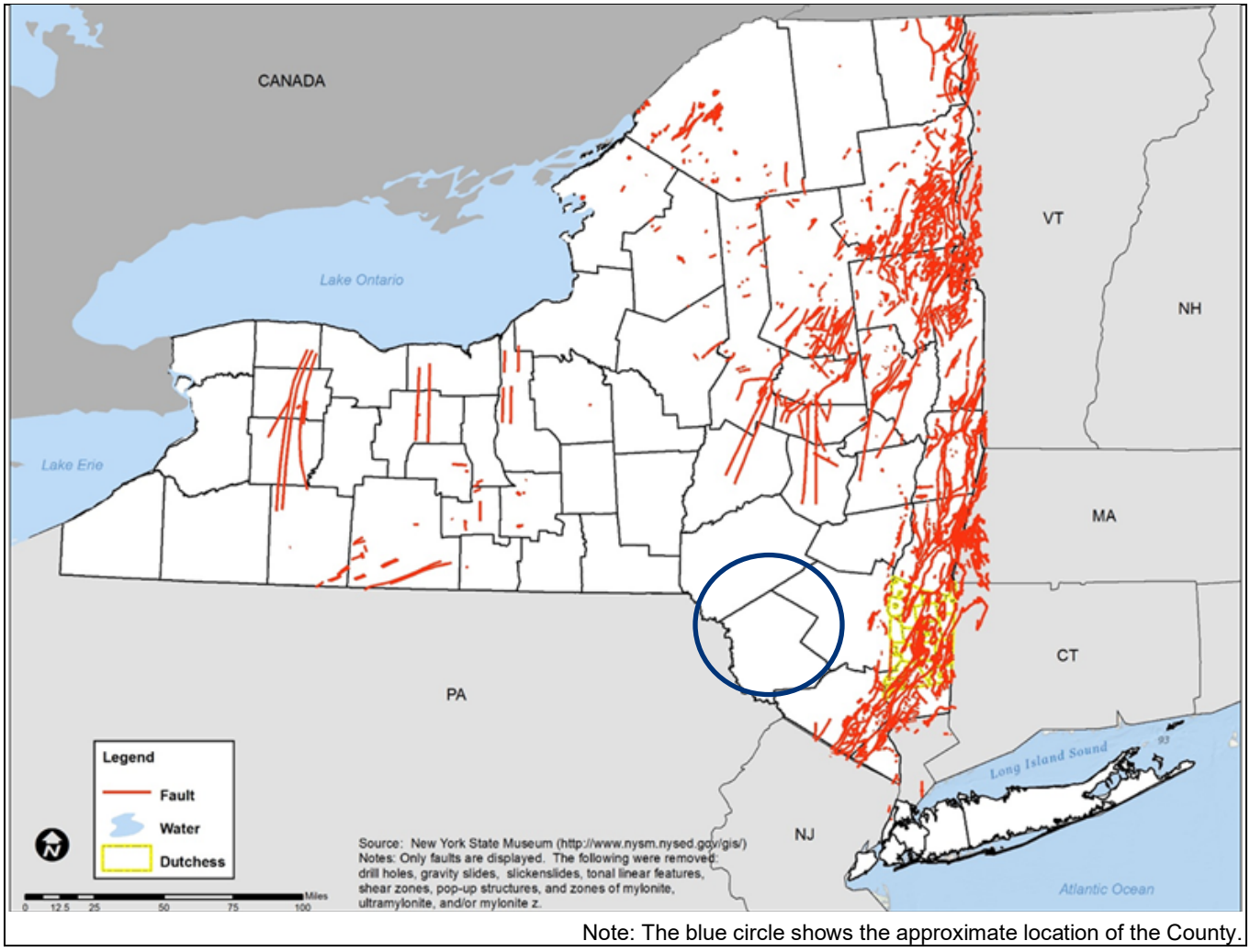
There are two major fault lines within New York State's borders: the Ramapo Fault Zone that extends from New Jersey into southeastern New York, and the Clarendon-Linden fault system in western New York State. Numerous smaller fault lines run throughout New York City and the Adirondack Mountains, where some of New York's biggest earthquakes have occurred (NYS DHSES 2023).

8.1.2 Location

Faults

There are no documented fault lines that run through Sullivan County, as illustrated in Figure 8-1.

Figure 8-1. Faults in Sullivan County



Note: The blue circle shows the approximate location of the County.

Source: (New York State Museum 2023)

Earthquake-Sensitive Soils

Surficial materials are soils at or near earth's surface. The New York State Geological Survey has categorized the surficial materials of New York State according to the National Earthquake Hazard Reduction Program's (NEHRP) soil classifications. The NEHRP developed five soil classifications that indicate the potential severity of an earthquake based on the velocity with which certain energy waves from earthquakes move through the soil. Seismic waves travel faster through hard rock than through softer rock and sediments. As the waves the waves slow down, their amplitude increases. Shaking tends to be stronger at locations with softer surface layers where seismic waves move more slowly. Ground motion above an unconsolidated landfill or soft soils can be more than 10 times stronger than at neighboring locations on rock for small ground motions (FEMA 2016b).

The NEHRP soil classification system ranges from A to E, as noted in Table 8-1, where A represents hard rock that reduces ground motions from an earthquake and E represents soft soils that magnify ground shaking and increase building damage. Class E soils include water-saturated mud and artificial fill. The strongest amplification of shaking due to earthquakes is expected for this soil type. Figure 8-2 shows the location of NEHRP soils in Sullivan County.

Table 8-1. NEHRP Soil Classifications

Soil Classification	Description
A	Hard Rock
B	Rock
C	Very dense soil and soft rock
D	Stiff soils
E	Soft soils

Source: (FEMA 2021a)

8.1.3 Extent

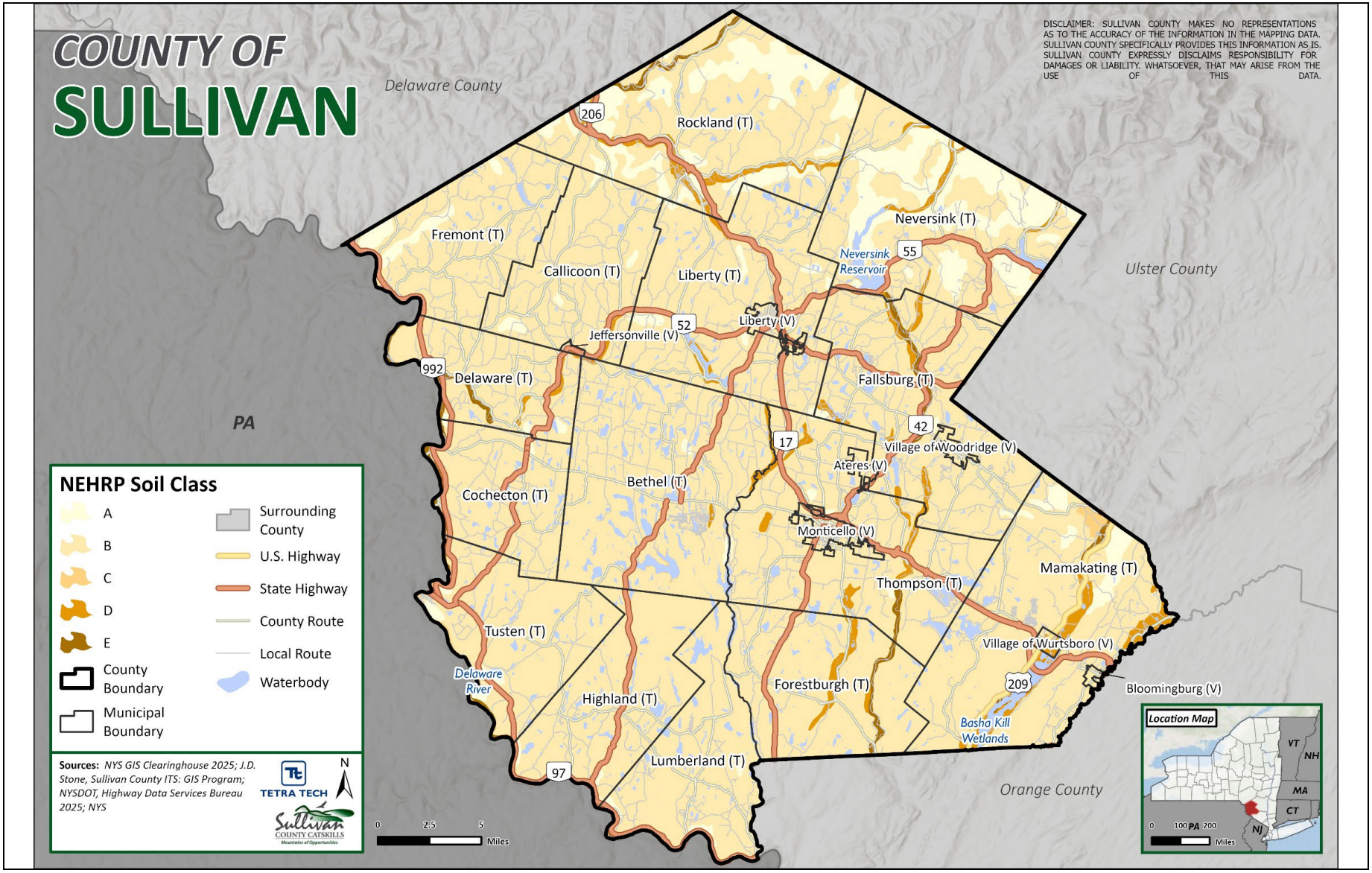
Earthquake severity is measured by magnitude and intensity. Magnitude describes the energy released at the focus of an earthquake; intensity describes the severity of shaking at any given location affected by the earthquake.

Earthquake Magnitude

Moment is a physical quantity related to the total energy released by an earthquake. The total moment release of an earthquake is the product of the distance a fault moved and the force required to move it. It can be estimated from seismograms and from geodetic measurements. The moment magnitude (Mw) scale uses a standard formula to convert measured moment into a number representing magnitude (USGS 2023a). This scale provides an estimate of earthquake size that is valid over the complete range of magnitudes. For very large earthquakes, moment magnitude gives the most reliable estimate of earthquake size. The scale is as follows (USGS 2023a):

- Great Mw > 8
- Major Mw = 7.0 – 7.9
- Strong Mw = 6.0 – 6.9
- Moderate Mw = 5.0 – 5.9
- Light Mw = 4.0 – 4.9
- Minor Mw = 3.0 – 3.9
- Micro Mw = 3.0 – 3.9

Figure 8-2. NEHRP Soils in Sullivan County



Earthquake Intensity

Intensity is the overall severity of shaking felt during an earthquake event. Earthquake intensity is based on the observed effects of ground shaking on people, buildings, and natural features, and varies across affected locations. The Modified Mercalli Intensity (MMI) scale expresses how strongly a shock was felt at a particular location. Table 8-2 summarizes earthquake intensity as expressed by the MMI scale.

Table 8-2. Modified Mercalli Intensity Scale

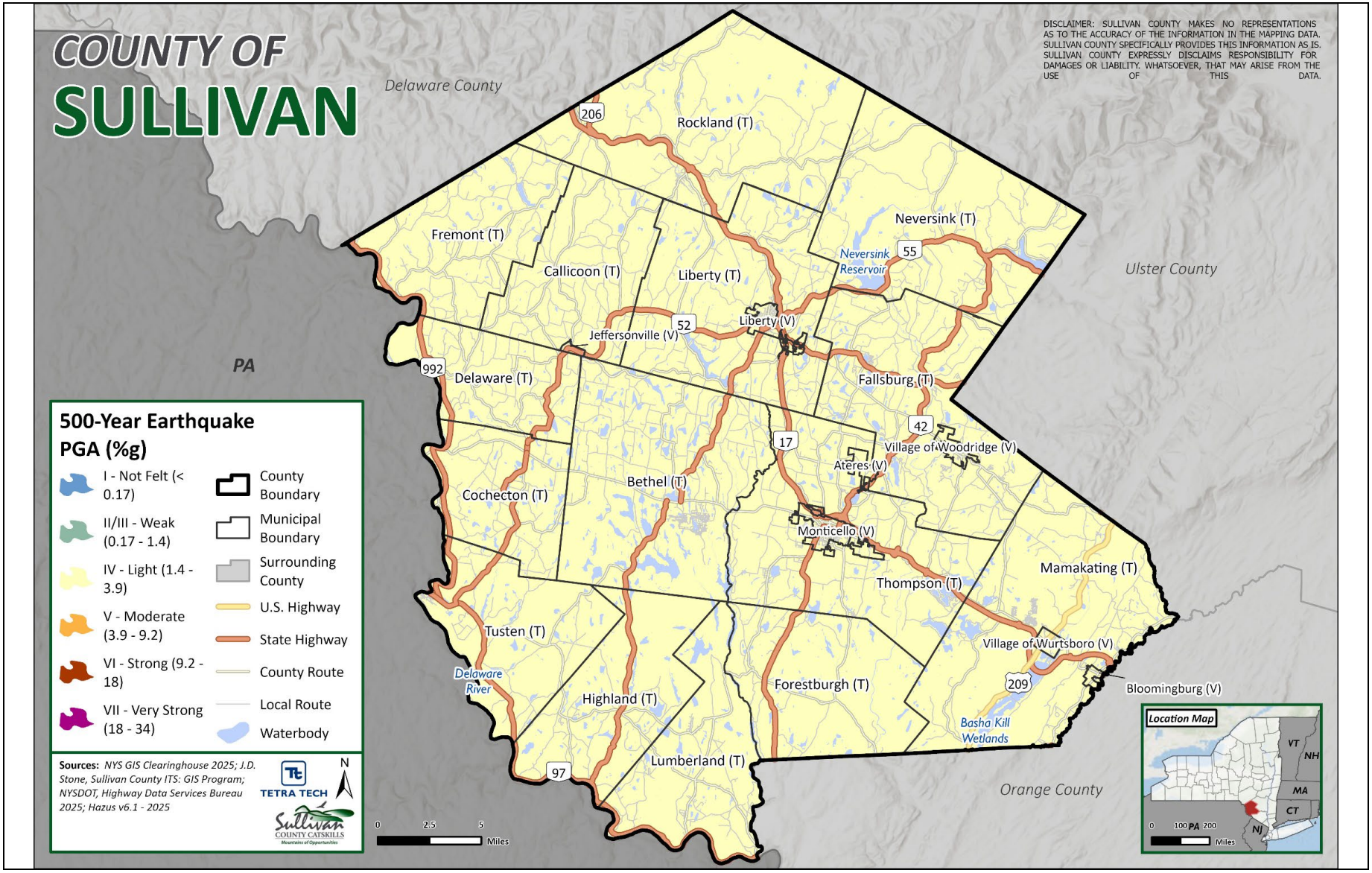
MMI	Shaking	Typical Damage	Typical PGA	Description
I	Not Felt	None	< 0.17	Not felt except by a very few under especially favorable conditions.
II	Weak	None	0.17 – 1.4	Felt only by a few persons at rest, especially on upper floors of buildings.
III				Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	None	1.4 – 3.9	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Very Light	3.9 – 9.2	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Light	9.2 – 18	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very Strong	Moderate	18 – 34	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Moderate to Heavy	34 – 65	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Heavy	65-124	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Very Heavy	>124	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: (USGS n.d.-a)

Peak ground acceleration (PGA) is the maximum acceleration during an earthquake event of ground shaking at any location. PGA is expressed as a percent of the acceleration associated with gravity (%g). For example, a PGA of 10%g means that the ground acceleration is 10 percent of the acceleration due to gravity (USGS 2019).

Table 8-2 describes the MMI scale alongside PGA equivalents. Figure 8-3 shows expected MMI and PGA across Sullivan County for the 500-year mean return period (MRP) earthquake. For that event, the entire county is projected to experience an acceleration of 1.4 to 3.9 %g and an MMI of IV (Light).

Figure 8-3. 500-Year Earthquake PGA for Sullivan County



Building construction, type of structure, building materials, and other factors play a role in determining the extent of earthquake damage within the planning area. Table 8-3 summarizes typical damage levels experienced in an earthquake based on measured PGA.

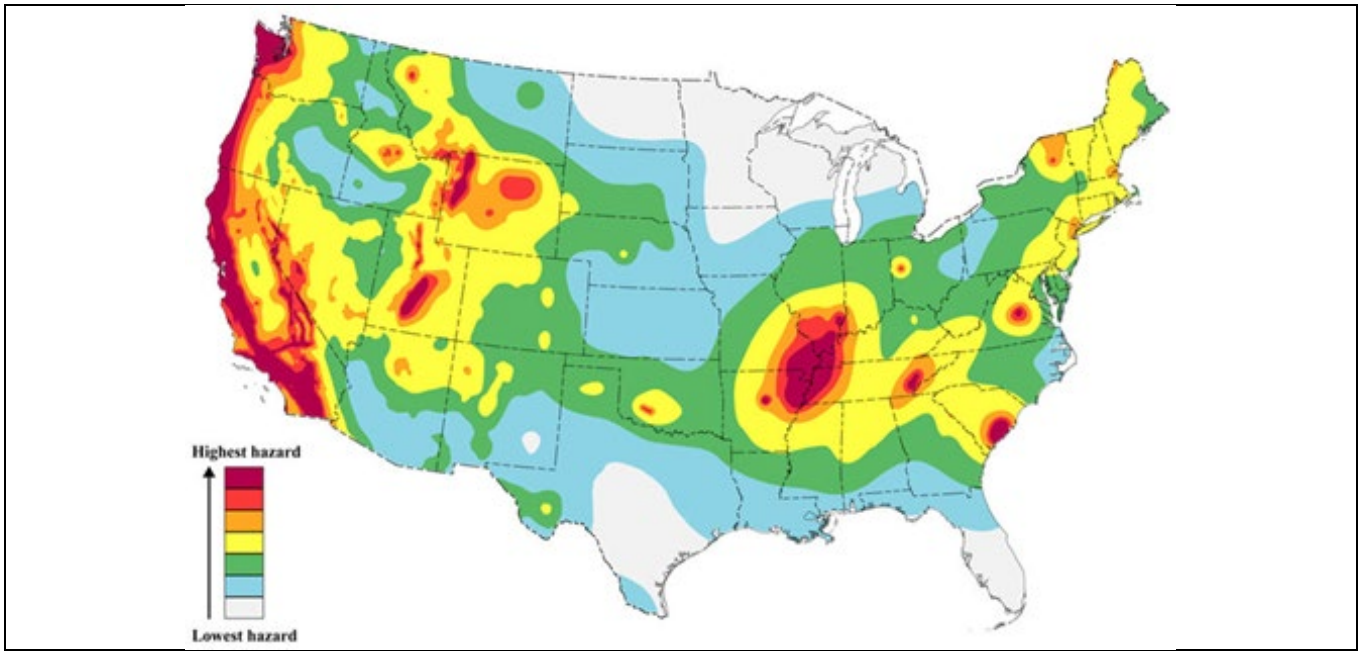
Table 8-3. Damage Levels Experienced in Earthquakes Based on PGA

PGA	Explanation of Damage
1-2%g	Motions are widely felt by people; hanging plants and lamps swing strongly, but damage levels, if any, are usually very low.
< 10%g	Usually causes only slight damage, except in unusually vulnerable facilities.
10 - 20%g	May cause minor-to-moderate damage in well-designed buildings, with higher levels of damage in poorly designed buildings. At this level of ground shaking, only unusually poor buildings would be subject to potential collapse.
20 - 50%g	May cause significant damage in some modern buildings and very high levels of damage (including collapse) in poorly designed buildings.
≥50%g	May causes higher levels of damage in many buildings, even those designed to resist seismic forces.

Source: (USGS 2019)

National maps of earthquake shaking hazards provide information for creating and updating seismic design requirements for building codes, insurance rate structures, earthquake loss studies, retrofit priorities, and land use planning. After thorough review of the studies, professional organizations of engineers update the seismic-risk maps and seismic design requirements contained in building codes (Brown 2001). The USGS updated the National Seismic Hazard Maps in 2023 and new seismic, geologic, and geodetic information on earthquake rates and associated ground shaking were incorporated into these revised maps. Figure 8-4 represents the best available data, as determined by the USGS.

Figure 8-4. USGS National Seismic Hazard Model



Source: (USGS 2022)

8.1.4 Previous Occurrences

FEMA Disaster Declarations

Between 1954 and 2025, Sullivan County was not included in any major disaster (DR) or emergency (EM) declarations for geological-related events (FEMA 2025b). There has been one federally declared disaster in New York State due to an earthquake, following an event of Magnitude 5.1 that occurred in the far northeastern part of the state in April 2002 (with aftershocks in May 2002).

USDA Declarations

Since the 2021 HMP, Sullivan County has not been included in any earthquake-related USDA agricultural disaster declarations (USDA 2025).

All Recent Events

There have been no recorded earthquake-related events impacting Sullivan County since the previous HMP was developed. For historical context or earlier events outside the county, refer to the previous HMP.

8.1.5 Probability of Future Occurrences

Based on historical records and input from the Steering Committee, the probability of occurrence for earthquakes in Sullivan County is considered “possible.”

8.1.6 Cascading Impacts Associated with the Hazard

Earthquakes can trigger surface ruptures, volcanic activity, tsunamis, landslides, and sloshing water in closed basins. Dams storing high volumes of water due to changes in the hydrograph could fail during seismic events. Soils saturated by repetitive storms could experience liquefaction during seismic activity due to the increased saturation. Ground failure can become exacerbated due to earthquake events, causing landslides and coastal erosion. Areas of steep slopes are at greater risk of ground failure and potential erosion during earthquakes (USGS n.d.-b). Further, residual impacts from earthquakes could alter the floodplain extent if ground failure and erosion occur.

One of the most likely earthquake impacts is post-earthquake fires, both small household fires and wildfires. Earthquake shaking can cause movement or damage to equipment and household appliances. Particularly in urban areas, gas leaks can start fires that can quickly spread and cause severe damage to homes and neighborhoods, potentially leading to uncontrolled wildfires. About one in four fires after an earthquake is related to natural gas leaks.

8.2 VULNERABILITY AND IMPACT ASSESSMENT

A vulnerability analysis was conducted for the County’s assets using NEHRP soil data. Assets with their centroid in the Class D and E soil class hazard areas were totaled to estimate the numbers and values of buildings vulnerable to the earthquake hazard. An advanced Hazus analysis estimated a range of potential loss due to building damage for the 500-year mean return period (MRP) earthquake in Sullivan County. The default assumption is a magnitude 7.0 earthquake.

8.2.1 Life, Health, and Safety

Overall Population

Table 8-4 presents the estimated planning area populations living on NEHRP Class D and E soils. The Town of Mamakating has the greatest population in the hazard area, with 1,882 persons (18.0 percent of the Town's total).

Table 8-4. Population in the NEHRP D & E Soils Hazard Area

Jurisdiction	Total Population	Population in the D&E NEHRP Soils Hazard Area	
		Number of Persons	% of Jurisdiction Total
Ateres (V)	834	0	0.0%
Bethel (T)	3,997	98	2.5%
Bloomingburg (V)	1,022	0	0.0%
Callicoon (T)	2,594	128	4.9%
Cochecton (T)	1,392	41	2.9%
Delaware (T)	2,301	232	10.1%
Fallsburg (T)	13,292	1,577	11.9%
Forestburgh (T)	829	59	7.1%
Fremont (T)	1,204	0	0.0%
Highland (T)	2,007	31	1.5%
Jeffersonville (V)	417	117	28.1%
Liberty (T)	5,196	156	3.0%
Liberty (V)	5,083	0	0.0%
Lumberland (T)	2,276	37	1.6%
Mamakating (T)	10,456	1,882	18.0%
Monticello (V)	7,252	0	0.0%
Neversink (T)	3,381	132	3.9%
Rockland (T)	3,323	1,166	35.1%
Thompson (T)	8,628	156	1.8%
Tusten (T)	1,528	22	1.4%
Woodridge (V)	954	0	0.0%
Wurtsboro (V)	1,181	894	75.7%
Sullivan County (Total)	**79,147**	**6,728**	**8.5%**

Source: U.S. Census Bureau, American Community Survey 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; NYS, n.d.

In Sullivan County, risk to public safety and loss of life from a low-magnitude earthquake would be minimal. Hazus provides casualty estimates for three times of day representing when different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate represents the maximum residential occupancy, the 2:00 PM estimate represents the maximum educational, commercial and industrial sector occupancy, and the 5:00 PM estimate represents peak commute time. The analysis for the 500-year MRP earthquake event estimated that this event would result in one non-hospitalized injury at each of the three times, as shown in Table 8-5. The Hazus analysis found that there would be no displaced households or persons seeking short-term shelter as a result of that event.

Table 8-5. Predicted Casualties from the 500-Year MRP Earthquake

	2:00 AM	2:00 PM	5:00 PM
Non-hospitalized injuries	1	1	1
Hospitalizations	0	0	0
Fatalities	0	0	0

While the entire population of Sullivan County can experience impacts from the earthquake hazard, those living in more vulnerable areas are more susceptible. The degree to which Sullivan County residents are affected by potential earthquakes depends on many factors, including the age and type of construction people live in, the soil type homes are located on, and the intensity of the earthquake. A strong correlation exists between structural building damage and the number of injuries and casualties from an earthquake event (NYCEM 2003a). The risk is highest for those inside buildings that receive structural damage or people walking below building ornamentations and chimneys that are shaken loose by the earthquake.

Whether directly impacted or indirectly impacted, the entire population will be affected to some degree. Business interruption could keep people from working, road closures could isolate populations, and loss of utilities could impact populations that suffered no direct damage from an event itself.

At-Risk Populations

The populations most at risk from the earthquake hazard include persons over age 65 and individuals living below the poverty threshold. Factors leading to this higher susceptibility include decreased mobility, lack of financial resources to react during a hazard, and the location and construction quality of their housing. Table 8-6 details the number of at-risk persons living in areas of Class D and E soils. Within the hazard area, the Town of Rockland has the highest population over age 65 (320), the Town of Mamakating has the largest population under age 5 (151) and the highest number of individuals with disabilities (268), and the Town of Fallsburg has the greatest number of non-English speakers (67) and the largest population living in poverty (297).

8.2.2 General Building Stock

Buildings located on NEHRP Soil Classes D and E have an increased risk of damage from an earthquake. Table 8-7 summarizes the number and replacement cost value of buildings in Sullivan County on NEHRP Soil Classes D and E soils. The estimated 4,487 buildings within that hazard area represents 9.0 percent of Sullivan County's total general building stock replacement cost value. The Town of Rockland has the greatest number of buildings on Class D and E soils (1,029 buildings or 38.7 percent of its total building stock). Table 8-8 lists the buildings in the NEHRP Classes D and E hazard areas by general occupancy.

The shaking of the ground due to an earthquake can lead to buildings being damaged and/or collapsing. There is a strong correlation between PGA and damage a building might undergo. A building's construction determines how well it can withstand the force of an earthquake. Unreinforced masonry buildings are most at risk during an earthquake because the walls are prone to collapse outward, whereas steel and wood buildings absorb more of the earthquake's energy. Additional attributes that affect a building's capability to withstand an earthquake's force include its age, number of stories, and quality of construction (NYCEM 2003a).

Table 8-6. At-Risk Persons Living in the NEHRP D & E Soils Hazard Area

Jurisdiction	At-Risk Persons Living in the NEHRP D&E Soils Hazard Area									
	Population Over 65		Population Under 5		Non-English-Speaking Population		Population with Disability		Population Below Poverty Level	
	Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total
Ateres (V)	-	-	-	-	-	-	-	-	-	-
Bethel (T)	27	2.4%	3	2.0%	4	2.0%	15	2.4%	14	2.3%
Bloomingburg (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Callicoon (T)	27	4.8%	3	4.2%	0	0.0%	19	4.8%	7	4.9%
Cochecton (T)	12	3.0%	2	2.2%	0	0.0%	5	2.6%	3	2.6%
Delaware (T)	54	10.1%	6	9.5%	0	0.0%	29	9.8%	24	9.7%
Fallsburg (T)	236	11.9%	72	11.8%	67	11.7%	215	11.9%	297	11.8%
Forestburgh (T)	19	7.0%	1	4.2%	0	0.0%	7	6.6%	2	5.1%
Fremont (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Highland (T)	9	1.5%	0	0.0%	0	0.0%	9	1.6%	2	1.2%
Jeffersonville (V)	22	27.5%	2	22.2%	0	0.0%	24	28.2%	24	27.3%
Liberty (T)	25	2.9%	13	2.9%	6	3.0%	28	2.9%	12	2.9%
Liberty (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Lumberland (T)	5	1.6%	2	1.6%	0	0.0%	2	1.2%	3	1.3%
Mamakating (T)	275	18.0%	151	18.0%	39	17.9%	268	18.0%	161	17.9%
Monticello (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Neversink (T)	26	3.8%	4	3.8%	13	3.8%	25	3.8%	9	3.8%
Rockland (T)	320	35.0%	39	34.8%	46	34.5%	229	35.0%	187	35.0%
Thompson (T)	44	1.8%	8	1.7%	5	1.7%	27	1.8%	22	1.8%
Tusten (T)	4	1.4%	0	0.0%	0	0.0%	3	1.3%	1	0.7%
Woodridge (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Wurtsboro (V)	196	75.4%	31	73.8%	24	74.7%	112	75.7%	94	75.2%
Sullivan County (Total)	**1,301**	**8.6%**	**337**	**7.2%**	**204**	**6.2%**	**1,017**	**8.2%**	**862**	**7.5%**

Source: American Community Survey 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; NYS n.d.

Table 8-7. Buildings in the NEHRP D&E Soils Hazard Area

Jurisdiction	Jurisdiction Total Buildings		Buildings in the D&E NEHRP Soils Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Ateres (V)	99	$104,501,618	0	0.0%	$0	0.0%
Bethel (T)	4,671	$3,993,363,362	100	2.1%	$37,830,923	0.9%
Bloomingburg (V)	172	$223,874,493	0	0.0%	$0	0.0%
Callicoon (T)	1,942	$1,579,365,779	102	5.3%	$69,369,897	4.4%
Cochecton (T)	1,189	$1,051,465,789	40	3.4%	$20,417,937	1.9%
Delaware (T)	1,663	$1,867,149,344	212	12.7%	$291,272,544	15.6%
Fallsburg (T)	8,114	$8,608,748,500	1,025	12.6%	$1,181,561,440	13.7%
Forestburgh (T)	680	$627,023,982	50	7.4%	$52,888,349	8.4%
Fremont (T)	1,322	$1,156,125,779	0	0.0%	$0	0.0%
Highland (T)	1,853	$1,449,898,732	41	2.2%	$45,436,594	3.1%
Jeffersonville (V)	201	$275,534,732	46	22.9%	$34,422,842	12.5%
Liberty (T)	4,041	$3,988,125,428	117	2.9%	$79,726,443	2.0%
Liberty (V)	1,540	$2,185,506,732	0	0.0%	$0	0.0%
Lumberland (T)	1,796	$1,429,481,922	35	1.9%	$36,198,659	2.5%
Mamakating (T)	5,508	$3,516,266,251	1,022	18.6%	$849,269,589	24.2%
Monticello (V)	2,164	$2,972,791,748	0	0.0%	$0	0.0%
Neversink (T)	2,292	$1,693,278,156	103	4.5%	$58,800,768	3.5%
Rockland (T)	2,659	$2,106,441,850	1,029	38.7%	$1,045,828,885	49.6%
Thompson (T)	7,526	$7,018,047,712	140	1.9%	$123,951,585	1.8%
Tusten (T)	1,254	$908,701,677	16	1.3%	$9,987,219	1.1%
Woodridge (V)	601	$624,670,518	0	0.0%	$0	0.0%
Wurtsboro (V)	517	$414,341,458	409	79.1%	$362,542,075	87.5%
Sullivan County (Total)	**51,804**	**$47,794,705,561**	**4,487**	**8.7%**	**$4,299,505,749**	**9.0%**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; RSMeans 2024; NYS n.d.

Table 8-8. General Occupancy Class of Buildings in the NEHRP D&E Soils Hazard Area

Jurisdiction	Buildings in the D&E NEHRP Soils Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Other
Ateres (V)	0	0	0	0
Bethel (T)	99	0	0	1
Bloomingburg (V)	0	0	0	0
Callicoon (T)	87	11	0	4
Cochecton (T)	33	6	0	1
Delaware (T)	140	51	9	12
Fallsburg (T)	902	88	24	11
Forestburgh (T)	44	4	0	2
Fremont (T)	0	0	0	0
Highland (T)	27	11	0	3
Jeffersonville (V)	43	1	0	2
Liberty (T)	101	10	1	5
Liberty (V)	0	0	0	0
Lumberland (T)	26	9	0	0
Mamakating (T)	934	73	4	11
Monticello (V)	0	0	0	0
Neversink (T)	76	25	1	1
Rockland (T)	800	182	18	29
Thompson (T)	125	7	7	1
Tusten (T)	16	0	0	0
Woodridge (V)	0	0	0	0
Wurtsboro (V)	328	61	5	15
Sullivan County (Total)	**3,781**	**539**	**69**	**98**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; NYS n.d.
Note: Other = Government, Religion, Agricultural, and Education

The Hazus probabilistic earthquake model was applied to analyze the effects of the 500-year MRP earthquake hazard on general building stock in Sullivan County. The analysis shows that nearly all buildings across all occupancy types are expected to experience no damage, as shown in Table 8-9. About 99 percent of the 46,026 residential buildings would remain unaffected, with only a small number seeing slight or moderate impacts. Commercial, industrial, and government, religious, agricultural, and educational buildings show similarly low vulnerability, with roughly 98 percent in each category projected to have no damage and only a handful expected to sustain minor effects. No buildings in any category are expected to experience complete or collapse-level damage. Table 8-10 summarizes the estimated value of damage by structural general occupancy class for each jurisdiction. Hazus estimated $8,662,002 in total damage as a result of the 500-year earthquake event, representing less than 0.1 percent of the total replacement value for general building stock in Sullivan County.

8.2.3 Community Lifelines and Other Critical Facilities

All community lifelines and other critical facilities in Sullivan County are vulnerable to the earthquake hazard. Table 8-11 summarizes the number of critical facilities by lifeline category located on NEHRP soil classes D and E. Earthquakes can significantly affect bridges, many of which provide the only access to certain neighborhoods. Because softer soils generally follow floodplain boundaries, bridges that cross watercourses are considered vulnerable. Another key factor in the degree of vulnerability is the age of facilities and infrastructure, which correlates with standards in place at times of construction.

The Hazus earthquake model was used to estimate probability of each damage state category to the critical facilities in Sullivan County for the 500-year MRP earthquake. In addition, Hazus estimated the time to restore critical facilities to fully functional use. Results are presented as a the average level of functionality (for all facilities in a given lifeline category) at specified time increments after the event. For example, Hazus might estimate that can provide 70 percent of its full functionality on Day 3 and a 98 percent chance on Day 90. Table 8-12 summarizes the Hazus results. The analysis estimates that community lifelines will be nearly 100 percent functional from the first day after the event, with functionality reaching only as low as 98.0 percent for energy lifelines. Functionality would exceed 99 percent for all categories by Day 7.

8.2.4 Economy

Earthquake impacts on the economy include loss of business function, damage to inventory, relocation costs, wage loss, and rental loss due to the repair/replacement of buildings. Damage to transportation infrastructure would interrupt the distribution of materials. Hazus estimates the volume of debris that may be generated as a result of an earthquake event in two categories (FEMA 2022d): reinforced concrete and steel that require special equipment to break up before they can be transported; and brick, wood, and other debris that can be loaded directly onto trucks with bulldozers. For the 500-year MRP earthquake event, Hazus estimates that 4,564.4 tons of debris will be generated countywide, as shown in Table 8-13. The Township of Thompson will generate the most debris.

Table 8-9. Severity of Expected Building Damage from the 500-Year MRP Earthquake

Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	Building Count	% Buildings in Occupancy Class
Residential Exposure (Single and Multi-Family Dwellings)	46,026	None	45,543	99.0%
		Slight	384	0.8%
		Moderate	93	0.2%
		Extensive	7	<0.1%
		Complete	0	0.0%
Commercial Buildings	3,881	None	3,821	98.4%
		Slight	47	1.2%
		Moderate	12	0.3%
		Extensive	1	<0.1%
		Complete	0	0.0%
Industrial Buildings	411	None	404	98.3%
		Slight	5	1.3%
		Moderate	1	0.3%
		Extensive	0	0.0%
		Complete	0	0.0%
Government, Religion, Agricultural, and Education Buildings	1,486	None	1,463	98.5%
		Slight	18	1.2%
		Moderate	5	0.3%
		Extensive	0	0.0%
		Complete	0	0.0%

Source: Sullivan County 2024; Sullivan County Real Property 2025; U.S. Army Corp of Engineers, NSI 2022

Table 8-10. Building Damage from the 500-Year MRP Earthquake

Jurisdiction	Total Replacement Cost Value	500-Year MRP - Estimated Losses					
		Estimated Total Damage	% of Total Replacement Cost Value	Estimated Residential Damage	Estimated Commercial Damage	Estimated Industrial Damage	Estimated Damage for All Other Occupancies
Ateres (V)	$104,501,618	$28,093	<0.1%	$20,601	$5,515	$457	$1,520
Bethel (T)	$3,993,363,362	$1,180,043	<0.1%	$579,122	$223,907	$39,020	$337,993
Bloomingburg (V)	$223,874,493	$17,469	<0.1%	$14,275	$1,394	$500	$1,300
Callicoon (T)	$1,579,365,779	$164,821	<0.1%	$121,134	$25,248	$112	$18,327
Cochecton (T)	$1,051,465,789	$105,575	<0.1%	$83,980	$13,091	$1,271	$7,233
Delaware (T)	$1,867,149,344	$226,131	<0.1%	$120,995	$66,059	$10,309	$28,768
Fallsburg (T)	$8,608,748,500	$1,624,097	<0.1%	$1,303,174	$172,472	$69,380	$79,070
Forestburgh (T)	$627,023,982	$82,278	<0.1%	$65,484	$10,109	$1,782	$4,903
Fremont (T)	$1,156,125,779	$100,798	<0.1%	$68,268	$14,120	$2,122	$16,288
Highland (T)	$1,449,898,732	$285,631	<0.1%	$183,690	$74,084	$1,857	$26,000
Jeffersonville (V)	$275,534,732	$17,059	<0.1%	$12,538	$2,613	$12	$1,897
Liberty (T)	$3,988,125,428	$586,809	<0.1%	$281,580	$167,275	$22,219	$115,735
Liberty (V)	$2,185,506,732	$207,851	<0.1%	$88,859	$63,138	$11,222	$44,632
Lumberland (T)	$1,429,481,922	$188,234	<0.1%	$100,060	$62,848	$12,027	$13,300
Mamakating (T)	$3,516,266,251	$564,134	<0.1%	$371,700	$121,891	$41,731	$28,812
Monticello (V)	$2,972,791,748	$855,243	<0.1%	$426,309	$290,968	$22,922	$115,045
Neversink (T)	$1,693,278,156	$186,550	<0.1%	$100,954	$48,798	$3,668	$33,129
Rockland (T)	$2,106,441,850	$194,698	<0.1%	$115,100	$52,496	$7,948	$19,155
Thompson (T)	$7,018,047,712	$1,765,743	<0.1%	$1,190,299	$369,207	$68,567	$137,670
Tusten (T)	$908,701,677	$133,943	<0.1%	$80,556	$28,147	$7,745	$17,495
Woodridge (V)	$624,670,518	$93,714	<0.1%	$69,316	$13,450	$7,595	$3,353
Wurtsboro (V)	$414,341,458	$53,090	<0.1%	$31,712	$15,218	$2,708	$3,452
Sullivan County (Total)	**$47,794,705,561**	**$8,662,002**	**<0.1%**	**$5,429,706**	**$1,842,048**	**$335,172**	**$1,055,075**

Source: Sullivan County 2024; Sullivan County Real Property 2025; U.S. Army Corp of Engineers, NSI 2022; RSMeans 2024
Note: Other = Government, Religion, Agricultural, and Education

Table 8-11. Number of Critical Facilities in the D&E NEHRP Soils Hazard Area

Jurisdiction	Number of Critical Facilities in the D&E NEHRP Soils Hazard Area, by Lifeline Category									Total	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Ateres (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Bethel (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Bloomingburg (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Callicoon (T)	0	0	0	0	0	1	4	0	1	6	16.7%
Cochecton (T)	0	0	0	0	0	1	2	0	0	3	13.6%
Delaware (T)	1	0	0	0	0	2	10	0	1	14	31.1%
Fallsburg (T)	1	0	0	0	1	4	9	0	1	16	19.3%
Forestburgh (T)	0	0	0	0	0	3	3	0	0	6	14.0%
Fremont (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Highland (T)	0	0	0	0	0	0	1	0	0	1	1.9%
Jeffersonville (V)	0	0	0	0	0	2	1	0	0	3	18.8%
Liberty (T)	0	0	0	0	0	0	5	0	0	5	4.0%
Liberty (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Lumberland (T)	0	0	0	0	0	0	1	0	0	1	2.5%
Mamakating (T)	0	0	1	0	0	5	18	0	5	29	37.7%
Monticello (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Neversink (T)	0	0	1	0	0	0	8	1	0	10	14.5%
Rockland (T)	1	0	2	0	2	6	32	0	5	48	47.1%
Thompson (T)	0	0	0	0	0	4	13	0	0	17	13.6%
Tusten (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Woodridge (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Wurtsboro (V)	0	0	2	0	1	3	2	1	1	10	100.0%
Sullivan County (Total)	**3**	**0**	**6**	**0**	**4**	**31**	**109**	**2**	**14**	**169**	**15.4%**

Source: Sullivan County 2025; AVAIL 2023; NYS GIS Clearinghouse 2023, 2025; Tetra Tech 2025; NYS n.d.

Table 8-12. Average Damage and Loss of Functionality for Sullivan County Community Lifelines for the 500-Year MRP Earthquake

Name	Average Percent Probability of Sustaining Damage					Average Percent Functionality Post-Event			
	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7	Day 30	Day 90
Communications	98.6%	1.1%	0.3%	<0.1%	0.0%	98.5%	99.6%	99.9%	99.9%
Energy	98.1%	1.5%	0.4%	<0.1%	0.0%	98.0%	99.5%	99.9%	99.9%
Food, Hydration, Shelter	98.4%	1.2%	0.3%	<0.1%	0.0%	98.4%	99.6%	99.9%	99.9%
Hazardous Materials[a]	—	—	—	—	—	—	—	—	—
Health and Medical	99.8%	0.2%	<0.1%	0.0%	0.0%	99.7%	99.9%	99.9%	99.9%
Safety and Security	98.5%	1.2%	0.3%	<0.1%	0.0%	98.4%	99.6%	99.9%	99.9%
Transportation	99.9%	<0.1%	<0.1%	<0.1%	0.0%	99.9%	100.0%	100.0%	100.0%
Water Systems	98.8%	0.9%	0.2%	<0.1%	0.0%	98.8%	99.7%	99.9%	99.9%

Source: Sullivan County 2025; AVAIL 2023; NYS GIS Clearinghouse 2023, 2025; Tetra Tech 2025

a. Hazus damage estimates are not provided for hazardous material facilities

Table 8-13. Debris Generated by the 500-Year MRP Earthquake Event

Jurisdiction	Debris Generated by 500-Year MRP	
	Brick/Wood (tons)	Concrete/Steel (tons)
Ateres (V)	10.5	3.5
Bethel (T)	467.7	131.2
Bloomingburg (V)	7.2	1.6
Callicoon (T)	79.8	18.1
Cochecton (T)	52.5	12.4
Delaware (T)	104.8	25.0
Fallsburg (T)	650.6	192.5
Forestburgh (T)	37.6	8.7
Fremont (T)	50.7	11.7
Highland (T)	122.1	31.1
Jeffersonville (V)	8.3	1.9
Liberty (T)	267.4	65.3
Liberty (V)	98.9	24.4
Lumberland (T)	85.0	20.6
Mamakating (T)	240.2	55.6
Monticello (V)	313.2	95.4
Neversink (T)	89.4	19.1
Rockland (T)	95.5	22.2
Thompson (T)	677.7	209.7
Tusten (T)	61.8	14.4
Woodridge (V)	39.9	11.3
Wurtsboro (V)	23.0	5.2
Sullivan County (Total)	**3,583.6**	**980.8**

Source: Sullivan County 2024; Sullivan County Real Property 2025; U.S. Army Corp of Engineers, NSI 2022

8.2.5 Natural Resources

Earthquakes can cause damage to the surface of the earth in various forms. Surface faulting can create wide ruptures in the ground. Ruptures can have a direct impact on the landscape and natural environment because they can disconnect habitats for miles, isolating animal species or tearing apart plant roots (USGS n.d.-b).

Ground failure as a result of soil liquefaction can have an impact on soil pores and retention of water resources. The greater the seismic activity and liquefaction properties of the soil, the more likely it is that drainage of groundwater can occur, which depletes groundwater resources. In areas where there is higher pressure of groundwater retention, the pores can build up more pressure and make soil behave more like a fluid rather than a solid, increasing the risk of localized flooding and deposition or accumulation of silt (USGS n.d.-b).

Earthquakes can cause large and sometimes disastrous landslides and mudslides. Any steep slope is vulnerable to slope failure, often as a result of loss of cohesion in clay-rich soils. Landslides that fall into streams may significantly impact fish and wildlife habitat as well as affect water quality. Hillsides that provide wildlife habitat can be lost for prolonged periods of time due to landslides.

8.2.6 Historic and Cultural Resources

Earthquake events affecting Sullivan County could damage historic and cultural landmarks and surrounding property. Many historic and cultural buildings may not be built to withstand earthquakes and are more vulnerable than other structures.

8.3 FUTURE CHANGES THAT MAY AFFECT RISK

8.3.1 Potential or Planned Development

Areas targeted for future development have been identified across the County. Current building codes require seismic provisions that should render new construction less vulnerable to seismic impacts than older, existing construction that may have been built using lower construction standards.

8.3.2 Projected Changes in Population

Changes in the density of population can impact the number of persons exposed to earthquake. Furthermore, visitors and tourists will continue to drive potential growth in the County's communities and their amenities, exposing more persons to earthquakes.

8.3.3 Future Conditions

The potential impacts of future conditions on earthquake probability are unknown. Some scientists feel that melting glaciers could induce tectonic activity. As ice melts and water runs off, tremendous amounts of weight are shifted on the earth's crust. As newly freed crust returns to its original, pre-glacier shape, it could cause seismic plates to slip according to research into prehistoric earthquakes and volcanic activity.

Soils saturated by repetitive storms could experience liquefaction during seismic activity because of increased saturation. Dams storing increased volumes of water could fail during seismic events. There are currently no models available to estimate these impacts.

9. FLOOD

9.1 HAZARD PROFILE

9.1.1 Hazard Description

Flooding is a general, temporary condition of partial or complete inundation of normally dry land as a result of rising surface waters or drainage system flows. Floods are one of the most common of natural hazards. They can develop slowly over a period of days or quickly in minutes or hours. Disastrous effects of flooding can be local (impacting a neighborhood or community) or regional (affecting entire river basins, coastlines and multiple counties or states) (FEMA 2007b).

Flooding potential is influenced by climatology, meteorology, and topography (elevations, latitude, and water bodies and waterways). It depends on the intensity and duration of rainfall, the steepness of the watershed, the number of impervious surfaces within the watershed, and vegetation.

Types of Flooding

For the purpose of this HMP and as deemed appropriate by the Core Planning Team, the flood hazard is defined as including riverine flooding, flash flooding, stormwater/urban flooding, and ice jam flooding, each of which is described below. Dam failure flooding is a separate hazard, as discussed in Chapter 6.

Riverine Flooding

Riverine floods are the most common flood type. They occur along a river or stream channel, defined as a ground feature that carries water through and out of a watershed. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas.

Flash Flooding

Flash floods are swift-flowing waters through riverbeds, streets, or canyons caused by heavy rainfall in a short period of time, generally less than 6 hours. They can occur within minutes of excessive rainfall (NWS 2009a).

Stormwater/Urban Flooding

Stormwater/urban flooding is caused by local drainage issues and high groundwater levels when heavy precipitation results in flooding in areas other than delineated floodplains or along recognizable channels, such as streets, underpasses, low-lying areas, or storm drains. If the rainfall is too much to accommodate through a combination of infiltration and surface runoff, water may accumulate and cause flooding. While riverine and lakeshore flooding is mapped and studied by FEMA, urban flooding is not.

Flooding of this nature generally occurs in areas with flat gradients and increase with urbanization, which speeds the accumulation of floodwaters because of impervious surfaces. Urban development and inadequate drainage systems can increase precipitation runoff, elevating the risk for flooding. Shallow street flooding can occur unless channels have been improved to account for increased flows (FEMA 2020a). Urban flooding can be worsened by aging or inadequate infrastructure and over-development of land. The growing number of extreme rainfall events that produce intense precipitation are resulting in increased urban flooding (Center for Disaster Resilience 2016).

High groundwater levels can cause problems even where there is no surface flooding. Basements are susceptible to high groundwater levels. Seasonally high groundwater is common in many areas; elsewhere, high groundwater occurs only after a long period of above-average precipitation (USGS 2016a). During winter and spring, frozen ground and snow accumulations may contribute to inadequate drainage and localized ponding.

Drainage systems channel surface water away from developed areas as quickly as possible to prevent localized flooding on streets and other urban areas. This bypasses the natural processes of water filtration through the ground, containment, and evaporation of excess water. Because drainage systems reduce the amount of time the surface water takes to reach surrounding streams, flooding in those streams can occur more quickly and reach greater depths than prior to development in that area (Harris 2008).

Ice Jam Flooding

An ice jam occurs when pieces of floating ice are carried with a stream's current and accumulate behind an obstruction to the stream flow. Obstructions may be river bends, mouths of tributaries, points where the river slope decreases, dams, or bridges. The water held back by the ice jam can cause flooding upstream, If the jam suddenly breaks, flash flooding can occur.

The formation of ice jams depends on the weather and physical condition of the river and stream channels. They are most likely where the channel slope naturally decreases, in culverts, and along shallows where channels may freeze solid. Ice jams and resulting floods can result from various conditions (NYS DHSES 2023):

- Freeze-up jams occur in winter when frazil ice—a slush-like form of floating ice—slows or stops due to a change in water slope as it reaches an obstruction to movement.
- Stream channels can freeze solid in mid-winter, forming anchor ice.
- Break-up jams occur during periods of thaw, generally in late winter and early spring, when rising water levels from snowmelt or rainfall break existing ice cover into pieces that accumulate at points of obstruction.

Floodplains

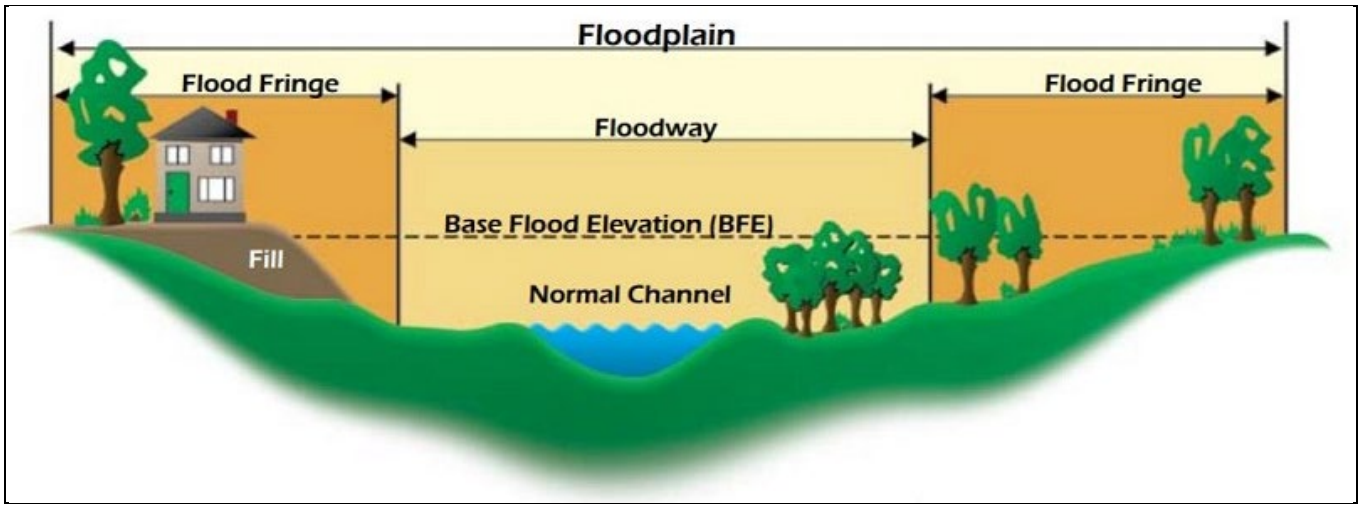
A floodplain is the land adjoining the channel of a river, stream, ocean, lake, or other water body that becomes inundated with water during a flood. Figure 9-1 depicts the components of a floodplain, which include the following (FEMA n.d.-e):

- *Floodway* is the channel of a river or other waterway and the adjacent land areas that are under water or reserved to carry and discharge the overflow of water caused by flooding.
- *Flood Fringe* is the area within the floodplain but outside the floodway. This area extends from the outer banks of a floodway to the river valley, where the elevation begins to rise.

Flood Mapping

FEMA prepares maps of floodplains based on existing riverine flooding conditions. FEMA flood maps identify Special Flood Hazard Areas (SFHA), which are the areas that will be inundated by the flood event that has a 1 percent chance of being equaled or exceeded in any given year. The 1 percent annual chance flood is also referred to as the base flood or 100-year flood, though it is statistically possible for such floods to occur more than once every 100 years. The 1 percent annual chance floodplain is the area where flood insurance and floodplain management requirements apply (FEMA 2020b). FEMA maps also show the 0.2 percent annual chance floodplain, sometimes called the 500-year floodplain. Additional definitions relating to flood maps can be seen in Table 9-1.

Figure 9-1. Characteristics of a Floodplain



Source: (FEMA n.d.-e)

Table 9-1. Flood Map Terms

Term	Description
Special Hazard Flood Areas (SFHAs)	Labeled as Zone A, Zone AO, Zone AH, Zones A1-A30, Zone AE, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/A1-A30, Zone AR/A, Zone V, Zone VE, and Zones V1-V30
Zone B or Zone X (shaded)	Moderate flood hazard areas; the areas between the limits of the base flood and the 0.2 percent annual chance (or 500-year) flood
Zone C or Zone X (unshaded)	Areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2 percent annual chance flood

Source: (FEMA 2022a)

The mapped boundaries of the floodplains are updated to account for changes in land use, the amount of impervious surface, placement of obstructing structures in floodways, changes in precipitation and runoff patterns, improvements in technology for measuring topographic features, and utilization of different hydrologic models.

Flooding outside of the SFHA area may include stormwater or urban flooding and flash flooding. Urban and stormwater flooding and flooding associated with changing future conditions (e.g., sea level rise and increased or decreased rainfall) are not reflected in the FEMA maps. As such, the maps may underestimate flood risk in some areas.

9.1.2 Location

Riverine Flooding

Riverine flooding is a significant hazard in Sullivan County due to the county's extensive network of rivers and streams, including the Delaware River and major tributaries such as the Beaverkill and Willowemoc, and Callicoon Creeks. Flooding typically occurs during spring rains and snowmelt, as well as summer tropical storms. Areas most vulnerable to riverine flooding include Beaverkill/Willowemoc, the Callicoon Creek watershed, the Neversink River

corridor, and portions of the Ten Mile River and Beaver Brook watersheds. These locations have a documented history of flooding and remain susceptible to future events (FEMA FIS 2015).

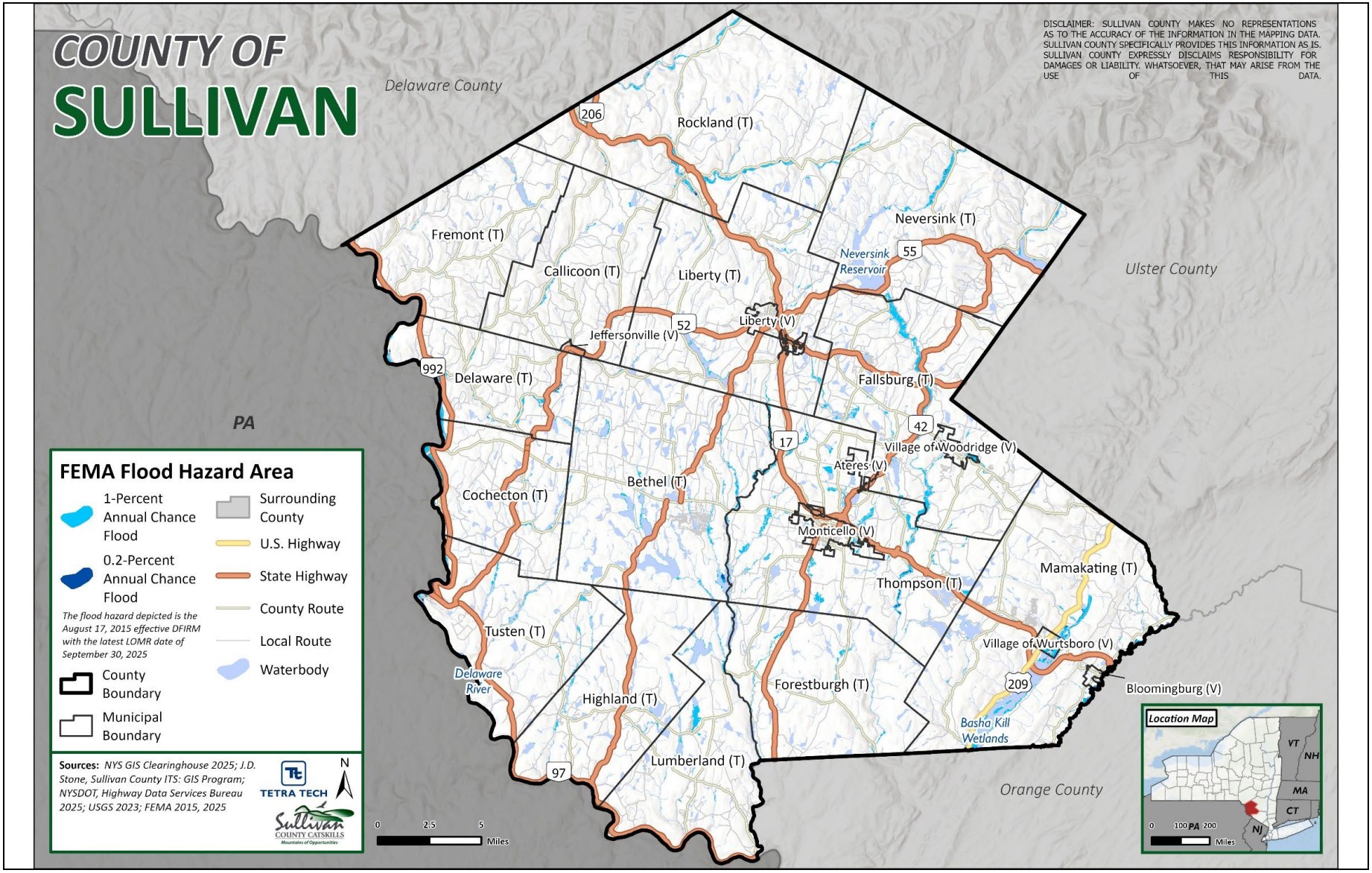
Locations of flood zones in Sullivan County as depicted on the FEMA preliminary Digital Flood Insurance Rate Map (DFIRM) are shown in Figure 9-2. Total land area in the floodplain, exclusive of water bodies, is summarized in Table 9-2.

Table 9-2. Number of Acres in the Sullivan County Exposed to the 1% and 0.2% Annual Chance Flood

Jurisdiction	Total Land Area (acres) (excludes water bodies)	Land Area (excluding water bodies) in the 1% Annual Chance Flood Hazard Area		Land Area (excluding water bodies) in the 0.2% Annual Chance Flood Hazard Area	
		Total Area (acres)	% of Jurisdiction Total	Total Area (acres)	% of Jurisdiction Total
Ateres (V)	838.1	11.6	1.4%	11.6	1.4%
Bethel (T)	51,761.8	1,378.1	2.7%	1,433.8	2.8%
Bloomingburg (V)	430.6	52.9	12.3%	61.6	14.3%
Callicoon (T)	30,590.7	534.9	1.7%	535.4	1.8%
Cochecton (T)	22,809.6	780.2	3.4%	802.3	3.5%
Delaware (T)	21,877.0	909.4	4.2%	1,026.4	4.7%
Fallsburg (T)	47,467.6	1,863.1	3.9%	1,866.2	3.9%
Forestburgh (T)	34,366.1	507.8	1.5%	507.8	1.5%
Fremont (T)	32,033.4	375.9	1.2%	397.8	1.2%
Highland (T)	31,122.4	589.9	1.9%	649.5	2.1%
Jeffersonville (V)	254.9	24.8	9.7%	28.0	11.0%
Liberty (T)	47,916.8	833.3	1.7%	883.4	1.8%
Liberty (V)	1,653.6	45.9	2.8%	73.3	4.4%
Lumberland (T)	29,349.6	1,052.5	3.6%	1,157.0	3.9%
Mamakating (T)	58,259.1	1,830.7	3.1%	2,083.1	3.6%
Monticello (V)	2,604.3	30.1	1.2%	30.1	1.2%
Neversink (T)	52,348.8	1,133.9	2.2%	1,235.3	2.4%
Rockland (T)	59,587.4	2,077.7	3.5%	2,271.1	3.8%
Thompson (T)	49,930.6	2,453.2	4.9%	2,594.6	5.2%
Tusten (T)	30,527.0	877.8	2.9%	988.8	3.2%
Woodridge (V)	1,148.0	126.5	11.0%	126.5	11.0%
Wurtsboro (V)	781.4	178.5	22.8%	208.0	26.6%
Sullivan County (Total)	**607,658.9**	**17,668.7**	**2.9%**	**18,971.4**	**3.1%**

Source: NYS GIS Clearinghouse 2025; J.D. Stone, Sullivan County ITS: GIS Program; FEMA 2015, 2025

Figure 9-2. FEMA Flood Hazard Areas in Sullivan County



Flash Flooding

Flash flooding occurs in Sullivan County during intense rainfall events, particularly in areas with steep terrain and small tributaries. These floods develop quickly and can impact roads, homes, and local infrastructure. Areas historically prone to flash flooding include Callicoon Center, which has experienced significant runoff issues, and low-lying sections of Schoolhouse Road near the school. Tributaries near Liberty Creek in the Mongaup River area are also vulnerable to localized flash flooding during severe storms (FEMA FIS 2015).

Stormwater/Urban Flooding

Stormwater and urban flooding occur in developed areas of Sullivan County with aging or undersized stormwater infrastructure and high percentages of impervious surfaces that increase runoff during heavy rain events. Locations most vulnerable include low-lying areas near the Delaware River and Callicoon Creek in the Village of Jeffersonville and Town of Delaware, tributaries near Liberty Creek in the Mongaup River area, and Exit 100 on State Route 17, where high flows during major storms can overtop banks and flood adjacent buildings (FEMA FIS 2015).

Ice Jam Flooding

According to the U.S. Army Corps of Engineers (USACE), New York State ranks second in the United States for total number of ice jam events, with over 1,700 incidents documented between 1867 and 2024. Areas of the state that include characteristics leading to ice jam flooding are the northern counties of the Finger Lakes region and far western New York, the Mohawk Valley of central and eastern New York, and the North Country (NYS DHSES 2023). Sullivan County's river systems and cold climate create conditions where ice jams may occur along major rivers such as the Delaware and Neversink, as well as smaller streams and tributaries during winter and early spring freeze-thaw cycles.

In Livingston Manor, ice jams on Little Beaver Kill have caused basement flooding and localized damage, particularly near the Main Street bridge. Additional ice jam issues have been reported along Willowemoc Creek near Roscoe, affecting homes on Yorktown Spur Road and causing scattered flooding within the hamlet. While less frequent than riverine floods, ice jam events pose significant risks to property and infrastructure and can occur suddenly during seasonal transitions.

9.1.3 Extent

Riverine Flooding

The severity of riverine flooding depends on the amount of water that accumulates in a period of time and on the land's ability to convey or absorb this water. When land is saturated or frozen, infiltration rates decrease and rainfall must flow as runoff. The severity of flooding is determined by factors such as river and basin topography; precipitation and weather patterns; soil moisture conditions; and degree of vegetative clearing and impervious surface (Harris 2008).

Once a river reaches flood stage, the NWS rates flood severity as follows based on property damage and public threat (NOAA NSSL n.d.-a):

- ***Minor Flooding*** produces minimal or no property damage, but possibly some public threat or inconvenience.
- ***Moderate Flooding*** produces some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.

- ***Major Flooding*** produces extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations are necessary.

Flash Flooding

The extent of a flash flood is consistent with that of a riverine flood, as described above.

Urban/Street Flooding

Currently, there is no measurement used to define the frequency and severity of stormwater/urban flooding.

Ice Jam Flooding

Ice jam flooding events often occur suddenly and are difficult to predict, allowing little time to prepare for and warn of an event. The size of the snowpack and the rate of snowmelt controls the extent of an ice jam (Rokaya 2018).

9.1.4 Previous Occurrences

FEMA Disaster Declarations

Table 9-3 lists all flood-related presidentially declared disasters that have included Sullivan County.

Table 9-3. FEMA Disaster Declarations for Flood Events in Sullivan County

Event Date	Declaration Date	Declaration Number	Description
August 26, 1969	August 26, 1969	DR-275-NY	Heavy rains and flooding
July 20, 1973	July 20, 1973	DR-401-NY	Severe storms and flooding
March 28 – April 8, 1984	April 17, 1984	DR-702-NY	Coastal storms and flooding
January 19-30, 1996	January 24, 1996	DR-1095-NY	Severe storms and flooding
June 25-July 10, 1998	July 7, 1998	DR-1233-NY	Severe storms and flooding
May 3-August 12, 2000	July 21, 2000	DR-1335-NY	Severe storms and flooding
July 21-August 13, 2003	August 29, 2003	DR-1486-NY	Severe storms, flooding, and tornadoes
May 13-June 17, 2004	August 3, 2004	DR-1534-NY	Severe storms and flooding
August 13-September 16, 2004	October 1, 2004	DR-1564-NY	Severe storms and flooding
April 2-4, 2005	April 19, 2005	DR-1589-NY	Severe storms and flooding
June 26-July 10, 2006	July 1, 2006	DR-1650-NY	Severe storms and flooding
November 16-17, 2006	December 12, 2006	DR-1670-NY	Severe storms and flooding
June 19, 2007	July 1, 2007	DR-1710-NY	Severe storms and flooding

Source: (FEMA 2025e)

USDA Declarations

Since the 2021 HMP, Sullivan County was included in two flood-related USDA agricultural disaster declarations, as shown in Table 9-4 (USDA 2025).

Table 9-4. USDA Declarations for Flood Events in Sullivan County Since Previous HMP

Event Date	USDA Declaration Number	Description
June 13 - July 31, 2023	S5607, S5641	Flash flooding and excessive rain

Source: (USDA 2025)

All Recent Events

Table 9-5 lists major recorded flood-related events that impacted Sullivan County between January 2020 and May 2025. For earlier events, refer to the previous HMP.

Table 9-5. Flood Events in Sullivan County (2020 to 2025)

Event Date	Location Impacted	Description
August 4, 2020	Maplewood	On August 4, Tropical Storm Isaias brought heavy rain and thunderstorms to south-central and eastern New York, with 3–5 inches of rainfall causing isolated flash flooding in Sullivan County. Floodwaters inundated a bridge on South Maplewood Road, scouring and damaging the road surface. Estimated property damage: $10,000.
September 1-2, 2021	Kenoza Lake, Maplewood, Hurleyville, Harris	Heavy rain from the remnants of Tropical Cyclone Ida moved from the DelMarVa Peninsula to New England, following weeks of wet weather. This caused flash flooding in Central New York, including Route 52A near Stone Arch Bridge and Holmes Road east of NY-17. A swiftwater rescue was required for a man stranded on his car roof on Big Woods Road near Spring Brook and the East Mongaup River. Estimated property damage: $14,000.
October 26, 2021	Jeffersonville, Kenoza Lake, Hortonville, Callicoon, Jeffersonville, Livingston Manor, Roscoe	Deep Atlantic moisture fed into a warm front over Central New York, producing 3–5 inches of rain and widespread flash flooding across the Southern Tier and Finger Lakes. Severe flooding blocked NY-52, washed out roads, and swept a vehicle into the river near NY-17B and Mesmer Hill Road. Multiple water rescues were conducted. Estimated property damage: $51,000
June 13 - July 31, 2023	Countywide	Torrential downpours impacted the County, flooding main roads. Debris were also scattered across many roads from the fast-moving flood waters. Creeks, streams, and brooks overflowed their banks.
December 18, 2023	Bloomingburg	Low pressure along the Atlantic Seaboard brought 2–4 inches of rain and melting snow to central New York, causing widespread flash and river flooding. Floodwaters entered the first floor of a home. Estimated property damage: $20,000.

Source: (NOAA NCEI 2025b)

9.1.5 Probability of Future Occurrences

Information on previous flood occurrences in the County was used to calculate the probability of future occurrence of such events, as summarized in Table 9-6. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Steering Committee, the probability of occurrence for flood in the County is considered “highly likely.”

Table 9-6. Probability of Future Flood Events in Sullivan County

Hazard Type	Number of Occurrences Between 1996 and 2025	Percent Chance of Occurring in Any Given Year
Flash Flood	68	100%
Flood	19	63.3%
Ice Jam	0	0.00%
Total	87	100%

Source: (NOAA NCEI 2025b); (FEMA 2025e); (USDA 2025)
Note: Due to limitations in data, not all flood events occurring between 1954 and 1996 are accounted for in the tally of occurrences. As a result, the number of hazard occurrences is calculated using the number of occurrences between 1996 and 2025.

9.1.6 Cascading Impacts Associated with the Hazard

Annual direct and indirect impacts of floods on Sullivan County are expected to continue. Some flooding events may induce secondary hazards related to water quality and water supply. Some may lead to evacuations, infrastructure deterioration or failure, utility failures, transportation accidents or delays, or public health concerns.

Erosion

Riverine flooding often results in bank erosion. This is especially true in the upper courses of rivers with steep gradients, where floodwaters may pass quickly and without much property damage, but scour the banks, edging properties closer to the floodplain or causing them to fall in. Flooding is also responsible for hazards such as landslides when high flows over-saturate soils on steep slopes, causing them to fail.

Public Health

After flood events, excess moisture and standing water contribute to the growth of mold in buildings. Mold may present a health risk to building occupants, especially those with already compromised immune systems such as infants, children, the elderly and pregnant women. Mold spores can grow in as little as 24 to 48 hours in wet and damaged areas of buildings that have not been properly cleaned. Very small mold spores can be inhaled, creating the potential for respiratory problems. Buildings should be properly cleaned and dried out to safely prevent mold growth (FEMA n.d.-a).

Floodwaters also can be contaminated by pollutants such as sewage, human and animal feces, pesticides, fertilizers, oil, asbestos, and rusting building materials. Other common public health risks from flooding include the following (FEMA 2022b):

- Unsafe food
- Mosquitos and animals
- Carbon monoxide poisoning
- Secondary hazards associated with re-entering/cleaning flooded structures
- Mental stress and fatigue

Utility Disruption

Floods can impact utilities as follows (EPA 2014):

- **Water Supply Contamination**—Floodwater picks up debris, increasing the amount of bacteria, sewage, and other industrial waste and chemicals in the water supply. Excess water makes it more difficult for water treatment plants to treat the water effectively. Contamination at any step of the water flow process puts consumers at risk from toxins that could result in infections, rashes, gastrointestinal illnesses, or tetanus. Consumers are unable to cook or clean at home until the water is certified as safe, which could take days, weeks, or months. Without access to clean drinking and cooking water, consumers become reliant on bottled water. People who live in impoverished communities may not have the financial resources to stock up on bottled water. Moreover, retail locations are often inaccessible after a flood or low on water supply.
- **Damage to Power Utilities**—Flooded buildings may have utilities disrupted if a service panel, generator, meter, etc. is not elevated above the flood level. Oversaturated soils from periods of heavy rain and flooding may cause utility poles to tip over or fall completely, potentially interrupting the power grid for a large area, especially if a transformer is impacted.

Dam Failure

Severe storms, which are often a precursor to flooding events, can result in large quantities of rain upstream of a dam that will ultimately be impounded by the dam, which could raise water levels behind the dam, resulting in overtopping of the dam or flooding of properties upstream of the dam. Should flooding result in a dam failure, the water behind the dam, including floodwaters, may inundate locations downstream of the dam. More information on dam failure can be found in Chapter 6.

9.2 VULNERABILITY AND IMPACT ASSESSMENT

The 1 and 0.2 percent annual chance flood events were examined to evaluate the county's risk from the flood hazard. Additional information on the methodology utilized is provided in Chapter 4.

9.2.1 Life, Health, and Safety

The total number of injuries and casualties resulting from flooding is generally limited based on advance weather forecasting, blockades, and warnings. Ongoing mitigation efforts should help to avoid the most likely cause of injury, which results from persons trying to cross flooded roadways or channels during a flood. However, persons can become displaced from their homes or may require shelter due to the impacts of a flood event.

Overall Population

Table 9-7 summarizes the population exposed to the 1 and 0.2 percent annual chance flood events by jurisdiction. There are an estimated 2,170 residents living in the 1 percent annual chance floodplain, or 2.7 percent of the County's total population. The Town of Fallsburg has the highest number of residents in this floodplain, with an estimated 561 individuals. For the 0.2 percent annual chance floodplain, an estimated 2,737 residents are exposed, or 3.5 percent of the County's population. Again, the Town of Fallsburg accounts for the highest number, at 564.

Hazus estimates 2,630 individuals displaced as a result of a 1 percent annual chance flood event, and 735 people seeking short-term shelter. Table 9-8 shows the breakdown by jurisdiction.

Table 9-7. Population Exposed to the 1% and 0.2% Annual Chance Flood Event Hazard Area

Jurisdiction	Total Population	Population in the 1% Annual Chance Flood Hazard Area		Population in the 0.2% Annual Chance Flood Hazard Area	
		Number of Persons	% of Jurisdiction Total	Number of Persons	% of Jurisdiction Total
Ateres (V)	834	0	0.0%	0	0.0%
Bethel (T)	3,997	29	0.7%	33	0.8%
Bloomingburg (V)	1,022	0	0.0%	8	0.8%
Callicoon (T)	2,594	41	1.6%	41	1.6%
Cochecton (T)	1,392	63	4.5%	73	5.2%
Delaware (T)	2,301	106	4.6%	167	7.3%
Fallsburg (T)	13,292	561	4.2%	564	4.2%
Forestburgh (T)	829	6	0.7%	6	0.7%
Fremont (T)	1,204	62	5.1%	71	5.9%
Highland (T)	2,007	60	3.0%	86	4.3%
Jeffersonville (V)	417	65	15.6%	68	16.3%
Liberty (T)	5,196	71	1.4%	85	1.6%
Liberty (V)	5,083	33	0.6%	62	1.2%
Lumberland (T)	2,276	21	0.9%	58	2.5%
Mamakating (T)	10,456	247	2.4%	399	3.8%
Monticello (V)	7,252	0	0.0%	0	0.0%
Neversink (T)	3,381	95	2.8%	128	3.8%
Rockland (T)	3,323	425	12.8%	554	16.7%
Thompson (T)	8,628	103	1.2%	106	1.2%
Tusten (T)	1,528	95	6.2%	138	9.0%
Woodridge (V)	954	17	1.8%	17	1.8%
Wurtsboro (V)	1,181	70	5.9%	73	6.2%
Sullivan County (Total)	**79,147**	**2,170**	**2.7%**	**2,737**	**3.5%**

Source: U.S. Census Bureau, American Community Survey 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; FEMA 2015, 2025

Table 9-8. Population Displaced or Seeking Short-Term Shelter Due to the 1% Annual Chance Flood Event

Jurisdiction	Total Population	1% Annual Chance Flood Impacts on People	
		Displaced Population	Persons Seeking Short-Term Shelter
Ateres (V)	834	0	0
Bethel (T)	3,997	47	17
Bloomingburg (V)	1,022	6	6
Callicoon (T)	2,594	64	27
Cochecton (T)	1,392	57	5
Delaware (T)	2,301	122	23
Fallsburg (T)	13,292	681	164
Forestburgh (T)	829	11	0
Fremont (T)	1,204	40	7
Highland (T)	2,007	95	20
Jeffersonville (V)	417	37	1
Liberty (T)	5,196	86	35
Liberty (V)	5,083	77	36
Lumberland (T)	2,276	26	7
Mamakating (T)	10,456	246	53
Monticello (V)	7,252	0	0
Neversink (T)	3,381	111	17
Rockland (T)	3,323	576	240
Thompson (T)	8,628	173	52
Tusten (T)	1,528	91	8
Woodridge (V)	954	7	1
Wurtsboro (V)	1,181	77	16
Sullivan County (Total)	**79,147**	**2,630**	**735**

Source: U.S. Census Bureau 2020; U.S. Census, American Community Survey 5-Year Estimates 2022; FEMA 2015, 2025; NYS Office of Information Technology Services Geospatial Services, FEMA 2019.

At-Risk Populations

Some populations are more susceptible to flood events based on factors including their physical and financial ability to react or respond during a flood. At-risk populations include homeless persons, persons over 65 years old, low income or linguistically isolated populations, people with life-threatening illnesses, and residents who may struggle to evacuate.

Table 9-9 presents the estimated at-risk populations living in the 1 percent annual chance flood hazard area. Of the 2,170 persons living in that flood hazard area, 443 are over the age of 65, 90 are under 5, 64 are non-English speakers, 346 have a disability, and 289 live in poverty.

Table 9-10 presents the estimated at-risk populations living in the 0.2 percent annual chance flood hazard area. Of the 2,737 persons living in that flood hazard area, 559 are over the age of 65, 122 are under 5, 78 are non-English speaker, 438 have a disability, and 355 live in poverty.

Table 9-9. At-Risk Persons Living in the 1% Annual Chance Flood

Jurisdiction	At-Risk Persons Living in the 1% Annual Chance Flood Hazard Area									
	Population Over 65		Population Under 5		Non-English-Speaking Population		Population with Disability		Population Below Poverty Level	
	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
Ateres (V)	-	-	-	-	-	-	-	-	-	-
Bethel (T)	8	0.7%	1	0.7%	1	0.5%	4	0.6%	4	0.7%
Bloomingburg (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Callicoon (T)	8	1.4%	1	1.4%	0	0.0%	6	1.5%	2	1.4%
Cochecton (T)	18	4.4%	4	4.4%	0	0.0%	8	4.2%	5	4.3%
Delaware (T)	24	4.5%	2	3.2%	0	0.0%	13	4.4%	11	4.5%
Fallsburg (T)	83	4.2%	25	4.1%	24	4.2%	76	4.2%	106	4.2%
Forestburgh (T)	2	0.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Fremont (T)	17	5.2%	2	3.6%	0	0.0%	11	4.9%	4	4.7%
Highland (T)	17	2.9%	0	0.0%	0	0.0%	17	3.0%	5	2.9%
Jeffersonville (V)	12	15.0%	1	11.1%	0	0.0%	13	15.3%	13	14.8%
Liberty (T)	11	1.3%	6	1.3%	2	1.0%	13	1.4%	5	1.2%
Liberty (V)	4	0.6%	3	0.6%	2	0.6%	6	0.6%	5	0.6%
Lumberland (T)	2	0.6%	1	0.8%	0	0.0%	1	0.6%	2	0.9%
Mamakating (T)	36	2.3%	19	2.3%	5	2.3%	35	2.3%	21	2.3%
Monticello (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Neversink (T)	19	2.8%	2	1.9%	9	2.7%	18	2.7%	6	2.6%
Rockland (T)	117	12.8%	14	12.5%	17	12.7%	83	12.7%	68	12.7%
Thompson (T)	29	1.2%	5	1.0%	3	1.0%	17	1.1%	14	1.1%
Tusten (T)	18	6.1%	1	3.2%	0	0.0%	14	6.1%	8	6.0%
Woodridge (V)	3	1.8%	1	1.8%	0	0.0%	3	1.6%	3	1.6%
Wurtsboro (V)	15	5.8%	2	4.8%	1	3.1%	8	5.4%	7	5.6%
Sullivan County (Total)	**443**	**2.9%**	**90**	**1.9%**	**64**	**2.0%**	**346**	**2.8%**	**289**	**2.5%**

Source: U.S. Census Bureau, American Community Survey 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; FEMA 2015, 2025

Table 9-10. At-Risk Persons Living in the 0.2% Annual Chance Flood

Jurisdiction	At-Risk Persons Living in the 0.2% Annual Chance Flood Hazard Area									
	Population Over 65		Population Under 5		Non-English-Speaking Population		Population with Disability		Population Below Poverty Level	
	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
Ateres (V)	-	-	-	-	-	-	-	-	-	-
Bethel (T)	9	0.8%	1	0.7%	1	0.5%	5	0.8%	5	0.8%
Bloomingburg (V)	0	0.0%	2	0.7%	1	0.5%	0	0.0%	4	0.7%
Callicoon (T)	8	1.4%	1	1.4%	0	0.0%	6	1.5%	2	1.4%
Cochecton (T)	21	5.2%	4	4.4%	0	0.0%	10	5.2%	6	5.1%
Delaware (T)	39	7.3%	4	6.3%	0	0.0%	21	7.1%	17	6.9%
Fallsburg (T)	84	4.2%	25	4.1%	24	4.2%	76	4.2%	106	4.2%
Forestburgh (T)	2	0.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Fremont (T)	19	5.8%	3	5.4%	0	0.0%	13	5.8%	5	5.9%
Highland (T)	25	4.2%	1	3.8%	0	0.0%	24	4.2%	7	4.0%
Jeffersonville (V)	13	16.3%	1	11.1%	0	0.0%	13	15.3%	14	15.9%
Liberty (T)	14	1.6%	7	1.5%	3	1.5%	15	1.6%	6	1.4%
Liberty (V)	8	1.2%	6	1.1%	3	1.0%	11	1.1%	10	1.1%
Lumberland (T)	7	2.3%	3	2.3%	0	0.0%	4	2.3%	5	2.2%
Mamakating (T)	58	3.8%	32	3.8%	8	3.7%	56	3.8%	34	3.8%
Monticello (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Neversink (T)	25	3.7%	4	3.8%	12	3.5%	25	3.8%	8	3.4%
Rockland (T)	152	16.6%	18	16.1%	22	16.5%	109	16.6%	89	16.6%
Thompson (T)	30	1.2%	5	1.0%	3	1.0%	18	1.2%	15	1.2%
Tusten (T)	26	8.9%	2	6.5%	0	0.0%	20	8.7%	12	9.0%
Woodridge (V)	3	1.8%	1	1.8%	0	0.0%	3	1.6%	3	1.6%
Wurtsboro (V)	16	6.2%	2	4.8%	1	3.1%	9	6.1%	7	5.6%
Sullivan County (Total)	**559**	**3.7%**	**122**	**2.6%**	**78**	**2.4%**	**438**	**3.5%**	**355**	**3.1%**

Source: U.S. Census Bureau, American Community Survey 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; FEMA 2015, 2025

9.2.2 General Building Stock

Table 9-11 lists the exposure of buildings to the 1 percent annual chance flood event by jurisdiction. There are an estimated 1,720 buildings in this flood hazard area, accounting for 3.9 percent of the County's total building stock replacement cost value ($1.8 billion). The Town of Rockland has the greatest number of buildings at risk, at 428 (16.1 percent of its total building stock). Table 9-12 shows the breakdown of exposed buildings by occupancy class.

Table 9-13 lists the exposure of buildings to the 0.2 percent annual chance flood event by jurisdiction. For the this flood hazard area, 2,175 buildings are exposed, accounting for 5.0 percent of the County's total building stock replacement cost value ($2.4 billion). The Town of Rockland has the highest number of buildings at risk, at 532 (20.0 percent of its total building stock). Table 9-14 shows the breakdown of exposed buildings by occupancy class.

Table 9-11. General Building Stock Exposure to the 1% Annual Chance Flood

Jurisdiction	Jurisdiction Total Buildings		Buildings in the 1% Annual Chance Flood Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Ateres (V)	99	$104,501,618	0	0.0%	$0	0.0%
Bethel (T)	4,671	$3,993,363,362	30	0.6%	$15,595,172	0.4%
Bloomingburg (V)	172	$223,874,493	0	0.0%	$0	0.0%
Callicoon (T)	1,942	$1,579,365,779	35	1.8%	$19,380,661	1.2%
Cochecton (T)	1,189	$1,051,465,789	60	5.0%	$38,954,030	3.7%
Delaware (T)	1,663	$1,867,149,344	96	5.8%	$161,585,285	8.7%
Fallsburg (T)	8,114	$8,608,748,500	350	4.3%	$310,743,454	3.6%
Forestburgh (T)	680	$627,023,982	8	1.2%	$23,779,816	3.8%
Fremont (T)	1,322	$1,156,125,779	67	5.1%	$65,695,809	5.7%
Highland (T)	1,853	$1,449,898,732	78	4.2%	$112,987,792	7.8%
Jeffersonville (V)	201	$275,534,732	28	13.9%	$27,075,687	9.8%
Liberty (T)	4,041	$3,988,125,428	59	1.5%	$79,659,621	2.0%
Liberty (V)	1,540	$2,185,506,732	23	1.5%	$171,539,198	7.8%
Lumberland (T)	1,796	$1,429,481,922	24	1.3%	$60,885,755	4.3%
Mamakating (T)	5,508	$3,516,266,251	133	2.4%	$79,844,868	2.3%
Monticello (V)	2,164	$2,972,791,748	1	<0.1%	$585,810	<0.1%
Neversink (T)	2,292	$1,693,278,156	100	4.4%	$74,968,376	4.4%
Rockland (T)	2,659	$2,106,441,850	428	16.1%	$451,420,232	21.4%
Thompson (T)	7,526	$7,018,047,712	88	1.2%	$77,659,552	1.1%
Tusten (T)	1,254	$908,701,677	74	5.9%	$43,134,751	4.7%
Woodridge (V)	601	$624,670,518	10	1.7%	$18,193,498	2.9%
Wurtsboro (V)	517	$414,341,458	28	5.4%	$15,731,341	3.8%
Sullivan County (Total)	**51,804**	**$47,794,705,561**	**1,720**	**3.3%**	**$1,849,420,708**	**3.9%**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; RSMeans 2024; FEMA 2015, 2025

Table 9-12. General Building Stock Exposure to the 1% Annual Chance Flood by Occupancy

Jurisdiction	Buildings in the 1% Annual Chance Flood Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Other
Ateres (V)	0	0	0	0
Bethel (T)	30	0	0	0
Bloomingburg (V)	0	0	0	0
Callicoon (T)	28	3	0	4
Cochecton (T)	50	8	1	1
Delaware (T)	64	20	6	6
Fallsburg (T)	321	23	3	3
Forestburgh (T)	5	1	2	0
Fremont (T)	62	5	0	0
Highland (T)	51	24	0	3
Jeffersonville (V)	24	3	0	1
Liberty (T)	46	10	2	1
Liberty (V)	8	13	2	0
Lumberland (T)	15	5	4	0
Mamakating (T)	123	8	1	1
Monticello (V)	0	1	0	0
Neversink (T)	55	43	1	1
Rockland (T)	292	108	15	13
Thompson (T)	83	0	4	1
Tusten (T)	68	4	2	0
Woodridge (V)	10	0	0	0
Wurtsboro (V)	26	1	1	0
Sullivan County (Total)	**1,361**	**280**	**44**	**35**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; FEMA 2015, 2025
Note: Other = Government, Religion, Agricultural, and Education

Table 9-13. General Building Stock Exposure to the 0.2% Annual Chance Flood

Jurisdiction	Jurisdiction Total Buildings		Buildings in the 0.2% Annual Chance Flood Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Ateres (V)	99	$104,501,618	0	0.0%	$0	0.0%
Bethel (T)	4,671	$3,993,363,362	36	0.8%	$20,516,327	0.5%
Bloomingburg (V)	172	$223,874,493	5	2.9%	$24,066,467	10.7%
Callicoon (T)	1,942	$1,579,365,779	35	1.8%	$19,380,661	1.2%
Cochecton (T)	1,189	$1,051,465,789	71	6.0%	$45,849,567	4.4%
Delaware (T)	1,663	$1,867,149,344	142	8.5%	$196,138,106	10.5%
Fallsburg (T)	8,114	$8,608,748,500	352	4.3%	$311,530,830	3.6%
Forestburgh (T)	680	$627,023,982	8	1.2%	$23,779,816	3.8%
Fremont (T)	1,322	$1,156,125,779	76	5.7%	$69,630,474	6.0%
Highland (T)	1,853	$1,449,898,732	106	5.7%	$140,283,453	9.7%
Jeffersonville (V)	201	$275,534,732	34	16.9%	$45,708,265	16.6%
Liberty (T)	4,041	$3,988,125,428	70	1.7%	$86,844,919	2.2%
Liberty (V)	1,540	$2,185,506,732	66	4.3%	$341,424,254	15.6%
Lumberland (T)	1,796	$1,429,481,922	58	3.2%	$85,492,576	6.0%
Mamakating (T)	5,508	$3,516,266,251	211	3.8%	$112,594,226	3.2%
Monticello (V)	2,164	$2,972,791,748	1	<0.1%	$585,810	<0.1%
Neversink (T)	2,292	$1,693,278,156	125	5.5%	$101,945,472	6.0%
Rockland (T)	2,659	$2,106,441,850	532	20.0%	$573,882,561	27.2%
Thompson (T)	7,526	$7,018,047,712	93	1.2%	$84,073,909	1.2%
Tusten (T)	1,254	$908,701,677	115	9.2%	$69,902,648	7.7%
Woodridge (V)	601	$624,670,518	10	1.7%	$18,193,498	2.9%
Wurtsboro (V)	517	$414,341,458	30	5.8%	$21,174,785	5.1%
Sullivan County (Total)	**51,804**	**$47,794,705,561**	**2,176**	**4.2%**	**$2,392,998,623**	**5.0%**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; RSMeans 2024; FEMA 2015, 2025

Table 9-14. Building Stock Potential Loss by Occupancy to the 0.2% Annual Chance Flood

Jurisdiction	Buildings in the 0.2% Annual Chance Flood Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Other
Ateres (V)	0	0	0	0
Bethel (T)	34	2	0	0
Bloomingburg (V)	1	1	3	0
Callicoon (T)	28	3	0	4
Cochecton (T)	58	11	1	1
Delaware (T)	101	29	6	6
Fallsburg (T)	323	23	3	3
Forestburgh (T)	5	1	2	0
Fremont (T)	71	5	0	0
Highland (T)	73	30	0	3
Jeffersonville (V)	25	7	0	2
Liberty (T)	55	12	2	1
Liberty (V)	15	45	3	3
Lumberland (T)	40	14	4	0
Mamakating (T)	198	9	1	3
Monticello (V)	0	1	0	0
Neversink (T)	74	48	1	2
Rockland (T)	380	120	15	17
Thompson (T)	85	0	7	1
Tusten (T)	98	14	2	1
Woodridge (V)	10	0	0	0
Wurtsboro (V)	27	1	2	0
Sullivan County (Total)	**1,701**	**376**	**52**	**47**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; FEMA 2015, 2025
Note: Other = Government, Religion, Agricultural, and Education

NFIP

The flood risk assessment included an analysis of FEMA data on flood insurance policies, claims, and repetitive loss (RL) for properties insured under the National Flood Insurance Program (NFIP). A property is considered a repetitive loss property when there are two or more reported losses since 1978 that were paid more than $1,000 for each loss. The two losses must be within 10 years of each other and be at least 10 days apart.

FEMA Region 2 provided an aggregate report of number of policies in force, total number of RL properties, the number of losses, and the payments received, as of November 2025. The data was organized by jurisdiction, as shown in Table 9-15. Severe repetitive loss (SRL) data was not available. Figure 9-3 shows the general locations of RL and SRL properties in Sullivan County.

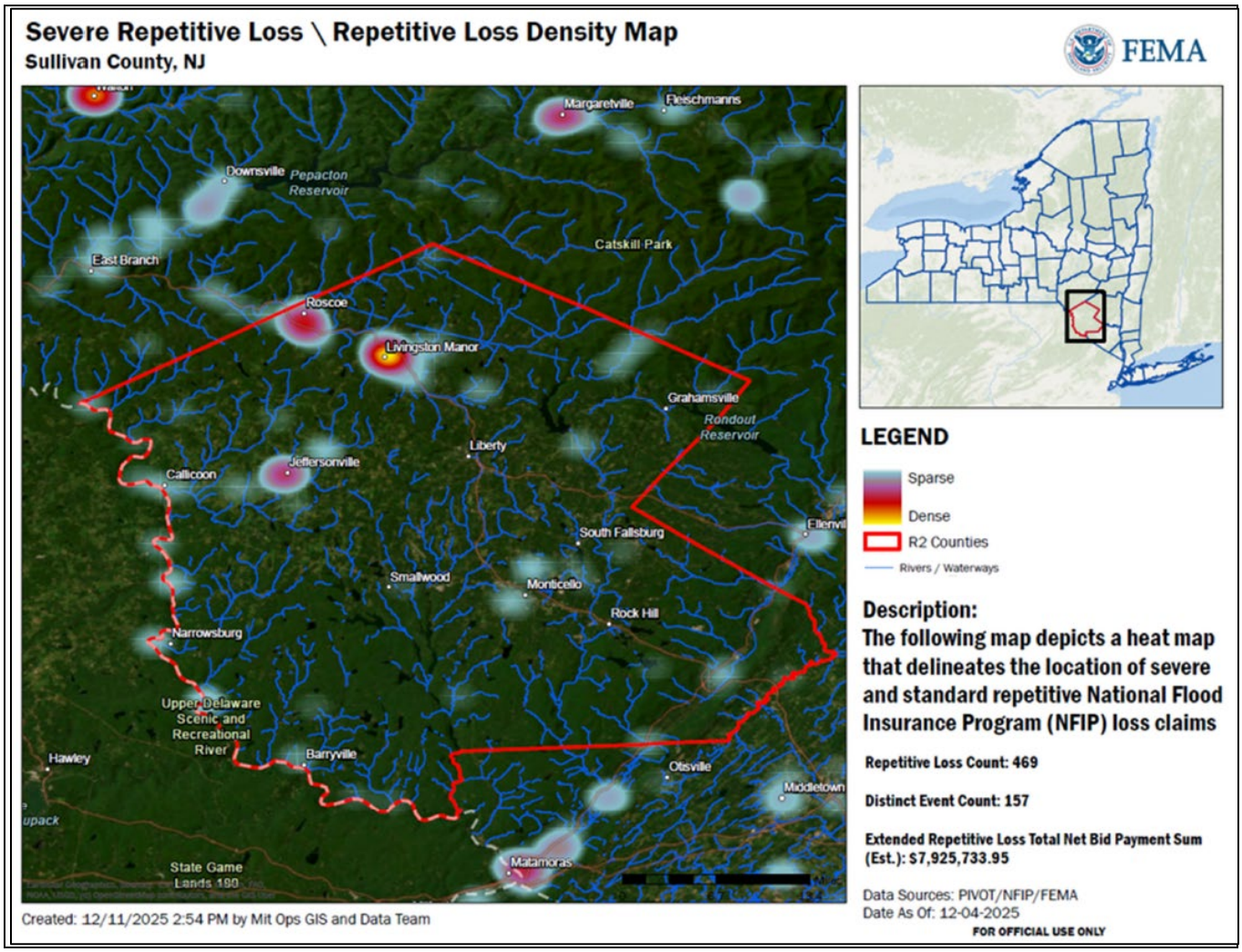
Table 9-15. NFIP Statistics for Sullivan as of November 2025

Jurisdiction	Policies in Force	Number of Repetitive Loss Properties	Number of Losses	Net Building Payment	Net Contents Payment	Total Net Payment
Ateres (V)	21	-	-	-	-	-
Bethel (T)	0	1	2	$6,671.33	$0.00	$6,671.33
Bloomingburg (V)	13	-	-	-	-	-
Callicoon (T)	9	6	24	$185,895.51	$27,795.12	$213,690.63
Cochecton (T)	0	4	9	$274,487.56	$20,000.00	$294,487.56
Delaware (T)	0	9	20	$356,496.42	$48,302.65	$404,799.07
Fallsburg (T)	40	2	4	$23,983.06	$5,190.69	$29,173.75
Forestburgh (T)	0	1	4	$2,601.00	$5,380.00	$7,981.00
Fremont (T)	35	4	10	$259,798.48	$7,733.52	$267,532.00
Highland (T)	0	2	6	$479,147.71	$0.00	$479,147.71
Jeffersonville (V)	1	12	43	$622,639.73	$141,377.32	$764,017.05
Liberty (T)	24	2	4	$18,135.44	$6,651.95	$24,787.39
Liberty (V)	19	-	-	-	-	-
Lumberland (T)	8	2	4	$34,943.72	$0.00	$34,943.72
Mamakating (T)	26	4	13	$154,880.72	$0.00	$154,880.72
Monticello (V)	8	-	-	-	-	-
Neversink (T)	0	5	11	$295,102.45	$18,235.82	$313,338.27
Rockland (T)	7	85	268	$4,248,808.04	$844,574.83	$5,093,382.87
Thompson (T)	34	7	19	$31,972.21	$22,031.98	$54,004.19
Tusten (T)	1	8	21	$599,846.98	$178,892.77	$778,739.75
Woodridge (V)	11	-	-	-	-	-
Wurtsboro (V)	0	1	2	$2,940.00	$2,216.00	$5,156.00
Sullivan County (Total)	**362**	**155**	**464**	**$7,598,350.36**	**$1,328,382.65**	**$8,926,733.01**

Source: FEMA Region 2 2025

Note: - = Data is Not Available. Data was not provided for the Villages of Bloomingburg, Liberty, Monticello, or Woodridge. The Village of Ateres is newly formed as of 2025 and currently does not participate in the NFIP.

Figure 9-3. Severe Repetitive Loss and Repetitive Loss Density Map of Sullivan County



Source: FEMA Region 2 2025

9.2.3 Community Lifelines and Other Critical Facilities

Table 9-16 and Table 9-17 provide jurisdictional breakdowns of critical facility exposure to the 1 and 0.2 percent annual chance flood events. Within the 1 percent annual chance flood boundary, 328 critical facilities are exposed. Transportation lifelines represent the largest category (255 facilities). Within the 0.2 percent annual chance flood boundary, 334 critical facilities are exposed. Transportation lifelines again account for the highest number (258 facilities).

Table 9-18 shows the number of facilities in each community lifeline category expected to experience various levels of damage due to a 1 percent annual chance flood. The safety and security category is the most heavily impacted, with 38 facilities experiencing less than 5 percent damage, 25 facilities experiencing 5 to 19 percent damage, and 1 experiencing 40 to 49 percent damage. No critical facilities are expected to reach the major damage threshold of 50 percent or greater.

Table 9-16. Number of Facilities in the 1% Annual Chance Flood Hazard Area, by Lifeline Category

Jurisdiction	Number of Facilities in the 1% Annual Chance Flood Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communi-cations	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Ateres (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Bethel (T)	0	0	0	0	0	5	8	0	0	13	21.3%
Bloomingburg (V)	0	0	0	0	0	0	1	0	0	1	12.5%
Callicoon (T)	0	0	0	0	0	0	13	0	0	13	36.1%
Cochecton (T)	0	0	0	0	0	1	5	0	0	6	27.3%
Delaware (T)	0	0	0	0	0	3	18	0	1	22	48.9%
Fallsburg (T)	0	0	0	0	0	3	18	0	0	21	25.3%
Forestburgh (T)	0	0	0	0	0	6	9	0	0	15	34.9%
Fremont (T)	0	0	0	0	0	0	11	0	0	11	25.6%
Highland (T)	0	0	0	0	0	3	12	0	0	15	27.8%
Jeffersonville (V)	0	0	1	0	0	1	2	0	0	4	25.0%
Liberty (T)	0	0	0	0	0	8	25	0	0	33	26.6%
Liberty (V)	0	0	0	0	0	0	3	0	0	3	9.1%
Lumberland (T)	0	0	0	0	0	4	5	0	0	9	22.5%
Mamakating (T)	0	0	0	0	0	8	25	0	0	33	42.9%
Monticello (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Neversink (T)	0	0	1	0	0	0	27	0	0	28	40.6%
Rockland (T)	0	0	0	0	1	2	43	0	3	49	48.0%
Thompson (T)	0	0	0	0	0	16	20	0	1	37	29.6%
Tusten (T)	0	0	0	0	0	4	9	0	0	13	24.1%
Woodridge (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Wurtsboro (V)	0	0	0	0	0	0	1	1	0	2	20.0%
Sullivan County (Total)	**0**	**0**	**2**	**0**	**1**	**64**	**255**	**1**	**5**	**328**	**29.8%**

Source: Sullivan County 2025; AVAIL 2023; NYS GIS Clearinghouse 2023,2025; Tetra Tech 2025; FEMA 2015, 2025

Table 9-17. Number of Facilities in the 0.2% Annual Chance Flood Hazard Area, by Lifeline Category

Jurisdiction	Number of Facilities in the 0.2% Annual Chance Flood Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communi-cations	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Ateres (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Bethel (T)	0	0	0	0	0	5	8	0	0	13	21.3%
Bloomingburg (V)	0	0	0	0	0	0	1	1	0	2	25.0%
Callicoon (T)	0	0	0	0	0	0	13	0	0	13	36.1%
Cochecton (T)	0	0	0	0	0	1	5	0	0	6	27.3%
Delaware (T)	0	0	0	0	0	3	18	0	1	22	48.9%
Fallsburg (T)	0	0	0	0	0	3	18	0	0	21	25.3%
Forestburgh (T)	0	0	0	0	0	6	9	0	0	15	34.9%
Fremont (T)	0	0	0	0	0	0	11	0	0	11	25.6%
Highland (T)	0	0	0	0	0	3	12	0	0	15	27.8%
Jeffersonville (V)	0	0	1	0	0	1	2	0	0	4	25.0%
Liberty (T)	0	0	0	0	0	8	25	0	0	33	26.6%
Liberty (V)	0	0	0	0	0	0	3	0	0	3	9.1%
Lumberland (T)	0	0	0	0	0	4	5	0	0	9	22.5%
Mamakating (T)	0	0	0	0	0	8	25	0	0	33	42.9%
Monticello (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Neversink (T)	0	0	1	0	0	0	30	0	0	31	44.9%
Rockland (T)	0	0	0	0	1	3	43	0	3	50	49.0%
Thompson (T)	0	0	0	0	0	16	20	0	1	37	29.6%
Tusten (T)	0	0	0	0	1	4	9	0	0	14	25.9%
Woodridge (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Wurtsboro (V)	0	0	0	0	0	0	1	1	0	2	20.0%
Sullivan County (Total)	**0**	**0**	**2**	**0**	**2**	**65**	**258**	**2**	**5**	**334**	**30.4%**

Source: Sullivan County 2025; AVAIL 2023; NYS GIS Clearinghouse 2023,2025; Tetra Tech 2025; FEMA 2015, 2025

Table 9-18. Number of Facilities Experiencing Damage Due to the 1% Annual Chance Flood Event

Lifeline Category	Number of Facilities Experiencing Damage Due to the 1% Annual Chance Flood				
	<5% Damage	5 - 19% Damage	20 - 39% Damage	40 - 49% Damage	50% or Greater Damage
Communications	0	0	0	0	0
Energy	0	0	0	0	0
Food, Hydration, Shelter	1	1	0	0	0
Hazardous Materials	0	0	0	0	0
Health and Medical	1	0	0	0	0
Safety and Security	38	25	0	1	0
Transportation	1	0	0	0	0
Water Systems	0	1	0	0	0

Source: Sullivan County 2025; AVAIL 2023; NYS GIS Clearinghouse 2023, 2025; Tetra Tech 2025; FEMA 2015, 2025; NYS Office of Information Technology Services Geospatial Services, FEMA 2019

Note: Results shown are for community lifelines in the 1% riverine floodplain, excluding "other" critical facilities.

Critical services during and after a flood event may not be available if the event damages critical facilities or the transportation routes used to access them. Road closures also can isolate residents and prevent access by service providers needing to assist at-risk populations or make repairs. Loss of overhead power, cable, and phone lines can create additional isolation issues in flooded areas. Health problems can be caused by flooded water and sewer systems or by drinking water contamination caused by floodwaters carrying pollutants in water supplies.

In cases where short-term functionality is impacted by a hazard, neighboring municipalities may need to increase disaster support response functions. Mitigation planning should consider means to reduce impact on critical facilities and ensure enough emergency and school services remain when a significant event occurs. Actions addressing shared services agreements are included in Volume II of this plan.

9.2.4 Economy

Flood events can significantly impact the local and regional economy. This includes general building stock damage and associated tax loss, impacts on utilities and infrastructure, business interruption, and impacts on tourism. In areas that are directly flooded, renovations of commercial and industrial buildings may be necessary, disrupting associated services.

Hazus estimates the amount of structural debris generated during a flood event. The model breaks down debris into three categories: finishes (dry wall, insulation, etc.); structural (wood, brick, etc.); and foundations (concrete slab and block, rebar, etc.). These distinctions recognize the different types of equipment needed to handle debris. Table 9-19 summarizes the Hazus debris estimates for the 1 percent annual chance flood event. Hazus only estimates structural debris generated by flooding; it does not include non-structural debris or any debris generated by wind associated with a storm that causes flooding. Hazus estimates that there will be 6,351.6 tons of debris generated during the 1 percent annual chance flood event in Sullivan County.

Table 9-19. Debris Created During the 1% Annual Chance Flood Event

Jurisdiction	Estimated Debris Created During the 1% Annual Chance Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Ateres (V)	0.1	0.1	0.0	0.0
Bethel (T)	95.9	74.1	11.1	10.7
Bloomingburg (V)	1.4	0.9	0.2	0.3
Callicoon (T)	99.3	67.0	15.6	16.8
Cochecton (T)	128.4	90.8	17.1	20.4
Delaware (T)	1,043.6	505.4	309.5	228.7
Fallsburg (T)	1,551.0	486.5	419.8	644.7
Forestburgh (T)	19.2	9.6	5.5	4.1
Fremont (T)	368.1	236.8	77.1	54.3
Highland (T)	187.0	108.7	39.3	38.9
Jeffersonville (V)	225.4	91.0	80.3	54.1
Liberty (T)	102.0	82.3	8.8	10.9
Liberty (V)	126.5	123.1	2.1	1.3
Lumberland (T)	82.3	37.7	24.7	20.0
Mamakating (T)	168.3	112.3	21.3	34.8
Monticello (V)	0.0	0.0	0.0	0.0
Neversink (T)	240.4	96.4	76.6	67.5
Rockland (T)	1,510.6	979.2	241.3	290.1
Thompson (T)	211.7	153.9	30.0	27.8
Tusten (T)	152.0	75.3	41.5	35.2
Woodridge (V)	22.1	21.1	0.6	0.4
Wurtsboro (V)	16.4	14.8	0.5	1.0
Sullivan County (Total)	**6,351.6**	**3,366.8**	**1,422.8**	**1,562.0**

Source: Sullivan County 2024; Sullivan County Real Property 2025; U.S. Army Corp of Engineers, NSI 2022; FEMA 2015, 2025; NYS Office of Information Technology Services Geospatial Services, FEMA 2019

9.2.5 Natural Resources

Floodwaters can back up sanitary sewer systems and inundate wastewater treatment plants, causing raw sewage to contaminate the flooded waterway. The contents of unsecured containers of oil, fertilizers, pesticides, and other chemicals get added to floodwaters. Hazardous materials may be released and distributed widely across the floodplain. After the floodwaters subside, contaminated and flood-damaged building materials and contents must be properly disposed of. In addition, severe erosion is likely; such erosion can negatively impact local ecosystems.

9.2.6 Historic and Cultural Resources

Historic places, community facilities, cultural institutions, parks and open spaces, and religious institutions are all vulnerable to impacts from flooding. Venues such as museums and historic buildings face structural damage during flood events, with additional risk of damage to important cultural artifacts housed within that are not easily replaceable. Parks, recreation, and community space closures due to flood events can disrupt residents' lives and hinder access to critical community services.

Historic structures often are not built to modern building code requirements, including design flood elevation and construction standards. Historic resources and structures, as well as parks and recreational areas, were often built closely to waterways, increasing their flood risk. Although these facilities often experience flooding, they are positioned with flooding in mind, as many parks are considered as open space to disallow development.

9.3 FUTURE CHANGES THAT MAY AFFECT RISK

9.3.1 Potential or Planned Development

Flood events may increase in frequency and/or severity as land use changes, more structures are built, and impervious surfaces expand. Any areas of growth located in the special flood hazard area could be impacted by flooding. Areas outside of the special flood hazard can also be impacted by urban flooding and less frequent and more severe flooding events.

9.3.2 Projected Changes in Population

Changes in population density can influence the number of people exposed to flood hazards and complicate evacuation during flood events. Historically, flooding and debris have severely impacted transportation corridors, limiting access for emergency services and residents. As development continues and impervious surfaces increase runoff, exposure to flooding remains a concern.

Cornell University's Program on Applied Demographics projects Sullivan County will increase in population to 79,082 by 2030 but decrease to 77,165 by 2040 (Cornell University 2018). Higher population density can increase demand on critical facilities and emergency resources during flood events. Chapter 3 describes the County's population trends.

9.3.3 Future Conditions

Flood extents for the 1 percent annual chance flood event will continue to evolve alongside natural occurrences. Both globally and at the local scale, future conditions have the potential to alter the prevalence and severity of events that lead to flooding. Warmer temperatures may lead to an increase in frequency and severity of storms. The change will heighten the risk of riverine flooding. A secondary impact on flooding that could occur due to future conditions is increasing water temperature in rivers and streams, which will affect aquatic health and reduce the capacity of streams to assimilate effluent from wastewater treatment plants (Stevens & Lamie 2024).

10. LANDSLIDE

10.1 HAZARD PROFILE

10.1.1 Hazard Description

Landslides are rock, soil, or artificial fill moving along a downward slope. They can flow rapidly and can travel several miles, growing as they pick up trees, boulders, and other materials. Landslides occur when the slope or soil stability changes from stable to unstable, which may be caused by earthquakes, storms, volcanic eruptions, erosion, fire, or human-induced activities. Typically, the steeper the slope, the higher the risk for landslide occurrence. Slopes greater than 10 degrees are more likely to slide, as are slopes where the height from the top of the slope to its toe is greater than 40 feet. Slopes are also more likely to fail if vegetative cover is low and/or soil water content is high. However, landslides can occur with little slope, sometimes classified as earth slumping or flow.

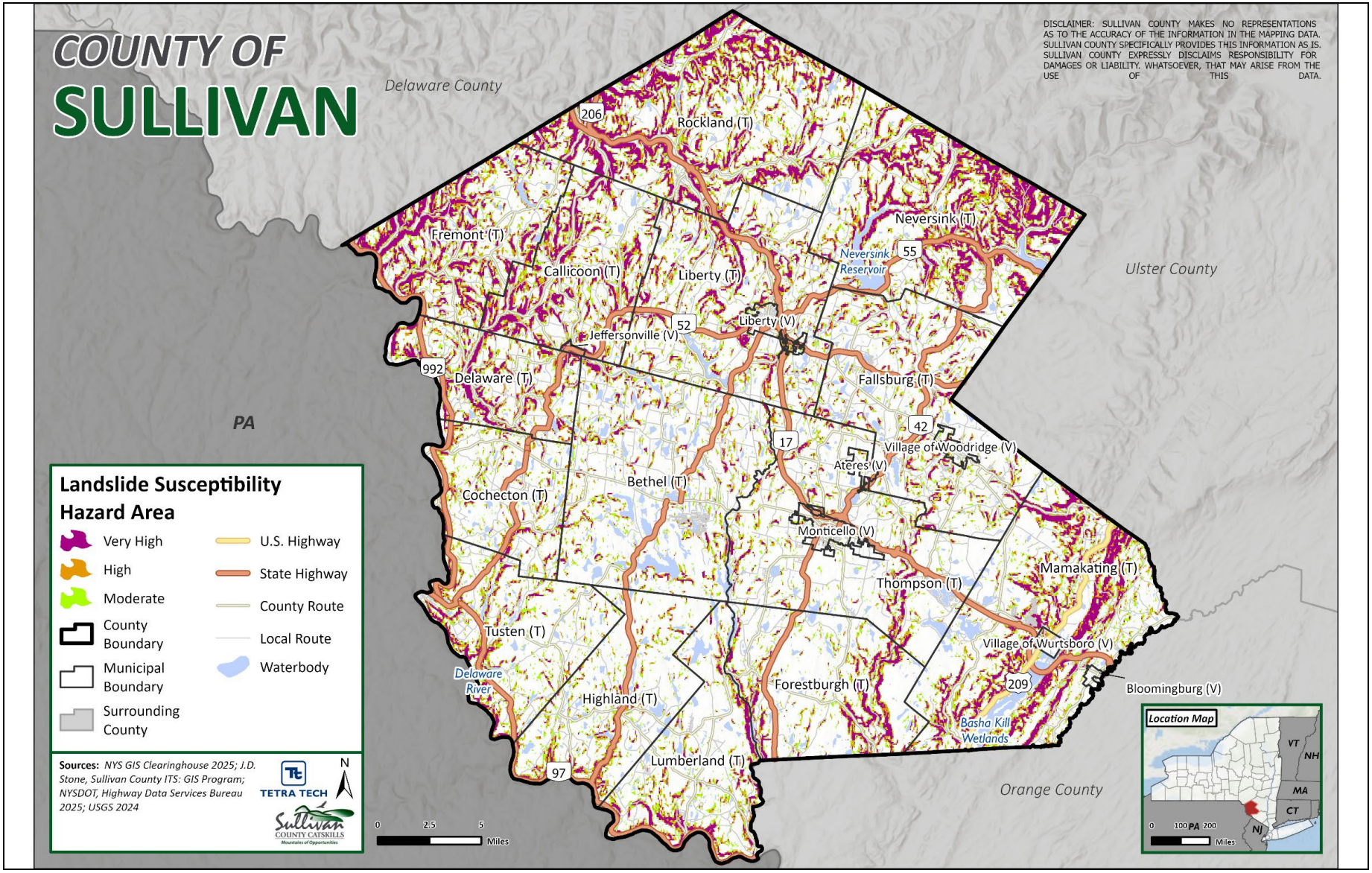
Landslide hazard assessments often rely on landslide incidence and susceptibility:

- Unusually high precipitation or changes in existing conditions can initiate landslide movement in areas where rocks and soils have experienced landslides in the past. Landslide incidence is the number of landslides that have occurred in a given geographic area. High incidence means greater than 15 percent of a given area has been involved in landsliding; medium incidence means that 1.5 to 15 percent of an area has been involved; and low incidence means that less than 1.5 percent of an area has been involved (Radbruch-Hall 1982).
- Landslide susceptibility is defined as the probable degree of response of geologic formations to natural or artificial cutting, to loading of slopes, or to unusually high precipitation. Landslide susceptibility depends on slope angle and the geologic material underlying the slope. Landslide susceptibility only identifies areas potentially affected and does not imply a time frame when a landslide might occur (Radbruch-Hall 1982).
    - A very high landslide susceptibility on the USGS map indicates areas where landslides are highly likely to occur. The very high classification suggests that these areas are at a high risk for landslides, which can be caused by various factors such as topography, soil composition, vegetation cover, and rainfall patterns (USGS 2025).
    - In the context of USGS landslide susceptibility, a high color on the map indicates a higher likelihood of landslides occurring in that area. This means that the terrain is more susceptible to landslides due to factors such as steep slopes, unstable soil, and other geological conditions (USGS 2025).
    - The term moderate in the context of USGS landslide susceptibility indicates a level of potential for slope movement in an area. This means that while there is a significant likelihood of landslides occurring, the specific risk and potential impact may vary. A moderate susceptibility level suggests that while landslides are possible, they are not the most likely or the most severe (USGS 2025).

10.1.2 Location

The potential for landslides exists in Sullivan County due to its hilly nature and steep elevation changes. Figure 10-1 shows the County's landslide susceptibility, featuring areas of very high landslide susceptibility along the County's northern boundaries. While most landslides documented within Sullivan County are not significant events, localized, often vacant areas are most often damaged by landslide events, which do not result in measurable damage to existing infrastructure or property, as most steep sloped area is restricted for development.

Figure 10-1. Landslide Susceptibility Hazard Area



During the jurisdictional interview process in the Town of Delaware, landslide activity was designated near the Youngsville area, specifically along the North Branch. The Sullivan County Soil & Water Conservation District, indicated the following locations where landslides have occurred within Sullivan County:

- Russel Peters Farm (Route 121, North Branch)—Steep slope adjacent to North Branch Callicoon Creek
- Ernie Reimer Farm (Route 95 Obernburg Road, North Branch)—Steep slope adjacent to Callicoon Creek
- County Route 128 (between Jeffersonville and North Branch)—Corrected by Sullivan County
- Along Craigie Clair Road (near Clear Lake adjacent to Beaver Kill)—Caused the closure of the road for several years
- Steep slope along Route 151 (south of Lew Beach)—Required extensive grading and reforestation by the Sullivan County Soil & Water Conservation District
- Shin Creek Road (east of Lew Beach)—Home slid into Shin Creek

10.1.3 Extent

The severity of a landslide is defined by its type, size, and velocity. Natural factors influencing landslide activity include soil properties, slope and topographic position, and historical incidence. In Sullivan County, landslides can range from minor rock movements to massive events involving thousands of tons of debris spread across large areas. Movement rates vary from inches per year to more than 100 miles per hour.

10.1.4 Previous Occurrences

FEMA Disaster Declarations

Between 1954 and 2025, Sullivan County was not included in any major disaster (DR) or emergency (EM) declarations for landslide-related events (FEMA 2025c).

USDA Declarations

Since the 2021 HMP, Sullivan County has not been included in any landslide-related USDA agricultural disaster declarations (USDA 2025).

All Recent Events

There are not many recorded events of landslide events occurring in Sullivan County. However, this does not mean that landslide events have not and do not occur regularly in the area. There were no landslide events that impacted Sullivan County between 2020 and December 2025. For events prior to 2020, refer to the 2021 Sullivan County HMP.

10.1.5 Probability of Future Occurrences

Information on previous landslide occurrences in the County was used to calculate the probability of future occurrence of such events. Based on these records and input from the Steering Committee, the probability of occurrence for landslide in the County is considered “possible.” However, there have been no documented recent landslide incidents in Sullivan County.

10.1.6 Cascading Impacts Associated with the Hazard

Landslides can block roads, which can isolate residents and businesses and delay commercial, public, and private transportation. Other potential problems can result from landslides if vegetation or poles on slopes are knocked over, causing losses to power and communication lines. Landslides also have the potential of destabilizing the foundation of structures, which may result in monetary loss for residents. Landslides can damage rivers or streams, potentially harming water quality, fisheries, and spawning habitat. Landslides can contribute to instances of flooding if the collapsed soil and sediment block streams, causing waters to flow outside of its bank.

10.2 VULNERABILITY AND IMPACT ASSESSMENT

The moderate, high, and very high landslide susceptibility areas were examined to evaluate the county's risk from the landslide hazard. Additional information on the methodology utilized is provided in Chapter 4.

10.2.1 Life, Health, and Safety

Overall Population

Table 10-1 lists the population living in the landslide susceptibility areas in each municipality. Countywide, 4,796 people (6.1 percent of the County's population) live in areas of moderate susceptibility, 3,438 people (4.3 percent) live in high susceptibility areas, and 2,361 people (3.0 percent) live in very high susceptibility areas. Generally, a landslide event is an isolated incidence, impacting the populations within the immediate area.

At-Risk Populations

Some populations experience exacerbated impacts and prolonged recovery if affected by a hazard event. For example, persons over the age of 65 and people below the poverty level are at risk because of their potential limited access to mobilization or medical resources if a landslide event occurs.

As shown in Table 10-2, the Town of Mamakating has the largest population within the moderate landslide susceptibility area of individuals over age 65 (119), under age 5 (65), and with disabilities (116). The Town of Neversink has the highest percentage of non-English-speaking individuals in this area (35), and the Town of Fallsburg has the greatest number of individuals below the poverty level (111).

As shown in Table 10-3, the Town of Mamakating has the largest population within the high landslide susceptibility area of individuals over age 65 (107), under age 5 (58), and with disabilities (104). The Town of Neversink has the highest percentage of non-English-speaking individuals in this area (27), and the Town of Fallsburg has the greatest number of individuals below the poverty level (68).

As shown in Table 10-4, the Town of Neversink has the largest population within the very high landslide susceptibility area of individuals over age 65 (66), non-English-speaking individuals (32), and persons with disabilities (64). The Town of Mamakating has the largest number of children under age 5 in this area (32), and the Town of Fallsburg has the greatest number of individuals below the poverty level (46).

Table 10-1. Population in the Landslide Susceptibility Hazard Areas

Jurisdiction	Total Population	Population in the Moderate Landslide Susceptibility Hazard Area		Population in the High Landslide Susceptibility Hazard Area		Population in the Very High Landslide Susceptibility Hazard Area	
		Number of Persons	% of Jurisdiction Total	Number of Persons	% of Jurisdiction Total	Number of Persons	% of Jurisdiction Total
Ateres (V)	834	18	2.2%	9	1.1%	0	0.0%
Bethel (T)	3,997	235	5.9%	172	4.3%	77	1.9%
Bloomingburg (V)	1,022	72	7.0%	0	0.0%	0	0.0%
Callicoon (T)	2,594	245	9.4%	190	7.3%	173	6.7%
Cochecton (T)	1,392	92	6.6%	48	3.4%	36	2.6%
Delaware (T)	2,301	291	12.6%	150	6.5%	203	8.8%
Fallsburg (T)	13,292	592	4.5%	360	2.7%	248	1.9%
Forestburgh (T)	829	32	3.9%	36	4.3%	18	2.2%
Fremont (T)	1,204	139	11.5%	153	12.7%	97	8.1%
Highland (T)	2,007	162	8.1%	100	5.0%	74	3.7%
Jeffersonville (V)	417	35	8.4%	43	10.3%	49	11.8%
Liberty (T)	5,196	382	7.4%	270	5.2%	168	3.2%
Liberty (V)	5,083	422	8.3%	175	3.4%	16	0.3%
Lumberland (T)	2,276	137	6.0%	134	5.9%	121	5.3%
Mamakating (T)	10,456	814	7.8%	731	7.0%	411	3.9%
Monticello (V)	7,252	107	1.5%	59	0.8%	11	0.2%
Neversink (T)	3,381	353	10.4%	270	8.0%	329	9.7%
Rockland (T)	3,323	277	8.3%	262	7.9%	239	7.2%
Thompson (T)	8,628	181	2.1%	130	1.5%	48	0.6%
Tusten (T)	1,528	140	9.2%	83	5.4%	29	1.9%
Woodridge (V)	954	24	2.5%	33	3.5%	1	0.1%
Wurtsboro (V)	1,181	46	3.9%	30	2.5%	13	1.1%
Sullivan County (Total)	**79,147**	**4,796**	**6.1%**	**3,438**	**4.3%**	**2,361**	**3.0%**

Source: U.S. Census Bureau, American Community Survey 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; USGS 2024

Table 10-2. At-Risk Persons Living in the Moderate Landslide Susceptibility Hazard Area

Jurisdiction	At-Risk Persons Living in the Moderate Landslide Susceptibility Hazard Area									
	Population Over 65		Population Under 5		Non-English-Speaking Population		Population with Disability		Population Below Poverty Level	
	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
Ateres (V)	-	-	-	-	-	-	-	-	-	-
Bethel (T)	65	5.9%	8	5.4%	11	5.5%	37	5.8%	35	5.8%
Bloomingburg (V)	4	6.8%	20	6.9%	14	7.0%	5	6.0%	42	7.0%
Callicoon (T)	53	9.4%	6	8.3%	1	6.7%	37	9.3%	13	9.2%
Cochecton (T)	26	6.4%	6	6.6%	0	0.0%	12	6.3%	7	6.0%
Delaware (T)	68	12.7%	7	11.1%	0	0.0%	37	12.5%	31	12.6%
Fallsburg (T)	88	4.4%	27	4.4%	25	4.4%	80	4.4%	111	4.4%
Forestburgh (T)	10	3.7%	0	0.0%	0	0.0%	4	3.8%	1	2.6%
Fremont (T)	37	11.3%	6	10.7%	0	0.0%	26	11.5%	9	10.6%
Highland (T)	47	8.0%	2	7.7%	0	0.0%	45	8.0%	13	7.5%
Jeffersonville (V)	6	7.5%	0	0.0%	0	0.0%	7	8.2%	7	8.0%
Liberty (T)	63	7.3%	33	7.3%	14	7.0%	69	7.3%	30	7.2%
Liberty (V)	57	8.3%	43	8.1%	26	8.3%	80	8.3%	73	8.3%
Lumberland (T)	18	5.8%	7	5.5%	1	3.1%	10	5.8%	13	5.6%
Mamakating (T)	119	7.8%	65	7.7%	16	7.4%	116	7.8%	69	7.7%
Monticello (V)	14	1.4%	7	1.4%	9	1.4%	16	1.5%	30	1.4%
Neversink (T)	71	10.4%	10	9.5%	35	10.3%	69	10.4%	24	10.2%
Rockland (T)	76	8.3%	9	8.0%	11	8.2%	54	8.2%	44	8.2%
Thompson (T)	51	2.1%	10	2.1%	6	2.1%	31	2.1%	25	2.0%
Tusten (T)	27	9.2%	2	6.5%	0	0.0%	21	9.1%	12	9.0%
Woodridge (V)	4	2.4%	1	1.8%	0	0.0%	4	2.1%	4	2.2%
Wurtsboro (V)	10	3.8%	1	2.4%	1	3.1%	5	3.4%	4	3.2%
Sullivan County (Total)	**914**	**6.1%**	**270**	**5.8%**	**170**	**5.2%**	**765**	**6.1%**	**597**	**5.2%**

Source: U.S. Census Bureau, American Community Survey 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; USGS 2024

Table 10-3. At-Risk Persons Living in the High Landslide Susceptibility Hazard Area

Jurisdiction	At-Risk Persons Living in the High Landslide Susceptibility Hazard Area									
	Population Over 65		Population Under 5		Non-English-Speaking Population		Population with Disability		Population Below Poverty Level	
	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
Ateres (V)	-	-	-	-	-	-	-	-	-	-
Bethel (T)	47	4.3%	6	4.1%	8	4.0%	27	4.3%	26	4.3%
Bloomingburg (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Callicoon (T)	41	7.2%	5	6.9%	1	6.7%	29	7.3%	10	7.0%
Cochecton (T)	14	3.5%	3	3.3%	0	0.0%	6	3.1%	4	3.4%
Delaware (T)	35	6.5%	4	6.3%	0	0.0%	19	6.4%	16	6.5%
Fallsburg (T)	53	2.7%	16	2.6%	15	2.6%	49	2.7%	68	2.7%
Forestburgh (T)	11	4.1%	1	4.2%	0	0.0%	4	3.8%	1	2.6%
Fremont (T)	41	12.5%	7	12.5%	0	0.0%	28	12.4%	10	11.8%
Highland (T)	29	4.9%	1	3.8%	0	0.0%	28	5.0%	8	4.6%
Jeffersonville (V)	8	10.0%	0	0.0%	0	0.0%	8	9.4%	9	10.2%
Liberty (T)	44	5.1%	23	5.1%	10	5.0%	49	5.2%	21	5.0%
Liberty (V)	23	3.3%	18	3.4%	10	3.2%	33	3.4%	30	3.4%
Lumberland (T)	18	5.8%	7	5.5%	1	3.1%	10	5.8%	13	5.6%
Mamakating (T)	107	7.0%	58	6.9%	15	6.9%	104	7.0%	62	6.9%
Monticello (V)	7	0.7%	4	0.8%	5	0.8%	9	0.8%	17	0.8%
Neversink (T)	54	7.9%	8	7.6%	27	8.0%	52	7.9%	18	7.7%
Rockland (T)	72	7.9%	8	7.1%	10	7.5%	51	7.8%	42	7.9%
Thompson (T)	37	1.5%	7	1.5%	4	1.4%	22	1.5%	18	1.5%
Tusten (T)	15	5.1%	1	3.2%	0	0.0%	12	5.2%	7	5.2%
Woodridge (V)	5	3.0%	1	1.8%	1	2.7%	6	3.2%	6	3.3%
Wurtsboro (V)	6	2.3%	1	2.4%	0	0.0%	3	2.0%	3	2.4%
Sullivan County (Total)	**667**	**4.4%**	**179**	**3.8%**	**107**	**3.3%**	**549**	**4.4%**	**389**	**3.4%**

Source: U.S. Census Bureau, American Community Survey 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; USGS 2024

Table 10-4. At-Risk Persons Living in the Very High Landslide Susceptibility Hazard Area

Jurisdiction	At-Risk Persons Living in the Very High Landslide Susceptibility Hazard Area									
	Population Over 65		Population Under 5		Non-English-Speaking Population		Population with Disability		Population Below Poverty Level	
	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
Ateres (V)	-	-	-	-	-	-	-	-	-	-
Bethel (T)	21	1.9%	2	1.4%	3	1.5%	12	1.9%	11	1.8%
Bloomingburg (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Callicoon (T)	37	6.5%	4	5.6%	1	6.7%	26	6.5%	9	6.3%
Cochecton (T)	10	2.5%	2	2.2%	0	0.0%	5	2.6%	3	2.6%
Delaware (T)	47	8.8%	5	7.9%	0	0.0%	26	8.8%	21	8.5%
Fallsburg (T)	37	1.9%	11	1.8%	10	1.7%	33	1.8%	46	1.8%
Forestburgh (T)	6	2.2%	0	0.0%	0	0.0%	2	1.9%	0	0.0%
Fremont (T)	26	8.0%	4	7.1%	0	0.0%	18	8.0%	6	7.1%
Highland (T)	21	3.6%	0	0.0%	0	0.0%	21	3.7%	6	3.5%
Jeffersonville (V)	9	11.3%	1	11.1%	0	0.0%	10	11.8%	10	11.4%
Liberty (T)	28	3.2%	14	3.1%	6	3.0%	30	3.2%	13	3.1%
Liberty (V)	2	0.3%	1	0.2%	1	0.3%	3	0.3%	2	0.2%
Lumberland (T)	16	5.2%	6	4.7%	1	3.1%	9	5.2%	12	5.2%
Mamakating (T)	60	3.9%	32	3.8%	8	3.7%	58	3.9%	35	3.9%
Monticello (V)	1	0.1%	0	0.0%	1	0.2%	1	0.1%	3	0.1%
Neversink (T)	66	9.7%	10	9.5%	32	9.5%	64	9.7%	22	9.4%
Rockland (T)	65	7.1%	8	7.1%	9	6.7%	47	7.2%	38	7.1%
Thompson (T)	13	0.5%	2	0.4%	1	0.3%	8	0.5%	6	0.5%
Tusten (T)	5	1.7%	0	0.0%	0	0.0%	4	1.7%	2	1.5%
Woodridge (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Wurtsboro (V)	3	1.2%	0	0.0%	0	0.0%	1	0.7%	1	0.8%
Sullivan County (Total)	**473**	**3.1%**	**102**	**2.2%**	**73**	**2.2%**	**378**	**3.0%**	**246**	**2.1%**

Source: U.S. Census Bureau, American Community Survey 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; USGS 2024

10.2.2 General Building Stock

In general, the building environment located in the evaluated landslide susceptibility zones is vulnerable to this hazard. Table 10-5 through Table 10-7 presents the detailed results for general building stock exposed to these hazard areas. Table 10-8 through Table 10-10 present the general building stock exposed to this hazard by occupancy class.

Table 10-5. Buildings in the Moderate Landslide Susceptibility Hazard Area

Jurisdiction	Jurisdiction Total Buildings		Buildings in the Moderate Landslide Susceptibility Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Ateres (V)	99	$104,501,618	2	2.0%	$1,066,306	1.0%
Bethel (T)	4,671	$3,993,363,362	269	5.8%	$166,835,084	4.2%
Bloomingburg (V)	172	$223,874,493	10	5.8%	$6,652,819	3.0%
Callicoon (T)	1,942	$1,579,365,779	183	9.4%	$149,789,322	9.5%
Cochecton (T)	1,189	$1,051,465,789	82	6.9%	$153,664,389	14.6%
Delaware (T)	1,663	$1,867,149,344	202	12.1%	$241,679,032	12.9%
Fallsburg (T)	8,114	$8,608,748,500	367	4.5%	$386,425,664	4.5%
Forestburgh (T)	680	$627,023,982	25	3.7%	$12,622,594	2.0%
Fremont (T)	1,322	$1,156,125,779	149	11.3%	$120,369,351	10.4%
Highland (T)	1,853	$1,449,898,732	142	7.7%	$93,655,304	6.5%
Jeffersonville (V)	201	$275,534,732	15	7.5%	$7,755,497	2.8%
Liberty (T)	4,041	$3,988,125,428	293	7.3%	$240,278,616	6.0%
Liberty (V)	1,540	$2,185,506,732	119	7.7%	$100,682,142	4.6%
Lumberland (T)	1,796	$1,429,481,922	105	5.8%	$70,487,401	4.9%
Mamakating (T)	5,508	$3,516,266,251	425	7.7%	$279,230,813	7.9%
Monticello (V)	2,164	$2,972,791,748	32	1.5%	$16,875,101	0.6%
Neversink (T)	2,292	$1,693,278,156	237	10.3%	$153,122,581	9.0%
Rockland (T)	2,659	$2,106,441,850	207	7.8%	$191,312,463	9.1%
Thompson (T)	7,526	$7,018,047,712	153	2.0%	$101,511,050	1.4%
Tusten (T)	1,254	$908,701,677	132	10.5%	$118,562,598	13.0%
Woodridge (V)	601	$624,670,518	16	2.7%	$17,594,798	2.8%
Wurtsboro (V)	517	$414,341,458	17	3.3%	$7,093,543	1.7%
Sullivan County (Total)	**51,804**	**$47,794,705,561**	**3,182**	**6.1%**	**$2,637,266,469**	**5.5%**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; RSMeans 2024; USGS 2024

Table 10-6. Buildings in the High Landslide Susceptibility Hazard Area

Jurisdiction	Jurisdiction Total Buildings		Buildings in the High Landslide Susceptibility Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Ateres (V)	99	$104,501,618	2	2.0%	$7,525,680	7.2%
Bethel (T)	4,671	$3,993,363,362	185	4.0%	$88,246,239	2.2%
Bloomingburg (V)	172	$223,874,493	0	0.0%	$0	0.0%
Callicoon (T)	1,942	$1,579,365,779	141	7.3%	$179,840,912	11.4%
Cochecton (T)	1,189	$1,051,465,789	38	3.2%	$17,601,706	1.7%
Delaware (T)	1,663	$1,867,149,344	108	6.5%	$89,496,143	4.8%
Fallsburg (T)	8,114	$8,608,748,500	215	2.6%	$146,312,974	1.7%
Forestburgh (T)	680	$627,023,982	30	4.4%	$27,915,987	4.5%
Fremont (T)	1,322	$1,156,125,779	164	12.4%	$94,319,452	8.2%
Highland (T)	1,853	$1,449,898,732	87	4.7%	$67,318,220	4.6%
Jeffersonville (V)	201	$275,534,732	17	8.5%	$12,767,688	4.6%
Liberty (T)	4,041	$3,988,125,428	206	5.1%	$128,812,095	3.2%
Liberty (V)	1,540	$2,185,506,732	58	3.8%	$60,363,359	2.8%
Lumberland (T)	1,796	$1,429,481,922	102	5.7%	$57,124,145	4.0%
Mamakating (T)	5,508	$3,516,266,251	371	6.7%	$205,114,011	5.8%
Monticello (V)	2,164	$2,972,791,748	16	0.7%	$12,146,534	0.4%
Neversink (T)	2,292	$1,693,278,156	179	7.8%	$149,406,002	8.8%
Rockland (T)	2,659	$2,106,441,850	195	7.3%	$117,416,362	5.6%
Thompson (T)	7,526	$7,018,047,712	124	1.6%	$99,666,055	1.4%
Tusten (T)	1,254	$908,701,677	70	5.6%	$54,866,965	6.0%
Woodridge (V)	601	$624,670,518	25	4.2%	$35,451,751	5.7%
Wurtsboro (V)	517	$414,341,458	12	2.3%	$12,203,707	2.9%
Sullivan County (Total)	**51,804**	**$47,794,705,561**	**2,345**	**4.5%**	**$1,663,915,987**	**3.5%**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; RSMeans 2024; USGS 2024

Table 10-7. Buildings in the Very High Landslide Susceptibility Hazard Area

Jurisdiction	Jurisdiction Total Buildings		Buildings in the Very High Landslide Susceptibility Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Ateres (V)	99	$104,501,618	0	0.0%	$0	0.0%
Bethel (T)	4,671	$3,993,363,362	86	1.8%	$66,417,707	1.7%
Bloomingburg (V)	172	$223,874,493	0	0.0%	$0	0.0%
Callicoon (T)	1,942	$1,579,365,779	126	6.5%	$73,895,767	4.7%
Cochecton (T)	1,189	$1,051,465,789	29	2.4%	$15,375,555	1.5%
Delaware (T)	1,663	$1,867,149,344	136	8.2%	$101,698,098	5.4%
Fallsburg (T)	8,114	$8,608,748,500	147	1.8%	$115,647,082	1.3%
Forestburgh (T)	680	$627,023,982	15	2.2%	$8,319,831	1.3%
Fremont (T)	1,322	$1,156,125,779	100	7.6%	$51,747,618	4.5%
Highland (T)	1,853	$1,449,898,732	64	3.5%	$33,144,757	2.3%
Jeffersonville (V)	201	$275,534,732	18	9.0%	$15,633,736	5.7%
Liberty (T)	4,041	$3,988,125,428	120	3.0%	$67,700,806	1.7%
Liberty (V)	1,540	$2,185,506,732	4	0.3%	$2,156,909	0.1%
Lumberland (T)	1,796	$1,429,481,922	86	4.8%	$48,875,711	3.4%
Mamakating (T)	5,508	$3,516,266,251	205	3.7%	$95,026,941	2.7%
Monticello (V)	2,164	$2,972,791,748	3	0.1%	$1,008,061	<0.1%
Neversink (T)	2,292	$1,693,278,156	212	9.2%	$136,508,845	8.1%
Rockland (T)	2,659	$2,106,441,850	171	6.4%	$75,823,102	3.6%
Thompson (T)	7,526	$7,018,047,712	43	0.6%	$46,789,398	0.7%
Tusten (T)	1,254	$908,701,677	22	1.8%	$9,661,397	1.1%
Woodridge (V)	601	$624,670,518	1	0.2%	$609,184	0.1%
Wurtsboro (V)	517	$414,341,458	5	1.0%	$7,472,687	1.8%
Sullivan County (Total)	**51,804**	**$47,794,705,561**	**1,593**	**3.1%**	**$973,513,192**	**2.0%**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; RSMeans 2024; USGS 2024

Table 10-8. Buildings in the Moderate Landslide Susceptibility Hazard Area by General Occupancy Class

Jurisdiction	Buildings in the Moderate Landslide Susceptibility Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Other
Ateres (V)	2	0	0	0
Bethel (T)	236	25	2	6
Bloomingburg (V)	9	0	0	1
Callicoon (T)	167	6	0	10
Cochecton (T)	73	5	0	4
Delaware (T)	176	12	4	10
Fallsburg (T)	339	23	1	4
Forestburgh (T)	24	1	0	0
Fremont (T)	138	8	1	2
Highland (T)	137	5	0	0
Jeffersonville (V)	13	0	0	2
Liberty (T)	247	30	4	12
Liberty (V)	101	14	2	2
Lumberland (T)	94	9	2	0
Mamakating (T)	404	17	2	2
Monticello (V)	27	5	0	0
Neversink (T)	203	30	1	3
Rockland (T)	190	15	2	0
Thompson (T)	145	7	1	0
Tusten (T)	100	27	2	3
Woodridge (V)	14	2	0	0
Wurtsboro (V)	17	0	0	0
Sullivan County (Total)	**2,856**	**241**	**24**	**61**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; USGS 2024
Note: Other = Government, Religion, Agricultural, and Education

Table 10-9. Buildings in the High Landslide Susceptibility Hazard Area by General Occupancy Class

Jurisdiction	Buildings in the High Landslide Susceptibility Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Other
Ateres (V)	1	1	0	0
Bethel (T)	173	6	1	5
Bloomingburg (V)	0	0	0	0
Callicoon (T)	129	0	0	12
Cochecton (T)	38	0	0	0
Delaware (T)	91	10	1	6
Fallsburg (T)	206	7	1	1
Forestburgh (T)	27	2	1	0
Fremont (T)	151	8	0	5
Highland (T)	85	2	0	0
Jeffersonville (V)	16	1	0	0
Liberty (T)	175	28	0	3
Liberty (V)	42	9	2	5
Lumberland (T)	92	8	0	2
Mamakating (T)	363	3	4	1
Monticello (V)	15	1	0	0
Neversink (T)	155	13	2	9
Rockland (T)	180	13	0	2
Thompson (T)	104	17	2	1
Tusten (T)	59	7	0	4
Woodridge (V)	19	2	3	1
Wurtsboro (V)	11	1	0	0
Sullivan County (Total)	**2,132**	**139**	**17**	**57**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; USGS 2024
Note: Other = Government, Religion, Agricultural, and Education

Table 10-10. Buildings in the Very High Landslide Susceptibility Hazard Area by General Occupancy Class

Jurisdiction	Buildings in the Very High Landslide Susceptibility Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Other
Ateres (V)	0	0	0	0
Bethel (T)	78	2	0	6
Bloomingburg (V)	0	0	0	0
Callicoon (T)	118	3	0	5
Cochecton (T)	29	0	0	0
Delaware (T)	123	6	0	7
Fallsburg (T)	142	3	0	2
Forestburgh (T)	14	1	0	0
Fremont (T)	96	2	0	2
Highland (T)	63	1	0	0
Jeffersonville (V)	18	0	0	0
Liberty (T)	109	7	0	4
Liberty (V)	4	0	0	0
Lumberland (T)	83	2	1	0
Mamakating (T)	204	1	0	0
Monticello (V)	3	0	0	0
Neversink (T)	189	13	1	9
Rockland (T)	164	7	0	0
Thompson (T)	39	4	0	0
Tusten (T)	21	0	0	1
Woodridge (V)	1	0	0	0
Wurtsboro (V)	5	0	0	0
Sullivan County (Total)	**1,503**	**52**	**2**	**36**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; USGS 2024
Note: Other = Government, Religion, Agricultural, and Education

An estimated 3,182 buildings are located within the moderate landslide susceptibility hazard area, accounting for 5.5 percent of the County's total general building stock replacement cost value. The Town of Mamakating has the greatest number of buildings in this area, with 425 structures (7.7 percent of its total building stock).

For the high landslide susceptibility hazard area, there are 2,345 buildings, representing 3.5 percent of the County's total building stock replacement cost value. The municipality with the highest number of buildings in this category is the Town of Mamakating with 371 buildings (6.7 percent of its total stock).

In the very high landslide susceptibility hazard area, there are 1,593 buildings, 2.0 percent of the County's total building stock replacement cost value. The municipality with the highest number of buildings in this category is Town of Neversink, with 212 buildings (9.2 percent of its total stock).

There are an estimated 2,856 residential buildings, 241 commercial buildings, 24 industrial buildings, and 61 other building types located within the moderate landslide susceptibility hazard area. The Town of Mamakating has the greatest number of residential buildings (404), while both the Town of Neversink and the Town of Liberty have the highest number of commercial buildings (30 each) in this area. The Town of Delaware and the Town of Liberty each have the greatest number of industrial buildings (4), and the Town of Liberty has the highest number of other types of buildings (12).

For the high landslide susceptibility hazard area, there are 2,132 residential buildings, 139 commercial buildings, 17 industrial buildings, and 57 other building types. The Town of Mamakating has the greatest number of residential buildings (363) and industrial buildings (4), the Town of Liberty has the highest number of commercial buildings (28), and the Town of Callicoon has the greatest number of other building types (12).

In the very high landslide susceptibility hazard area, there are 1,503 residential buildings, 52 commercial buildings, 2 industrial buildings, and 36 buildings classified as other types. The municipality with the greatest number of residential buildings is the Town of Mamakating (204). The Town of Neversink has the highest number of commercial buildings (13), while the highest number of industrial buildings is shared by the Town of Lumberland and the Town of Neversink (1 each). The Town of Neversink has the greatest number of other building types (9).

10.2.3 Community Lifelines and Other Critical Facilities

Table 10-11 through Table 10-13 lists the critical facilities situated within the evaluated hazard areas. Countywide, 93 critical facilities are located in the moderate landslide susceptibility area, representing 8.5 percent of the County's critical facilities. Additionally, 55 facilities (5.0 percent) are located in the high susceptibility area, and 18 facilities (1.6 percent) are in the very high susceptibility area.

A significant amount of infrastructure can be exposed to mass movements of geological material (USGS 2023d):

- *Roads*—Access to major roads is crucial to life-safety after a disaster event and to response and recovery operations. Landslides can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems, and delays for public and private transportation.
- *Bridges*—Landslides can significantly impact road bridges. Mass movements can knock out bridge abutments or significantly weaken the soil supporting them, making them hazardous for use.
- *Power Lines*—Power lines are generally elevated above steep slopes; but the towers supporting them can be subject to landslides. A landslide could trigger failure of the soil underneath a tower, causing it to collapse and ripping down the lines.
- *Rail Lines*—Rail lines are important for response and recovery operations after a disaster. Landslides can block travel along the rail lines, and it is not as easy to detour a rail line as it is a local road or highway.

10.2.4 Economy

Direct costs associated with the landslide hazard include the damage sustained by buildings, property, and infrastructure. Indirect costs include clean-up costs, business interruption, loss of tax revenues, reduced property values, and loss of productivity. Additionally, landslides threaten transportation corridors, fuel and energy conduits, and communication lines (USGS 2016b). Damage to general building stock represents additional economic impact on the community.

Table 10-11. Number of Facilities in the Moderate Susceptibility Hazard Area, by Lifeline Category

Jurisdiction	Number of Facilities in the Moderate Landslide Susceptibility Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communi-cations	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Ateres (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Bethel (T)	0	0	0	0	0	2	1	0	0	3	4.9%
Bloomingburg (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Callicoon (T)	0	0	0	0	0	1	1	0	0	2	5.6%
Cochecton (T)	0	0	0	0	0	0	3	0	0	3	13.6%
Delaware (T)	0	0	1	0	0	0	8	0	0	9	20.0%
Fallsburg (T)	0	0	0	0	0	0	4	1	0	5	6.0%
Forestburgh (T)	0	0	0	0	0	4	1	0	0	5	11.6%
Fremont (T)	0	0	0	0	0	2	0	0	0	2	4.7%
Highland (T)	0	0	0	0	0	2	3	0	1	6	11.1%
Jeffersonville (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Liberty (T)	0	0	1	0	0	2	7	0	0	10	8.1%
Liberty (V)	0	0	0	0	0	1	0	0	0	1	3.0%
Lumberland (T)	0	0	0	0	0	3	1	0	0	4	10.0%
Mamakating (T)	0	0	0	0	0	0	4	0	0	4	5.2%
Monticello (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Neversink (T)	0	0	0	0	0	1	7	0	0	8	11.6%
Rockland (T)	0	0	0	0	0	1	16	0	0	17	16.7%
Thompson (T)	0	0	0	0	0	1	1	0	1	3	2.4%
Tusten (T)	0	0	1	0	0	5	5	0	0	11	20.4%
Woodridge (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Wurtsboro (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Sullivan County (Total)	**0**	**0**	**3**	**0**	**0**	**25**	**62**	**1**	**2**	**93**	**8.5%**

Source: Sullivan County 2025; AVAIL 2023; NYS GIS Clearinghouse 2023, 2025; Tetra Tech 2025; USGS 2024

Table 10-12. Number of Facilities in the High Susceptibility Hazard Area, by Lifeline Category

Jurisdiction	Number of Facilities in the High Landslide Susceptibility Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communi-cations	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Ateres (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Bethel (T)	0	0	0	0	0	3	0	0	0	3	4.9%
Bloomingburg (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Callicoon (T)	0	0	0	0	0	0	1	0	0	1	2.8%
Cochecton (T)	0	0	0	0	0	1	0	0	0	1	4.5%
Delaware (T)	0	0	0	0	0	0	2	0	0	2	4.4%
Fallsburg (T)	0	0	0	0	0	1	1	0	0	2	2.4%
Forestburgh (T)	0	0	0	0	0	1	2	0	0	3	7.0%
Fremont (T)	0	0	0	0	0	2	1	0	0	3	7.0%
Highland (T)	0	0	0	0	0	1	1	0	0	2	3.7%
Jeffersonville (V)	0	0	1	0	0	0	0	0	0	1	6.3%
Liberty (T)	0	0	0	0	0	2	4	0	0	6	4.8%
Liberty (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Lumberland (T)	0	0	0	0	0	1	1	0	0	2	5.0%
Mamakating (T)	0	0	0	0	0	1	4	0	0	5	6.5%
Monticello (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Neversink (T)	0	0	0	0	0	1	8	0	1	10	14.5%
Rockland (T)	0	0	0	0	0	1	7	0	0	8	7.8%
Thompson (T)	0	0	0	0	0	0	3	0	1	4	3.2%
Tusten (T)	0	0	0	0	0	0	2	0	0	2	3.7%
Woodridge (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Wurtsboro (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Sullivan County (Total)	**0**	**0**	**1**	**0**	**0**	**15**	**37**	**0**	**2**	**55**	**5.0%**

Source: Sullivan County 2025; AVAIL 2023; NYS GIS Clearinghouse 2023, 2025; Tetra Tech 2025; USGS 2024

Table 10-13. Number of Facilities in the Very High Susceptibility Hazard Area, by Lifeline Category

Jurisdiction	Number of Facilities in the Very High Landslide Susceptibility Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communi-cations	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Ateres (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Bethel (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Bloomingburg (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Callicoon (T)	0	0	0	0	0	1	0	0	0	1	2.8%
Cochecton (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Delaware (T)	0	0	0	0	0	1	0	0	0	1	2.2%
Fallsburg (T)	0	0	0	0	0	2	2	0	0	4	4.8%
Forestburgh (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Fremont (T)	0	0	0	0	0	1	0	0	0	1	2.3%
Highland (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Jeffersonville (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Liberty (T)	0	1	0	0	0	0	5	0	0	6	4.8%
Liberty (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Lumberland (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Mamakating (T)	0	0	0	0	0	0	2	0	0	2	2.6%
Monticello (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Neversink (T)	0	0	0	0	0	0	1	0	0	1	1.4%
Rockland (T)	0	0	0	0	0	1	0	0	0	1	1.0%
Thompson (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Tusten (T)	0	0	0	0	0	1	0	0	0	1	1.9%
Woodridge (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Wurtsboro (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Sullivan County (Total)	**0**	**1**	**0**	**0**	**0**	**7**	**10**	**0**	**0**	**18**	**1.6%**

Source: Sullivan County 2025; AVAIL 2023; NYS GIS Clearinghouse 2023, 2025; Tetra Tech 2025; USGS 2024

10.2.5 Natural Resources

In addition to altering topography, landslides can damage or destroy vegetation and wildlife habitats. Soil and sediment runoff will accumulate downslope, potentially blocking waterways and roadways and impacting quality of streams and other water bodies. Additional environmental impacts include loss of forest productivity.

Furthermore, soil and sediment runoff can accumulate downslope potentially blocking waterways and roadways and impacting quality of streams and other water bodies. Mudflows that erode into downstream waterways can threaten the life of freshwater species (USGS 2020b). The impacts of eroded landscape can travel for miles downstream into adjacent waterways and create issues for surrounding watersheds.

10.2.6 Historic and Cultural Resources

Within Sullivan County, landslide impacts on historic and cultural resources are most significant in areas near hillsides characterized by unstable soils and ongoing erosion. These conditions create heightened vulnerability for landmarks situated in such terrain, particularly following seismic activity, when the risk of slope failure increases.

10.3 FUTURE CHANGES THAT MAY AFFECT RISK

10.3.1 Potential or Planned Development

Areas targeted for future growth and development have been identified across the County. Any areas of growth located in areas with landslide susceptibility could be impacted by the landslide hazard. Both forms of development clear forest and hillsides of stabilizing trees and result in stormwater management issues (e.g., erosion and runoff). Specific areas of anticipated development are included in the jurisdictional annexes in Volume II of this HMP.

10.3.2 Projected Changes in Population

Cornell University's Program on Applied Demographics projects Sullivan County will increase in population to 79,082 by 2030 but decrease to 77,165 by 2040 (Cornell University 2018). Changes in population density can affect vulnerability by increasing development in areas prone to slope instability. Chapter 3 describes Sullivan County's population trends.

10.3.3 Future Conditions

Both globally and at the local scale, future conditions have the potential to alter the prevalence and severity of extremes such as severe storms, including those that may bring intense and prolonged precipitation (EPA 2013). An increase in rainfall intensity and duration will saturate the soil and potentially erode the local landscape and impact slope stability. This may lead to an increase of landslide events in Sullivan County.

11. PANDEMIC

11.1 HAZARD PROFILE

11.1.1 Hazard Description

A pandemic is an outbreak of an infectious disease that substantially exceeds what is expected over a wide geographical area, affecting a large portion of the world's population (Britannica 2024). An epidemic may be restricted to one locale; when it becomes international or global it is called a pandemic. A highly contagious disease has pandemic potential if it spreads easily from person to person and there is little human immunity to it.

Phases of a Pandemic

The World Health Organization (WHO) has identified six phases of a global pandemic as outlined in Table 11-1 (WHO 2009). In New York State, activities to be undertaken during the pandemic period use the WHO's classification system. The *Pandemic Influenza Preparedness and Response* document provides guidance to government agencies, individuals, families, communities, and health sectors at the local and global levels.

Table 11-1. WHO Global Pandemic Phases

Phase	Description
Preparedness and Response– Global, Regional, National, Sub-National Level	
Phase 1	No animal influenza virus circulating among animals has been reported to cause infection in humans.
Phase 2	An animal influenza virus circulating in domesticated or wild animals is known to have caused infection in humans and is therefore considered a potential pandemic threat.
Phase 3	An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks.
Containment	
Phase 4	Human-to-human transmission (H2H) of an animal or human-animal influenza reassortant virus able to sustain community-level outbreaks has been verified.
Response – Global Level	
Phase 5	The same identified virus has caused sustained community-level outbreaks in two or more countries in one WHO region.
Phase 6	In addition to the criteria defined in Phase 5, the same virus has caused sustained community-level outbreaks in at least one other country in another WHO region.
Post-Pandemic	
Post-Peak Period	Levels of pandemic influenza in most countries with adequate surveillance have dropped below peak levels.
Possible New Wave	Level of pandemic influenza activity in most countries with adequate surveillance rising again.
Post-Pandemic Period	Levels of influenza activity have returned to the levels seen for seasonal influenza in most countries with adequate surveillance.

Source: (WHO 2009)

Diseases Assessed

Most pandemics occur due to respiratory viruses. Previous events that exemplify this hazard include the 1918 (Spanish flu) and 2009 (swine flu) influenza pandemics, the 2003 SARS outbreak, and the COVID-19 pandemic that began in 2020 (NYCEM 2019). In addition to respiratory viruses, diseases with new or emerging features can challenge control. Emerging diseases are difficult to contain or treat and present significant challenges to risk communication since the mechanics of transmission, laboratory identification, and effective treatment protocols may be unknown (NYCEM 2019).

Tick- or mosquito-borne diseases are bacterial or viral illnesses that spread to humans through infected ticks and mosquitos (vectors). These vectors become infected by microorganisms when feeding on other infected animals. Different diseases are caused by different microorganisms, and it is possible to be infected with more than one vector-borne disease at a time (NYS DOH 2019).

Influenza

Influenza is a contagious virus that affects the nose, throat, lungs, and other parts of the body. It can quickly spread from one person to another, causing mild to severe illness, and can lead to death. Symptoms include fever, cough, sore throat, runny or stuffy nose, muscle or body aches, headache, and tiredness (NYS DOH 2021). While flu symptoms are typically mild, at-risk populations, such as older adults, younger children, pregnant persons, and people with pre-existing conditions, are more likely to experience complications.

Pandemic influenza differs from seasonal influenza because outbreaks of seasonal flu are caused by viruses already living among people. Seasonal flu pandemics occur yearly, typically beginning at the end of October and continuing through the colder months (NYS DOH 2023). Pandemic influenza is a global outbreak of a new influenza A virus, which can infect people easily and spread from person to person in an efficient and sustained manner (CDC 2020).

A global influenza pandemic can claim thousands of lives and adversely affect critical infrastructure and key resources. An influenza pandemic can reduce the health, safety, and welfare of the essential services workforce; immobilize core infrastructure; and induce fiscal instability.

Coronavirus

Coronavirus disease incudes COVID-19, which is an infectious disease caused by the SARS-CoV-2 virus, first identified in 2019. The virus rapidly spread into a global pandemic by spring of 2020. With the virus being relatively new at that time, information regarding its transmission and symptoms was incomplete during the initial response. The virus can spread from an infected person's mouth or nose, in small liquid particles, through coughing, sneezing, speaking, singing, or breathing. Symptoms may appear 2 to 14 days after exposure to the virus (CDC 2021a).

Reported cases have ranged from mild to severe illness and death. Symptoms include difficulty breathing and shortness of breath, fever or chills, cough, fatigue, muscle or body aches, loss of smell or taste, sore throat, congestion, and nausea or vomiting. Emergency symptoms that require immediate medical attention include trouble breathing, persistent pain or pressure in the chest, confusion, or inability to wake or stay awake, and bluish lips or face. Older people, and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illnesses (WHO 2022).

West Nile Virus

West Nile virus (WNV) disease is spread by the bite of a mosquito infected with the virus. Mosquitoes become infected when they feed on infected birds (NYS DOH 2017). The disease is usually diagnosed during mosquito season, starting in summer and continuing through the fall (CDC 2022b). It was first found in New York State in 1999. From 2000 to 2017, 490 human cases and 37 deaths of WNV were reported statewide.

WNV is the leading cause of mosquito-borne disease in the continental United States. There are no vaccines to prevent or medications to treat WNV in people, and those infected rarely experience sickness or symptoms. About 1 in 5 infected people will develop a fever and other symptoms, and 1 in 150 infected people will develop a serious, sometimes fatal, illness (CDC 2022b). Usually, symptoms occur from 3 to 14 days after being bitten by an infected mosquito (NYS DOH 2017).The symptoms of severe infection (West Nile encephalitis or meningitis) can include headache, high fever, neck stiffness, muscle weakness, stupor, disorientation, tremors, seizures, paralysis, and coma. WNV can cause serious illness, and in some cases, death.

Lyme Disease

Lyme disease is the most common vector-borne disease in the United States. It is an illness caused by the bacterium *Borrelia burgdorferi*, which is spread to people by the bite of an infected tick (CDC 2021b). Typical symptoms include fever, headache, fatigue, and skin rash. If left untreated, symptoms can be severe.

The three types of ticks in New York that may carry disease-causing micro-organisms are the blacklegged tick (*Ixodes scapularis,* also known as deer tick), the Lone Star tick (*Amblyomma americanum*), and the American dog tick (*Dermacentor variabilis*). The most commonly infected tick in the state is the deer tick. Immature ticks become infected by feeding on infected white-footed mice and other small mammals. Anyone who is bitten by a tick carrying the bacteria can become infected (NYS DOH 2019). Deer ticks can also spread other tick-borne diseases.

11.1.2 Location

Diseases that can infect humans are variable in their nature and methods of transmission. Factors such as population density, visitation, and the length of time the public spends in a location all contribute to the spread of infectious diseases.

The transmission rates of respiratory disease are often higher in more densely populated areas. Populations that live close to one another are more likely to spread diseases. When there is a significant change in a circulating strain of a virus, more of the population is susceptible, and the strain could rapidly spread from person to person (NYCEM 2019).There are some more densely populated municipalities in the County, which may lead to the spread of influenza and coronavirus more quickly than less densely populated communities.

The fine droplets and particles that transmit influenza and coronavirus spread and accumulate more rapidly in an indoor setting. Therefore, the transmission of respiratory illness from contact with infected individuals is more likely to occur in indoor spaces. Ultimately, residents need to be vigilant about diseases altogether to better understand and respond to disease outbreaks.

The transmission rates of vector-borne disease are often higher in less densely populated areas that provide more habitat for mosquitoes and ticks. Infectious diseases spread by vectors may be subject to other types of location hazards. For example, the prevalence of standing water can provide breeding grounds for mosquitoes, and wooded areas are favored by the ticks that spread Lyme disease. Sullivan County has large areas that have potential to breed mosquitoes. The presence of disease-carrying mosquitoes and ticks has been reported throughout most of

New York State and Sullivan County. These areas include farmland, private yards, stormwater facilities, and sewer plants. These areas need to be addressed as best as possible to control mosquitoes and the viruses they can spread.

11.1.3 Extent

The magnitude of disease outbreaks depends on how easily the illness is spread, the mode of transmission, and the amount of contact between infected and uninfected individuals. The transmission rate of infectious diseases depends on the mode of transmission, and whether a vaccine, cure, or treatment is available. The severity and length of the next pandemic cannot be predicted; however, experts anticipate that its effect on the United States could be severe.

11.1.4 Previous Occurrences

FEMA Disaster Declarations

Between 1954 and 2025, Sullivan County was included in three major disaster (DR) or emergency (EM) declarations for pandemic events, as listed in Table 11-2 (FEMA 2025d).

Table 11-2. FEMA Disaster Declarations for Pandemic Events in Sullivan County

Event Date	Declaration Date	Declaration Number	Description
May 22, 2000–November 1, 2000	October 11, 2000	EM-3155	West Nile Virus
January 20, 2020–May 11, 2023	March 20, 2020	DR-4480	COVID-19 Pandemic
January 20, 2020–May 11, 2023	March 13, 2020	EM-3434	COVID-19 Pandemic

Source: (FEMA 2025e)

USDA Declarations

Since the 2021 HMP, Sullivan County has not been included in any pandemic-related USDA agricultural disaster declarations (USDA 2025).

All Recent Events

Known hazard pandemic events that impacted Sullivan County between January 2020 and July 2025 are listed in Table 11-3. For earlier events, refer to the 2021 Sullivan County HMP.

Sullivan County's average annual incidence rate of WNV disease is 0.05 per 100,000 (CDC 2023c). Between 2000 and 2020, there were 649 confirmed cases of Lyme disease in Sullivan County, including 118 cases in 2008, the highest number of reported cases of a given year (TickCheck 2025). However, the CDC only reports confirmed cases; the true number of cases is estimated at 6,490.

Table 11-3. Pandemic Events in Sullivan County (2020 to 2025)

Event Date	Location Impacted	Description
2020	Countywide	There were 35 reported deaths as a result from Coronavirus in the County.
2021	Countywide	There were 47 reported deaths as a result from Coronavirus in the County.
2021	Countywide	There were 5 reported cases of Lyme Disease in the County.
2022	Countywide	There were 24 reported deaths as a result from Coronavirus in the County.
2022	Countywide	There were 268 reported cases of Lyme Disease in the County.
2023	Countywide	There were five reported deaths as a result from Coronavirus in the County.
2023	Countywide	There were 360 reported cases of Lyme Disease in the County. 79 hospitalizations.
2023-2024	Countywide	There were 3,183 cases of influenza that were reported in the County.
2024-2025	Countywide	There were 2,834 cases of influenza that were reported in the County. 86 hospitalizations.
2024	Countywide	One reported human case of West Nile Virus.
2025-2026	Countywide	There were 170 cases of influenza that were reported in the County. One hospitalization.
2025	Countywide	There were three reported deaths as a result from Coronavirus in the County.

Source: (NYS DOH 2025); (CDC 2025a); (NYSHC 2025); (NYS DOH 2025b)
Note: The NYS Flu Tracker did not have data for flu seasons prior to 2023-2024.

11.1.5 Probability of Future Occurrences

Information on previous pandemic occurrences in the County was used to calculate the probability of future occurrences of such events. Based on historical records and input from the Steering Committee, the probability of occurrence for pandemics in the County is considered “likely.”

As long as mosquitoes and ticks are found in Sullivan County, the risk of contracting WNV, Lyme disease, or other diseases carried by these vectors exists. Instances of WNV have been generally decreasing throughout the northeast United States due to planning and eradication efforts. However, some scientists anticipate an increase in mosquito-borne diseases due to changing conditions creating new suitable habitats for mosquitoes (CDC 2013). Disease-carrying ticks will continue to inhabit Sullivan County, and the threat of Lyme disease and other tick-borne diseases will continue. There are eradication efforts in place to control the tick population (Steere, Coburn and Glickstein 2004). Therefore, based on all available information and available data regarding mosquito and tick populations, it is anticipated that mosquito- and tick-borne diseases will continue to be a threat to Sullivan County.

11.1.6 Cascading Impacts Associated with the Hazard

There are no known cascading impacts that pandemics may cause to other hazards of concern for Sullivan County.

11.2 VULNERABILITY AND IMPACT ASSESSMENT

Due to a lack of quantifiable loss information, a qualitative assessment was conducted to evaluate the assets exposed to the pandemic hazard and the potential impacts associated with the hazard.

11.2.1 Life, Health, and Safety

Overall Population

The entire population of Sullivan County is at risk from the pandemic hazard. Health care providers and first responders have an increased risk of exposure due to their frequent contact with infected populations. Areas with a higher population density also have an increased risk of exposure or transmission of disease due to the proximity of the population to one another. People who spend a lot of time outdoors or reside in forested areas may have a greater risk of becoming infected by tick-borne diseases.

At-Risk Populations

Recent research into COVID-19 demonstrated "a disproportionate burden associated with the longstanding social determinants of health, including racial/ethnic and socioeconomic disparities" (Karmakar, Lantz and Tipirneni 2021). The study found that racial/ethnic disparities correspond to disparities in health outcomes. For example, historically disadvantaged and low-income communities may live in more crowded housing situations where it is difficult to isolate or socially distance, and lower-income and racial minority residents are more likely to hold essential or frontline worker positions. Research has also found that low-income populations are less likely to be vaccinated against influenza or COVID-19 (Strully and Yang 2022, CDC 2023a, Karmakar, Lantz and Tipirneni 2021).

11.2.2 General Building Stock

No structures are anticipated to be directly affected by pandemics.

11.2.3 Community Lifelines and Other Critical Facilities

A pandemic will not directly impact County and municipal buildings, critical facilities, and infrastructure. However, the effect of worker absenteeism will impact local government services.

The most significant impact on critical facilities would be increased service demands that would take place because of a pandemic, such as hospitalizations and emergency room visits. This would create a greater demand on these critical facilities, their staff, and resources. The health care system will be severely strained, if not overwhelmed, from the large number of illnesses and complications requiring critical care. Ventilators would be the most critical shortage if a respiratory outbreak were to occur (Homeland Security Council 2006).

A pandemic may quickly result in mass fatalities, which would place extraordinary demands (including religious, cultural, and emotional burdens) on local jurisdictions and the families of the victims (Homeland Security Council 2006). Mortuary services could be substantially impacted due to the increased numbers of deaths. The timely, safe, and respectful disposition of the deceased is an essential component of an effective response.

11.2.4 Economy

The COVID-19 pandemic had significant economic impacts across the State of New York, including Sullivan County. Over the course of two months, nearly 2 million jobs were lost as businesses were forced to close, disrupting the economy at the state, county, and local levels. Smaller-scale pandemics can also cause negative economic impacts, though the extent of the impact is variable. For example, an outbreak of mosquito or tick-borne diseases can impact Sullivan County's local economies associated with tourism and the use of parks and water bodies.

11.2.5 Natural Resources

Pandemics may have an impact on the environment if the outbreaks are caused by invasive species, which can be the major transmitters of vector-borne disease. Invasive species tend to be competitive with native species and their habitat (Placer Mosquito and Vector Control District 2019). Impacts from mitigating pandemics—such as using pesticides to control disease-carrying insects like mosquitos—could also have an impact on the environment. If these sprays are applied in large concentrations, they could leach into waterways and harm nearby terrestrial species (NYSDEC 2020b).

11.2.6 Historic and Cultural Resources

Pandemics may limit access to historic and cultural resources. As seen during the COVID-19 pandemic, historic and cultural monuments, facilities, and sites imposed restricted access to minimize the spread of the disease. The limitation of access during a pandemic can assist in lowering the rate of contraction. Pandemics can also halt or postpone gatherings and community events for prolonged periods of time, which can negatively impact the social and cultural resources within the County.

11.3 FUTURE CHANGES THAT MAY AFFECT RISK

11.3.1 Potential or Planned Development

Areas targeted for future growth and development have been identified across the County. Any growth could be impacted by the pandemic hazard because the entire planning area is vulnerable. Additional development in areas with high population density increases risk. Specific areas of anticipated development are indicated in the jurisdictional annexes in Volume II of this HMP.

11.3.2 Projected Changes in Population

Cornell University's Program on Applied Demographics projects Sullivan County will increase in population to 79,082 by 2030 but decrease to 77,165 by 2040 (Cornell University 2018). Changes in the density of the population can impact the number of people exposed to pandemic events. Higher density jurisdictions are at risk of greater exposure to pandemics, and density may reduce available basic services, such as hospitals and emergency facilities, for people that are not affected by a disease. Chapter 3 describes Sullivan County's population trends.

11.3.3 Future Conditions

Some scientists anticipate an increase in WNV and other mosquito-borne diseases due to changing conditions creating suitable habitats for disease carriers (CDC 2013). Warmer temperatures and changing rainfall patterns provide an environment where mosquitoes can remain active longer, greatly increasing the risk for animals and humans. Lyme disease could also expand throughout the United States as temperatures warm, allowing ticks to move into new areas of the country. Future changing conditions may allow tropical and subtropical mosquitoes to move from regions where diseases thrive into new places (NRDC 2015). An increase in temperature and humidity may also lead to a larger number of influenza outbreaks, as studies have shown that warmer winters lead to an increase in influenza cases (Towers, et al. 2013).

12. SEVERE STORM

12.1 HAZARD PROFILE

12.1.1 Hazard Description

Severe storms in Sullivan County have damaged property and infrastructure, disrupted power, downed trees and power lines, and caused injuries and fatalities. The following sections describe the weather conditions addressed in this profile for the severe storm hazard.

Extreme Heat

Extreme heat is defined as temperatures that hover 10 ºF or more above the average high temperature for a region for an extended period (CDC 2012b). A heat wave is a period of abnormally and uncomfortably hot and unusually humid weather lasting two or more days. Humid conditions occur when a dome of high atmospheric pressure traps hazy, damp air near the ground (NOAA 2009). In New York State, extreme hot days are defined as individual days with maximum temperatures at or above 90 ºF or 95 ºF, and heat waves are defined as three consecutive days with maximum temperatures above 90° F (NYSERDA 2014).

Extreme heat events can create or aggravate secondary hazards including dust storms, droughts, wildfires, water shortages, and power outages. These secondary hazards can result in broad and far-reaching impacts throughout a local area or a larger region. Impacts could include loss of life; illness; economic costs in transportation, agriculture, production, energy, and infrastructure; and losses of ecosystems, wildlife habitats, and water resources (NYS DHSES 2023).

Extreme heat is the number one weather-related cause of death in the United States. More than 700 people die from extreme heat every year in the United States (CDC 2024).

Hail

Hail forms inside a thunderstorm where there are strong updrafts of warm air and downdrafts of cold water. A water droplet freezes when it is picked up by the updrafts and carried well above the freezing level. When the frozen droplet falls, it can begin to thaw and then be picked up again by another updraft and carried back into the cold air to re-freeze. With each trip above and below the freezing level, the frozen droplet adds another layer of ice. Finally, the frozen droplet, with many layers of ice, falls to the ground as hail (NOAA NSSL 2021b).

High Wind

Wind is the rough horizontal movement of air caused by uneven heating of the earth's surface. Wind occurs at all scales, from local breezes lasting a few minutes to global winds resulting from solar heating of the earth. High winds are often associated with severe storm events such as thunderstorms, tornadoes, hurricanes, and tropical storms (NWS 2012). The following are types of damaging straight-line winds (winds that do not rotate as tornadoes do) (NOAA n.d.-c):

- **Down draft**—A small-scale column of air that sinks toward the ground
- **Microburst—**An outward burst of relatively strong winds near the surface caused by a small, concentrated down draft

- **Macroburst—**An outward burst of strong winds that is more than 2.5 miles in diameter
- **Gust front—**Leading edge of rain-cooled air that clashes with a warm thunderstorm inflow
- **Derecho—**Long-lived windstorm associated with rapidly moving precipitation or thunderstorms with a wind damage swath of more than 240 miles and gusts of wind that reach 58 mph or greater

Hurricane

Hurricanes, along with tropical depressions and tropical storms, are all forms of tropical cyclones, which are rotating, organized system of clouds and thunderstorms that originate over tropical or sub-tropical waters. A hurricane is a tropical cyclone that reaches wind speed of at least 74 mph.

Hurricanes develop in the Atlantic Ocean between the Lesser Antilles and the African coast, or in the warm tropical waters of the Caribbean and Gulf of Mexico. These storms may move up the Atlantic coast or through the the Gulf Coast states, bringing wind and rain as far north as New England before moving offshore and heading east. Almost all hurricanes in the Atlantic Basin form between June and November. August and September are peak months for hurricane development in the North Atlantic Basin (NHC 2020).

These storms are accompanied by heavy rain and strong winds. As a hurricane approaches, its strong winds cause waves to build up. These waves can extend far from the storm's center, impacting coastal areas even before landfall. Hurricane landfall is when the storm's center moves from over the ocean onto land, leading to a range of impacts:

- **Storm surge**—Storm surge is an abnormal rise of water generated by a storm, over and above the predicted astronomical tides. Storm surge occurs when water is pushed toward the shoreline by the force of winds from the storm. Friction between the water and the moving air creates drag that, depending upon the distance of water and velocity of the wind, can pile water up to depths greater than 20 feet from the shoreline inland. The rise in water level can cause extreme flooding in coastal areas, especially when storm surge coincides with normal high tide.
- **Wind damage**—The size of a hurricane-force wind field (with sustained wind speeds greater than 73 mph) is typically about 100 miles across. Hurricanes can also create microbursts—sudden and intense downdrafts—and mini swirls, which are localized wind bursts that can exceed speeds of 200 mph.
- **Rain**—Hurricanes often produce widespread, torrential rains in excess of 6 inches, which may result in deadly and destructive flooding. Rainfall amounts are not directly correlated with the storm's intensity, but rather with its speed and size; larger, slower-moving storms typically produce more precipitation.

Lightning

Lightning is a bright flash of electrical energy produced by a thunderstorm. The resulting clap of thunder is the result of a shock wave created by the rapid heating and cooling of the air in the lightning channel (NWS n.d.-b). There are four types of lightning:

- Cloud to sky lightning is a discharge jumping from a cloud into the surrounding sky.
- Intra-cloud lightning is the most common. Intra-cloud lightning occurs when oppositely charged centers within the same cloud ignite and cause a bright flash.
- Inter-cloud lightning occurs between oppositely charged areas of different clouds.
- Cloud to ground lightning is the most dangerous to people and therefore the most researched. It travels from the negative charge of the bottom of a cloud to the positively charged ground below.

On average, 55 people are killed and hundreds are injured each year by lightning strikes in the United States. Lightning can strike communications equipment (e.g., radio or cell towers, antennae, satellite dishes, etc.) and hamper communication and emergency response. Lightning strikes can also cause significant damage to buildings, critical facilities, and infrastructure, largely by igniting a fire. Lightning can also ignite a wildfire (NWS n.d.-b).

Thunderstorm

A thunderstorm is a local storm produced by a cumulonimbus cloud and accompanied by lightning and thunder (NOAA NSSL n.d.-d). A thunderstorm forms from a combination of moisture, warm air, and a force capable of lifting the air, such as a warm or cold front, a sea breeze, or a mountain. Although thunderstorms generally affect a small area when they occur, they have the potential to become dangerous due to their ability to generate tornadoes, hailstorms, strong winds, flash flooding, and lightning. During the warm season, thunderstorms are responsible for most of the rainfall in the United States.

Typical thunderstorms are 15 miles in diameter and last an average of 30 minutes. The National Weather Service (NWS) considers a thunderstorm severe if it produces wind gusts of 58 mph or higher, hail 1 inch in diameter or larger, or tornadoes (NWS n.d.-c).

An estimated 100,000 thunderstorms occur each year in the United States, and about 10 percent are classified as severe (NOAA 1994). It is estimated that there are as many as 40,000 thunderstorms each day worldwide (NOAA 2023c).

Tornado

A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground (NOAA 2011). A tornado becomes visible when it forms a condensation funnel made up of water droplets, dust, and debris. Tornadoes are the most violent of all atmospheric storms and the most hazardous when they occur in populated areas. Tornadoes can topple mobile homes, lift cars, snap trees, and turn objects into destructive missiles. Among the most unpredictable weather phenomena, tornadoes can occur at any time of day, in any state in the nation, and in any season. While most tornadoes cause little or no damage, some are capable of tremendous destruction with wind speeds potentially exceeding 200 mph (NOAA 2023b).

From 1996 to 2023, an average of 18 tornadoes occurred each year in New York State, causing 317 injuries and 27 fatalities (NYS DHSES 2023).

12.1.2 Location

Extreme Heat

Excessive heat can occur anywhere and is generally widespread. However, there can be spot locations that are somewhat cooler (e.g., a shady park near a stream) or hotter (e.g., urban areas where the built environment holds the heat) (NYS DHSES 2023). Extreme heat temperatures of varying degrees exist throughout New York State for most of the summer (Cornell University n.d.).

Hail

Hailstorms are most likely in areas that have the most thunderstorms, which feature the updrafts and downdrafts that lead to the formation of hail. Smaller hailstones may be blown away from the updraft by horizontal winds, so larger hail typically falls closer to the updraft than smaller hail (NOAA n.d.-d).

High Wind

The entire County is subject to high winds from thunderstorms, hurricanes/tropical storms, tornadoes, and other severe storm events.

Hurricane

All locations along the U.S. East and Gulf coasts are vulnerable to the wind, rain, and storm surges associated with hurricanes. Storm surge can even travel up rivers and canals, reaching well inland from the coastline.

Lightning

Tall objects such as trees, mountains, and skyscrapers are more likely than the surrounding ground to be struck by lightning. Lightning generally starts within a cloud and may develop a channel downward toward the surface. When the channel gets less than a hundred yards from the ground, tall objects like trees and buildings start sending up sparks to meet it. When one of the sparks connects to the downward developing channel, an electric current surges rapidly down the channel to the object that produced the spark. (NOAA n.d.-a).

Thunderstorm

Thunderstorms affect relatively small, localized areas, rather than large regions like those affected by winter storms or hurricanes. Thunderstorms can strike anywhere in Sullivan County.

Tornado

The entire State of New York is susceptible to tornado activity and impacts. The County can experience a tornado at any time when suitable conditions are present.

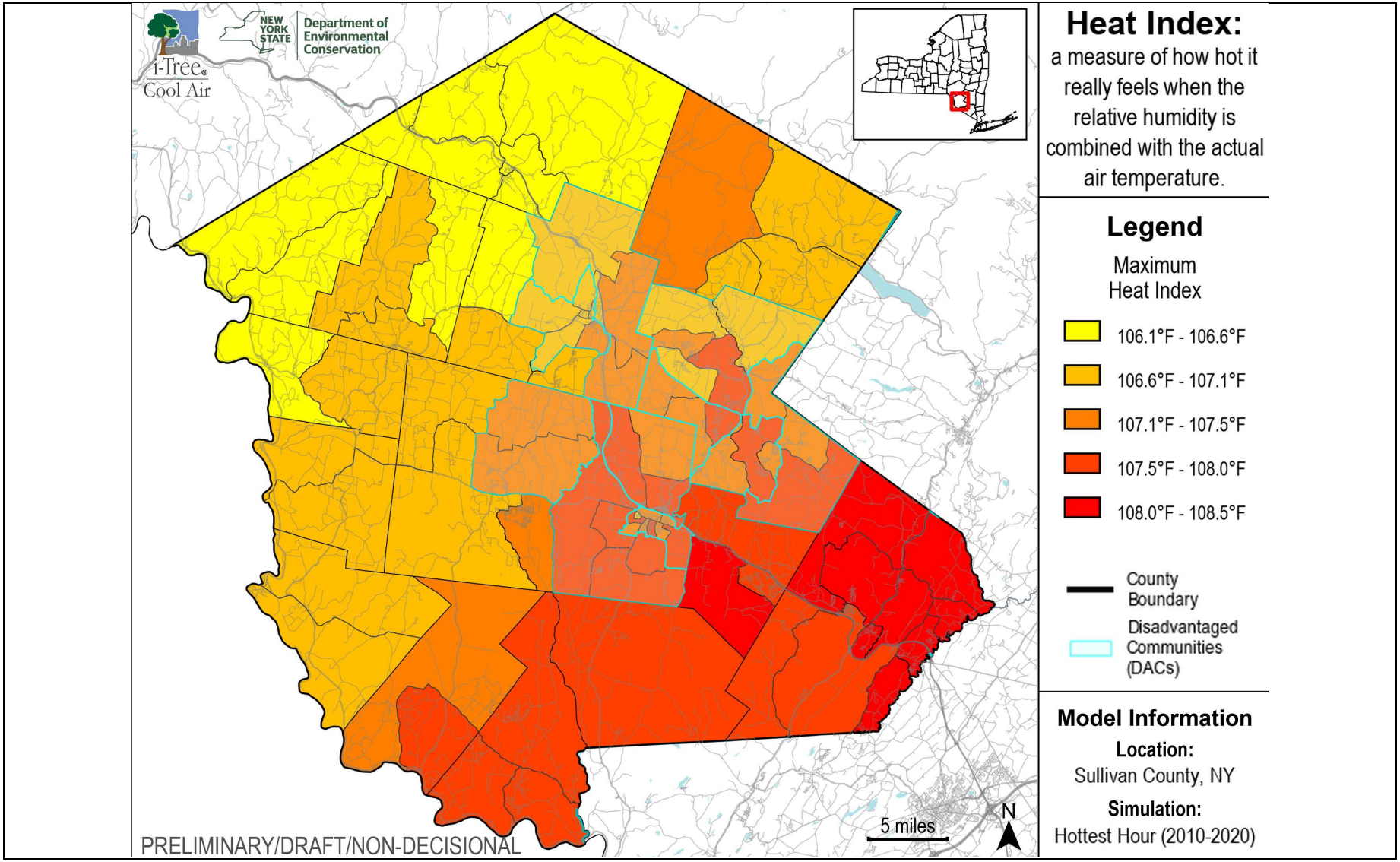
12.1.3 Extent

Extreme Heat

The extent of extreme heat temperatures is generally measured through the NWS Heat Index. The heat index measures apparent temperature of the air as it increases with relative humidity. It provides a measure of how temperatures actually feel. The values are devised for shady, light wind conditions; exposure to full sun can increase the index by up to 15 ºF (NWS n.d.-a). Figure 12-1 shows the maximum heat index in Sullivan County from 2010 to 2020. It is expected that the county will experience similar temperatures in the future.

NWS provides alerts when heat index values approach hazardous levels, as shown on Table 12-1. In the event of an extreme heat advisory, the NWS issues special weather statements, including who is most at risk, safety rules for reducing risk, the extent of the hazard, and heat index values. Additionally, the NWS includes heat index values in weather forecasts and aids the state and local health officials in preparing civil emergency messages during severe heat waves (NWS 2025).

Figure 12-1. Maximum Heat Index in Sullivan County



Source: (NYSDEC n.d.-h)

Table 12-1. National Weather Service Alerts

Alert	Criteria
Heat Advisory	Issued within 12 hours of when maximum daytime heat index values are predicted to reach 100 ºF to 104 ºF for at least 2 consecutive hours
Excessive Heat Watch	Issued when conditions are favorable for excessive heat in the next 24 to 72 hours
Excessive Heat Warning	Issued within 12 hours of when maximum heat index temperature is expected to be 105 F or higher for at least 2 days and nighttime air temperatures will not drop below 75 ºF

Source: (NWS 2025)

Hail

Hail can exhibit a variety of sizes, though only the largest hail stones pose serious risk to people. The size is often estimated by comparing it to a known object, such as a pea or golf ball. Most hailstorms are made up of a mix of sizes (NOAA NSSL 2021a). The NWS considers a weather event to be severe if hailstones exceed 1 inch in diameter.

High Wind

Table 12-2 describes wind levels used by the NWS and their associated sustained wind speed.

Table 12-2. NWS Wind Descriptions

Descriptive Term	Sustained Wind Speed (mph)
Strong, dangerous, or damaging	≥40
Very windy	30–40
Windy	20–30
Breezy, brisk, or blustery	15–25
None	5–15 or 10–20
Light or light and variable wind	0–5

Source: (NWS 2009b)

The NWS issues advisories and warnings when wind speeds can pose a hazard or are life threatening. The NWS wind warnings and advisories for New York State are as follows (NWS n.d.-f):

- **Wind Advisories** are issues when sustained winds of 30 to 39 mph are forecast for one hour or longer, or wind gusts of 46 to 57 mph for any duration.
- **High Wind Warnings** are issued when sustained wind speeds of 40 mph or greater lasting for one hour or longer or winds of 58 mph or greater for any duration or widespread damage are possible.

Hurricane

Hurricane magnitude is measured using the Saffir-Simpson Hurricane Scale, which rates storms from Category 1 to Category 5 (from least to most severe) based on a sustained wind speed. As shown in Table 12-3, this scale includes estimates of potential property damage and flooding expected when a hurricane makes landfall.

Table 12-3. The Saffir-Simpson Hurricane Scale

Category	Wind Speed (mph)	Expected Damage
1	74 to 95	Very dangerous winds will produce some damage: Homes with well-constructed frames could have damage to roof, shingles, vinyl siding, and gutters. Large tree branches will snap and shallow-rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96 to 110	Extremely dangerous winds will cause extensive damage: Homes with well-constructed frames could sustain major roof and siding damage. Many shallow-rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111 to 129	Devastating damage will occur: Homes with well-built frames may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130 to 156	Catastrophic damage will occur: Homes with well-built frames can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	>157	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: (NOAA 2023e)

Hurricanes at Category 3 and higher are considered major hurricanes, with potential for significant damage and loss of life. Category 1 and 2 storms are still dangerous and require preventative measures (NOAA 2023e). For all of Sullivan County except Fremont Township, a 500-year mean return period (MRP) hurricane wind event would be a Category 1 hurricane, as shown in Figure 12-2. In Fremont Township the event would be a tropical storm.

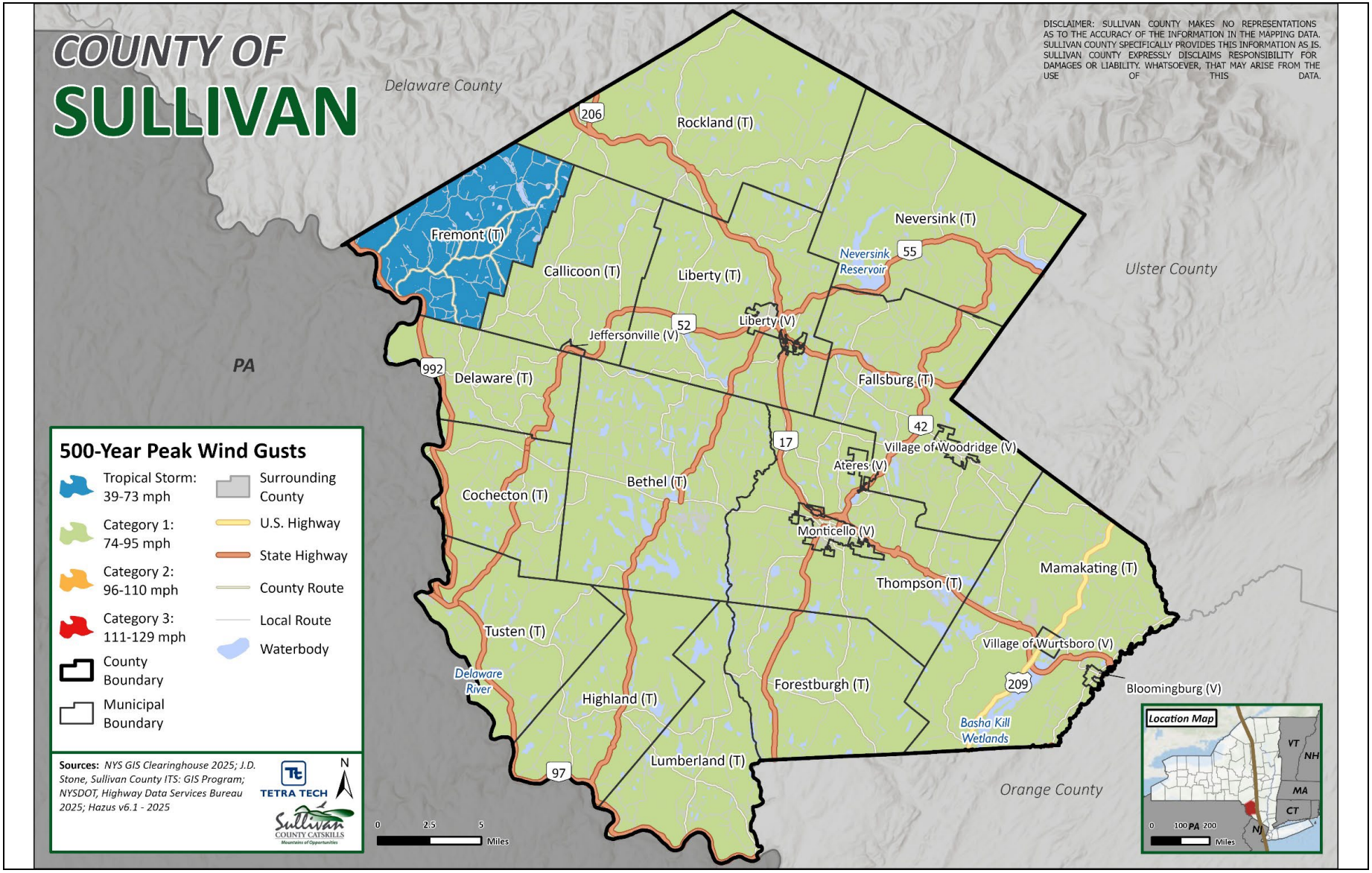
Lightning

Lightning severity is determined by the frequency of lightning strikes during a storm. The Lightning Activity Level Guide (LAL) is a scale of 1 to 6 based on intensity and cloud configurations:

- LAL 1—No thunderstorms.
- LAL 2—Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud-to-ground strikes in a 5-minute period.
- LAL 3—Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud-to-ground strikes in a 5-minute period.
- LAL 4—Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud-to-ground strikes in a 5-minute period.
- LAL 5—Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud-to-ground strikes in a 5-minute period.
- LAL 6—Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with Red Flag Warning.

Lightning strikes in New York State average 3.8 strikes per square mile each year (NYCEM n.d.).

Figure 12-2. 500-Year Peak Wind Gusts for Sullivan County



Thunderstorm

The NWS has five risk categories for thunderstorms expressing the best estimate of a severe storm event occurring within 25 miles of a point, as shown in Figure 12-3 (NWS 2022a).

Figure 12-3. Severe Thunderstorm Risk Categories

THUNDERSTORMS (no label)	1 - MARGINAL (MRGL)	2 - SLIGHT (SLGT)	3 - ENHANCED (ENH)	4 - MODERATE (MDT)	5 - HIGH (HIGH)
No severe* thunderstorms expected	**Isolated severe thunderstorms possible**	**Scattered severe storms possible**	**Numerous severe storms possible**	**Widespread severe storms likely**	**Widespread severe storms expected**
Lightning/flooding threats exist with all thunderstorms	Limited in duration and/or coverage and/or intensity	Short-lived and/or not widespread, isolated intense storms possible	More persistent and/or widespread, a few intense	Long-lived, widespread and intense	Long-lived, very widespread and particularly intense
					
• *Winds to 40 mph* • *Small hail*	• *Winds 40-60 mph* • *Hail up to 1”* • *Low tornado risk*	• *One or two tornadoes* • *Reports of strong winds/wind damage* • *Hail ~1”, isolated 2”*	• *A few tornadoes* • *Several reports of wind damage* • *Damaging hail, 1 - 2”*	• *Strong tornadoes* • *Widespread wind damage* • *Destructive hail, 2” +*	• *Tornado outbreak* • *Derecho*

Source: (NWS 2019c)

The local NWS office and the NOAA Storm Prediction Center issue watches and warnings for severe thunderstorms as follows (NWS 2020):

- **Special Weather Statement—**Issued for strong storms that are below severe levels but may have impacts. Usually reserved for the threat of wind gust of 40 to 58 mph with no hail larger than 1 inch in diameter.
- **Severe Thunderstorm Watch—**Severe thunderstorms with large hail, damaging winds, and/or tornadoes are possible, but the exact time and location of storm development is uncertain. A watch means be prepared for storms.
- **Severe Thunderstorm Warning—**A severe thunderstorm is imminent or occurring; it is either detected by weather radar or reported by storm spotters. A severe thunderstorm is one that produces winds 58 mph or stronger and/or hail 1 inch in diameter or larger. A warning means to take shelter.

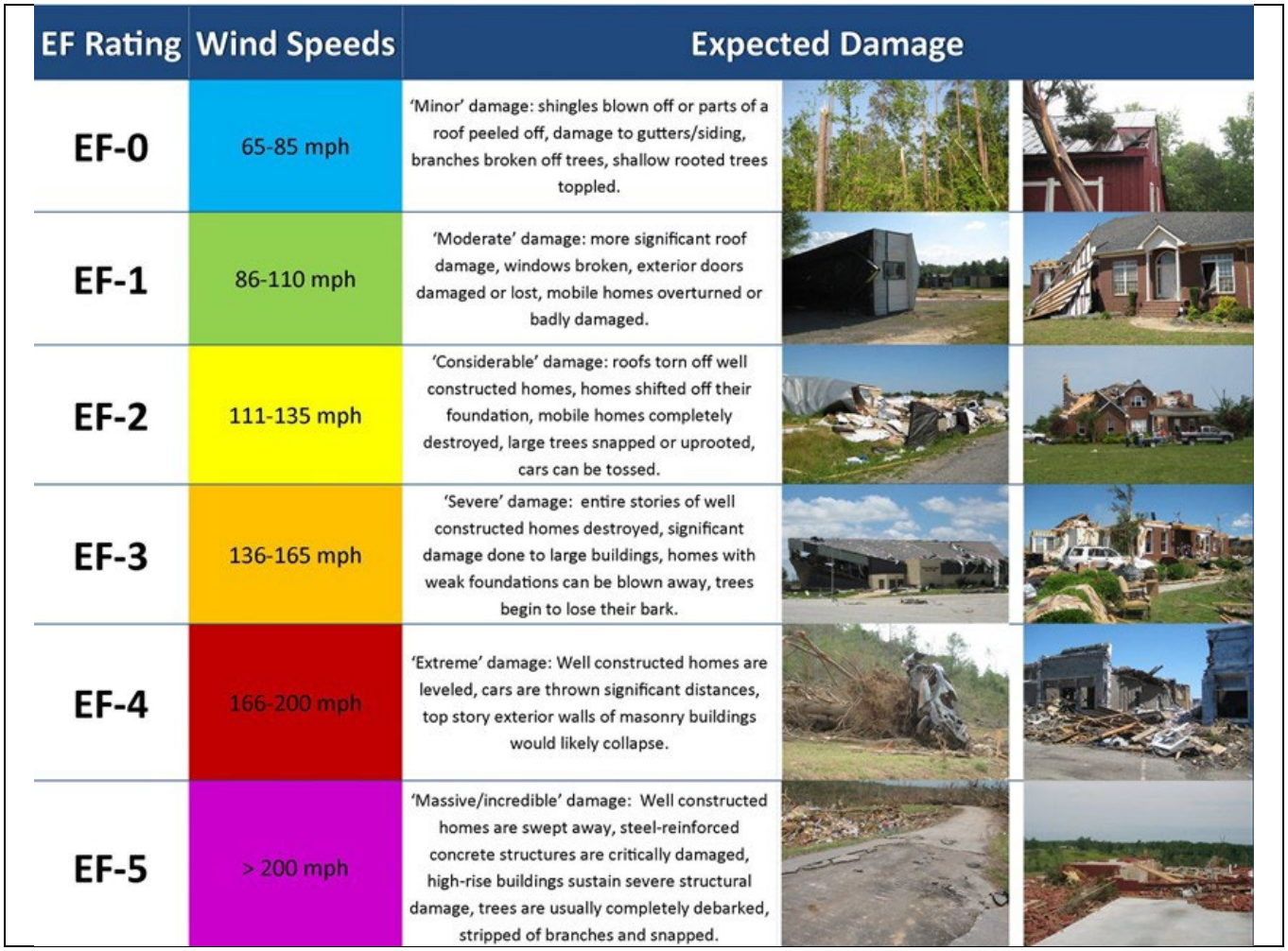
The NWS and Storm Prediction Center update the watches and warnings and notify the public when they are no longer in effect:

Tornado

The Enhanced Fujita Scale (EF-Scale) is the standard used to measure the strength of a tornado. It assigns a rating based on estimated wind speeds and related damage. When tornado-related damage is surveyed, it is compared to a list of damage indicators and degrees of damage to estimate the range of wind speeds produced by the tornado.

From that, a rating is assigned from EF0 to EF5, representing increasing degrees of damage. The EF-Scale considers how most structures are designed (NWS n.d.-d). Figure 12-4 illustrates the relationship between EF ratings, wind speed, and expected tornado damage. Sullivan County may experience tornadoes that may range from EF0 to EF1.

Figure 12-4. Explanation of EF-Scale Ratings



Source: (NWS 2015)

The NOAA Storm Prediction Center issues watch and warning alerts for tornadoes:

- A tornado watch is when conditions are favorable for a tornado to form. A watch can cover parts of a state or span several states (NOAA NSSL n.d.-c).
- A tornado warning is when a tornado is spotted by a radar, and action should be taken to ensure safety and shelter. Warnings can cover parts of counties or several counties, depending on the tornado's path (NOAA NSSL n.d.-c).

The current average lead time for tornado warnings is 13 minutes. Occasionally, tornadoes develop so rapidly that little, if any, advance warning is possible (NWS n.d.-e).

12.1.4 Previous Occurrences

FEMA Disaster Declarations

Table 12-4 lists all severe storm-related presidentially declared disasters that have included Sullivan County.

Table 12-4. FEMA Disaster Declarations for Severe Storm Events in Sullivan County

Event Date	Declaration Date	Declaration Number	Description
June 25-July 10, 1998	July 7, 1998	DR-1233-NY	Severe Storms and Flooding
May 3-August 12, 2000	July 21, 2000	DR-1335-NY	Severe Storms and Flooding
July 21-August 13, 2003	August 29, 2003	DR-1486-NY	Severe Storms, Flooding and Tornadoes
May 13-June 17, 2004	August 3, 2004	DR-1534-NY	Severe Storms and Flooding
September 16-24, 2004	October 1, 2004	DR-1565-NY	Tropical Depression Ivan
August 13-September 16, 2004	October 1, 2004	DR-1564-NY	Severe Storms and Flooding
April 2-4, 2005	April 19, 2005	DR-1589-NY	Severe Storms and Flooding
August 29-October 1, 2005	September 30, 2005	EM-3262-NY	Hurricane Katrina Evacuation
June 26-July 10, 2006	July 1, 2006	DR-1650-NY	Severe Storms and Flooding
November 16-17, 2006	December 12, 2006	DR-1670-NY	Severe Storms and Flooding
June 19, 2007	July 2, 2007	DR-1710-NY	Severe Storms and Flooding
August 25-September 5, 2011	August 26, 2011	EM-3328-NY	Hurricane Irene
August 26-September 5, 2011	August 31, 2011	DR-4020-NY	Hurricane Irene
September 7-11, 2011	September 8, 2011	EM-3341-NY	Remnants of Tropical Storm Lee
October 27-November 8, 2012	October 28, 2012	EM-3351-NY	Hurricane Sandy
October 27-November 8, 2012	October 30, 2012	DR-4085-NY	Hurricane Sandy
August 21-24, 2021	August 22, 2021	EM-3565-NY	Hurricane Henri
September 1-3, 2021	September 2, 2021	EM-3572-NY	Remnants of Hurricane Ida
September 1-3, 2021	September 5, 2021	DR-4615-NY	Remnants of Hurricane Ida

Source: (FEMA 2025e)

USDA Declarations

Table 12-5 lists severe storm-related USDA agricultural disaster declarations that have included Sullivan County since the County's previous HMP was developed.

All Recent Events

Table 12-6 lists major recorded severe storm-related events that impacted Sullivan County since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 12-5. USDA Declarations for Severe Storm Events in Sullivan County Since Previous HMP

Event Date	USDA Declaration Number	Description
June 13-July 31, 2023	S5607	Flash Flooding and Excessive Rain
June 13-July 31, 2023	S5641	Flash Flooding and Excessive Rain
August 5-10, 2024	S5875	Hurricane Debby

Source: (USDA 2025)

Table 12-6 Severe Storm Events in Sullivan County (2020 to 2025)

Event Date	Location Impacted	Description
June 28, 2020	Kenoza Lake	Strong thunderstorm winds brought down trees and produced large hail and other wind damage. The County incurred $5,000 in property damages.
July 6, 2020	County-wide	Thunderstorms became severe and produced mainly tree damage and some large hail which led to roadblocks. The County incurred $40,000 in property damages.
July 19, 2020	Freemont and Woodridge	A cluster of thunderstorms led to tree damage and downed wires that resulted in road blockages. The County incurred $20,000 in property damages.
August 27, 2020	Kenoza Lake, Jeffersonville, Monticello, Highview, Bloomingburg	Severe thunderstorms resulted in downed trees and wires that resulted Route 209 being closed temporarily. The County incurred $55,000 in property damages.
August 29, 2020	Bradley	Severe storms resulted in strong winds that brought down trees and wires and resulted in $5,000 in property damages.
November 15, 2020	Glen Spey, Fallsburgh, Wurtsboro	A line of thunderstorms became severe and produced tree and powerline damage. The County incurred $20,000 in property damages.
June 21, 2021	Monticello, Woodridge, Wurtsboro, Bloomingburg	Scattered thunderstorms produced damaging winds and one inch hail that contributed to tree and wire damage. The County incurred $15,600 in property damages.
July 6-7, 2021	County-wide	Scattered thunderstorms produced damaging wind and large hail that resulted in trees downed and some structural damage. The County incurred $63,000 in property damages.
July 27, 2021	Long Eddy, Obernburg, Tennanah Lake, Callicoon, White Sulpher Springs	A severe storm developed which resulted in multiple trees and wires downed. The County incurred $14,000 in property damages.
November 12, 2021	Joscelyn, Kiamesha Lake, Lowes Corners	A line of storms produced strong wind gusts that resulted in trees, wires and a utility pole downed. The County incurred $5,200 in property damages.
June 16, 2022	Long Eddy, Cochecton	Severe storms produced damaging wind gusts which led to trees and wires downed on Route 97 and Route 114. The County incurred $5,000 in property damages.
July 1, 2022	Kenoza Lake, Bethel	Thunderstorm events produced severe wind that knocked trees down in the Town of Delaware and Bethel. The County incurred $10,000 in property damages.

Event Date	Location Impacted	Description
July 12-13, 2022	Curry, Joscelyn	A thunderstorm created a microburst with winds estimated of 90mph. Trees and wires were knocked down along roadways. The County incurred $5,000 in property damages.
July 24, 2022	Hortonville, Maplewood, Pond Eddy, Bridgeville	Thunderstorms produced strong winds that knocked trees and wires over which led to a few fires and blocked roadways. The County incurred $15,500 in property damages.
April 22, 2023	Fosterdale, Jeffersonville, Bethel	Thunderstorms produced strong wind gusts and some large hail. There were some reports of downed trees and power lines. A tornadic storm also developed in Sullivan County. An NWS survey rated the tornado as an EF-2. Surveyed areas included multiple downed trees and structures that sustained damage including a couple of old barns that were destroyed. The County incurred $207,000 in property damages.
July 27, 2023	Neversink, Grahamsville, Glen Wild, Forrestburg	Strong storms produced damaging wind gusts that resulted in trees and wires downed that also resulted in a fire. The County incurred $11,000 in property damages.
August 4, 2023	Jeffersonville, Rock Hill, Yankee Lake	Thunderstorms resulted in damaging wind gusts and large hail that measured to be over an inch. The County incurred $10,500 in property damages.
August 12, 2023	White Sulpher Springs, Liberty, Acidalia, Neversink, Bloomingburg	Strong thunderstorms produced strong wind gusts and large hail that resulted in damaged cars and wires that were knocked down. The County incurred $10,500 in property damages.
September 7-8, 2023	County-wide	A line of thunderstorms produced damaging wind gusts and utility and tree damages. The County incurred $16,250 in property damages.
June 30, 2024	Rockland, Debruce, Willowemoc	Scattered thunderstorms produced damaging wind gusts that knocked down trees and wires. The County incurred $32,500 in property damages.
July 15, 2024	County-wide	Strong thunderstorms led to damaging wind gusts that also produced tornadoes and widespread tree and wire damage. The County incurred $20,000 in property damages.
July 24, 2024	Swan Lake, Ferndale	Scattered thunderstorms led to damaging wind that knocked down trees and wires across the region. The County incurred $6,000 in property damages.
August 14, 2024	Roscoe	Strong storms produced strong winds and a microburst that resulted in tree damages. The County incurred $22,500 in property damages.

Source: (NOAA NCEI 2025b)
Note: The events reported incurred damage of $5,000 or more.

12.1.5 Probability of Future Occurrences

Information on previous severe storm occurrences in the County was used to calculate the probability of future occurrence of such events, as shown in Table 12-7. Based on these records and input from the Steering Committee, the probability of occurrence for severe storm in the County is considered “highly likely.”

Table 12-7. Probability of Future Severe Storm Events in Sullivan County

Hazard Type	Number of Occurrences Between 1996 and 2025	Percent Chance of Occurring in Any Given Year
Extreme Heat	4	13.79%
Hail	43	100.00%

Hazard Type	Number of Occurrences Between 1996 and 2025	Percent Chance of Occurring in Any Given Year
High Wind	142	100.00%
Lightning	6	20.69%
Thunderstorm	121	100.00%
Tornado	5	17.24%

Source: (NOAA NCEI 2025b); (FEMA 2025e); (USDA 2025)
Note: The time period presented in this table is the most complete period of record for the various data sources reviewed. Please note that the events for Thunderstorm are also counted in the High Wind category.
100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

12.1.6 Cascading Impacts Associated with the Hazard

Severe storms, including extreme heat, hail, high winds, lightning, thunderstorms, and tornadoes, can create cascading impacts that intensify other natural hazards. Extreme heat can worsen drought conditions and increase wildfire risks by drying out vegetation. Hail and high winds can damage crops, infrastructure, and power lines, leading to power outages and economic losses. Lightning often ignites wildfires, especially in dry areas. Thunderstorms and tornadoes can cause flooding through heavy rainfall, disrupt transportation and emergency services, and damage buildings, increasing vulnerability to secondary hazards. Tornadoes can also directly destroy infrastructure, compounding recovery challenges. Collectively, these severe storm elements can amplify the occurrence and severity of wildfires, floods, droughts, and infrastructure failures.

12.2 VULNERABILITY AND IMPACT ASSESSMENT

A qualitative assessment was performed to evaluate what assets are vulnerable to the extreme storm hazard. Additionally, a probabilistic assessment was conducted for the 500-year MRP hurricane wind event (see Figure 12-2) through an advanced analysis in Hazus to provide a range of loss estimates due to wind impacts, using methods described in Chapter 4.

12.2.1 Life, Health, and Safety

Overall Population

All jurisdictions are at risk from severe storm events. Extreme heat and severe storm events have potential health impacts including injury and death. Potential impacts include the following:

- Impacts of extreme wind events, such as downed trees, damaged buildings, and debris carried by high winds, can lead to injury or loss of life.
- Anyone who overexerts during work or exercise is at risk during extreme heat events.
- Anyone spending extended time outdoors may experience hypothermia during extreme cold events.

The Hazus analysis of the 500-year MRP wind event found that no persons will be displaced from their homes or will require shelter as a result of such an event in Sullivan County.

At-Risk Populations

Some populations are more susceptible to severe storm events based on their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Populations are at risk if power loss results in interruption of heating and cooling services, stagnated hospital operations, or potable water supplies. Populations most at risk from these events include the following (CDC 2022a, CDC 2005):

- People over 65, who are less able to withstand temperature extremes because of their age, health conditions, and limited mobility to access shelters, may require extra time or outside assistance during evacuations, and are more likely to need medical attention, which may not be available due to isolation during a storm event
- Children up to 4 years of age
- Individuals who are physically ill (such as with heart disease or high blood pressure)
- Low-income persons who cannot afford proper heating and cooling

Meteorologists can accurately forecast extreme heat development and the severity of the associated conditions with several days of lead time. These forecasts provide an opportunity for public health and other officials to notify at-risk populations, implement short-term emergency response actions, and focus on surveillance and relief efforts for those at greatest risk. Adhering to extreme temperature warnings and conducting appropriate mitigation and preparation measures can significantly reduce the risk of temperature-related deaths.

12.2.2 General Building Stock

Storm damage to buildings is dependent on storm duration, wind speed, the path of the storm, and building construction. Wood and masonry construction that is most common for residential structures tends to experience more damage than concrete or steel buildings that are more common for commercial uses. Hazus estimated potential losses due to building damage for the 500-year MRP wind event in the County, as summarized in Table 12-8. Table 12-9 details the severity of expected damage in buildings by occupancy class, with few buildings incurring slight, moderate or extensive damages.

Elevated summer temperatures can cause the overheating of heating, ventilation, and air conditioning (HVAC) systems. Additionally, manufactured homes (mobile homes) and antiquated or poorly constructed facilities can have inadequate capabilities to withstand extreme temperatures.

Table 12-8. Building Loss Estimates for the 500-Year MRP Hurricane Event

Jurisdiction	Estimated Damage (All Occupancies)	Estimated Damage (Residential)	Estimated Damage (Commercial)	Estimated Damage (Industrial)	Estimated Damage (Other Occupancies)
Ateres (V)	$130,298	$121,828	$4,893	$521	$3,056
Bethel (T)	$3,985,865	$3,677,649	$122,654	$15,272	$170,290
Bloomingburg (V)	$293,990	$278,780	$4,759	$1,369	$9,081
Callicoon (T)	$924,343	$876,211	$22,924	$54	$25,153
Cochecton (T)	$1,012,013	$990,703	$11,556	$623	$9,132
Delaware (T)	$1,202,122	$1,127,300	$42,961	$4,403	$27,459
Fallsburg (T)	$14,098,352	$13,530,731	$229,465	$129,352	$208,805
Forestburgh (T)	$1,414,431	$1,382,892	$16,175	$2,376	$12,987

Jurisdiction	Estimated Damage (All Occupancies)	Estimated Damage (Residential)	Estimated Damage (Commercial)	Estimated Damage (Industrial)	Estimated Damage (Other Occupancies)
Fremont (T)	$357,456	$322,766	$12,212	$1,475	$21,003
Highland (T)	$2,124,097	$2,034,771	$55,087	$1,562	$32,677
Jeffersonville (V)	$95,671	$90,689	$2,373	$6	$2,603
Liberty (T)	$4,222,473	$3,826,406	$210,004	$32,840	$153,223
Liberty (V)	$1,688,210	$1,481,511	$92,640	$18,665	$95,393
Lumberland (T)	$2,275,764	$2,132,614	$103,500	$12,120	$27,530
Mamakating (T)	$8,788,878	$8,316,699	$291,558	$73,268	$107,353
Monticello (V)	$2,999,731	$2,570,857	$236,013	$17,481	$175,379
Neversink (T)	$3,285,189	$3,053,010	$95,609	$7,040	$129,530
Rockland (T)	$1,088,112	$963,983	$71,658	$9,200	$43,271
Thompson (T)	$11,191,287	$10,489,406	$392,387	$94,656	$214,838
Tusten (T)	$892,413	$854,512	$18,966	$4,058	$14,877
Woodridge (V)	$1,006,742	$958,711	$22,444	$16,469	$9,119
Wurtsboro (V)	$726,541	$665,822	$43,964	$6,122	$10,633
Sullivan County (Total)	**$63,803,979**	**$59,747,852**	**$2,103,802**	**$448,934**	**$1,503,391**

Source: Sullivan County 2024; Sullivan County Real Property 2025; U.S. Army Corp of Engineers, NSI 2022; RSMeans 2024

Table 12-9. Severity of Expected Damage in Buildings by Occupancy Class

Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	500-Year MRP Hurricane	
			Building Count	Percent Buildings in Occupancy Class
Residential Exposure (Single and Multi-Family Dwellings)	46,026	None	45,231	98.3%
		Slight	731	1.6%
		Moderate	63	0.1%
		Extensive	1	<0.1%
		Complete	0	0.0%
Commercial Buildings	3,881	None	3,821	98.5%
		Slight	55	1.4%
		Moderate	5	0.1%
		Extensive	0	0.0%
		Complete	0	0.0%
Industrial Buildings	411	None	403	98.1%
		Slight	7	1.7%
		Moderate	1	0.2%
		Extensive	0	0.0%
		Complete	0	0.0%
	1,486	None	1,467	98.7%

Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	500-Year MRP Hurricane	
			Building Count	Percent Buildings in Occupancy Class
Government, Religion, Agricultural, and Education Buildings		Slight	18	1.2%
		Moderate	1	0.1%
		Extensive	0	0.0%
		Complete	0	0.0%

Source: Sullivan County 2024; Sullivan County Real Property 2025; U.S. Army Corp of Engineers, NSI 2022

12.2.3 Community Lifelines and Other Critical Facilities

Hazus was used to determine the probability of damage to critical facilities as a result of the 500-year MRP hurricane wind event. The analysis estimated that the average probability of any damage is around 1.5 percent for most lifeline categories, as seen in Table 12-10. For the water system category, the average probability is nearly 2 percent.

The potential impacts of severe storm events on critical facilities include the following:

- High winds can cause structural damage, damage from falling tree limbs or flying debris, and loss of power.
- Emergency personnel such as police, fire, and emergency medical services (EMS) will not be able to effectively respond in a power loss event to maintain the safety of the population.
- Extreme heat events can cause utility failures, commonly referred to as “brownouts,” created by increased usage from air conditioners, appliances, and similar equipment.

Backup power is recommended for critical facilities and infrastructure. During extreme temperature events, facilities serving as warming or cooling shelters may be opened. Power supply is vital at these facilities.

Table 12-10. Average Percent Probability of Sustaining Damage for the 500-Year MRP Hurricane Event

Name	Loss of Days	Average Percent Probability of Sustaining Damage 500-Year MRP Hurricane			
		Minor	Moderate	Severe	Complete
Communications	0	1.4%	0.1%	<0.1%	0.0%
Energy	0	1.4%	0.1%	0.0%	0.0%
Food, Hydration, Shelter	0	1.4%	0.1%	<0.1%	0.0%
Hazardous Materials	0	0.0%	0.0%	0.0%	0.0%
Health and Medical	0	0.6%	<0.1%	0.0%	0.0%
Safety and Security	0	1.7%	0.2%	0.0%	0.0%
Transportation	0	1.3%	0.1%	<0.1%	0.0%
Water Systems	0	1.9%	0.1%	0.0%	0.0%

Source: Sullivan County 2025; AVAIL 2023; NYS GIS Clearinghouse 2023, 2025; Tetra Tech 2025

12.2.4 Economy

Severe storm events can have short- and long-lasting impacts on the economy. Overall, economic impacts include the loss of business function (e.g., tourism, recreation), damage to inventory, relocation costs, wage loss, and rental loss due to the repair/replacement of buildings. Specific potential impacts of severe storm events on critical facilities include the following:

- Utility infrastructure damage (power lines, gas lines, electrical systems) can result in a loss of power, which can impact business operations.
- When a business is closed during storm recovery, there is lost economic activity in the form of day-to-day business and wages to employees.
- Business owners may be faced with costs associated with repairs to damaged buildings or higher than normal utility bills.
- Impacts on transportation lifelines affect the economy's travel-related functions such as day-to-day commuting and transport of goods.

Hazus estimated the amount of building and tree debris that may be produced as a result of the 500-year MRP wind event in the County, as listed in Table 12-11. Hazus estimates over 300,000 tons of total tree debris for this event. The estimated debris production does not include flooding, so it is likely a conservative estimate.

Table 12-11. Debris Created During the 500-Year MRP Wind Event

Jurisdiction	Estimated Debris Created During the 500-Year MRP Wind Event			
	Brick and Wood (tons)	Concrete and Steel (tons)	Tree (tons)	Eligible Tree (tons)
Ateres (V)	8.2	0.0	311.1	614.2
Bethel (T)	141.9	0.0	16,115.7	18,955.7
Bloomingburg (V)	23.1	0.0	431.2	1,077.9
Callicoon (T)	51.7	0.0	1,417.3	1,417.6
Cochecton (T)	32.1	0.0	5,939.0	5,345.1
Delaware (T)	48.0	0.0	4,554.4	5,009.3
Fallsburg (T)	717.4	0.0	33,007.7	60,996.4
Forestburgh (T)	51.0	0.0	30,609.2	15,311.9
Fremont (T)	26.0	0.0	1,635.0	1,308.3
Highland (T)	55.3	0.0	13,360.3	13,372.1
Jeffersonville (V)	5.3	0.0	146.7	146.7
Liberty (T)	172.9	0.0	16,328.6	20,484.7
Liberty (V)	78.3	0.0	3,552.9	6,164.6
Lumberland (T)	73.5	0.0	21,941.6	24,136.0
Mamakating (T)	514.1	0.0	52,150.9	59,919.3
Monticello (V)	183.8	0.0	2,559.4	9,534.1
Neversink (T)	121.4	0.0	41,141.6	28,799.2
Rockland (T)	65.9	0.0	6,087.5	5,247.6
Thompson (T)	553.2	0.0	34,885.0	54,347.9
Tusten (T)	25.1	0.0	9,378.4	7,510.2

Jurisdiction	Estimated Debris Created During the 500-Year MRP Wind Event			
	Brick and Wood (tons)	Concrete and Steel (tons)	Tree (tons)	Eligible Tree (tons)
Woodridge (V)	49.9	0.0	2,921.2	5,409.2
Wurtsboro (V)	50.8	0.0	3,175.4	4,334.8
Sullivan County (Total)	**3,049.0**	**0.0**	**301,650.0**	**349,442.9**

Source: Source: Sullivan County 2024; Sullivan County Real Property 2025; U.S. Army Corp of Engineers, NSI 2022
Note: Eligible trees are the downed trees that would likely be collected and disposed of at public expense. Trees (tons) is the weight of all wind-generated tree debris.

12.2.5 Natural Resources

Specific potential impacts of severe storm events on natural resources include the following:

- Severe storms that create long periods of rainfall can erode natural banks along waterways and degrade soil stability for terrestrial species.
- Tornadoes can tear apart habitats, causing fragmentation across ecosystems (EPA 2023b).
- Researchers believe that a greater number of diseases will spread across ecosystems because of impacts that severe storms have on water supplies (U.S. Climate Resilience Toolkit 2016).
- Freezing and warming weather patterns can create changes in natural processes.
- Earlier warming periods may affect natural processes such as flow within water resources (USGS 2020a).
- Extreme heat can have negative impacts on aquatic systems, contributing to fish kills, aquatic plant die offs, and increased likelihood of harmful algal blooms.
- Extreme temperature events can destroy food webs and deplete resources in the environment.

12.2.6 Historic and Cultural Resources

Severe storms can cause damage or destruction to the County's historical and cultural resources. Many historical buildings and homes are not built to modern building code standards to withstand high winds and are more vulnerable than other infrastructure. Specific potential impacts of severe storm events on historical and cultural resources include the following:

- Outdoor events are likely to be postponed or cancelled as the result of severe storm conditions.
- Historic buildings may be susceptible to damage from extreme temperature conditions.
- Cultural heritage sites, particularly those exposed to the elements, are subject to weathering.
- Extreme heat can increase the risk of ignition of fires and their propagation. Fire causes material loss and deformation of cultural heritage assets and may increase the probability of cracking or splitting in built structures.
- Under extreme heat, stones can face degradation in the form of cracking, soot accumulation, color change, and mineralogical and textural changes, leading to potential structural instability. Long-term impacts include weakened stones and increased susceptibility to deterioration processes such as salt weathering and temperature cycling (Sesana, et al. 2021).

Proper strategies help safeguard buildings and their contents. Sudden and dramatic fluctuations in heating or cooling should be minimized. Slower heating and cooling give building materials and stored contents time to acclimate to new temperatures in the building and corresponding new humidity levels (CCAHA 2019).

12.3 FUTURE CHANGES THAT MAY AFFECT RISK

12.3.1 Potential or Planned Development

Any areas of growth could be impacted by the severe storm hazard, which poses risk to the entirety of the County. Additionally, by increasing development, green space preservation will need to continue to be a priority to mitigate increased heat islands. However, due to increased standards and codes, new development may be less vulnerable to the severe storm hazard than the aging building stock in the County.

12.3.2 Projected Changes in Population

Any changes in the density of population may require utility system upgrades (e.g., water, electricity) to keep up with demand during extreme temperature events. Changes in population density also can create issues for residents during evacuation from a severe storm event that generates flooding and debris that block transportation corridors.

12.3.3 Future Conditions

Anticipated future conditions identify an increase in the frequency and severity of extreme storms and rainfall. Major clusters of summertime thunderstorms in North America are anticipated to grow larger, more intense, and more frequent, unleashing far more rain and posing a greater threat of flooding across wide areas (NASA 2013). Heavy rainstorms are projected to happen more often and can become more intense, a change which has the potential to affect drinking water and increase delays and hazards related to extreme weather events (such as flooding).

An increase in storms will produce more wind events. An increase in temperature will provide more energy to produce storms that generate tornadoes (NASA 2013). Research also suggests that there is a greater risk of more off-season tornadoes in a warmer future, which suggests that more tornadic activity may occur when people are not expecting it (NOAA 2023c). With an increased likelihood of strong winds and tornado events, all the County's assets will experience additional risk for wind-related losses.

Winds and associated flooding from hurricanes and tropical storms are expected to increase. The number of hurricanes and tropical storms in the Atlantic basin may not increase, but storms that form are projected to be stronger and shift farther north (Stevens & Lamie 2024). The length of hurricane season is likely to expand due to rising water temperatures.

Changing conditions are a potential threat to historical and cultural sites as they may aggravate the physical, chemical, and biological mechanisms causing degradation by affecting the structure or composition of building materials. Milder winters can reduce impacts associated with extreme cold temperatures while summertime impacts increase due to increasing extreme heat events.

13. SEVERE WINTER STORM

13.1 HAZARD PROFILE

13.1.1 Hazard Description

A winter storm is a weather event in which the main types of precipitation are snow, sleet, or freezing rain, often with blowing snow and dangerous wind chills. The three basic components of a winter storm are as follows (NOAA NSSL n.d.-b):

- Moisture to form clouds and precipitation, such as air blowing across a large lake or the ocean
- A lifting force that raises moist air to form clouds and cause precipitation (such as warm air colliding with cold air and being forced to rise over the cold dome or air flowing up a mountainside)
- Below freezing air temperatures in the clouds and near the ground to make snow and ice

Some winter storms can immobilize an entire region, while others might affect only a single community. Potential impacts include cold temperatures, flooding, storm surge, closed and blocked roadways, downed utility lines, and power outages. The aftermath of a winter storm can have an impact on a community or region for days, weeks, or even months.

Blizzard

A blizzard is a winter snowstorm with sustained wind or frequent wind gusts of 35 miles per hour (mph) or more over a 3-hour period, accompanied by falling or blowing snow reducing visibility to 0.25 miles or less. Extremely cold temperatures often are associated with blizzard conditions but are not part of the formal definition. The hazard created by the combination of snow, wind, and low visibility, significantly increases when temperatures are below 20 ºF. A severe blizzard is categorized as having temperatures near or below 10 ºF, winds exceeding 45 mph, and visibility reduced by snow to near zero.

Storm systems powerful enough to cause blizzards usually form when the jet stream dips far to the south, allowing cold air from the north to clash with warm, moist air from the south. Blizzard conditions often develop on the northwest side of an intense storm system. The difference between the lower pressure in the storm system and the higher pressure surrounding it creates a tight pressure gradient, resulting in strong winds and extreme conditions caused by the blowing snow (Lam 2019).

Extreme Cold

Extreme cold events are when temperatures drop well below normal for an area. In regions where temperatures below freezing are not uncommon, extreme cold might refer to temperatures below 0 ºF. In regions where winter storms are rare, temperatures near freezing may be considered extreme cold (NWS n.d.-a). For this HMP, extreme cold temperatures are defined as temperatures around 0 °F or below.

Several health hazards are related to extensive exposure to extreme cold temperatures and wind chill (the combined effect on body temperature of cold and wind) (CDC 2023b):

- Frostbite is damage to body tissue caused by extreme cold. Frostbite can cause a loss of feeling and a white or pale appearance in extremities. A wind chill of -20 ºF will cause frostbite in 30 minutes.

- Hypothermia is a potentially deadly condition brought on when the body temperature drops to less than 95 ºF. Warning signs of hypothermia include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion.

Extreme cold can cause emergencies for those without shelter, those who are stranded, or those who live in a home that is poorly insulated or without heat. Infants and the elderly are most susceptible to the effects of extreme changes in temperatures and are particularly at risk (CDC 2012b).

Heavy Snow

Snow is precipitation in the form of ice crystals. It originates in clouds when temperatures are below the freezing point (32 ºF) and water vapor in the atmosphere condenses directly into ice without going through the liquid stage. Once an ice crystal has formed, it absorbs and freezes additional water vapor from the surrounding air, growing into a snow crystal or snow pellet, which then falls to the earth.

Snowflakes are clusters of ice crystals that form from a cloud (NOAA 2024). Snow pellets are opaque ice particles that form when ice crystals fall through super-cooled cloud droplets, which are below freezing but remain a liquid. The cloud droplets then freeze to the crystals.

Ice Storm

An ice storm is a damaging accumulation of ice—usually 0.25 inches or more—during freezing rain (FEMA n.d.-b). The accumulations of ice can bring down trees, power lines, utility poles, and communication towers. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians (Dolce 2012).

13.1.2 Location

New York State experiences abundant snowfall. Winter storms can reach the state as early as October and are usually in full force by late November. Inland regions of the state receive more snow than most other communities in the United States. Although the entire state is subject to winter storms, the easternmost and west-central portions of the state are the most likely to see such storms (NYS DHSES 2023). An area that is somewhat more vulnerable to severe winter weather is the floodplain, where a winter storm can cause flooding through blockage of streams or through snow melt.

13.1.3 Extent

The magnitude of a severe winter storm is defined by snowfall rates, wind speeds, temperatures, visibility, and storm duration. A severe winter storm can be classified by meteorological measurements and by societal impacts. NOAA's Regional Snowfall Index (RSI) rates significant snowstorms that impact the eastern two-thirds of the United States from 1 to 5, based on the spatial extent of the storm, the amount of snowfall, and the affected population. NOAA has assigned RSI values to over 500 storms since 1900 (NOAA n.d.-b). Table 13-1 presents the five RSI ranking categories.

The National Weather Service (NWS) classifies the magnitude of severe winter storms into five categories as shown in Table 13-2 (NWS 2021). The NWS also issues winter weather watches, warnings, and advisories as described in Figure 13-1 to help people know what to expect prior to an approaching storm (NWS 2021).

Table 13-1. RSI Ranking Categories

Category	Description	RSI Value
1	Notable	1–3
2	Significant	3–6
3	Major	6–10
4	Crippling	10–18
5	Extreme	18.0+

Source: (NOAA n.d.-b)

Table 13-2. Winter Storm Category Thresholds

Winter Storm Type	Threshold
Heavy Snowstorm	Accumulations of 4 inches or more of snow in a 6-hour period, or 6 inches of snow in a 12-hour period.
Sleet Storm	Significant accumulations of solid pellets that form from the freezing of raindrops or partially melted snowflakes causing slippery surfaces, posing a hazard to pedestrians and motorists.
Ice Storm	Significant accumulation of rain or drizzle freezing on objects (trees, power lines, roadways) as it strikes them, causing slippery surfaces and damage from sheer weight of ice accumulations.
Blizzard	Wind velocity of 35 mph or more, temperatures below freezing, considerable blowing snow with visibility frequently below one-quarter mile prevailing over an extended period.
Severe Blizzard	Wind velocity of 45 mph, temperatures of 10°F or lower, a high density of blowing snow with visibility frequently measured in feet prevailing over an extended period.

Source: (NWS 2021)

Figure 13-1. Winter Storm Warning Thresholds



Source: (NWS 2021)

The extent of extreme cold temperatures is generally measured through the Wind Chill Temperature Index. Wind chill is a term used to describe what the air temperature feels like to the human skin due to the combination of cold temperatures and winds blowing on exposed skin. The colder the air temperature and the higher the wind speeds, the colder it will feel on the skin (NOAA n.d.-f).

13.1.4 Previous Occurrences

FEMA Disaster Declarations

Table 13-3 lists all severe winter storm-related presidentially declared disasters that have included Sullivan County.

Table 13-3. FEMA Disaster Declarations for Severe Winter Storm Events in Sullivan County

Event Date	Declaration Date	Declaration Number	Description
March 13-17, 1993	March 17, 1993	EM-3107-NY	Severe Blizzard
January 6-12, 1996	January 12, 1996	DR-1083-NY	Blizzard of '96 (Severe Snow Storm)
December 25, 2002- January 4, 2003	February 25, 2003	EM-3173-NY	Snowstorms
February 17-18, 2003	March 27, 2003	EM-3184-NY	Snow
December 11-31, 2008	December 18, 2008	EM-3299-NY	Severe Winter Storm
March 14-15, 2017	July 12, 2017	DR-4322-NY	Severe Winter Storm and Snowstorms

Source: (FEMA 2025e)

USDA Declarations

Table 13-4 lists severe winter storm-related USDA agricultural disaster declarations that have included Sullivan County since the County's previous HMP was developed.

Table 13-4. USDA Declarations for Severe Winter Storm Events in Sullivan County Since Previous HMP

Event Date	USDA Declaration Number	Description
May 14-25, 2023	S5485	Freeze and frost

Source: (USDA 2025)

All Recent Events

Table 13-5 lists major recorded severe winter storm-related events that impacted Sullivan County since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 13-5. Severe Winter Storm Events in Sullivan County (2020 to 2025)

Event Date	Location Impacted	Description
December 16-17, 2020	County-wide	A Nor'easter produced snowfall totals ranging from 11 to 17 inches.
January 31-February 2, 2021	County-wide	A strong snowstorm produced 9 to 24 inches of snow.

Event Date	Location Impacted	Description
February 15-16, 2021	County-wide	A winter storm produced six inches of snow and up to a half inch of ice in some parts of the County.
January 16-17, 2022	County-wide	A snowstorm produced six to 14 inches of snow and strong winds that contributed to drifting snow.
January 22, 2022	County-wide	Temperatures as low as negative 16 degrees were reported across the region.
December 15-17, 2022	County-wide	A winter storm system produced between four and ten inches of snow.
February 27-28, 2023	County-wide	A winter storm produced heavy snowfall resulting in between six and nine inches of snowfall.
March 10-11, 2023	County-wide	A winter storm produced between four and seven inches of snowfall.
March 13-15, 2023	County-wide	A snowstorm produced between six and eight inches of snow.
January 6-7, 2024	County-wide	A large winter storm produced between six and 12 inches of snowfall.
November 21-22, 2024	County-wide	A storm produced snowfall totals between four and 13 inches.

Source: (NOAA NCEI 2025b)

13.1.5 Probability of Future Occurrences

Information on previous severe winter storm occurrences in the County was used to calculate the probability of future occurrence of such events. Table 13-6 lists the number of events from various sources from 1996 to 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for severe winter storm in the County is considered “highly likely.”

Table 13-6. Probability of Future Severe Winter Storm Events in Sullivan County

Hazard Type	Number of Occurrences Between _1996 and 2025	Percent Chance of Occurring in Any Given Year
Blizzard	2	6.89%
Extreme Cold	12	41.37%
Heavy Snow	55	100.00%
Ice Storm	9	31.03%
Winter Storm/Weather	30	100.00%

Source: (NOAA NCEI 2025b)
Note: The time period presented in this table is the most complete period of record for the various data sources reviewed. 100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

13.1.6 Cascading Impacts Associated with the Hazard

Severe winter storms are often accompanied by extreme cold temperatures, which may require warming shelters to be opened. Snow and ice conditions on the road make transportation accidents more likely, which may lead to utility and power lines being knocked over. Heavy snow and ice can lead to utility failure and downed trees and wires. Electrical utility failure also has the potential to start fires that can damage infrastructure and woodlands.

Snow and ice melt may contribute to flooding. Responding to winter weather hazards with snow and ice removal could minimize the potential risk of flooding during a warming period.

13.2 VULNERABILITY AND IMPACT ASSESSMENT

All of Sullivan County is exposed and vulnerable to the winter storm hazard. Current modeling tools are not available to estimate specific losses for this hazard. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

13.2.1 Life, Health, and Safety

Overall Population

The entire population of Sullivan County is exposed to severe winter storm events. Winter storms kill hundreds of people in the United States each year, primarily from automobile accidents, overexertion, and exposure. Winter storms are often accompanied by strong winds creating blizzard conditions with blinding wind-driven snow, drifting snow and extreme cold temperatures and dangerous wind chill. People can die in traffic accidents on icy roads, heart attacks while shoveling snow, or of hypothermia from prolonged exposure to cold (NOAA NSSL 2021c).

At-Risk Populations

People who experience homelessness, are over the age of 65, or are under the age of 5 are the most susceptible to this hazard. Older adults are susceptible due to their increased risk of injuries and death from falls and overexertion and/or hypothermia from attempts to clear snow and ice.

13.2.2 General Building Stock

The entire general building stock is vulnerable to the severe winter storm hazard. Structural impacts usually include damage to roofs and building frames but not building contents. Damage can include roof damage from heavy snow loads, structural damage from downed trees, and power outages. Severe winter storms can cause flooding through blockage of streams or through snow melt. Generally, losses resulting from such flooding is less than that associated with a 100-year flood.

13.2.3 Community Lifelines and Other Critical Facilities

Severe winter storm damage to critical facilities can include roof damage from heavy snow loads, structural damage from downed trees, and power outages. Full functionality of critical facilities such as police, fire, and medical facilities is essential for response during and after severe winter weather events. These critical facility structures are largely constructed of concrete and masonry; therefore, they should suffer minimal structural damage from severe winter storms. Because power interruption can occur, backup power is recommended.

Infrastructure at risk for this hazard includes roadways that could be damaged due to the application of salt and intermittent freezing and warming conditions that can damage roads over time. Severe snowfall requires clearing roadways and alerting citizens to dangerous conditions. Following the winter season, resources are required for road maintenance and repair of winter weather related damage, including cracks and potholes caused by freezing or plowing (NWS 2019b).

Heavy accumulations of snow and ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days during extremely cold temperatures while utility companies work to repair the damage. Bridges and overpasses are particularly dangerous because they freeze before other surfaces (NWS 2019a). Heavy snow can immobilize a region, shutting down air and rail transportation and disrupting medical and emergency services (NOAA 2023f).

13.2.4 Economy

The cost of snow and ice removal and repair of roads from the freeze/thaw process can drain local financial resources. Severe winter storms also affect the ability of people to commute to and from work, which may cause a loss in economic productivity.

13.2.5 Natural Resources

Excessive snowfall can affect natural processes such as river or stream flows. Rain-on-snow events, which occur when rain falls onto an existing snowpack and melts it, can exacerbate runoff rates during warming winter weather. Consequentially, stream flow rates and excess volumes of water can erode banks, tear apart habitat along the banks and coastline, and disrupt terrestrial plants and animals (NSIDC n.d.).

The methods communities use to maintain their infrastructure during winter storms also can have impacts on the environment. Road-salt runoff can cause groundwater salinization, modify the soil structure, and result in loss or reduction in lake turnover. Additionally, road salt can cause changes in the composition of aquatic invertebrate assemblages and pose threats to birds, roadside vegetation, and mammals (Tiwari and Rachlin 2018).

13.2.6 Historic and Cultural Resources

Historic and cultural buildings, archaeological sites, and artifacts are vulnerable to severe winter storms. Freeze-thaw cycles can cause significant damage as water seeps into cracks, freezes, expands, and then thaws, leading to the gradual breakdown of materials like stone, brick, and mortar. Proper strategies help safeguard buildings and their contents. Sudden and dramatic fluctuations in heating or cooling should be minimized. Slower heating and cooling give building materials and stored contents time to acclimate to new temperatures in the building and corresponding new humidity levels (CCAHA 2019).

Snow and ice introduce moisture into structures and artifacts, which can freeze and cause expansion and cracking, while fluctuating humidity levels can deteriorate organic materials like wood and textiles. The weight of accumulated snow and ice can stress roofs and other structural elements, potentially leading to collapses. Sudden temperature changes can cause thermal shock, damaging delicate artifacts. Severe winter weather can hinder access and maintenance, making it challenging to perform necessary upkeep and repairs (NPS 2016).

13.3 FUTURE CHANGES THAT MAY AFFECT RISK

13.3.1 Potential or Planned Development

Any areas of growth could be impacted by severe winter storm events. Implementing the following activities can eliminate or reduce the loss of life and property and infrastructure damage during winter storm events:

- Remove snow from roadways
- Remove dead trees and trim trees/brush from roadways to lessen falling limbs and trees
- Ensure proper road signs are visible and installed properly
- Bury electrical and telephone utility lines to minimize downed lines
- Remove debris/obstructions in waterways and develop routine inspections/maintenance plans to reduce potential flooding
- Replace substandard roofs of critical facilities to reduce exposure to airborne germs resulting from leakage
- Purchase and install backup generators in evacuation facilities and facilities critical to essential services for residents
- Install cell towers in areas where limited telecommunication is available to increase emergency response and cell phone coverage.

13.3.2 Projected Changes in Population

Historically, winter storms with associated snowfall and ice accumulation have severely impacted transportation corridors as well as infrastructure. Any changes in the density of population may impact the ability of persons in the County to mobilize or receive essential services during severe winter storm events.

13.3.3 Future Conditions

Studies project that New York State will see an increase in average annual temperatures and precipitation. Annual precipitation amounts in the region are projected to increase, primarily in the form of heavy rainfall. As the century progresses, snowfall is likely to become less frequent, with the snow season decreasing in length. As winters continue to warm, ice is projected to become rarer, which may lead to more lake-effect snow in the short term due to additional moisture available in the atmosphere to create precipitation. Over the long term, however, more of this is likely to fall as rain (Stevens & Lamie 2024).

14. WILDFIRE

14.1 HAZARD PROFILE

14.1.1 Hazard Description

A wildfire is any fire that is not planned, controlled, or supervised in a natural area such as a forest, grassland, or prairie (MitigateNY 2023). Wildfires cause both short-term and long-term losses. Short-term losses can include destruction of timber, wildlife habitat, scenic vistas, and watersheds. Long-term effects include smaller timber harvests, reduced access to affected recreational areas, and the destruction of cultural and economic resources and community infrastructure. In New York State, wildfires are not as frequent or intense as in the western United States, but they still pose a significant hazard, particularly in areas with dense forests, brush, and grasslands.

Types of Wildfire

Wildfires include those commonly referred to as forest fires, brush fires, grass fires, range fires, or ground fires. There are three classes of wildfires: surface fires, ground fires, and crown fires. Surface fires are the most common type and burn along the forest floor, moving slowly and killing or damaging trees. Ground fires are usually started by lightning and burn on or below the forest floor. Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees.

The term wildfire typically excludes agricultural fires, which are intentional fires to manage croplands. It also excludes so-called beneficial fire, which is a wildland fire intentionally set or intentionally allowed to burn for cultural, ecosystem, or public-safety purposes. Common types of beneficial fire include cultural fire, which can be part of indigenous cultural practices, and prescribed burns, which are conducted in a controlled manner to simulate the fires an ecosystem has evolved to require or to remove dangerous fuel loads from near communities.

Wildfire Causes

Wildfires often begin unnoticed and spread quickly. Most wildfires in New York State are caused by human activities such as debris burning, campfires, equipment use, smoking and arson. Lightning is the second most common source of ignition. The likelihood of a lightning strike starting a wildfire depends on the intensity of the strike and the type and dryness of the fuel it contacts.

The major fire seasons in New York are in the spring and in the fall, when there is an increase of dead grass and leaves on the ground, combined with bare trees that allow direct sunlight to hit the dry ground. Additionally, spring and fall weather patterns sometimes lead to extended dry periods, drying the fire fuels, dead grass and leaves further. Typically, the spring fire season is larger than the fall season.

Wildfire Behavior

Almost all actions in response to a wildfire depend on an understanding of how the fire behaves. Fire behavior is defined as the way fuel ignites, flame develops, and fire spreads, which depend on interactions among fuel, weather, and topography.

Fuel

Fuels are classified by weight or volume (fuel loading) and by type. Fuel loading is the amount of vegetative material available. If this amount doubles, energy released can also double. Each fuel type is given a burn index—an estimate of amount of potential energy that may be released, effort required to ignite a fire in a given fuel and expected flame length. Different fuels have different burning qualities, and some burn more easily than others. Grass fires release relatively little energy but can sustain very high rates of spread. A forest stand may consist of several layers of fuels (USFS 2013):

- Surface fuels consist of grasses, shrubs, litter, and woody material lying on the ground. Surface fires burn low vegetation, woody debris, and litter. Under the right conditions, surface fires reduce the likelihood that future wildfires will grow into crown fires. Surface fuels are generally defined to be less than 6 feet in height off the ground and are categorized into one of six types: grass, grass/shrub, shrub, timber/understory, timber litter and slash. Fire behavior fuel models are used to compute surface fire behavior, including rate of spread, flame length, and fire line intensity.
- Ladder fuels consist of live and dead small trees and shrubs; live and dead lower branches from larger trees, needles, vines, lichens, mosses; and any other combustible biomass between the top of surface fuels and bottom of overstory tree crowns.
- Crown fuels are suspended above the ground in treetops or other vegetation and consist mostly of live and dead fine material. When historically low-density forests become overcrowded, tree crowns may merge and form a closed canopy. Tree canopies constitute the primary fuel layer in a forest crown fire.

Weather / Air Mass

Weather factors that affect wildfire include temperature, relative humidity, local wind speed and direction, cloud cover, precipitation amount and duration, and stability of the atmosphere (NWS 2009). Extreme weather leads to extreme events, and often a subsidence of severe weather marks the end of a wildfire's growth and the beginning of successful containment. High temperatures and low humidity can produce vigorous fire activity. Fronts and thunderstorms can produce winds that radically and suddenly change in speed and direction, causing similar changes in fire activity. The rate of spread of a fire varies directly with wind velocity. Winds may play a dominant role in directing the course of a fire. The most damaging firestorms are typically marked by high winds (FEMA 1997a).

Topography

Movement of air over the terrain tends to direct a fire's course. A gulch or canyon can funnel air and act as a chimney, intensifying fire and inducing faster spread. Saddles on ridgetops tend to offer lower resistance to passage of air and draw fires. Solar heating of drier, south-facing slopes produces upslope thermal winds that can complicate behavior. Slope is an important factor. If the percentage of uphill slope doubles, the rate the wildfire spreads will most likely double as well. Terrain can inhibit wildfires: fire travels downslope much more slowly than it does upslope, and ridgetops often mark the end of a wildfire's rapid spread (FEMA 1997a).

14.1.2 Location

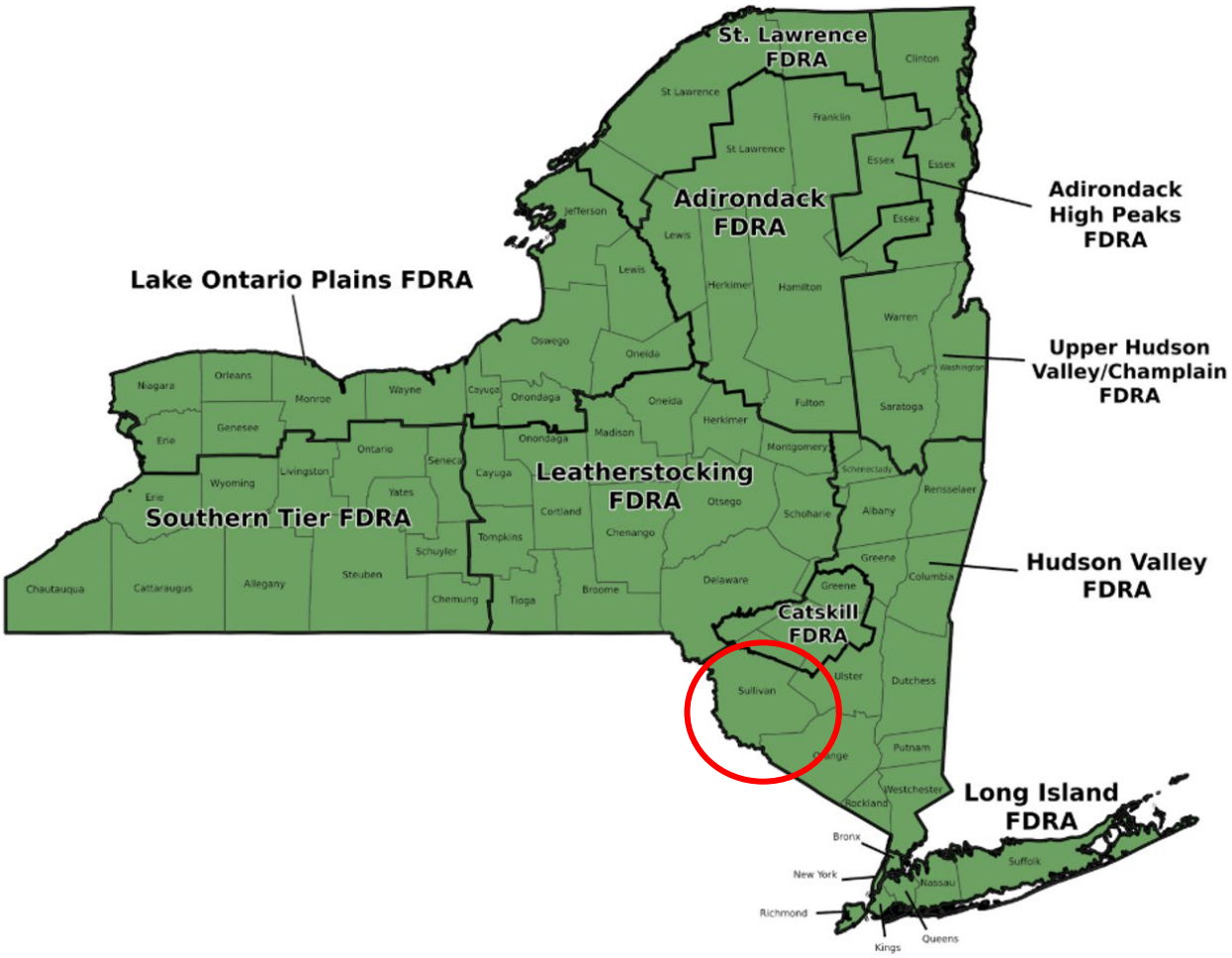
Wildfire risk is greatest in areas of high fuel loading and steep slopes. Areas typically considered to be prone to wildfires include large tracts of wild lands containing heavier fuels with high continuity such as forested areas in many parts of the County. Wildfires are also likely to occur in open grasslands. Areas that are typically considered

to be safe from wildfires include highly urbanized, developed areas that are not contiguous with vast areas of wild lands.

Wildfire Risk by Region

The State of New York is divided into 10 fire danger rating areas (FDRAs) as shown in Figure 14-1. FDRAs are defined by areas of similar vegetation, climate, and topography in conjunction with agency regional boundaries, National Weather Service (NWS) fire weather zones, political boundaries, fire occurrence history, and other influences. The Forest Ranger Division issues daily fire danger warnings when the fire danger rating is at high or above in one or more FDRAs. Sullivan County is in the Hudson Valley FDRA with a portion of the County in the Catskill FDRA.

Figure 14-1. New York Fire Danger Rating Areas



Note: Map shows FDRA risk level for dates December 4-5, 2025; The red circle indicates the location of Sullivan County.

Source: (NYSDEC 2025b)

Wildland-Urban Interface

The threat to people and property is greatest in the fringe areas where developed areas meet open grasslands, called wildland-urban interface (WUI) zones (U.S. Forest Service 2020). These fringe zones combine flammable vegetation with human structures and activities. In these areas, wildfires pose a particular risk to humans. WUI areas grow nationwide by approximately 2 million acres each year as communities continue to expand, often due to the pressures of high housing costs in more densely populated areas.

The WUI is divided into two categories:

- The WUI intermix is where structures and wildlands intermingle, with no clear boundary between the two. In an intermix area, homes and other structures are scattered throughout a wildland area. These structures are often surrounded by trees and vegetation and are only accessible by narrow roads. This makes it difficult to reach these areas if a fire occurs. WUI interface accounts for 5.4 percent (7,599 square miles) of New York State (Radeloff, et al. 2020).
- The WUI interface is where human development is adjacent to natural environments, such as forests, grasslands, or shrublands. WUI intermix accounts for 21.9 percent (30,890 square miles) of New York State.

Recent maps show that almost every county in New York State has both WUI interface and WUI intermix zones. Figure 14-2 shows these areas in Sullivan County.

14.1.3 Extent

Fire Damage

Between 1996 and 2024, 32 New York State wildfire events listed in the National Center for Environmental Information (NCEI) storm events database collectively resulted in approximately $218,000 in damage. The National Risk Index expected annual loss associated with wildfire events in Sullivan County is $6,622 (MitigateNY 2023).

Ratings and Indices

Wildland Fire Assessment System | National Fire Danger Rating System

The Wildland Fire Assessment System (WFAS) is an internet-based system that provides a national view of weather and fire potential, including national fire danger, weather maps and satellite-derived “greenness” maps. It was developed by the Fire Sciences Laboratory in Missoula, Montana and is maintained at the National Interagency Fire Center (NIFC) in Boise, Idaho (WFAS 2023).

Each day during the fire season, the WFAS produces national maps of selected fire weather and fire danger components of the National Fire Danger Rating System (NFDRS). Fire Danger Rating level considers current and antecedent weather, fuel types, and both live and dead fuel moisture. This information is provided by local station managers (WFAS 2023). Table 14-1 shows the fire danger rating and color code, which is also used by the NYSDEC to update state fire danger rating maps, as identified later in this section.

Figure 14-2. WUI Interface and Intermix Hazard Areas in Sullivan County

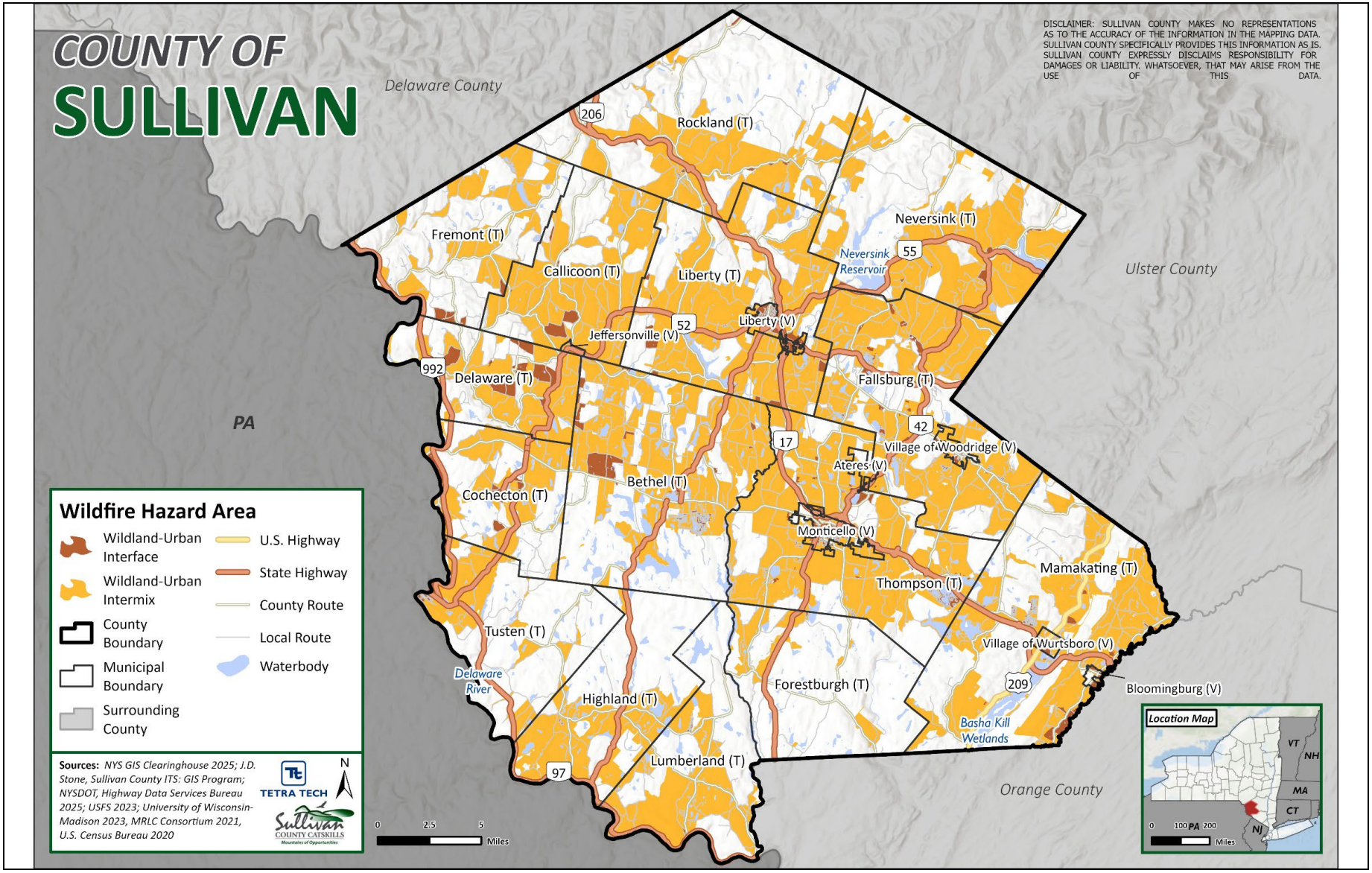


Table 14-1. Description of Fire Danger Ratings in New York State

Adjective Rating Class and Color Code	Class Description
Red Flag	A short-term, temporary warning, indicating the presence of a dangerous combination of temperature, wind, relative humidity, fuel, or drought conditions that can contribute to new fires or rapid spread of existing fires. A Red Flag Warning can be issued at any Fire Danger level.
Extreme (Red)	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. Direct attack is rarely possible and may be dangerous, except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions, the only effective and safe control action is on the flanks until the weather changes, or the fuel supply lessens.
Very High (orange)	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels.
High (yellow)	All fine dead fuels ignite readily, and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly, and short-distance spotting is common. High intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while small.
Moderate (blue)	Fires can start from most accidental causes but, with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur but is not persistent. Fires are not likely to become serious, and control is relatively easy.
Low (green)	Fuels do not ignite readily from small firebrands, although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.

Source: (NYSDEC 2025a)

NYSDEC Fire Danger Rating Map

A current fire danger rating map is updated daily on the NYSDEC website (NYSDEC 2023c). The map is developed by information obtained from the Division of Forest Protection and Division of Air Resources (impact assessment and meteorology section). The figure is color coded and indicates where there are red flag warning areas at the time the map is issued.

Fire Potential Index

The Fire Potential Index (FPI) is a moisture-based vegetation flammability indicator. The FPI indicates the estimated proportion (percentage) of the vegetation that is dry enough to burn. The FPI is highest when dead fuel moisture and vegetation greenness are low. The FPI is calculated once daily for the continental US at a resolution of one square kilometer. Although these maps provide a relative measure of fuel flammability across the nation, they do not indicate the chance that a large fire will occur (USFS 2016) (USGS 2023e).

Fuel Moisture

Fuel moisture is a measure of the amount of water in a fuel (vegetation) available to a fire and is expressed as a percentage of the dry weight of that specific fuel. When fuel moisture content is high, fires do not ignite readily, or at all, because heat energy must be used to evaporate and drive water from the plant before it can burn. When the fuel moisture content is low, fires start easily and will spread rapidly because all the heat energy goes directly into the burning flame. When the fuel moisture content is less than 30 percent, that fuel is considered to be dead. Dead fuels respond solely to current environmental conditions and are critical in determining fire potential (NOAA 2023a).

Table 14-2 outlines four fuel classifications based on response time, or time lag. A fuel's time lag is based on how long it would take for two-thirds of the dead fuel to respond to atmospheric moisture.

Table 14-2. Fuel Moisture Classifications

1-Hour Fuels	10-Hour Fuels	100-Hour Fuels	1000-Hour Fuels
Up to ¼-inch diameter – fine, flashy fuels that respond quickly to weather changes. Computed from observation time, temperature, humidity, and cloudiness.	¼-inch to 1-inch in diameter - computed from observation time, temperature, humidity, and cloudiness or can be an observed value.	1-inch to 3-inch in diameter - computed from 24-hour average boundary condition composed of day length (daylight hours), hours of rain, and daily temperature/humidity ranges.	3-inch to 8-inch in diameter - computed from a seven-day average boundary condition composed of day length, hours of rain, and daily temperature/humidity ranges.

Source: (NPS 2025a)

Keetch-Byram Drought Index

The Keetch-Byram Drought Index (KBDI) assesses the risk of fire by representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers. The KBDI attempts to measure the amount of precipitation necessary to return the soil to full field capacity. The index ranges from zero, the point of no moisture deficiency, to 800, the maximum drought that is possible, and represents a moisture regime from 0 to 8 inches of water through the soil layer. At 8 inches of water, the KBDI assumes saturation. At any point along the scale, the index number indicates the amount of net rainfall that is required to reduce the index to zero, or saturation (NIDIS 2023).

14.1.4 Previous Occurrences

FEMA Disaster Declarations

Between 1954 and 2025, Sullivan County was not included in any major disaster (DR) or emergency (EM) declarations for wildfire-related events (FEMA 2025a).

USDA Declarations

Since the 2021 HMP, Sullivan County has not been included in any wildfire-related USDA agricultural disaster declarations (USDA 2025).

All Recent Events

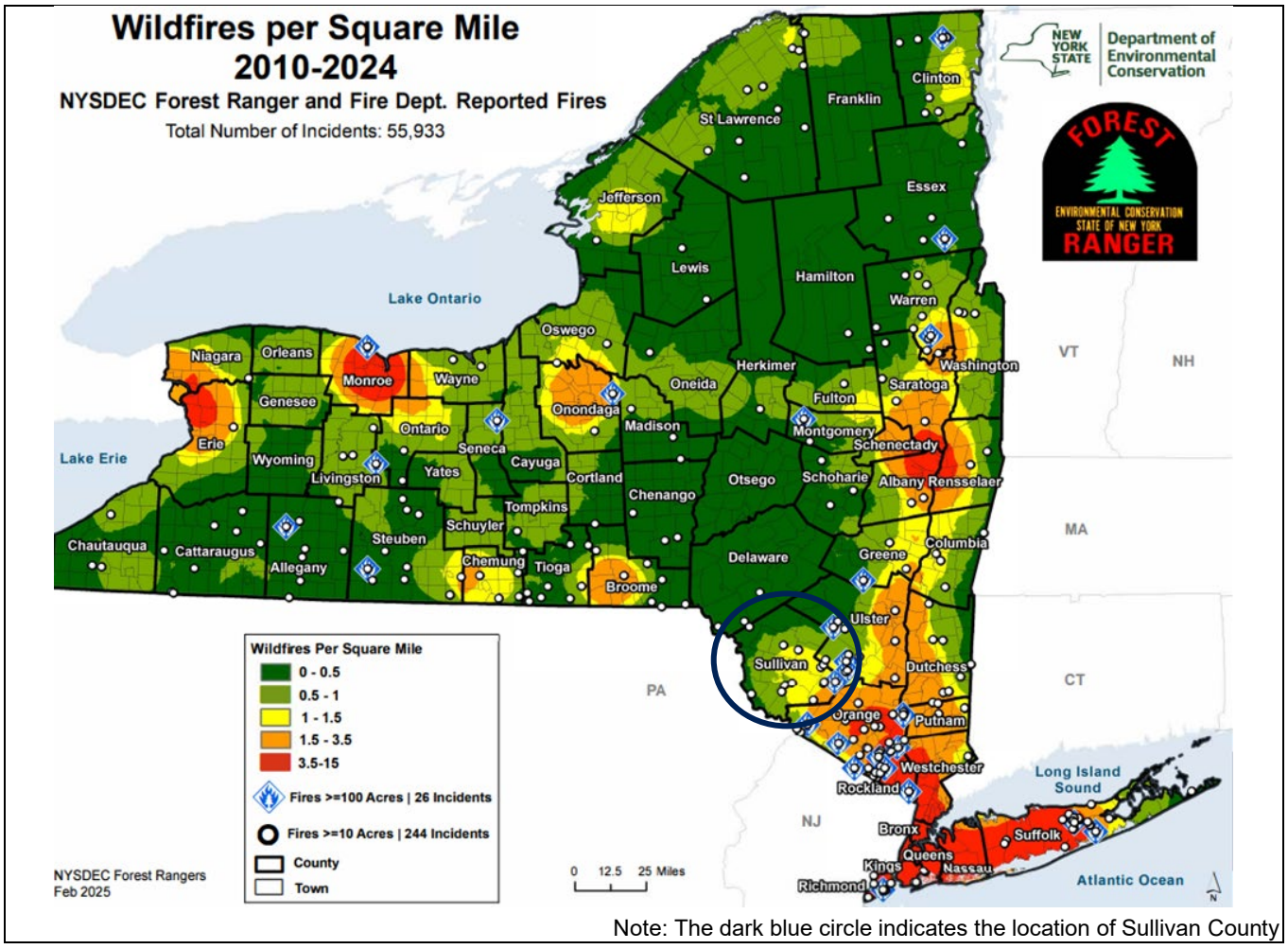
Known hazard events that impacted Sullivan County between January 2020 and July 2025 are listed in Table 14-3. For events prior to 2020, refer to the 2021 Sullivan County HMP. Figure 14-3 shows the distribution of wildfires per square mile across New York State from 2010 to 2024. The New York State Hazard Mitigation Plan identifies wildfire as a recurring hazard, especially in rural and forested regions.

Table 14-3. Wildfire Events in Sullivan County (2020 to 2025)

Event Date	Location Impacted	Description
March 9, 2020	Liberty	NYS-2020-0013 Castle Hill Road Fire
March 27, 2020	Lumberland Highland	NYS-2020-0025 Mapes Rd Fire NYS-2020-0024 Barryville-Yulan Rd Fire
April 2, 2020	Lumberland	NYS-2020-0027 Shortell Road Fire
May 21-22, 2020	Liberty	NYS-2020-0059 Elk Point Fire
June 21, 2020	Fallsburg	NYS-2020-0094 Illing Dr Fire
July 6-8, 2020	Forestburgh	NYS-2020-0118 Baer Rd Fire
November 8-9, 2020	Highland	NYS-2020-0201 Cork Screw Rd Fire
March 9-10, 2021	Mamakating	NYS-2021-0001 Ferguson Road Fire
April 5-6, 2021	Mamakating	NYS-2021-0050 Pine Kill Rd Fire
April 7, 2021	Lumberland	NYS-2021-0061 Black Forest Rd Fire
April 24-25, 2021	Mamakating	NYS-2021-0090 South Road Fire
May 20-21, 2021	Highland	NYS-2021-0129 Clark Road Fire
May 21, 2021	Callicoon	NYS-2021-0131 Buck Brook Road Fire
May 9-10, 2022	Liberty	NYS-2022-0072 Tamzan/Budnick Rd Fire
July 23-27, 2022	Mamakating	NYS-2022-0123 Village Green Fire
August 19-24, 2022	Fallsburg	NYS-2022-0146 Silver Lake Fire
August 27-September 9, 2022	Mamakating	NYS-2022-0159 Wurtsboro
February 13-14, 2023	Callicoon	NYS-2023-0002 Gulf Rd Fire
February 15, 2023	Callicoon	NYS-2023-0005 Bayer Rd Fire
April 13-15, 2023	Thompson	NYS-2023-0052 Southwoods Fire
April 14-17, 2023	Fremont	NYS-2023-0072 Specht Road Fire
May 16-18, 2023	Neversink	NYS-2023-0118 Van Valkenburg Fire
May 17-18, 2023	Neversink	NYS-2023-0121 Rocky Hill Fire
May 18-20, 2023	Forestburgh	NYS-2023-0129 Plank Rd Fire
March 12, 2024	Bethel	NYS-2024-0019 Burr Rd Fire
May 2-4, 2024	Fallsburg	NYS-2024-0077 Spring Glen Fire
October 28-November 1, 2024	Mamakating	NYS-2024-0149 Haven Fire
October 28- November 7, 2024	Highland	NYS-2024-0147 Route 55 Brook Road Fire
November 1-6, 2024	Neversink	NYS-2024-0160 Rocky Hill Fire
November 8-14, 2024	Neversink	NYS-2024-0172 Glade Hill Fire

Source: (GSA 2025)

Figure 14-3. Wildfires per Square Mile in the State of New York, 2010-2024



Note: The dark blue circle indicates the location of Sullivan County

Source: (NYSDEC 2025c)

14.1.5 Probability of Future Occurrences

Information on previous wildfire occurrences in the County was used to calculate the probability of future occurrence of such events, as summarized in Table 14-4. Based on historical records and input from the Steering Committee, the probability of occurrence for severe storms in the County is considered "likely."

Table 14-4. Probability of Future Wildfire Events in Sullivan County

Hazard Type	Number of Occurrences Between 2008 and 2024	Percent Chance of Occurring in Any Given Year
Wildfire	103	100%

Source: (GSA 2025)

Note: The time period presented in this table is the most complete period of record for the various data sources reviewed.; 100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

It is likely that the State of New York will experience small wildfires throughout the state on a yearly basis (as the state has regularly experienced in the past). However, advanced methods of wildfire management and control and a better understanding of the fire ecosystems should help in reducing the number of devastating fires in the future.

Several factors impact the potential for a fire to occur, and some conditions (for example, ongoing land use development patterns, location, fuel sources, and construction sites) exert increasing pressure on the WUI zone. Based on available data, wildfires will continue to present a risk to Sullivan County. Given the numerous factors that can impact urban fire and wildfire potential, the likelihood of a fire event starting and sustaining itself should be gauged by professional fire managers on a continuous basis.

14.1.6 Cascading Impacts Associated with the Hazard

Cascading impacts of wildfires are secondary and tertiary effects that result from the primary wildfire event. While wildfires in New York State are relatively less frequent and severe compared to Western states, their impacts can still be significant, particularly due to increasing climate variability and the presence of WUI zones. Here are some potential cascading impacts of wildfires in New York State:

- Environmental Impacts
  - **Air Quality Degradation**—Wildfire smoke releases fine particulate matter (PM2.5) and harmful gases (e.g., carbon monoxide, nitrogen oxides), leading to poor air quality across large areas.
  - **Soil Degradation and Erosion**—High-intensity fires can destroy vegetation and organic matter, reducing soil stability and leading to erosion, sedimentation in waterways, and loss of soil fertility.
  - **Water Quality Decline**—Ash and debris from burned areas can wash into streams and rivers, increasing turbidity and contaminating water supplies with chemicals and heavy metals.
- Community Service and Public Health Impacts
  - **Utility Disruptions**—Wildfires can damage power lines, transformers, and other critical infrastructure, leading to outages and repair costs.
  - **Agricultural Losses**—Crops, livestock, and farmland can be destroyed, disrupting the local food supply and economy.
  - **Tourism Decline**—Popular natural and recreational areas, such as the Adirondacks, may become inaccessible or less attractive to visitors post-fire.
  - **Evacuations and Displacement**—Communities in affected areas may face temporary or prolonged displacement, creating challenges for housing and social services.
  - **Loss of Cultural Resources**—Wildfires can destroy historic sites, cultural landmarks, and sacred spaces.
  - **Strain on Emergency Services**—Increased demands on firefighters, EMS, and public health services during and after a wildfire event.
  - **Respiratory Issues**—Exposure to smoke can exacerbate respiratory diseases such as asthma, bronchitis, and COPD.
  - **Wildfire Smoke**—Wildfire smoke is generated by both planned beneficial wildfire and unplanned hazardous wildfire. Planned burns can be carried out in a way that mitigates adverse health impacts, such as by planning for days with specific weather patterns and by notifying the public in advance.
  - **Heat Stress**—Combined with extreme heat events, wildfires can increase risks of heat-related illnesses.

- **Mental Health Strain**—Anxiety, depression, and PTSD can arise from evacuation, property loss, and environmental devastation.

- Secondary Natural Hazards
  - **Flooding**—Loss of vegetation increases runoff and reduces soil absorption, heightening flood risks, especially in areas with heavy rainfall following a fire.
  - **Landslides**—Burned hillsides may become unstable, especially in the Catskill and Adirondack mountain regions.
  - **Invasive Species Proliferation**—Disturbed ecosystems are more susceptible to colonization by invasive plant and animal species.
  - **Carbon Emissions**—Wildfires release significant amounts of greenhouse gases, contributing to an increased likelihood of future extreme weather events.
  - **Altered Ecosystems**—Changes in vegetation and habitat can reduce biodiversity and affect ecosystem services.

14.2 VULNERABILITY AND IMPACT ASSESSMENT

For the wildfire risk assessment, WUI interface and intermix areas were analyzed as hazard areas, using methodologies described in Chapter 4.

14.2.1 Life, Health, and Safety

Overall Population

Table 14-5 summarizes the population exposed to the wildfire hazard by municipality. Based on the analysis, an estimated 23,530 residents, or 29.7 percent of the County's population, are in the WUI interface hazard area. The Village of Monticello has the greatest number of individuals living in the WUI interface hazard area (5,565 persons). An estimated 47,543 residents, or 60.1 percent of the County's population, are in the WUI intermix hazard area. The Town of Fallsburg has the greatest number of individuals living in the WUI intermix hazard area (8,960 persons).

Vulnerable populations include emergency responders, who are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. Wildfire smoke contains particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, nitrogen oxides), and toxics (formaldehyde, benzene), depending on the type of fuel, the moisture content of the fuel, the efficiency of combustion, and the weather. Public health impacts associated with smoke include difficulty in breathing, odor, and reduction in visibility.

The duration of smoke impacts is affected by the size and duration of the fires that create the smoke and the duration of the weather pattern that transports it across the state. Major fires outside New York that create enough smoke to reach the state tend to have durations of weeks or longer.

At-Risk Populations

Smoke from wildfires can be a severe health hazard for sensitive populations, including children, the elderly, and those with respiratory and cardiovascular diseases. Economically disadvantaged populations are more at risk because they may lack the financial resources to evacuate. The population over age 65 is at risk because they are more likely to need medical attention that may not be available due to isolation during a wildfire event, and they may have more difficulty evacuating.

Table 14-5. Population in the WUI Interface and Intermix Hazard Areas

Jurisdiction	Total Population	Population in the WUI Interface Hazard Area		Population in the WUI Intermix Hazard Area	
		Number of Persons	% of Jurisdiction Total	Number of Persons	% of Jurisdiction Total
Ateres (V)	834	235	28.2%	344	41.2%
Bethel (T)	3,997	922	23.1%	2,645	66.2%
Bloomingburg (V)	1,022	603	59.0%	410	40.1%
Callicoon (T)	2,594	291	11.2%	2,032	78.3%
Cochecton (T)	1,392	177	12.7%	872	62.6%
Delaware (T)	2,301	417	18.1%	1,347	58.5%
Fallsburg (T)	13,292	2,915	21.9%	8,960	67.4%
Forestburgh (T)	829	14	1.7%	524	63.2%
Fremont (T)	1,204	120	10.0%	704	58.5%
Highland (T)	2,007	113	5.6%	1,658	82.6%
Jeffersonville (V)	417	208	49.9%	208	49.9%
Liberty (T)	5,196	674	13.0%	3,975	76.5%
Liberty (V)	5,083	4,254	83.7%	819	16.1%
Lumberland (T)	2,276	197	8.7%	1,767	77.6%
Mamakating (T)	10,456	2,301	22.0%	7,253	69.4%
Monticello (V)	7,252	5,565	76.7%	1,496	20.6%
Neversink (T)	3,381	212	6.3%	2,772	82.0%
Rockland (T)	3,323	739	22.2%	2,035	61.2%
Thompson (T)	8,628	2,096	24.3%	5,995	69.5%
Tusten (T)	1,528	198	13.0%	935	61.2%
Woodridge (V)	954	459	48.1%	432	45.3%
Wurtsboro (V)	1,181	820	69.4%	360	30.5%
Sullivan County (Total)	**79,147**	**23,530**	**29.7%**	**47,543**	**60.1%**

Source: U.S. Census Bureau, American Community Survey 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; USFS 2023; University of Wisconsin-Madison 2023, MRLC Consortium 2021, U.S. Census Bureau 2020

Table 14-6 presents the estimated at-risk populations living in the WUI interface hazard area. This includes 3,979 persons over the age of 65, 1,656 persons under the age of 5, 1,296 non-English speakers, 3,699 persons with a disability, and 4,402 living in poverty.

Table 14-7 presents the estimated at-risk populations living in the WUI intermix hazard area. This includes 9,415 persons over the age of 65, 2,599 persons under the age of 5, 1,719 non-English speakers, 7,512 persons with a disability, and 6,176 living in poverty.

Table 14-6. At-Risk Persons in the WUI Interface Hazard Area

Jurisdiction	At-Risk Persons Living in the WUI Interface Hazard Area									
	Population Over 65		Population Under 5		Non-English-Speaking Population		Population with Disability		Population Below Poverty Level	
	Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total
Ateres (V)	-	-	-	-	-	-	-	-	-	-
Bethel (T)	254	23.0%	33	22.4%	46	23.0%	146	23.1%	139	23.0%
Bloomingburg (V)	34	57.6%	170	59.0%	118	59.0%	49	59.0%	351	58.9%
Callicoon (T)	63	11.1%	8	11.1%	1	6.7%	44	11.0%	15	10.6%
Cochecton (T)	51	12.6%	11	12.1%	1	10.1%	24	12.5%	14	12.0%
Delaware (T)	97	18.1%	11	17.5%	1	13.5%	53	17.9%	44	17.8%
Fallsburg (T)	436	21.9%	133	21.9%	125	21.8%	397	21.9%	550	21.9%
Forestburgh (T)	4	1.5%	0	0.0%	0	0.0%	1	0.9%	0	0.0%
Fremont (T)	32	9.8%	5	8.9%	0	0.0%	22	9.7%	8	9.4%
Highland (T)	33	5.6%	1	3.8%	0	0.0%	32	5.7%	9	5.2%
Jeffersonville (V)	40	50.0%	4	44.4%	0	0.0%	42	49.4%	44	50.0%
Liberty (T)	112	13.0%	58	12.8%	25	12.5%	123	12.9%	54	13.0%
Liberty (V)	576	83.6%	441	83.5%	262	83.5%	809	83.7%	736	83.6%
Lumberland (T)	26	8.4%	11	8.6%	2	6.2%	14	8.1%	20	8.7%
Mamakating (T)	337	22.0%	184	21.9%	47	21.6%	328	22.0%	197	21.9%
Monticello (V)	747	76.7%	381	76.7%	509	76.6%	844	76.7%	1,602	76.7%
Neversink (T)	42	6.2%	6	5.7%	21	6.2%	41	6.2%	14	6.0%
Rockland (T)	203	22.2%	24	21.4%	29	21.7%	145	22.1%	119	22.2%
Thompson (T)	595	24.3%	116	24.1%	70	24.2%	362	24.3%	296	24.2%
Tusten (T)	38	13.0%	4	12.9%	0	0.0%	30	13.0%	17	12.7%
Woodridge (V)	79	47.9%	26	47.3%	17	45.9%	91	47.9%	87	47.8%
Wurtsboro (V)	180	69.2%	29	69.0%	22	68.5%	102	68.9%	86	68.8%
Sullivan County (Total)	**3,979**	**26.4%**	**1,656**	**35.6%**	**1,296**	**39.7%**	**3,699**	**29.7%**	**4,402**	**38.1%**

Source: U.S. Census Bureau American Community Survey 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; USFS 2023; University of Wisconsin-Madison 2023, MRLC Consortium 2021, U.S. Census Bureau 2020

Table 14-7. At-Risk Persons in the WUI Intermix Hazard Area

Jurisdiction	At-Risk Persons Living in the WUI Intermix Hazard Area									
	Population Over 65		Population Under 5		Non-English-Speaking Population		Population with Disability		Population Below Poverty Level	
	Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total
Ateres (V)	-	-	-	-	-	-	-	-	-	-
Bethel (T)	731	66.2%	97	66.0%	132	66.0%	418	66.0%	399	66.1%
Bloomingburg (V)	23	39.0%	115	39.9%	80	40.0%	33	39.8%	239	40.1%
Callicoon (T)	443	78.3%	56	77.8%	11	74.2%	313	78.3%	111	78.2%
Cochecton (T)	253	62.5%	57	62.6%	6	60.7%	120	62.5%	73	62.4%
Delaware (T)	314	58.5%	36	57.1%	4	54.0%	173	58.4%	144	58.3%
Fallsburg (T)	1,340	67.4%	409	67.3%	386	67.4%	1,221	67.4%	1,692	67.4%
Forestburgh (T)	170	63.0%	15	62.5%	3	60.7%	67	63.2%	24	61.5%
Fremont (T)	191	58.4%	32	57.1%	0	0.0%	132	58.4%	49	57.6%
Highland (T)	486	82.5%	21	80.8%	0	0.0%	466	82.5%	142	82.1%
Jeffersonville (V)	40	50.0%	4	44.4%	0	0.0%	42	49.4%	44	50.0%
Liberty (T)	660	76.5%	347	76.4%	153	76.5%	726	76.4%	318	76.4%
Liberty (V)	111	16.1%	85	16.1%	50	15.9%	155	16.0%	141	16.0%
Lumberland (T)	240	77.4%	99	77.3%	24	74.7%	134	77.5%	179	77.5%
Mamakating (T)	1,062	69.3%	582	69.4%	150	69.0%	1,035	69.3%	622	69.3%
Monticello (V)	200	20.5%	102	20.5%	137	20.6%	226	20.5%	430	20.6%
Neversink (T)	557	81.9%	86	81.9%	277	81.9%	542	81.9%	192	81.7%
Rockland (T)	559	61.2%	68	60.7%	81	60.7%	401	61.2%	327	61.1%
Thompson (T)	1,703	69.5%	334	69.4%	200	69.2%	1,036	69.4%	848	69.5%
Tusten (T)	179	61.1%	18	58.1%	0	0.0%	141	61.0%	82	61.2%
Woodridge (V)	74	44.8%	24	43.6%	16	43.2%	86	45.3%	82	45.1%
Wurtsboro (V)	79	30.4%	12	28.6%	9	28.0%	45	30.4%	38	30.4%
Sullivan County (Total)	**9,415**	**62.5%**	**2,599**	**55.8%**	**1,719**	**52.6%**	**7,512**	**60.3%**	**6,176**	**53.5%**

Source: U.S. Census Bureau American Community Survey 2023; Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; USFS 2023; University of Wisconsin-Madison 2023, MRLC Consortium 2021, U.S. Census Bureau 2020

14.2.2 General Building Stock

Table 14-8 shows the estimated number and replacement cost value of buildings in the wildfire hazard areas by jurisdiction. There are an estimated 12,232 buildings in the WUI interface hazard area, representing 23.6 percent of the County's total general building stock replacement cost value. The Town of Fallsburg has the greatest number of its buildings in the WUI interface hazard area (1,807 buildings or 22.3 percent of its total building stock). There are an estimated 33,132 buildings in the WUI intermix hazard area, representing 58.1 percent of the County's total general building stock replacement cost value. The Town of Fallsburg has the greatest number of its buildings in the WUI intermix hazard area (5,426 buildings or 66.9 percent of its total building stock). Table 14-9 and Table 14-10 summarize the buildings in the WUI interface and WUI intermix hazard areas by occupancy class.

Buildings with wood or vinyl siding are generally more likely to be impacted by fire than brick or concrete buildings.

14.2.3 Community Lifelines and Other Critical Facilities

Table 14-11 and Table 14-12 summarize the number of community lifelines exposed to the wildfire hazard. Of the 213 community lifelines in the WUI interface hazard area, the greatest number are in the safety and security lifeline category (71). Of the 517 community lifelines in the WUI intermix hazard area, the greatest number are in the safety and security lifeline category (208).

Wildfires can impact water supplies throughout the County because of residual pollutants like char or debris landing in water resources, which can clog wastewater pipes, culverts, etc. Wildfires may also impact transportation routes, blocking residents and commuters from getting in and out of the County during a wildfire event because of char and debris polluting the air making it difficult to drive, or flames near the roadways making the route unsafe. In general, roads and bridges surrounding the areas of fire risk are important because they provide ingress and egress to large areas and, in some cases, to isolated neighborhoods. Fires can create conditions that block or prevent access and can isolate residents and emergency service providers.

If a wildfire reached the following critical facilities, their vulnerability could complicate response and recovery efforts during and following an event:

- **Hazardous Materials and Fuel Storage**—During a wildfire event, these materials could rupture due to excessive heat and act as fuel for the fire, causing rapid spreading and escalating the fire to unmanageable levels. In addition, they could leak into surrounding areas, saturating soils, and seeping into surface waters, and have a disastrous effect on the environment.
- **Communication Facilities**—If these facilities are damaged and become inoperable, it would exacerbate already difficult communication in the planning area.
- **Fire Stations**—If fire stations were compromised during a wildfire event, it would make fire suppression and support services even more challenging.

14.2.4 Economy

Wildfire events can have major economic impacts on a community from the initial loss of structures and the subsequent loss of revenue from destroyed businesses and decreases in tourism. Wildfires can cost thousands of taxpayer dollars to suppress and control and can involve hundreds of operating hours on fire apparatus and thousands of volunteer man hours from the volunteer firefighters. There are also costs to local businesses that provide employees with time off to volunteer to fight these fires.

Table 14-8. Buildings in the WUI Interface and Intermix Hazard Areas

Jurisdiction	Jurisdiction Total Buildings		Buildings in the WUI Interface Hazard Area				Buildings in the WUI Intermix Hazard Area			
			Number of Buildings		Replacement Cost Value		Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Ateres (V)	99	$104,501,618	30	30.3%	$28,059,784	26.9%	39	39.4%	$43,670,168	41.8%
Bethel (T)	4,671	$3,993,363,362	975	20.9%	$511,285,600	12.8%	3,113	66.6%	$2,714,648,804	68.0%
Bloomingburg (V)	172	$223,874,493	104	60.5%	$136,432,847	60.9%	66	38.4%	$81,481,491	36.4%
Callicoon (T)	1,942	$1,579,365,779	246	12.7%	$227,062,306	14.4%	1,497	77.1%	$1,208,049,542	76.5%
Cochecton (T)	1,189	$1,051,465,789	155	13.0%	$121,389,348	11.5%	749	63.0%	$727,289,824	69.2%
Delaware (T)	1,663	$1,867,149,344	328	19.7%	$451,351,289	24.2%	950	57.1%	$975,842,801	52.3%
Fallsburg (T)	8,114	$8,608,748,500	1,807	22.3%	$1,455,133,959	16.9%	5,426	66.9%	$4,724,597,749	54.9%
Forestburgh (T)	680	$627,023,982	12	1.8%	$7,078,650	1.1%	412	60.6%	$271,989,807	43.4%
Fremont (T)	1,322	$1,156,125,779	135	10.2%	$109,879,210	9.5%	755	57.1%	$714,110,966	61.8%
Highland (T)	1,853	$1,449,898,732	141	7.6%	$186,559,888	12.9%	1,471	79.4%	$1,004,603,714	69.3%
Jeffersonville (V)	201	$275,534,732	117	58.2%	$209,082,697	75.9%	84	41.8%	$66,452,036	24.1%
Liberty (T)	4,041	$3,988,125,428	539	13.3%	$563,974,212	14.1%	3,012	74.5%	$2,788,030,186	69.9%
Liberty (V)	1,540	$2,185,506,732	1,266	82.2%	$1,568,822,923	71.8%	245	15.9%	$416,056,666	19.0%
Lumberland (T)	1,796	$1,429,481,922	146	8.1%	$69,250,697	4.8%	1,400	78.0%	$1,114,929,664	78.0%
Mamakating (T)	5,508	$3,516,266,251	1,177	21.4%	$710,538,550	20.2%	3,810	69.2%	$2,302,286,045	65.5%
Monticello (V)	2,164	$2,972,791,748	1,679	77.6%	$2,143,425,798	72.1%	419	19.4%	$648,503,755	21.8%
Neversink (T)	2,292	$1,693,278,156	148	6.5%	$237,985,701	14.1%	1,819	79.4%	$1,145,182,521	67.6%
Rockland (T)	2,659	$2,106,441,850	621	23.4%	$548,838,112	26.1%	1,516	57.0%	$1,071,255,909	50.9%
Thompson (T)	7,526	$7,018,047,712	1,744	23.2%	$1,222,560,741	17.4%	5,229	69.5%	$4,911,463,028	70.0%
Tusten (T)	1,254	$908,701,677	200	15.9%	$222,902,273	24.5%	704	56.1%	$435,163,614	47.9%
Woodridge (V)	601	$624,670,518	297	49.4%	$263,498,609	42.2%	264	43.9%	$302,064,267	48.4%
Wurtsboro (V)	517	$414,341,458	365	70.6%	$299,032,522	72.2%	152	29.4%	$115,308,936	27.8%
Sullivan County (Total)	**51,804**	**$47,794,705,561**	**12,232**	**23.6%**	**$11,294,145,714**	**23.6%**	**33,132**	**64.0%**	**$27,782,981,492**	**58.1%**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; RSMeans 2024; USFS 2023; University of Wisconsin-Madison 2023, MRLC Consortium 2021, U.S. Census Bureau 2020

Table 14-9. Buildings in the WUI Interface Hazard Area, by General Occupancy Class

Jurisdiction	Buildings in the WUI Interface Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Other
Ateres (V)	26	3	1	0
Bethel (T)	923	29	2	21
Bloomingburg (V)	75	20	0	9
Callicoon (T)	198	25	2	21
Cochecton (T)	140	6	0	9
Delaware (T)	252	64	1	11
Fallsburg (T)	1,667	114	16	10
Forestburgh (T)	11	1	0	0
Fremont (T)	119	8	3	5
Highland (T)	96	35	0	10
Jeffersonville (V)	76	35	0	6
Liberty (T)	436	47	9	47
Liberty (V)	1,017	182	11	56
Lumberland (T)	135	5	0	6
Mamakating (T)	1,142	28	0	7
Monticello (V)	1,402	228	6	43
Neversink (T)	122	18	3	5
Rockland (T)	507	88	7	19
Thompson (T)	1,673	49	6	16
Tusten (T)	141	41	6	12
Woodridge (V)	260	30	1	6
Wurtsboro (V)	301	48	3	13
Sullivan County (Total)	**10,719**	**1,104**	**77**	**332**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; USFS 2023; University of Wisconsin-Madison 2023, MRLC Consortium 2021, U.S. Census Bureau 2020

Note: Other = Government, Religion, Agricultural, and Education

Table 14-10. Buildings in the WUI Intermix Hazard Area, by General Occupancy Class

Jurisdiction	Buildings in the WUI Intermix Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Other
Ateres (V)	38	1	0	0
Bethel (T)	2,648	202	16	247
Bloomingburg (V)	51	11	4	0
Callicoon (T)	1,380	48	0	69
Cochecton (T)	687	44	2	16
Delaware (T)	813	67	10	60
Fallsburg (T)	5,124	201	45	56
Forestburgh (T)	390	17	2	3
Fremont (T)	695	32	3	25
Highland (T)	1,400	58	1	12
Jeffersonville (V)	76	4	0	4
Liberty (T)	2,569	255	9	179
Liberty (V)	196	23	11	15
Lumberland (T)	1,210	175	0	15
Mamakating (T)	3,599	165	11	35
Monticello (V)	377	31	8	3
Neversink (T)	1,591	186	5	37
Rockland (T)	1,396	86	12	22
Thompson (T)	4,785	323	43	78
Tusten (T)	664	19	12	9
Woodridge (V)	245	13	5	1
Wurtsboro (V)	132	15	2	3
Sullivan County (Total)	**30,066**	**1,976**	**201**	**889**

Source: Sullivan County 2024; Sullivan County Real Property 2025; USACE NSI 2022; USFS 2023; University of Wisconsin-Madison 2023, MRLC Consortium 2021, U.S. Census Bureau 2020

Note: Other = Government, Religion, Agricultural, and Education

Table 14-11. Critical Facilities in the WUI Interface Hazard Area, by Lifeline Category

Jurisdiction	Number of Facilities in the WUI Interface Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Ateres (V)	0	0	0	0	0	2	0	1	0	3	60.0%
Bethel (T)	0	0	0	0	0	3	0	0	0	3	4.9%
Bloomingburg (V)	0	0	1	0	1	3	1	0	1	7	87.5%
Callicoon (T)	0	0	0	0	0	2	4	0	1	7	19.4%
Cochecton (T)	0	0	0	0	1	3	1	0	1	6	27.3%
Delaware (T)	0	0	0	0	0	7	4	0	2	13	28.9%
Fallsburg (T)	0	0	0	0	2	4	4	0	5	15	18.1%
Forestburgh (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Fremont (T)	0	0	0	0	0	1	4	0	0	5	11.6%
Highland (T)	0	0	0	0	1	3	4	0	2	10	18.5%
Jeffersonville (V)	1	0	2	0	0	4	2	0	1	10	62.5%
Liberty (T)	0	0	5	0	0	0	9	0	0	14	11.3%
Liberty (V)	1	0	9	0	2	8	2	0	4	26	78.8%
Lumberland (T)	0	0	0	0	0	2	1	0	0	3	7.5%
Mamakating (T)	0	0	0	0	0	1	2	0	2	5	6.5%
Monticello (V)	0	0	13	0	1	10	1	0	7	32	72.7%
Neversink (T)	0	0	0	0	0	3	1	0	1	5	7.2%
Rockland (T)	1	0	2	0	1	4	11	0	2	21	20.6%
Thompson (T)	0	0	0	0	0	5	2	0	2	9	7.2%
Tusten (T)	0	0	2	0	0	3	2	0	2	9	16.7%
Woodridge (V)	0	0	0	0	0	2	0	0	1	3	60.0%
Wurtsboro (V)	0	0	2	0	1	1	2	0	1	7	70.0%
Sullivan County (Total)	**3**	**0**	**36**	**0**	**10**	**71**	**57**	**1**	**35**	**213**	**19.4%**

Source: Sullivan County 2025; AVAIL 2023; NYS GIS Clearinghouse 2023, 2025; Tetra Tech 2025; USFS 2023; University of Wisconsin-Madison 2023, MRLC Consortium 2021, U.S. Census Bureau 2020

Table 14-12. Critical Facilities in the WUI Intermix Hazard Area, by Lifeline Category

Jurisdiction	Number of Facilities in the WUI Intermix Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Ateres (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Bethel (T)	2	0	2	0	0	16	8	0	9	37	60.7%
Bloomingburg (V)	0	0	0	0	0	0	1	1	0	2	25.0%
Callicoon (T)	1	0	0	0	1	8	15	0	2	27	75.0%
Cochecton (T)	1	0	0	0	0	4	0	0	0	5	22.7%
Delaware (T)	1	0	1	0	0	3	11	0	2	18	40.0%
Fallsburg (T)	2	0	2	0	3	22	21	1	4	55	66.3%
Forestburgh (T)	0	0	0	0	0	6	7	0	0	13	30.2%
Fremont (T)	0	0	1	0	0	11	8	0	1	21	48.8%
Highland (T)	1	0	1	0	0	13	8	0	1	24	44.4%
Jeffersonville (V)	0	0	0	0	0	3	1	0	1	5	31.3%
Liberty (T)	2	1	3	0	0	23	26	0	9	64	51.6%
Liberty (V)	0	0	0	0	0	2	0	0	2	4	12.1%
Lumberland (T)	0	0	0	0	1	15	3	0	2	21	52.5%
Mamakating (T)	0	0	1	0	0	21	24	0	3	49	63.6%
Monticello (V)	2	0	0	0	0	5	2	0	0	9	20.5%
Neversink (T)	3	0	2	0	1	6	21	1	3	37	53.6%
Rockland (T)	0	0	0	0	1	10	26	0	3	40	39.2%
Thompson (T)	4	0	3	0	2	28	18	1	10	66	52.8%
Tusten (T)	1	0	0	0	1	8	5	0	0	15	27.8%
Woodridge (V)	0	0	0	0	0	2	0	0	0	2	40.0%
Wurtsboro (V)	0	0	0	0	0	2	0	1	0	3	30.0%
Sullivan County (Total)	**20**	**1**	**16**	**0**	**10**	**208**	**205**	**5**	**52**	**517**	**47.0%**

Source: Sullivan County 2025; AVAIL 2023; NYS GIS Clearinghouse 2023, 2025; Tetra Tech 2025; USFS 2023; University of Wisconsin-Madison 2023, MRLC Consortium 2021, U.S. Census Bureau 2020

14.2.5 Natural Resources

Wildfires are a necessary part of ecosystem health, but intense wildfires severely damage the environment, including burning and killing of plant and animal life. Intense fires can also heat narrow and shallow waterways, resulting in damage to aquatic systems.

The age and density of infrastructure in Sullivan County can exacerbate the consequences of fires on the environment because of the increased amount of chemicals and contaminants that would be released from burning infrastructure. Chemicals such as iron, lead, and zinc may leach into the stormwater, contaminate nearby streams, and impair aquatic life. Post-fire runoff polluted with debris and contaminants can be extremely harmful to terrestrial ecosystems and aquatic life (USGS 2023c).

Intense wildfire events that destroy existing ecosystems can result in an increase in invasive species that may be able to move into an area with a lack of natural competitors (U.S. Department of the Interior 2012).

14.2.6 Historic and Cultural Resources

Historic and cultural documents and physical artifacts that must be stored in a climate-controlled facility are at risk from wildfires. Additionally, the factors that can spur a wildfire, such as severe storms and high winds, can impact the structural integrity of historically or culturally significant buildings. Many historically or culturally significant structures are made of weakened materials and not up to current building codes, which increases the risk of incurring damage.

14.3 FUTURE CHANGES THAT MAY AFFECT RISK

14.3.1 Potential or Planned Development

Any changes in development can impact the County's risk to the wildfire hazard, especially new development in WUI areas. Pressure to develop some forested areas and open land adjacent to forested areas, especially for residential use, will generally result in increases to the WUI and the value of improved property within these areas in most jurisdictions, and hence an increased risk of future property damage and public danger due to wildfires.

The County should implement wildfire management strategies in existing building code to protect structures against the residual impacts from wildfire such as heat, debris, and char. Furthermore, development should be built with access to transit routes that will enable easier evacuation during a wildfire event.

14.3.2 Projected Changes in Population

Cornell University's Program on Applied Demographics projects Sullivan County will increase in population to 79,082 by 2030 but decrease to 77,165 by 2040 (Cornell University 2018). Changes in the density of the population can impact the number of persons exposed to wildfires and the draw upon water resources. Fire suppression capabilities are high at the state and local levels. However, new development and changes in population with a mix of additional structures, ornamental vegetation, and wildland fuels will require continued assessment of the hazard and mitigation risk.

14.3.3 Future Conditions

Future conditions associated with warmer temperatures, changes in rainfall, and increased periods of drought may create an atmospheric and fuel environment that is more conducive to large, severe fires (United Nations 2021). In New York, future models project (NOAA n.d.-e):

- Warmer average temperatures, especially in spring and summer
- More frequent and intense heatwaves
- Earlier snowmelt and longer dry periods
- Increased variability in precipitation, including both droughts and heavy rainfall events

These changes may lead to a longer and earlier wildfire season, particularly in areas with dense vegetation and limited moisture retention. Future conditions indicate the likelihood of an increased number of droughts, prolonged fire seasons, and extreme heat, which can exacerbate wildfire risks and cascading impacts. When fuel loads and fuel moisture become altered, forest susceptibility to wildfires changes. An increase in winds may assist in the rapid spread fires, making them harder to contain and more likely to expand into residential areas. Changes in conditions may impact the distribution and perseverance of insect outbreaks that create dead trees (increase fuel).

Some studies project that the Northeast's fire season may start earlier and last longer due to warming temperatures. The risk of air quality impacts from wildfire smoke from local and regional wildfire events will increase if the fire season starts earlier and lasts longer (Stevens & Lamie 2024). Additionally, warmer winters may reduce snowpack and allow for earlier vegetation growth, which can dry out and become fuel for spring wildfires.

While New York is not expected to experience the same scale of wildfire activity as western states, the frequency and intensity of wildfires are projected to increase modestly (NOAA n.d.-e). Proactive mitigation strategies, such as forest thinning, controlled burns, and public education, are critical to reducing these risks. The spring burn ban (March 16 to May 14) enforced by the New York State Department of Environmental Conservation is likely to remain a critical tool in managing risk.

15. HAZARD RANKING

Hazard rankings have been used as one of the bases for identifying the jurisdictional hazard mitigation strategies included in Volume II. These rankings may vary among the jurisdictions. For example, a hazard may be ranked low in one municipality but, due to differences in vulnerability and impact, be ranked as high for the County or another municipality. Jurisdictional ranking results are presented in each jurisdictional annex in Volume II.

15.1 HAZARD RANKING METHODOLOGY

Each jurisdiction participating in this HMP has differing levels of vulnerability to and potential impacts from each of the hazards assessed in this plan. Each jurisdiction needs to recognize the hazards that pose the greatest risk to its community and direct its attention and resources accordingly to manage risk and reduce losses. To achieve this, the hazards of concern were ranked using methodologies promoted by FEMA's hazard mitigation planning guidance and input from all Planning Partners.

15.1.1 Categories Used in Ranking

A relative hazard risk ranking process was conducted for the County. The Risk Factor (RF) approach produces numerical values that allow identified hazards to be ranked against one another (the higher the RF value, the greater the hazard risk). The ranking methodology is based on five risk assessment categories (probability of occurrence, impact, spatial extent, warning time, and duration), with the following scoring parameters defined for each category:

- **Level**—The level is a qualitative description of how each hazard rates in each category (such as low to high, or unlikely to frequent)
- **Criteria**—The criteria are clearly determinable quantities or descriptions that define which level should apply to each hazard
- **Index**—The index is the hazard's score in each category, based on the assigned level
- **Weight Value**—The weighting is a multiplier applied to each hazard's numeric value in each category, to represent the relative importance of the category (the higher the weighting, the more important the category)

Figure 15-1 identifies the risk assessment categories, the criteria and associated risk level indices used to quantify their risk, and the weighting factor (weight value) applied to each category.

Figure 15-1. Summary of Risk Factor Approach

Summary of Risk Factor (RF) Methodology				
Risk Assessment Category	Degree of Risk			Weight Value
	Level	Criteria	Index	
PROBABILITY *What is the likelihood of a hazard event occurring in a given year?*	UNLIKELY	LESS THAN 1% ANNUAL PROBABILITY	1	30%
	POSSIBLE	BETWEEN 1% & 49.9% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 50% & 90% ANNUAL PROBABILITY	3	
	HIGHLY LIKELY	GREATER THAN 90% ANNUAL PROBABILTY	4	
IMPACT *In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?*	MINOR	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	30%
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	2	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE WEEK.	3	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.	4	
SPATIAL EXTENT *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	NEGLIGIBLE	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10.9% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 11 & 25% OF AREA AFFECTED	3	
	LARGE	GREATER THAN 25% OF AREA AFFECTED	4	
WARNING TIME *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	MORE THAN 24 HRS	SELF-DEFINED	1	10%
	12 TO 24 HRS	SELF-DEFINED	2	
	6 TO 12 HRS	SELF-DEFINED	3	
	LESS THAN 6 HRS	SELF-DEFINED	4	
DURATION *How long does the hazard event usually last?*	LESS THAN 6 HRS	SELF-DEFINED	1	10%
	LESS THAN 24 HRS	SELF-DEFINED	2	
	LESS THAN 1 WEEK	SELF-DEFINED	3	
	MORE THAN 1 WEEK	SELF-DEFINED	4	

(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)

15.1.2 Total Ranking Score

To calculate the RF value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the example equation below:

Risk Factor Methodology Equation

RF Value = [(Probability x 0.3) + (Impact x 0.3) + (Spatial Extent x 0.2) + (Warning Time x 0.1) + (Duration x 0.1)]

Hazards identified as high-risk have RFs greater than or equal to 2.5. RFs ranging from 2.0 to 2.4 are considered moderate-risk hazards. Hazards with RFs less than 2.0 are considered low risk hazards. The threat posed to life and property for moderate-risk and high-risk hazards is considered significant enough to warrant the need for hazard-specific mitigation actions.

15.2 HAZARD RANKING RESULTS

Using the methodology described above, the hazard ranking for the identified hazards of concern was determined for the County. Table 15-1 shows the values of five risk assessment categories for each of the County's hazards and each hazard's RF. A risk assessment result for the entire County does not mean that each jurisdiction is at the same amount of risk to each hazard. The finalized hazard ranking for each jurisdiction can be found in the jurisdictional annexes in Volume II.

Mitigation actions were developed for all high-ranked hazards as presented in the jurisdictional annexes. For jurisdictions that do not have two or more high rankings, medium rankings that have associated actions can be considered as hazards of concern. Mitigation actions developed are presented in the jurisdictional annexes in Volume II.

Table 15-1. Preliminary Hazard Ranking for Sullivan County

Hazards	Risk Assessment Category					Risk Factor
	Probability	Impact	Spatial Extent	Warning Time	Duration	
High-Risk Hazards						
Flood	4	2	3	2	2	**2.8**
Severe Winter Storm	4	2	3	1	2	**2.7**
Moderate-Risk Hazards						
Severe Storm	4	1	3	1	2	**2.4**
Drought	3	1	4	1	3	**2.4**
Wildfire	3	2	2	2	2	**2.3**
Pandemic	3	2	2	1	3	**2.3**
Earthquake	2	1	2	4	1	**1.8**
Low-Risk Hazards						
Landslide	2	1	2	3	1	**1.7**
Dam Failure	1	2	2	2	1	**1.6**

PART 3: CAPABILITY ASSESSMENT

16. CAPABILITY ASSESSMENT

A capability assessment is an inventory of a community's missions, programs, and policies and an analysis of its capacity to carry them out (FEMA 2003b). This integral part of the planning process analyzes current governmental programs, policies, regulations, and funding that could either facilitate or hinder mitigation. Through assessing its capabilities, a jurisdiction learns whether it can implement certain mitigation actions by determining the following:

- The range of local and/or state administrative, programmatic, regulatory, financial, and technical resources available to assist in implementing mitigation actions
- Types of mitigation actions that may be technically, legally, administratively, politically, or fiscally challenging or infeasible because they are outside of current capabilities
- Opportunities to enhance local capabilities to support long-term mitigation and risk reduction

This chapter summarizes existing capabilities at all levels of government (federal, state, county, local) for supporting hazard mitigation within the planning area. These capabilities are presented in three categories:

- Planning and regulatory capabilities
- Administrative and technical capabilities
- Fiscal capabilities

Each Planning Partner's annex in Volume II also includes a capability assessment specific to those jurisdictions. In addition to the above categories, the annexes review capabilities in the more localized categories of adaptive capacity and education and outreach. Planning Partners evaluated the effectiveness of their capabilities for supporting hazard mitigation and identified opportunities to enhance those capabilities. Each jurisdiction identified how it has integrated hazard mitigation into its existing planning, regulatory, and operational/administrative framework and how it intends to promote ongoing integration.

16.1 PLANNING AND REGULATORY CAPABILITIES

Planning and regulatory capabilities are based on ordinances, policies, local laws, state statutes, plans, and programs that relate to managing growth and development. Planning and regulatory capabilities refer not only to current plans and regulations, but also to the jurisdiction's ability to change and improve those plans and regulations as needed. This section summarizes planning and regulatory capabilities at the federal, state, and county levels. Further information specific to each Planning Partner is provided in the jurisdictional annexes in Volume II.

16.1.1 Federal

Biggert Waters National Flood Insurance Reform Act of 2012

The Biggert-Waters National Flood Insurance Reform Act of 2012 increased National Flood Insurance Program rates to more accurately reflect the flood risk to buildings in flood hazard areas. It encouraged property owners to consider long-term insurance costs when undertaking reconstruction or elevation of damaged buildings. An investment to reconstruct the lowest floor of a building at a higher elevation could result in significant future flood insurance savings. This Act was modified by the Homeowner's Flood Insurance Affordability Act if 2014 as described in a later section of this chapter.

Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004

The Flood Insurance Reform Act of 2004 established a program for mitigation of severe repetitive loss properties and gave FEMA the authority to fund mitigation activities for individual repetitive loss claims properties. The Act provided additional coverage for compliance with land use and control measures.

Disaster Mitigation Act of 2000

The Disaster Mitigation Act of 2000 (DMA) is the current federal legislation addressing hazard mitigation planning. The DMA emphasizes the need for state, tribal, and local entities to closely coordinate mitigation planning and implementation efforts. It specifically addresses planning at the local level. Communities with approved hazard mitigation plans are eligible to apply for federal funds for mitigation of hazards. HMPs that meet DMA requirements are eligible for FEMA Hazard Mitigation Assistance funds.

Disaster Recovery Reform Act

The Disaster Recovery Reform Act permits the use of technical and financial assistance through the Pre-Disaster Hazard Mitigation Grant Program to implement codes, specifications, and standards that incorporate the latest hazard-resistant designs. The Act called for the creation of a National Public Infrastructure Pre-Disaster Mitigation Fund and authorized the President's contribution to the cost of hazard mitigation measures to be used to increase resilience in any area affected by a major disaster.

Emergency Support Function #14, Long-Term Recovery Planning

FEMA's Emergency Support Function (ESF) #14 (Long-Term Community Recovery) provides a mechanism for coordinating federal support to state, tribal, regional, and local governments, nongovernmental organizations (NGOs), and the private sector to enable community recovery from the long-term consequences of extraordinary disasters. ESF #14 accomplishes this by identifying and facilitating availability and use of sources of recovery funding, and providing technical assistance for community recovery and recovery planning support. ESF #14 may be activated for incidents that require a coordinated federal response to address significant long-term impacts (e.g., impacts on housing, government operations, agriculture, businesses, employment, community infrastructure, the environment, human health, and social services) to foster sustainable recovery. Actions coordinated under ESF #14 include pre-incident planning and coordination, immediately prior to the incident, post-event planning, and operations (FEMA 2008).

Homeowner's Flood Insurance Affordability Act of 2014

The Homeowner's Flood Insurance Affordability Act modified the Biggert-Waters Flood Insurance Reform Act to lower rate increases on some NFIP policies, prevent some future rate increases, and implement a surcharge on all policyholders. The Act authorized resources for the National Academy of Sciences (NAS) to complete an affordability study. It authorized private insurers and other stakeholders to work together to implement its reforms and to work toward helping families maintain affordable flood insurance, ensuring the financial stability of the NFIP, and reducing the risks and consequences of flooding nationwide.

Local Hazard Mitigation Plan Regulations

FEMA has prepared policies and procedures for FEMA's review and approval of local hazard mitigation plans (44 CFR Part 201.6). The rules provide detailed guidance on what communities must include in a plan.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a federal program enabling property owners in participating communities to purchase insurance against flood losses in exchange for state and community floodplain management regulations that reduce future flood damage. Flood 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 floods. Flood damage in the U.S. is reduced by nearly $1 billion each year through communities implementing sound floodplain management requirements and property owners purchasing flood insurance. Additionally, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance (FEMA 2007a).

Community participation in the NFIP is voluntary. Communities participate by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, the NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in these communities. States and municipalities may adopt higher regulatory standards than required by the NFIP, specifically related to the following:

- **Base Flood Elevation (BFE)—**The elevation of surface water due to flooding that has a 1 percent chance of being equaled or exceeded in any given year. The NFIP requires that, when there is a base flood elevation available, the lowest floor, including any basement, must be at or above the base flood elevation. Community floodplain management ordinances are permitted to require even higher lowest-floor elevations.
- **Cumulative Substantial Improvement/Damage—**The NFIP allows improvements valued at up to 50 percent of the building's pre-improvement value to be permitted without meeting flood protection requirements. Over the years, a community may issue a succession of permits for different repairs or improvement to the same structures. This can greatly increase the overall flood damage potential for structures within a community. The community may wish to deem "substantial improvement" cumulatively so that once a threshold of improvement within a certain length of time is reached, the structure is considered to be substantially improved and must meet flood protection requirements.

Additional information on the NFIP program and its implementation throughout Sullivan County may be found in the flood hazard profile (see Section 9.2.2). Municipal compliance with the NFIP is described in the jurisdictional annexes in Volume II. Several municipalities propose actions in their mitigation strategies to update their flood damage prevention ordinance or to ensure that their floodplain administrators complete training on floodplain management and the NFIP. This information is also included in the annexes.

NFIP Community Rating System

FEMA's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. NFIP flood insurance premiums are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance.

As of November 2025, no communities in Sullivan County participate in the CRS program. Sullivan County is exploring CRS program requirements through technical expertise and assistance to guide interested municipalities through the application process.

Presidential Policy Directive 8

Presidential Policy Directive 8 (PPD-8) requires that a threat hazard identification and risk assessment (THIRA) be developed for a state to remain eligible for Homeland Security Grant Program (HSGP) and Emergency Management Program Grant funding.

Risk Mapping, Assessment, and Planning

FEMA works with federal, state, tribal, and local partners across the nation to identify flood risk and promote informed planning and development practices to help reduce that risk through the Risk Mapping, Assessment, and Planning (Risk MAP) program. Risk MAP provides high-quality flood maps and information, tools to better assess the risk from flooding, and planning and outreach support to communities to help them take action to reduce (or mitigate) flood risk. Each Risk MAP flood risk project is tailored to the needs of a specific community and may involve different products and services.

According to the Risk MAP Progress interactive map available online at the time of this HMP update, there are numerous active Risk MAP projects taking place throughout New York (FEMA n.d.-d). FEMA coordinates and works directly with municipal floodplain managers during the Risk MAP project process. The state NFIP Coordinator is kept apprised of project activities and consults as needed.

Risk Rating 2.0: Equity in Action

FEMA introduced Risk Rating 2.0: Equity in Action to provide more individualized and equitable flood insurance rates. The rating methodology considers frequency of flooding, flood types, proximity to flood sources, and building characteristics such as first floor heights and costs to rebuilt (FEMA 2022c). Continued shifts in flood insurance costs, coverage, impacts on mitigation of flood prone properties, and potential updates to Risk Rating 2.0 will be monitored by Sullivan County throughout the period of performance of the 2025 HMP.

Robert T. Stafford Disaster Relief and Emergency Assistance Act

The Robert T. Stafford Disaster Relief and Emergency Assistance Act provides federal government assistance to state and local governments to alleviate the impacts of disasters. The Act provides for the following

- Revising and broadening the scope of existing disaster relief programs
- Encouraging the development of comprehensive disaster preparedness and assistance plans, programs, capabilities, and organizations by state and local governments
- Achieving greater coordination and responsiveness of disaster preparedness and relief programs
- Encouraging individuals and state and local governments to protect themselves by obtaining insurance coverage to supplement or replace governmental assistance
- Encouraging hazard mitigation measures to reduce losses from disasters, including development of land-use and construction regulations
- Providing federal assistance programs for both public and private losses sustained in disasters

U.S. Army Corps of Engineers

Under Section 404(e) of the Clean Water Act, the U.S. Army Corps of Engineers (USACE) can issue general permits to authorize activities that have only minimal individual and cumulative adverse environmental effects. There are three types of USACE permits:

- A nationwide permit (NWP) is a general permit that authorizes activities across the country unless a district or division commander revokes the nationwide permit in a state or other geographic region. There are 59 nationwide permits, and they authorize a wide variety of activities, including linear transportation projects, bank stabilization activities, residential development, commercial and industrial developments, aids to navigation, and certain maintenance activities (USACE 2021).
- Standard permits are individual permits that involve full public interest review of an individual permit application and include the issuance of a public notice for any project that does not meet the terms and conditions of an NWP or a Letter of Permission.
- Regional general permits are for small, specialized projects. In New York State, there are six regional general permit categories (USACE Buffalo District n.d.).

16.1.2 State

Community Risk and Resiliency Act

New York State's Community Risk and Resiliency Act (CRRA) ensures that certain state monies, facility-siting regulations, and permits include consideration of the effects of climate risk and extreme weather. CRRA includes five major provisions (NYSDEC 2020a):

- **Official Sea-Level Rise Projections**—CRRA requires the NYSDEC to adopt science-based sea-level rise projections into regulation.
- **Consideration of Sea-Level Rise, Storm Surge and Flooding**—CRRA requires applicants for permits or funding in a number of specified programs to demonstrate that future physical climate risk due to sea-level rise, storm surge, and flooding have been considered. It requires NYSDEC to consider incorporating these factors into certain facility-siting regulations.
- **Smart-Growth Public Infrastructure Policy Act Criteria**—CRRA adds mitigation of risk due to sea-level rise, storm surge, and flooding to the list of smart-growth criteria to be considered by state public infrastructure agencies.
- **Guidance on Natural Resiliency Measures**—CRRA requires NYSDEC, in consultation with the New York Department of State, to develop guidance on the use of natural resources and natural processes to enhance community resilience.
- **Model Local Laws Concerning Climate Risk**—CRRA requires the Department of State, in cooperation with NYSDEC, to develop model local laws that include consideration of future risk due to sea-level rise, storm surge and/or flooding. These model local laws must be based on available data predicting the likelihood of extreme weather events, including hazard risk analysis.

CRRA requires NYSDEC, in consultation with the Department of State, to prepare guidance on implementation of the statute. To achieve this, NYSDEC created *New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act*. This document provides guidance to state agencies as they develop program-specific guidance requiring applicants to demonstrate consideration of sea-level rise, storm surge, and flooding, as permitted by program-authorizing statutes and operating regulations. The guidance document incorporates possible future conditions, including the greater risks of coastal flooding presented by sea-level rise and enhanced storm surge and inland flooding expected to result from increasingly frequent extreme precipitation events (NYSDEC 2020a).

Comprehensive Planning

Comprehensive planning is a process for achieving community goals and aspirations through community development. The outcome of this process is a comprehensive plan that directs public policy in terms of transportation, utilities, land use, recreation, and housing. New York State statutes require that all land use laws in a municipality be consistent with a comprehensive plan. Towns are authorized to develop and adopt a comprehensive plan by New York State Town Law Section 272-a. Villages can do the same per Section 7-722 of the Village Law.

Local Waterfront Revitalization Program

New York State's Waterfront Revitalization of Coastal Areas and Inland Waterways Act offers local governments the opportunity to participate in the State's Coastal Management Program (CMP) on a voluntary basis by preparing and adopting a Local Waterfront Revitalization Program (LWRP), providing detailed implementation of the CMP through use of such existing broad powers as zoning and site plan review. Any village, town, or city located along the state's coast or designated inland waterway can prepare a new or amend an existing LWRP. Municipalities are encouraged to use the LWRP to address local revitalization issues in a broader context, aligned with regional economic development strategies and regional resource protection and management programs (NYDOS n.d.).

An LWRP is a planning document prepared by a community and the program established to implement the plan. It may be comprehensive and address all issues that affect a community's entire waterfront, or it may address the most critical issues facing a significant portion of its waterfront. State rules and regulations outline required content of an LWRP, the processes of review and approval of an LWRP, and LWRP amendments (NYDOS n.d.).

An approved LWRP reflects community consensus and provides a clear direction for appropriate future development. It establishes a long-term partnership among local government, community-based organizations, and the State of New York. When an LWRP is approved by the New York State Secretary of State, state agency actions are required to be consistent with the approved LWRP to the maximum extent practicable. When the federal government concurs with the incorporation of an LWRP into the CMP, federal agency actions must be consistent with the approved addition to the CMP. This consistency provision is a strong tool that helps ensure all government levels work in unison to build a stronger economy and a healthier environment (NYDOS n.d.).

New York State Division of Homeland Security and Emergency Services

The NYS DHSES is the lead agency that reviews, submits, and administers federal funding to programs that mitigate hazards. These programs help find projects that are cost beneficial to help reduce damages from hazards. Through ESF #14 (Long-Term Recovery Planning), DHSES works to have a plan for long-term planning and recovery prior to a disaster or emergency. One of the areas of planning includes mitigation. This coordination allows for another statewide plan to incorporate mitigation principles and planning. The NYS DHSES also is the lead agency in preparing the State's THIRA.

New York Power Authority

The New York Power Authority (NYPA) operates 16 generating facilities and more than 1,400 circuit-miles of transmission lines. State and federal regulations shape NYPA's diverse customer base, which includes large and small businesses, not-for-profit organizations, community-owned electric systems, rural electric cooperatives, and government entities. NYPA provides the lowest-cost electricity in New York State and is the only statewide electricity supplier.

NYSDEC Floodplain Management Elevation Requirements

New York State law requires that, when there is a base flood elevation available, the lowest floor, including any basement, must be at or above the base flood elevation (plus 2 feet). Elevation may be by means of properly compacted fill, a solid slab foundation, or a "crawl space" foundation, which contains permanent openings to let flood waters in and out. Non-residential structures may be flood-proofed in lieu of elevation. Where a local floodplain administrator has information to estimate a base flood elevation, such as historical flood records or a hydraulic study, that elevation must be used. If the development consists of more than 5 acres or more than 50 lots, the permit applicant must develop a base flood elevation and build accordingly (NYSDEC 2018). Communities may go beyond this requirement, providing for additional freeboard. In most New York communities, new structures must have the lowest floor 3 feet or more above the highest adjacent grade.

Stormwater Management Planning

The goal of stormwater management is to ensure that the quantity and quality of stormwater runoff from a site that is undergoing construction, or development should not be substantially altered from its pre-development conditions. The federal law commonly known as Stormwater Phase II requires permits for stormwater discharges from Municipal Separate Storm Sewer Systems in urbanized areas and those designated by the NYSDEC. Owners or operators of such systems must be authorized in accordance with the State Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems. The permit requires development of a Stormwater Management Program (NYSDEC 2023b).

16.1.3 County

Comprehensive Bicycle and Pedestrian Master Plan, 2026

The Sullivan County Bicycle and Pedestrian Master Plan will focus on connecting residents and visitors to town and village centers through alternative transportation options, including walking, biking and public transit. Alternative transportation refers to travel modes that provide an option beyond motorized vehicles. A key component of this is active transportation, which includes human-powered forms of mobility such as walking, biking, and the use of scooters, skateboards, and electric mobility devices such as e-bikes. These options promote healthier lifestyles, environmental sustainability, and more equitable access to essential destinations (Sullivan County 2026). This plan will:

- Identify connections to public transit options and everyday destinations such as work, school, shopping, and essential services through a bike and pedestrian network;
- Strengthen economic activity and tourism by linking main streets and commercial corridors to existing and proposed recreational trails; and
- Support the County's commitment to reducing greenhouse gas (GHG) emissions by identifying safe and convenient connections that reduce vehicle trips within the County's population centers.

Resilient Sullivan, 2024

Resilient Sullivan is Sullivan County's 2024 resiliency plan, which seeks to prepare Sullivan County to address emerging challenges facing the county by focusing on resilience in the following areas (Sullivan County and NYDOS 2024):

- **Economic resilience** is the ability of the county's economy to withstand financial, social, environmental, and physical challenges to ensure a sustainable livelihood and opportunities for county residents.

- **Community resilience** is the ability of the county to ensure the health and well-being of all its residents, especially for at-risk populations.
- In an era of increasing extreme weather risks and vulnerabilities, **environmental resilience** describes the ability of human-built and natural systems to withstand environmental challenges.

Neversink Watershed Management Plan, 2024

The Neversink Watershed Management Plan (NWMP) is a collaborative effort among government agencies, non-profit organizations, and watershed residents and stakeholders throughout Ulster County, Sullivan County, and Orange County. This plan provides an in-depth review of the New York portion of the Neversink watershed (the small portion of the Neversink watershed in New Jersey is not covered). The NWMP lays out a planning approach to ensure the sound future management and conservation of the Neversink watershed. It is a tool for stakeholders to use in working toward a shared vision for the future of the watershed.

The NWMP reflects the interests and concerns of watershed residents, municipal officials, businesses, streamside landowners, and visitors. It is designed to be used by a wide range of watershed stakeholders to ensure that the watershed is managed properly for future generations to enjoy. The plan promotes and supports clean and abundant water, healthy habitat, expanded recreation, infrastructure improvements, climate resilience, flood mitigation, sustainable economic development, and cultural and historic amenities.

Sullivan County Comprehensive Housing Strategy, 2022

Sullivan County's Comprehensive Housing Strategy, developed in 2022 with guidance from the Sullivan County Housing Task Force, broadly addresses regional and localized influences on the housing market and how they shape the housing needs of county households. It contains a set of actions designed to have a positive influence at key pressure points in the housing market.

Sullivan County Climate Action Plan, 2022

The Sullivan County Climate Action Plan documents the carbon footprint of the County, sets goals for the County-wide reduction of greenhouse gas emissions, and recommends actions for adapting to impacts that cannot be mitigated through greenhouse gas reduction (Sullivan County 2022):

- Part I addresses greenhouse gas emissions from various County operations. Greenhouse gas reduction measures the County is already implementing are described, and additional greenhouse gas mitigation measures are identified. It presents mitigation and adaptation goals and measures for the energy, transportation, materials management, land and water use, public health, and emergency management sectors. Part I suggests pilot projects to demonstrate new technologies and approaches.
- Part II of the Plan includes data on countywide greenhouse gas emissions associated with residential, commercial and industrial energy use, domestic and commercial vehicles, agriculture, solid waste and wastewater treatment. It proposes actions for greenhouse gas reduction and adaptation strategies for town and village governments, for businesses and community organizations, and for county residents.

Sullivan County Coordinated Transportation Services Plan, 2015

The New York State Department of Transportation promoted a cost-sharing methodology for mobility programs and encouraged Sullivan County to plan for increased coordination of transportation services. The Sullivan County Division of Planning, Community Development and Environmental Management prepared this plan to identify opportunities for increasing efficiency and reducing waste in the existing system as well as quantifying and addressing unmet transportation needs in the County.

Upper Delaware River: Making Connections, 2015

The *Upper Delaware River: Making Connections* plan considers the work in the Upper Delaware aimed at increasing visitation and enjoyment of the natural resources. It builds on and ties together the vision expressed in existing documents and by residents. The plan is a vehicle to coalesce the ongoing efforts into a regional connected effort. It highlights concepts and ideas and sets forth a means of achieving the vision.

Agriculture and Farmland Protection Plan, 2014

The Agricultural and Farmland Protection Plan, funded by a planning grant from New York State Department of Agriculture and Markets and Sullivan County, evaluated the status of agriculture in Sullivan County, and outlined initiatives to further promote and enhance it. This plan built on an array of recent agricultural and economic development initiatives in Sullivan County that had taken place since the first agriculture and farmland protection plan was adopted in 1999. This plan outlined the current state of agriculture in the County and recommended a series of actions to help the County and its farmers take advantage of farm and agribusiness opportunities. It incorporated input from farmers, agricultural groups and organizations, economic development officials, community leaders, and the public. Plan highlights include the following:

- A long-term vision and direction to guide the development of policies and programs
- Strategies to maintain agriculture as a critical land use and economic driver
- A framework for organization and collaboration to promote existing and new farm operations
- An analysis of current conditions, issues, and trends in agriculture, including the impact of property taxes on Sullivan County farms
- An evaluation of local land use laws and policies to determine their “farm-friendliness”
- The development of priority farmland criteria for use in farmland protection initiatives
- The identification of marketing opportunities, potential project partners, and sources of funding
- Data, maps, and other information that can be used to support marketing, grant writing, and other programs related to agriculture
- Resources on agriculture to be used by county staff, elected officials, and farmers

Conserving Open Space and Managing Growth, 2008

The Conserving Open Space and Managing Growth Plan identified Sullivan County’s existing natural resources so that open space conservation can be focused in areas where it will have the greatest impact. The plan is a road map for Sullivan County to use in protecting and restoring these resources, as well as a guide for local municipalities to incorporate open space protection into land use decisions, local laws, and planning documents. It guides the development of new programs and partnerships to preserve open space while encouraging appropriate development throughout Sullivan County.

Sullivan County Comprehensive Emergency Management Plan, 2007

The Sullivan County Comprehensive Emergency Management Plan aims to enhance the County's ability to manage emergency and disaster situations. It is a part of a statewide emergency management program and contributes to its effectiveness. The plan evaluates potential hazards, assesses existing capabilities, and outlines short, medium, and long-range measures to improve the County's ability to manage hazards. It provides for the efficient use of all available resources during an emergency and the coordination of local government, state, and federal programs to

assist disaster victims. The plan is part of the larger Sullivan County network of emergency operations plans and includes strategies for resilience and adaptation.

Sullivan2020, 2005

The comprehensive plan guides the future actions of Sullivan County by providing a framework for land use, public services, and economic development. It aims to balance competing interests, protect public investments, and ensure the orderly growth and development of the community. The plan serves as a blueprint for future growth, ensuring equity and resilience for all stakeholders. The County plan addresses open space, farmland protection and forestry, water resource management, land use planning and zoning, infrastructure, housing and economic development. The County is currently in the process of updating the Comprehensive Plan.

Sullivan County Capital Improvement Plan

The Sullivan County Capital Improvement Plan identifies and prioritizes capital needs for the County. It is a guide for making capital investment decisions, ensuring that resources are allocated effectively and efficiently. The plan helps to address county priorities, serve the needs of the county over the next five years, and provide a planning foundation for future needs assessments. It also provides a mechanism to match cash flows to meet the desired level of capital improvements and to schedule projects that conform to cash flow constraints.

The Sullivan County Capital Improvement Plan is updated annually with the adoption of the Sullivan County Operating Budget, and projects capital expenses for the following 6 years.

Sullivan County Legislature

The Sullivan County Legislature adopts detailed legislation for the proper function and government of the County. Each legislator represents one of nine legislative districts representing approximately 8,400 people. These elected representatives are responsible for encouraging the growth and success of the county.

Municipal Land Use Planning and Regulatory Authority

Section 239 of New York State General Municipal Law requires the referral of certain local planning actions to the Sullivan County Planning Commission for the examination of possible intermunicipal impacts. The Sullivan County Division of Planning, Community Development and Environmental Management operates under that state law to advise local boards on the potential intermunicipal or countywide impact of local land use decisions. The County uses the Comprehensive Plan to direct recommendations on municipal land use referrals and to review proposed County capital improvement projects.

16.1.4 Local

Municipalities have various land use planning mechanisms that can be leveraged to mitigate flooding and support hazard risk reduction. Specific local planning and regulatory capabilities are identified in the jurisdictional annexes in Volume II. These include comprehensive plans, flood damage prevention ordinances, local codes and regulations, stormwater regulations, and municipal level plans. A list of plans reviewed for this HMP is also provided in each annex.

16.2 ADMINISTRATIVE AND TECHNICAL CAPABILITIES

This section summarizes administrative and technical capabilities in Sullivan County. Further information is provided in the jurisdictional annexes in Volume II.

16.2.1 Federal

FEMA Community Assistance Visits and Community Assistance Contacts

FEMA evaluates NFIP compliance through audits known as Community Assistance Visits (CAVs) or Community Assistance Contacts (CACs). CAVs and CACs are performed at entry into the CRS and to maintain ongoing CRS participation. FEMA may conduct these with Region 2 staff, with NYSDEC staff under the Compliance Assistance Program–State Support Services Element grant, or with private contractors. CAVs are generally more rigorous than CACs. FEMA evaluates the following key areas in a compliance audit:

- The community's flood damage prevention ordinance
- Mapping products and other ordinances used to regulate floodplain development
- Floodplain development permitting procedures
- Floodplain permit applications and other forms/records, including substantial damage and improvement determinations
- Floodplain development review and performance standards
- Floodplain development permits issued to applicants

Federal Energy Regulatory Commission Dam Safety Program

The Federal Energy Regulatory Commission (FERC) cooperates with federal and state agencies to ensure and promote dam safety for dams associated with hydropower. Every five years, an independent consulting engineer, approved by the FERC, must inspect and evaluate projects with dams higher than 32.8 feet (10 meters) or with a total storage capacity of more than 2,000 acre-feet.

HURREVAC

HURREVAC is the decision support tool of the National Hurricane Program used for tracking hurricanes. Administered by FEMA, USACE, and the National Hurricane Center, HURREVAC permits governmental agencies to coordinate notification, communication, activations, public warning, and evacuation and sheltering efforts (HURREVAC n.d.).

National Weather Service

Monitoring and Forecasting

The NWS monitors weather and delivers weather forecasting. New York State is serviced by five weather forecast offices: Albany, Binghamton, Buffalo, New York, and Burlington (VT). Sullivan County is covered by the office located in Binghampton. NYS DHSES uses conference calling with the NWS and county OEMs to share specific information and needs when severe storms are forecasted (NWS 2023).

StormReady Program

The NWS StormReady program provides local emergency managers with guidelines on how to improve hazardous weather operations. To participate, a community must establish a 24-hour warning point and emergency operations center; have more than one way to receive severe weather warnings and forecasts and to alert the public; create a system that monitors weather conditions locally; promote public readiness through community seminars; and develop a hazardous weather plan that includes training severe weather spotters and holding emergency exercises.

U.S. Army Corps of Engineers

New York State is serviced by the Buffalo, Pittsburgh, and New York districts of USACE, which have programs that support hazard mitigation measures, including the following:

- **Silver Jackets—**Silver Jackets is the state-level implementation program for the National Flood Risk Management Program. The program leverages resources from federal, state, and local agencies to improve flood risk management, improve public risk communication through a united effort, and implement initiatives beneficial to local communities.
- **Climate Preparedness and Resilience Community of Practice—**This practice develops and implements practical, nationally consistent, and cost-effective approaches to reduce vulnerabilities of the nation's water infrastructure.
- **Planning Assistance to States Program—**USACE assists states, local governments, Native American Tribes, and other non-federal entities in the preparation of comprehensive plans for the development and conservation of water and related land resources. Types of work that can be done include water quality studies, wetland evaluation studies, floodplain management studies, coastal zone management/protection studies, harbor/port studies, and other water resource planning investigations. The non-federal sponsors determine the planning assistance needed.
- **Floodplain Management Services Program—**USACE provides assistance and guidance on all aspects of floodplain management planning. This program develops or interprets site-specific data on obstructions to flood flows, flood formation, and the timing, extent, duration, and frequency of flooding. Services are provided without charge to state, regional, and local governments, Native American tribes, and other non-federal public agencies.
- **Inspection of Completed Works Program—**Civil works structures whose failure could endanger public safety or cause substantial property damage are periodically inspected to ensure their structural stability, safety, and operational adequacy. For those structures constructed by USACE and turned over to others for operation and maintenance, the operating entity is responsible for the inspections. USACE may conduct the inspection on behalf of the project sponsor if reimbursement is made or participate in the inspection with the operating entity at the government's expense.
- **Rehabilitation and Inspection Program—**This USACE program provides for inspection of flood control projects, the rehabilitation of damaged flood control projects, and the rehabilitation of federally authorized and constructed hurricane or shore protection projects.
- **Dam Safety Program—**USACE is responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. USACE has inventoried dams and has surveyed each state and federal agency's capabilities, practices, and regulations regarding design, construction, operation, and maintenance of the dams. USACE has also developed guidelines for inspection and evaluation of dam safety.

U.S. Geological Survey

The U.S. Geological Survey (USGS) maintains a network of gauges across New York that continuously measure lake, reservoir table, stream, and tidal levels. These data sets are transmitted to the USGS and made available over the internet. As project needs and funding levels change, gauges may be added or deactivated, and deactivated gauges may be reactivated (USGS 2023b). USGS provides data to the state for drought determinations. USGS also recovers high water marks post-coastal flooding (USGS 2018).

16.2.2 State

New York State Division of Homeland Security and Emergency Services

NYS DHSES is responsible for coordinating the activities of all state agencies to protect New York's communities, economic well-being, and the environment from natural and human-caused disasters and emergencies. NYS DHSES assists local governments, voluntary organizations, and private industry with emergency management programs, including hazard identification, loss prevention, planning, training, operational response to emergencies, technical support, and disaster recovery.

NYS DHSES administers the FEMA mitigation grant programs in the state and supports local mitigation planning in addition to developing and routinely updating the state hazard mitigation plan. The current state HMP, approved by FEMA in 2023, keeps New York eligible for recovery assistance in Public Assistance (Categories A through G) and Hazard Mitigation Assistance in each of the Unified Hazard Mitigation Assistance Program's five grant programs. The 2023 New York State HMP was used as guidance in updating the Sullivan County HMP (NYS DHSES 2023).

Northeast Regional Climate Center

The Northeast Regional Climate Center (NRCC) develops products for use by municipal officials, researchers, planners, highway departments, and other decision-makers who need to take future storm events into account. The NRCC's "Extreme Precipitation in New York & New England" website is an interactive tool for extreme precipitation analysis. The site includes estimates of extreme rainfall for various durations (5 minutes to 10 days) and recurrence intervals (1 year to 500 years). Regional extreme rainfall maps and graphic products are available. This tool can be used by municipalities to assist them in the design and feasibility assessment of future projects and allow them to see the future intensity and frequency of rain events (NRCC 2022). NRCC also partnered with the New York State Energy Research and Development Authority (NYSERDA) to compare methods of creating extreme precipitation projections to be used in adaptation planning for New York State (NRCC 2014).

New York State Department of State Division of Building Standards and Codes

The New York State Department of State's Division of Building Standards and Codes (DBSC) provides services related to the development, administration, and enforcement of the Uniform Fire Prevention and Building Code (Uniform Code) and Energy Conservation Construction Code (Energy Code). The statutory responsibility for maintaining the Uniform Code and the Energy Code is vested in the State Fire Prevention and Building Code Council (Code Council). The Code Development Unit evaluates proposed changes to the codes.

Executive Law §379 authorizes the legislative body of a local government to enact or adopt local laws and ordinances that impose standards for construction that are more restrictive than the corresponding standards imposed by the Uniform Code. Energy Law §11-109 allows counties, cities, towns, villages, school districts, or district corporations to promulgate local energy conservation construction codes that are more stringent than the state Energy Code. The Code Development Unit reviews the technical aspects of these local laws and ordinances

and reports its findings to the Code Council. The Code Council is empowered to approve these more restrictive standards and codes when they comply with Executive Law §379 and Energy Law §11-109.

The DBSC's Code Enforcement Disaster Assistance Response (CEDAR) program provides communities with post-disaster assistance. The program's initial disaster response focuses on performing rapid evaluation safety assessments of damaged structures in affected communities for use in the application process to request federal disaster assistance through FEMA. The CEDAR program's long-term disaster response provides a unified method for communities to access the range of resources available within and beyond the Department of State.

Technical Bulletins for the 2020 Codes of New York State

The DBSC has published technical bulletins with guidance related to flood hazard areas: *Electrical Systems and Equipment in Flood-damaged Structures and Accessory Structures*; and *Flood Venting in Foundations and Enclosures Below Design Flood Elevation* (October 31, 2017). The latter publication provides clarification on the requirements for flood vents in foundations and enclosures located below the design flood elevation and in flood hazard areas.

Forms and Publications

The DBSC, in conjunction with the DHSES Office of Fire Prevention and Control, has implemented a joint outreach program to provide code users with concise, easily digestible information on the following:

- New topics that code users must be aware of
- Frequently overlooked or misunderstood code requirements
- Concerns relating to the administration and enforcement of the Uniform Code and Energy Code

The program will foster professional growth, support the efforts of the code enforcement community, and provide helpful guidance to all code users. The Code Outreach Program publications are to be distributed at the beginning of every month.

The DBSC posts model reporting forms and related publications on its web page. The Building Permit Application requests the applicant to indicate whether the site is or is not in a floodplain and advises checking with town clerks or NYSDEC. The General Residential Code Plan Review form includes a reminder to add 2 feet pf freeboard. Sample Flood Hazard Area Review Forms, including plan review checklists and inspection checklists for Zone A and Zone V, are based on the forms in *Reducing Flood Losses* through the series published by the International Code Council and FEMA.

New York State Department of Transportation

The New York State Department of Transportation (NYSDOT) offers grant, education, and training opportunities; has several environmental initiatives and programs; issues permits for traffic signals, driveways, advertisements, and other permitting needs; provides statistical roadway information; and provides information on community resources, such as scenic highways and fishing access sites. Sullivan County is served by the Southern Tier, Region 9 NYSDOT office, which is based in Poughkeepsie, NY.

New York State Office of Planning, Development and Community Infrastructure

The New York State Office of Planning, Development and Community Infrastructure works with communities to increase their resilience to changing conditions. The Office employs key resilience principles that help communities

understand their vulnerabilities, advance resilience measures that reduce risk, including using natural infrastructure and natural processes, and avoid investments that are not highly adapted to a changing climate.

Resilient NY

Resilient NY is a state-provided web site to help New Yorkers adapt to changes from extreme weather events. This website provides a centralized platform with quick links and tools to help plan and implement measures to reduce risk and adapt to climate change. Guidance, best practices, funding opportunities, and resources are provided to help local governments, businesses, and residents plan and act with confidence (New York State n.d.).

NYSDEC

The NYSDEC's mission is "To conserve, improve and protect New York's natural resources and environment and to prevent, abate and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well-being." NYSDEC's goal is to achieve this mission through the simultaneous pursuit of environmental quality, public health, economic prosperity, and social well-being, including environmental justice and the empowerment of individuals to participate in environmental decisions that affect their lives (NYSDEC 2023a). NYSDEC staff are responsible for natural resource management and environmental quality protection in New York (NYSDEC 2023d). NYSDEC Region 3 in southern New York includes Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, and Westchester counties.

NFIP Coordination

NYSDEC serves as the NFIP State Coordinating Agency and, in this capacity, is the liaison between FEMA and New York communities that elect to participate in the NFIP.

Bureau of Dam Safety, Coastal and Flood Protection

Within the NYSDEC Division of Water, the Bureau of Dam Safety, Coastal and Flood Protection cooperates with federal, state, regional, and local partners to protect lives and property from floods, coastal erosion and dam failures through floodplain management and both structural and nonstructural means; and provides support for information technology needs in the division (NYSDEC n.d.-d). The NYSDEC Division of Water flood protection section provides a wide range of technical assistance related to hazard mitigation (NYSDEC n.d.-c):

- **Dam Safety—**NYSDEC reviews repairs and modifications to dams and ensures that dam owners operate and maintain dams in a safe condition through inspections, technical reviews, enforcement, and emergency planning.
- **Coastal Erosion and Flooding**—NYSDEC works to reduce coastal erosion and storm damage to protect lives, natural resources, and properties through structural and nonstructural means.
- **Flood Protection and Flood Management**—NYSDEC is responsible for reducing flood risk to life and property through management of activities such as development in flood hazard areas and through construction, operation, and maintenance of flood control facilities. NYSDEC also reviews and develops revised flood maps.

Grants for High Hazard Potential Dam

Grant funding is available to assist eligible dam owners with infrastructure repair costs. Funding is provided through the FEMA's High Hazard Potential Dam grant program. NYSDEC accepts applications for grants to assist with

technical, planning, design, and other pre-construction activities associated with the rehabilitation of eligible dams classified as High Hazard dams.

16.2.3 County

Sullivan County Division of Public Safety

The Sullivan County Division of Public Safety is charged with ensuring the safety and security of the citizens and government of Sullivan County and oversees the Office of Emergency Management/Homeland Security, the Bureau of Fire, the Bureau of Emergency Medical Services (EMS), and the 911 Center. The Division provides education, prevention, technical support, inter-agency coordination and direct services.

Bureau of Fire

The Bureau of Fire provides training instruction and safety guidelines for firefighters and operational and technical assistance to fire officers. The Bureau ensures that the highest-level of service can be provided to the residents and visitors of Sullivan County during any and all emergency incidents. The Fire Coordinator has direct authority over the following:

- Fire battalion deputy fire coordinators
- Sullivan County emergency services training facility
- Sullivan County fire investigation team
- Sullivan County weapons of mass destruction/ haz-mat team
- Sullivan County special operations teams

In the event of a large scale emergency anywhere in the state, the Fire Coordinator is required to respond to an activation of the New York State Fire Mobilization and Mutual Aid Plan by acting as Regional Fire Administrator with the responsibility of tracking personnel and equipment from the fire service of Sullivan County and deploying resources to any affected area in the state.

Bureau of EMS

The Bureau of EMS provides leadership, support, education, and cooperation to enable the EMS agencies serving Sullivan County to provide the best emergency medical care possible through a lasting and professional partnership with the men and women of the Sullivan County EMS System.

Office of Emergency Management and Homeland Security

The Office of Emergency Management/Homeland Security monitors and assists in emergency and security situations, both natural and manmade.

Sullivan County Division of Planning, Community Development and Environmental Management

The Sullivan County Division of Planning, Community Development and Environmental Management creates programs that foster orderly development and redevelopment of the County's physical infrastructure in a manner that conserves natural resources while providing economic opportunity for area residents. The Division also offers technical assistance to local municipalities and assists with the development of land use policies.

Sullivan County Division of Health and Human Services

The Sullivan County Division of Health and Human Services is responsible for preventing illness and disease and focuses on protecting and promoting public health.

Sullivan County Department of Human Resources

The Sullivan County Human Resources Department ensures that qualified applicants are available to fill any vacancies in county departments, local municipalities, school districts, special districts and special jurisdictions by posting and administering civil service tests and providing lists of eligible candidates pursuant to New York State Civil Service Law. Additionally, the Sullivan County Human Resources Department provides necessary functions for training, employee benefits, labor negotiations, maintaining employee roster information, contract compliance, certifying municipal payrolls and advising appointing authorities on Civil Service Law.

Sullivan County Office for the Aging

The Sullivan County Office for the Aging is the lead advocate for the older population of Sullivan County. Programs sponsored or directly operated by this office are designed to give choices to older people that enable them to remain in their own homes and communities as long as possible. The Office for the Aging is made possible by the Sullivan County Legislature, New York State Office for the Aging, and the Older Americans Act.

Sullivan County Center for Workforce Development

The Sullivan County Center for Workforce Development helps build a robust, diverse economy by bringing businesses and the workforce together. The Center connects workers with tools to learn skills and match them with employers' needs. It also contains disability services, youth services, and veterans' services.

Sullivan County Department of Community Services

The Sullivan County Department of Community Services offers services in mental health, alcoholism and opioid use disorder to residents of Sullivan County, including the following:

- Individual psychotherapy
- Marital and family counseling
- Group therapy
- Medication therapy
- Crisis intervention/outreach
- Court evaluations
- Consultation and education
- Case management
- Anger management
- Coordinated children's services initiative

Sullivan County Parks & Recreation Department

Sullivan County Parks & Recreation Department operates and maintains Lake Superior State Park, the Delaware & Hudson Canal Linear Park and Interpretive Center, Minisink Battleground Park, Livingston Manor Covered Bridge

Park, Stone Arch Bridge Historical Park, and the Sullivan County Cultural Center (Museum). Fort Delaware Museum of Colonial History is owned by the County but operated by The Delaware Company, who also handles programming at the Minisink Battleground Park.

Sullivan County Information Technology Services

Sullivan County Information Technology Services (ITS) provides services and information to all County Divisions, several local governmental units (assessors, law enforcement, etc.), County staff, and vendor and service accounts. ITS provides systems support, maintenance, enhancements and new development for applications, copy/print/scan services, and fax and VoIP/legacy phone systems.

Sullivan County Geographic Information Systems

The Sullivan County GIS team develops and maintains data hosted in the Sullivan County GIS infrastructure. This data is used to provide maps, apps, and data to commercial vendors, government organizations, non-profit organizations, and the general public. Day-to-day operations include database development, data creation, data maintenance, app development, custom map orders, and GIS problem resolution.

Sullivan County Department of Grants Administration

The Department of Grants Administration (DGA) facilitates access to discretionary, external funding for divisions, departments, agencies and other units of the Sullivan County government while improving the administration of existing funding/grant resources. The DGA is part of the County's' overall effort to enhance economic and community development in the County. DGA supplies funding resource information to individuals seeking to establish a business in Sullivan County, not-for-profit organizations seeking to expand programs or services in the county, and the local municipalities.

Sullivan County Division of Public Works

The Sullivan County Division of Public Works provides services including designing, maintaining and repairing roads and bridges, plowing snow, operating and maintaining county buildings and parks, and fueling, maintaining and repairing the County's vehicle fleet. The division also operates the Sullivan County Sanitary Landfill, transfer stations, and recycling program and sponsors County cleanup initiatives. The Division maintains and operates the Sullivan County International Airport and provides Weights and Measures services to ensure sale quantity accuracy within the County.

Sullivan County Soil & Water Conservation District

The Soil & Water Conservation District is a municipal subdivision that partners with state, local and federal agencies, as well as watershed groups to educate and assist landowners and municipalities in implementing best management practices to stabilize soil, improve water quality, manage stormwater runoff, preserve open space, and manage fish and wildlife habitat. The District provides technical assistance in the preservation and restoration of streams, wetlands, woodlots, agricultural land and low impact development to landowners, farmers, engineers, contractors, developers, and municipalities.

16.3 FISCAL CAPABILITIES

This section summarizes fiscal capabilities in Sullivan County. Further information is provided in the jurisdictional annexes in Volume II. The state capabilities section of the 2023 New York State HMP features a section on funding administered by state agencies that eligible jurisdictions can use to fund mitigation actions.

16.3.1 Federal

FEMA Hazard Mitigation Funding Opportunities

FEMA administers programs that provide funding for eligible mitigation planning and projects that reduces disaster losses and protect life and property from future disaster damage (FEMA n.d.-c). The Hazard Mitigation Grant Program (HMGP) assists in implementing long-term hazard mitigation planning and projects following a presidential major disaster declaration. Flood Mitigation Assistance (FMA) provides funds for planning and projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP) on an annual basis. Pre-Disaster Mitigation (PDM) provides funds for hazard mitigation planning and projects on an annual basis (FEMA 2023c).

Federal mitigation grant funding is available to all communities with a current HMP (this plan). The grants require a local share in the range of 10 to 25 percent of the total project cost. Table 16-1 provides an overview of program funding eligibility and cost share.

Table 16-1. FEMA Hazard Mitigation Grant Cost Share Requirements

Programs	Cost Share (Percent of Federal/Non-Federal Share)
Hazard Mitigation Grant Program (HMGP)[a]	75/25
HMGP Post-Fire	75/25
Flood Mitigation Assistance (FMA) (community flood mitigation, project scoping, individual mitigation of insured properties, and planning grants)	75/25
FMA—repetitive loss property[b]	90/10
FMA—severe repetitive loss property[b]	100/0
Pre-Disaster Mitigation (PDM)	75/25
PDM—small and impoverished community	Up to 90/10

Source: FEMA 2023; FEMA 2023

a. Subapplicants should consult their state hazard mitigation officer for the percentage of HMGP subrecipient management cost funding their state has determined to be passed through subrecipients.

b. To be eligible for an increased federal cost share, a FEMA-approved state or tribal (standard or enhanced) mitigation plan that addressed repetitive loss properties must be in effect at the time of award, and the property is being submitted for consideration must be a repetitive loss property.

Hazard Mitigation Grant Program

The HMGP is a post-disaster mitigation program that is made available to states by FEMA after a federal disaster declaration. The HMGP can provide up to 75 percent funding for hazard mitigation measures. It can be used to fund projects that will protect public or private property in an area covered by a federal disaster declaration or that will reduce damage from future disasters. Examples of projects include acquisition and demolition of structures in

hazard-prone areas, flood-proofing or elevation to reduce future damage, minor structural improvements, and development of state or local standards. Projects must fit into an overall mitigation strategy for the area identified as part of a local planning effort.

Applicants who are eligible for the HMGP are state and local governments, nonprofit organizations or institutions that perform essential government services, and Native American tribes and authorized tribal organizations. Individuals or homeowners cannot apply directly for the HMGP; a local government must apply on their behalf (FEMA 2023c). Applications are submitted to NYS DHSES and placed in rank order for available funding and submitted to FEMA for final approval. Eligible projects not selected for funding are placed in an inactive status and may be considered as additional HMGP funding becomes available.

HMGP funding is generally 15 percent of the total amount of federal assistance provided to a state, territory, or federally recognized tribe following a major disaster declaration.

Flood Mitigation Assistance Program

The FMA program provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. The FMA is funded annually; no federal disaster declaration is required. Only NFIP insured homes and businesses are eligible for mitigation in this program.

Funding for FMA is limited and, as with the HMGP, individuals cannot apply directly for the program. Applications must come from local governments or other eligible organizations. The federal cost share for an FMA project is at least 75 percent. At most, 25 percent of the total eligible costs must be provided by a non-federal source. Of this 25 percent, no more than half can be provided as in-kind contributions from third parties. At minimum, a FEMA-approved local flood mitigation plan is required before a project can be approved. The FMA funds are distributed from FEMA to the state. The NYS DHSES serves as the grantee and program administrator for the FMA program.

Pre-Disaster Mitigation (PDM) Grant Program

The Pre-Disaster Mitigation (PDM) grant program makes federal funds available to state, local, tribal, and territorial governments to plan for and implement sustainable cost-effective measures designed to reduce the risk to individuals and property from future natural hazards, while also reducing reliance on federal funding from future disasters. The program is authorized by Section 203 of the Stafford Act.

The Further Consolidated Appropriations Act, 2024 authorizes funding for 110 projects for states, tribes, territories and local communities for FEMA's Hazard Mitigation Assistance Pre-Disaster Mitigation grant program.

These funds allow governments to plan for and implement sustainable cost-effective measures designed to reduce the risk to individuals and property from future natural hazards, while also reducing reliance on federal funding from future disasters.

Extraordinary Circumstances

For HMGP and FMA, an exception may be made to the requirement that applicants have a current approved HMP if extraordinary circumstances are declared. This can occur when a determination is made by the applicant and FEMA that the proposed project is consistent with the priorities and strategies identified in the state hazard mitigation plan and that the jurisdiction meets at least one of the following criteria:

- The jurisdiction meets the small, impoverished community criteria.

- The jurisdiction has been determined to have had insufficient capacity due to lack of available funding, staffing, or other necessary expertise to satisfy the mitigation planning requirement prior to the current disaster or application deadline.
- The jurisdiction has been determined to have been at low risk from hazards because of low frequency of occurrence or minimal damage from previous occurrences as a result of sparse development.
- The jurisdiction experienced significant disruption from a declared disaster or another event that impacts its ability to complete the mitigation planning process prior to award or final approval of a project award.
- The jurisdiction does not have a mitigation plan for reasons beyond the control of the state, federally recognized tribe, or local community, such as Disaster Relief Fund restrictions that delay FEMA from granting a subaward prior to the expiration of an existing hazard mitigation plan.

If the jurisdiction does not meet at least one of these criteria, the FEMA region must coordinate with FEMA headquarters for HMGP. For FMA, the FEMA region must coordinate and seek concurrence prior to granting an exception. For HMGP and FMA, the applicant must provide written justification that identifies the specific criteria or circumstance listed above, explains why there is no longer an impediment to satisfying the mitigation planning requirement, and identifies the specific actions or circumstances that eliminated the deficiency.

When an HMGP project funding is awarded under extraordinary circumstances, the recipient must acknowledge in writing to FEMA that a plan will be completed within 12 months of the award. The recipient must provide a work plan for completing the hazard mitigation plan, including milestones and a timetable, to ensure that the jurisdiction will complete the HMP in the required time. This requirement must be incorporated into the award.

Rehabilitation of High Hazard Potential Dams Program

The Rehabilitation of High Hazard Potential Dams (HHPD) grant program provides technical, planning, design, and construction assistance for the following activities to reduce dam risk and increase community preparedness:

- Repair
- Removal
- Structural or nonstructural rehabilitation of eligible dams

Disaster and Recovery Assistance Programs

The sections below describe the general types of federal assistance that may be provided should the president declare an event to be a major disaster.

FEMA Public Assistance

Public Assistance provides cost reimbursement aid to local governments (state, county, local, municipal authorities, and school districts) and certain nonprofit agencies that were involved in disaster response and recovery programs or that suffered loss or damage to facilities or property used to deliver government-like services. This program is largely funded by FEMA with both local and state matching contributions required.

Small Business Administration Loans (Individual Assistance)

The Small Business Administration (SBA) provides low-interest disaster loans (Individual Assistance) to homeowners, renters, business, and most private nonprofit organizations. SBA disaster loans can be used to repair or replace the following items damaged or destroyed in a declared disaster: real estate, personal property, machinery and equipment, and inventory and business assets. Available funding is as follows:

- Renters are eligible for loans to cover personal property losses. They may borrow up to $40,000 to replace or repair personal property (such as clothing, furniture, cars, and appliances) damaged or destroyed in a disaster.
- Homeowners may apply for up to $200,000 to replace or repair their primary residence. Individuals may borrow up to $200,000 to repair or replace real estate, $40,000 to cover losses to personal property, and an additional 20 percent for mitigation.
- Physical disaster loans of up to $2 million are available to qualified businesses and most private nonprofit organizations. For businesses, loans may be made to repair or replace disaster damage to property owned by the business, including real estate, machinery and equipment, inventory, and supplies. Businesses of any size are eligible. Nonprofit organizations such as charities, churches, private universities, etc. are also eligible.

Economic Injury Disaster Loan

An Economic Injury Disaster Loan provides necessary working capital until normal operations resume after a physical disaster. These loans are restricted, by law, to small businesses only.

Assistance to Firefighters Grant Program

Assistance to Firefighters Grants are direct financial assistance to fire departments, nonaffiliated emergency medical services organizations, and state fire training academies to enhance the safety of the public and firefighters with respect to fire-related hazards. This funding is for resources to equip and train emergency personnel to recognized standards, enhance operations efficiencies, foster interoperability, and support community resilience.

Emergency Management Performance Grants Program

The Emergency Management Performance Grant provides state, local, tribal, and territorial emergency management agencies with resources to implement the National Preparedness System. The program's supports efforts to build and sustain core capabilities across the prevention, protection, mitigation, response, and recovery mission areas.

Homeland Security Grant Program

The Homeland Security Grant Program (HSGP) supports the building, sustainment, and delivery of core capabilities essential to achieving the National Preparedness Goal of a secure and resilient nation. The program supports efforts to build and sustain core capabilities across the prevention, protection, mitigation, response, and recovery mission areas. This includes building and sustaining law enforcement and terrorism prevention capabilities, and enhancing state and major urban area fusion centers. HSGP is composed of three grant programs: the State Homeland Security Program, Urban Areas Security Initiative, and the Operation Stonegarden. These programs fund preparedness activities including planning, organization, equipment purchase, training, exercises, management, and administration.

National Park Service Land and Water Conservation Fund

The Land and Water Conservation Fund (LWCF) was established to safeguard natural areas, water resources, and cultural heritage, and to provide recreation opportunities. Using no taxpayer dollars, the LWCF invests earnings from offshore oil and gas leasing to help strengthen communities, preserve history, and protect the national endowment of lands and waters. The program is divided into the "State Side," which provides grants to state and local governments, and the "Federal Side," which is used to acquire lands, waters, and interests therein necessary

to achieve the natural, cultural, wildlife, and recreation management objectives of federal land management agencies.

Restore America's Estuaries Coastal Watersheds Grant Program

Restore America's Estuaries, in coordination with the U.S. EPA, administers the National Estuary Program Coastal Watersheds Grant Program. This program supports measures to address the following:

- Loss of key habitats resulting in significant impacts on fisheries and water quality such as seagrass, mangroves, tidal and freshwater wetlands, forested wetlands, kelp beds, shellfish beds, and coral reefs
- Recurring harmful algae blooms
- Unusual or unexplained marine mammal mortalities
- Proliferation or invasion of species that limit recreational uses, threaten wastewater systems, or cause other ecosystem damage
- Flooding and coastal erosion that may be related to sea-level rise, changing precipitation, or salt marsh, seagrass, or wetland degradation or loss
- Impacts of nutrients and warmer water temperatures on aquatic life and coastal ecosystems, including low dissolved oxygen conditions in estuarine waters
- Contaminants of emerging concern found in coastal and estuarine waters such as pharmaceuticals, personal care products, and microplastics

U.S. Department of Agriculture

Community Facilities Direct Loan and Grant Program

This program provides funding to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides an essential service to the local community for the orderly development of the community in a primarily rural area and does not include private, commercial, or business undertakings. Funds can be used to purchase, construct, and/or improve essential community facilities, purchase equipment, and pay related project expenses. Rural areas including cities, villages, townships, towns, and federally recognized tribal lands, with no more than 20,000 residents according to the latest U.S. Census, are eligible for this program.

Emergency Loan Program

The Emergency Loan Program is triggered when a natural disaster is designated by the secretary of agriculture, or a natural disaster or emergency is declared by the president under the Stafford Act. These loans help producers who suffer qualifying farm-related losses directly caused by the disaster in a county declared or designated as a primary disaster or quarantine area. Farmers in counties that are contiguous to the declared, designated, or quarantined area also may qualify for emergency loans. For production losses, a 30 percent reduction in a primary crop in a designated or contiguous county is required. Losses to quality, such as receiving a 30 percent reduced price for flood-damaged crops, may be eligible for assistance, too.

Emergency Watershed Protection Program

The Emergency Watershed Protection (EWP) Program offers financial and technical assistance for various activities, including the following:

- Remove debris from stream channels, road culverts, and bridges

- Reshape and protect eroded streambanks
- Correct damaged or destroyed drainage facilities
- Establish vegetative cover on critically eroding lands
- Repair levees and structures
- Repair certain conservation practices
- Buyouts

EWP does not require a disaster declaration by federal or state government officials for program assistance to begin. The Natural Resources Conservation Service (NRCS) state conservationist can declare a local watershed emergency and initiate EWP program assistance in cooperation with an eligible sponsor. The sponsor must sign a cooperative agreement with NRCS. The EWP program

EWP–Recovery

The EWP–Recovery program is aimed at relieving imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences. Public and private landowners are eligible for assistance but must be represented by a project sponsor that is a legal subdivision of the state, such as a city, county, township, or conservation district, and Native American tribal governments. NRCS will pay up to 75 percent of the construction cost of emergency measures. The remaining 25 percent must come from local sources and can be in the form of cash or in-kind services.

EWP–Recovery is for the installation of recovery measures to safeguard lives and property as a result of a natural disaster. NRCS completes a damage survey report, which provides a case-by-case investigation of the work necessary to repair or protect a site. Watershed impairments that the program addresses are debris-clogged stream channels, undermined and unstable streambanks, jeopardized water control structures and public infrastructures, wind-borne debris removal, and damaged upland sites stripped of protective vegetation by fire or drought.

EWP–Floodplain Easement

the EWP–Floodplain Easement program funds projects to restore easements to the natural environment to the extent practicable. Work can include both structural and nonstructural practices to restore flood storage and flow, control erosion, and improve the practical management of the easement. Privately owned lands or lands owned by local and state governments may be eligible for participation if they meet one of the following criteria:

- Lands that have been damaged by flooding at least once within the previous calendar year or have been subject to flood damage at least twice within the previous 10 years
- Other lands within the floodplain that would contribute to the restoration of flood storage and flow, provide for control of erosion, or improve the practical management of the floodplain easement
- Lands that would be inundated or adversely impacted as a result of a dam breach

Structures, including buildings, within the floodplain easement must be demolished and removed or relocated outside the 100-year floodplain or dam breach inundation area.

Regional Conservation Partnership Program

The Regional Conservation Partnership Program promotes coordination of NRCS conservation activities with partners that offer value-added contributions to expand the collective ability to address on-farm, watershed, and regional natural resource concerns. Through this program, NRCS seeks to co-invest with partners to implement

projects that demonstrate innovative solutions to conservation challenges and provide measurable improvements and outcomes tied to the resource concerns they seek to address.

U.S. Department of Health and Human Services Social Services Block Grant Program

The Social Services Block Grant is a flexible funding source that allows states and territories to tailor social service programming to their population's needs. Through this program, states provide essential social services that help to reduce dependency and promote self-sufficiency; protect children and adults from neglect, abuse, and exploitation; and help individuals who are unable to take care of themselves to stay in their homes or find the best institutional arrangements.

U.S. Department of Housing and Urban Development

Community Development Block Grants

Community Development Block Grants (CDBG) are federal funds intended to provide low and moderate-income households with viable communities, including decent housing, a suitable living environment, and expanded economic opportunities. Eligible activities include community facilities and improvements, roads and infrastructure, housing rehabilitation and preservation, development activities, public services, economic development, planning, and administration. Public improvements may include flood and drainage improvements.

In limited instances, and during times of urgent need as defined by the CDBG National Objectives (e.g., post-disaster), CDBG funding may be used to acquire a property in a floodplain that was severely damaged by a recent flood, demolish a structure severely damaged by an earthquake, or repair a public facility severely damaged by a hazard event.

Community Development Block Grant Disaster Recovery (CDBG-DR) grant funds are appropriated by Congress and allocated by HUD to rebuild disaster-impacted areas and provide crucial seed money to start the long-term recovery process. These flexible grants help cities, counties, Native American tribes, and states recover from presidentially declared disasters, especially in low-income areas. CDBG-DR assistance can help communities and neighborhoods that otherwise might not recover due to limited resources.

Disaster Housing Assistance Program

The Disaster Housing Assistance Program provides emergency assistance for housing, including minor repairs of a home to establish livable conditions, mortgage, and rental assistance.

HOME Investment Partnerships Program

The HOME Investment Partnerships Program (HOME) provides grants to states and localities—often in partnership with local nonprofit groups—to fund building, buying, and/or rehabilitating affordable housing for rent or homeownership or providing direct rental assistance to low-income people. HOME is the largest federal block grant to state and local governments designed exclusively to create affordable housing for low-income households. HOME funds are awarded annually as grants to participating jurisdictions. The program's flexibility allows states and local governments to use HOME funds for grants, direct loans, loan guarantees or other forms of credit enhancements, or rental assistance or security deposits. The program's requirement that participating jurisdictions match 25 cents of every dollar in program funds mobilizes community resources in support of affordable housing.

Section 108 Loan Guarantee Program

The Section 108 Loan Guarantee Program provides communities with a source of low-cost, long-term financing for economic and community development projects. Section 108 financing provides an avenue for communities to undertake larger, more costly projects, where they may have limited resources to invest upfront. Section 108 can fund economic development, housing, public facilities, infrastructure, and other physical development projects, including improvements to increase resilience against natural disasters. Section 108 assistance can be deployed in two ways:

- Directly by the community or its governmental or non-profit partner to carry out an eligible project
- Indirectly with a community or its partner re-lending (or, in limited circumstances, granting) the funds to a developer or business to undertake an eligible project

U.S. Department of Transportation

Federal Highway Administration Emergency Relief

Federal Highway Administration (FHWA) Emergency Relief is a grant program that can be used for the repair or reconstruction of federal-aid highways and roads on federal lands that have suffered serious damage as a result of a disaster. New York State serves as the liaison between local municipalities and FHWA, making the municipalities sub-applicants of New York State. The program is appropriated $100 million annually.

Federal Transit Administration Emergency Relief

Federal Transit Authority (FTA) Emergency Relief is a grant program that funds capital projects to protect, repair, reconstruct, or replace equipment and facilities of public transportation systems. Administered by the FTA and directly allocated to mass transit and port authorities, this transportation-specific fund was created as an alternative to FEMA's Public Assistance.

Federal Highway Administration Recreational Trails

The FHWA Recreational Trails Program provides funds to states to develop and maintain recreational trails and trail-related facilities for both nonmotorized and motorized recreational trail uses. The program requires that states use 30 percent of funds for non-motorized recreation, 30 percent for motorized recreation, and 40 percent for diverse recreational trail use. In New York State, the Recreational Trails Program is administered by the Office of Parks, Recreation, and Historic Preservation.

Rebuilding American Infrastructure with Sustainability and Equity Grant Program

The U.S. Department of Transportation (USDOT) Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grant program supports road, rail, transit, and port projects that promise to achieve national objectives. Project sponsors at the state and local levels can obtain funding for multi-modal, multi-jurisdictional projects that are more difficult to support through traditional USDOT programs. RAISE can provide funding directly to any public entity, including municipalities, counties, port authorities, tribal governments, or others, in contrast to traditional federal programs that provide funding to very specific groups of applicants (mostly state departments of transportation and transit agencies). This flexibility allows RAISE and USDOT partners at the state and local levels to work directly with a host of entities that own, operate, and maintain much of that nation's transportation infrastructure but otherwise cannot turn to the federal government for support.

U.S. Economic Development Administration

The U.S. Economic Development Administration (USEDA) is an agency of the U.S. Department of Commerce that supports regional economic development in communities around the country. It provides funding to support comprehensive planning and makes strategic investments that foster employment creation and attract private investment in economically distressed areas of the United States.

Public Works Program

Through its Public Works Program, USEDA invests in key public infrastructure, such as traditional public works projects, including water and sewer system improvements, expansion of port and harbor facilities, brownfields, multitenant manufacturing and other facilities, business and industrial parks, business incubator facilities, redevelopment technology-based facilities, telecommunications facilities, and development facilities.

Economic Adjustment Program

Through its Economic Adjustment Program, USEDA administers its Revolving Loan Fund Program, which supplies small businesses and entrepreneurs with the gap financing needed to start or expand their business in areas that have experienced or are under threat of serious structural damage to the underlying economic base.

U.S. Environmental Protection Agency

Smart Growth Implementation Assistance Program

The Smart Growth Implementation Assistance program focuses on complex issues such as stormwater management, code revision, transit-oriented development, affordable housing, infill development, corridor planning, and green building. Applicants can submit proposals under four categories: community resilience to disasters, job creation, the role of manufactured homes in sustainable neighborhood design, or medical and social service facilities siting.

Clean Water Act Section 604(b) Water Quality Planning Grants

Water Quality Planning Grants provide funding to implement regional comprehensive water quality management planning activities as described in Section 604(b) of the federal Clean Water Act. Funds are to be used for water quality management planning activities, including tasks to determine the nature, extent, and causes of point and nonpoint source water pollution problems, and to develop plans to resolve these problems.

U.S. Fish and Wildlife Service Partners for Fish and Wildlife

The Partners for Fish and Wildlife Program provides free technical and financial assistance to landowners, managers, tribes, corporations, schools, and nonprofits interested in improving wildlife habitat on their land. These projects range in size from a wetland of a few acres to a grassland restoration covering several hundred thousand acres. Efforts are focused on areas of conservation concern, such as upland forests, wetlands, native prairies, marshes, rivers, and streams. Many Partners for Fish and Wildlife projects take place on working landscapes such as forests, farms, and ranches. Projects are designed to benefit federal trust species including migratory birds and endangered, threatened, or at-risk species.

16.3.2 State

BRIDGE NY

The BRIDGE NY program, administered by the NYSDOT, is open to all municipal owners of bridges and culverts. Projects are awarded through a competitive process and support all phases of project development. Projects selected for funding under BRIDGE NY are evaluated based on the resilience of the structure, including such factors as hydraulic vulnerability and structural resilience; the significance and importance of the bridge, including traffic volumes, detour considerations, number and types of businesses served and impacts on commerce; and the current bridge and culvert structural conditions.

Empire State Development

Empire State Development offers a wide range of financing, grants, and incentives to promote business and employment growth and real estate development throughout the state. Several programs address infrastructure construction associated with project development, acquisition and demolition and brownfield remediation and redevelopment (NYS ESD 2023).

Funding for Local Waterfront Revitalization Programs

Funding for the preparation and implementation of LWRPs (as described in Section 16.1.2) may be requested through New York State's Environmental Protection Fund under Title 11, Local Waterfront Revitalization Program. Other state agencies with funding programs that may support LWRP implementation projects include the Office of Parks, Recreation and Historic Preservation, NYSDEC, and Empire State Development. Grant applications for these state programs are administered through the NYS Consolidated Funding Application (NYDOS 2024).

New York State Department of Archives Local Government Records Management Improvement Fund

The Local Government Records Management Improvement Fund provides grants to assist local governments in establishing records management programs or developing new program components. Funds come from fees collected by county clerks and the New York City Office of the City Register. These fees are collected during the recording of certain documents and when county clerks assign index numbers for certain court cases. The amount of grant funding available each year depends on the number of documents recorded and index numbers assigned that year. Project categories include the following:

- Disaster management
- Document conversion and access
- Files management
- Historical records
- Inactive records

Application types include:

- Individual (up to $75,000)
- Shared services (up to $150,000)
- New York City Department of Records

New York State Department of Environmental Conservation

Clean Water State Revolving Fund

The Clean Water State Revolving Fund (CWSRF) provides interest-free or low-interest rate financing for wastewater and sewer infrastructure projects to municipalities throughout New York State. Projects eligible for financing include construction or restoration of sewers and wastewater treatment facilities, stormwater management, landfill closures, and habitat restoration and protection projects. The New York State Environmental Facilities Corporation provides both short- and long-term financing—interest-free or low-interest—to accommodate municipalities of all population sizes with varying financial needs. When communities repay their financings, it allows the Environmental Facilities Corporation to finance new projects, so that the funds revolve over time.

Climate Smart Communities Grant Program

Climate Smart Community (CSC) grants support mitigation and adaptation projects to reduce greenhouse gas emissions and prepare for changing conditions. The CSC program enables high-performing registered communities to achieve recognition for their leadership. Designed around 10 pledge elements, the certification program recognizes communities achieving any of over 130 total possible actions through a rating system leading to four levels of award: Certified, Bronze, Silver, and Gold. Recertification of completed actions is required every five years.

Competitive grants ranging from $25,000 to $100,000 provide support for local governments to become certified CSCs. All counties, cities, towns, and villages of New York State are eligible to receive funding. The CSC grant program will provide 50/50 matching grants for eligible projects. It offers free technical support on energy and climate and guidance tailored to New York State communities. Funding is available for the following:

- Implementation projects that advance climate adaptation and mitigation actions, including the following:
  - Construction of natural resilience measures
  - Relocation or retrofit of vulnerable facilities
  - Conservation or restoration of riparian areas and tidal marsh migration areas
  - Reduction of flood risk
  - Clean transportation
  - Reduction or recycling of food waste
- Certification projects that advance actions aligned with CSC certification requirements, including the following:
  - Right-sizing government fleets
  - Developing natural resource inventories
  - Conducting vulnerability assessments
  - Developing climate adaptation strategies
  - Updating hazard mitigation plans to address changing conditions and reduce climate vulnerability

Environmental Protection Fund

New York State's Environmental Protection Fund (EPF) 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. The EPF also supports the stewardship of public lands, including state parks and millions of acres

of public lands throughout the state. Through partnerships with volunteer organizations, state agencies use stewardship funding to manage trails and lands, protect natural resources, preserve wildlife habitats, make critical capital improvements at parks and campgrounds, educate students about conservation, and provide access to persons with disabilities.

Volunteer Fire Assistance Grants

This 50/50 matching fund program makes funds available to rural fire companies for the purchase of wildland firefighting equipment such as portable backpack pumps, Nomex protective clothing, hand tools, hard hats, hoses, portable radios, and dry hydrants.

Wastewater Infrastructure Engineering Planning Grant

The Wastewater Infrastructure Engineering Planning Grant assists municipalities with the engineering and planning costs of CWSRF-eligible water quality projects. Eligibility for municipalities is based on median household income:

- Median household income of $65,000 or less in the Regional Economic Development Council regions of Capital District, Southern Tier, North Country, Mohawk Valley, Central New York, Finger Lakes, or Western New York (Sullivan County is located in the Southern Tier region)
- Median household income of $85,000 or less in Regional Economic Development Council regions of Long Island, New York City, or Mid-Hudson

Grants with a 20 percent required local match could finance activities to produce an engineering report, including engineering and consultant fees. Funding priorities go to projects that have one of the following qualities:

- Required by an executed order on consent
- Required by a draft or final State Pollutant Discharge Elimination System permit
- Upgrading or replacing an existing wastewater system
- Constructing a wastewater treatment and/or collection system for an area with failing onsite septic systems
- Identified in a total maximum daily load implementation plan

The goal of the Engineering Planning Grant program is to advance water quality projects to construction, so successful applicants can use the engineering report funded by the grant to seek financing through the CWSRF program, Water Quality Improvement Project program, or other funding entities to further pursue the identified solution.

Water Quality Improvement Project Program

The Water Quality Improvement Project program is a competitive reimbursement grant program that funds projects that directly address documented water quality impairments. The competitive, statewide grant program is open to local governments and not-for-profit corporations. Grant recipients may receive up to 75 percent of the project costs for high priority wastewater treatment improvement, non-agricultural nonpoint source abatement and control, land acquisition for source water protection, aquatic habitat restoration, and municipal separate storm sewer system projects; up to 50 percent for salt storage projects; and up to 40 percent for general wastewater infrastructure improvement projects. Eligible activities include the following (NYSDEC n.d.-e):

- Wastewater treatment improvement
- Non-agricultural nonpoint source abatement and control

- Land acquisition for source water protection
- Salt storage
- Aquatic habitat restoration
- Municipal separate storm sewer systems

New York State Emergency Services Revolving Loan

The New York State Emergency Services Revolving Loan Account makes loans to cities, villages, fire districts, counties, towns, and not-for-profit fire/ambulance corporations at an annual fixed interest rate of 2.5 percent. The loan supports the repair of firefighting apparatus, ambulances, or rescue vehicles and the renovation, rehabilitation, or repair of facilities that house firefighting equipment, ambulances, rescue vehicles, and related equipment. Principal and interest payments made by recipients are deposited in the revolving loan account and loaned again to new applicants. Therefore, funding levels in the account vary throughout the year depending upon the amount of repayment money, interest accrued, and number of new loans made.

16.3.3 County and Local

Sullivan County and individual jurisdictions are legally authorized to fund mitigation projects though existing local budgets, local appropriations (including referendums and bonding), and a variety of federal and state loan and grant programs. Many jurisdictions noted throughout the planning process that they are faced with increasing fiscal constraints, including decreasing revenues, budget constraints, and tax caps. In an effort to overcome these fiscal challenges, jurisdictions have continued to leverage the sharing of resources and combining available funding with grants and other sources and note that plans and interjurisdictional cooperation are beneficial in obtaining grants.

Sullivan Catskills Visitors Association

Tourism Grant Program

Funded through county lodging tax revenues, the Tourism Grant Program reinvests directly into projects that elevate the Sullivan Catskills' brand and enhance the visitor experience. The program supports a diverse range of initiatives, from destination marketing and event promotion to cultural programming and local branding, all with a focus on measurable outcomes and sustainable growth.

Sullivan180

Through a competitive grant process, Sullivan 180 offers funding, technical assistance, and other resources in support of building beautiful, active communities in Sullivan County, NY.

Community Beautification Grant

Beautification enhances the aesthetics of the environment for public use and enjoyment. The acts of gardening, planting trees, flowers, shrubs and combatting litter, all improve the quality of life and help foster connections among neighbors. Funding varies depending on the scope of the project and may include gardens, trees, containers, parks, and streetscape enhancements. Youth engagement is a requirement.

Municipal Partnership Grant

This program provides funding to local governments to care for public spaces, support youth initiatives, and/or engage in environmental stewardship. Funds can be used to offset the cost of hiring staff associated with the project, or for direct project costs such as material, equipment and contracted services.

Community Impact Grant

This grant program provides substantial funding for a capital project that would have a transformational impact on the community. Examples include public parks or plazas, trail development, recreational facilities and community centers.

Community Development Grant

This program provides funding to accomplish and implement community development-related goals through 3 grant categories:

- Community Events:
  - New or expanded festivals or celebrations that promote cultural diversity, community and youth engagement
  - Neighborhood-based events and activities that encourage interactions between residents
  - New or expanded events that address a community health-related issue or encourage healthy activities
- Projects/Initiatives:
  - Creation of trails, pocket parks, outdoor art installations, murals or other projects which incorporate or implement placemaking
  - Initiatives that address a health-related issue or topic and promote healthy, active communities
- Planning & Technical Assistance:
  - Professional services for design, planning or engineering for community buildings, parks or trails
  - Architectural services or renderings for building design and façade restoration
  - Capacity building activities, conference attendance or other professional development opportunities

PART 4: MITIGATION STRATEGY

17. MITIGATION STRATEGY

This chapter describes the process used to identify mitigation goals and actions and create mitigation strategies for each jurisdiction participating in the HMP. Planning Partners reviewed the risk assessment and capability assessment to develop jurisdiction-specific mitigation strategies, which are included in the annexes in Volume II.

FEMA defines ***Mitigation Actions*** as specific actions that help to achieve the mitigation goals.

17.1 MITIGATION GOALS

This section describes the process of updating hazard mitigation goals for reducing or avoiding long-term vulnerabilities to identified hazards. Goals are general guidelines that explain what is to be achieved. They are usually broad, long-term, policy-type statements and represent global visions. Goals help define the benefits that the HMP is trying to achieve. The success of the plan, once implemented, should be measured by the degree to which its goals have been met (that is, by the actual benefits in terms of hazard mitigation).

"The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards."

44 CFR 201.6(c)(3)(i)

The Steering Committee reviewed the 2021 goals and revised them based on the following considerations:

- Hazard events and losses since the 2021 plan
- The updated hazard profiles and risk assessment
- The goals and objectives established in the New York State 2023 HMP
- The Planning Partnership's interests in integrating this HMP with other planning mechanisms, including Sullivan County and local risk management plans
- Direct input from the Steering Committee, stakeholders, and the public on how the County and jurisdictions need to move forward to best manage their hazard risk
- Discussions and research on existing authorities, policies, programs, resources
- Support for mitigation through the protection of natural systems

As a result of this review process, the goals for the 2026 update were updated to the following:

- Goal 1: Promote a comprehensive countywide hazard mitigation program that includes coordination among County departments, jurisdictions and federal, state, and local organizations.
- Goal 2: Protect lives and existing property, including all populations at risk from hazards and vulnerable public, historic, and private structures and critical facilities and infrastructure.
- Goal 3: Increase awareness of hazard risk and mitigation capabilities among stakeholders, citizens, elected officials, and property owners to enable the successful implementation of mitigation strategies.
- Goal 4: Encourage the development and implementation of long-term, cost effective, and resilient mitigation projects to preserve or restore the functions of natural systems.
- Goal 5: Build stronger by promoting mitigation actions that emphasize sustainable construction and design measures to reduce or eliminate the impacts of natural hazards now and in the future.
- Goal 6: Address long-term vulnerabilities from high hazard potential dams and at-risk dams.

17.2 MITIGATION STRATEGY DEVELOPMENT

Beginning in November 2025, members of the Steering Committee and contract consultants worked directly with each jurisdiction (by phone, email, or virtual meetings) to update their annex with mitigation strategies that focus on well-defined, implementable projects that meet the definition or characteristics of mitigation. Mitigation actions were selected with a careful consideration of benefits (risk reduction, losses avoided), costs, and possible funding sources (including mitigation grant programs).

17.2.1 Mitigation Strategy Meetings

Three annex support meetings were held for Planning Partners to assist in the development of additional actions, foster collaboration between neighboring jurisdictions for mitigation actions, discuss actions that involve cooperation between the County and jurisdictions, and identify steps needed to complete the jurisdictional annexes.

17.2.2 Review of Previous Actions

To evaluate progress on local mitigation actions, each Planning Partner completed a Mitigation Action Plan Review Worksheet that listed all actions identified for their jurisdiction in the 2021 HMP. The Planning Partners indicated the status of each action ("In Progress," "Ongoing Capability," "No Progress," or "Complete") and provided comments to quantify the extent of progress and provide reasons for the level of progress. This information is included in the jurisdictional annexes in Volume II. At the kickoff and during subsequent local level planning meetings, all Planning Partners were further surveyed to identify completed mitigation actions, in-progress actions, or ongoing capabilities.

Mitigation actions identified as "Complete" have been removed from the Planning Partners' updated mitigation strategies. Actions identified as "No Progress" or "In Progress" have been carried forward for inclusion in the updated local mitigation strategies or discontinued for specific reasons. Updated action descriptions provide new details on these actions to better define the projects, identify benefits and costs, and improve implementation.

Actions from the previous plan identified as "Ongoing Capability" represent programs that are now fully integrated into the normal operational and administrative framework of the community. These are removed from the updated mitigation strategy (marked as "Discontinued") and identified in the capabilities assessment of each annex.

17.2.3 Identifying New Actions

Communities were made aware of potential new mitigation actions as such actions became evident during the HMP update process. Mitigation actions were developed for all high-ranked hazards as presented in the jurisdictional annexes. For jurisdictions that do not have two or more high rankings, medium rankings that have associated actions can be considered as hazards of concern. Throughout the course of the HMP update process, additional regional and County-level mitigation actions were identified by the following processes:

- Review of the results and findings of the updated risk assessment
- Review of available regional and County plans, reports, and studies
- Direct input from County departments and other regional agencies, including:
  - Sullivan County Division of Planning, Community Development and Environmental Management
  - Sullivan County Division of Health and Human Services

- Sullivan County Department of Grants Administration
- Sullivan County Office of Sustainable Energy
- Sullivan County Sheriff's Office
- Sullivan County Division of Public Works
- Sullivan County Division of Public Safety
- Sullivan County Real Property Tax Services
- Sullivan County Division of Community Resources
- Sullivan County Office of the County Manager
- Cornell Cooperative Extension Sullivan County
- Sullivan County Soil and Water Conservation District

- Input received through the public and stakeholder outreach process

The sections below describe the focus of the process followed to identify new mitigation actions.

Addressing Known Vulnerabilities

To help support the selection of an appropriate risk-based mitigation strategy, each annex includes a summary of hazard vulnerabilities. These were identified during the HMP update process by Planning Partner representatives, through review of available plans and reports, or through the hazard profiling and risk assessment process.

Discussions on mitigation strategies were conducted on February 18-19, 2026, for all Planning Partners to support the development of focused problem statements based on the impacts of hazards in the County and their communities. These problem statements provide a detailed description of a problem area, including its impacts on the jurisdiction; past damage; loss of service; etc. An effort was made to include the street address of the problem location, adjacent streets, water bodies, and well-known structures as well as a brief description of existing conditions (topography, terrain, hydrology) of the site. These problem statements form a bridge between the hazard risk assessment, which quantifies impacts on each community, and the development of actionable mitigation strategies.

Protecting Critical Facilities

Mitigation actions that address vulnerable critical facilities have been proposed in consideration of protection against worst-case scenarios. For projects funded through federal mitigation programs, the level of protection may be influenced by cost-effectiveness as determined through a formal benefit-cost analysis. For locally self-funded projects, local jurisdiction discretion must be recognized. It must be recognized that the County and jurisdictions have limited authority with regard to mitigation at any level of protection over privately owned critical facilities.

Accounting for Future Conditions

As discussed in the hazard profiles in this HMP, impacts of weather-related hazards (e.g., flood, severe storm, severe winter storm, and wildfire) are anticipated to be exacerbated as climate conditions change over time. Communities are working to evaluate and recognize these long-term implications and to incorporate their mitigation strategies into planning and capital improvement updates.

Incorporating a Range of Action Types

Efforts were made to ensure that Planning Partners develop updated mitigation strategies that cover the range of mitigation action types described in recent FEMA planning guidance (FEMA 2021b):

> ***Mitigation actions*** address a range of impacts, including impacts on the population, property, the economy, and the environment. They can include activities such as revisions to land-use planning, training and education, and structural and nonstructural safety measures.

- **Education Outreach**—Sustained programs to educate residents and community leaders about risks, vulnerabilities, and mitigation opportunities
- **Natural Systems Protection**—Actions that minimize damage and losses through preservation or restoration of natural systems
- **Planning and Regulations**—Policies or codes that influence the way land is developed and buildings are constructed
- **Structure and Infrastructure**—Actions modifying existing structures or infrastructure to remove them from a vulnerable area, or construction of new structures to protect existing development

Efforts were also made to develop mitigation strategies that cover the range of mitigation action types described in recent CRS guidance (FEMA 2017):

- **Preventive Activities**—Activities to keep flood problems from getting worse. The use and development of flood-prone areas is limited through planning, land acquisition, or regulation. They are usually administered by building, zoning, planning, and/or code enforcement offices. Examples include planning and zoning, local floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection**—Activities undertaken by property owners on a building-by-building or parcel basis. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
- **Natural Resource Protection**—Activities to preserve or restore natural areas or the natural functions of floodplain and watershed areas. They are implemented by a variety of agencies, primarily parks, recreation, or conservation agencies or organizations. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Emergency Services**—Measures taken during an emergency to minimize its impact. These measures are usually the responsibility of city or county emergency management staff and the owners or operators of major critical facilities. Services include warning systems, emergency response services, and the protection of essential facilities.
- **Structural Projects**—Projects to keep flood waters away from an area with a levee, reservoir, or other flood control measure. They are usually designed by engineers and managed or maintained by public works staff. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.
- **Public Information**—Activities to advise property owners, potential property owners, and visitors about hazards, ways to protect people and property from the hazards, and the natural and beneficial functions of local floodplains. They are usually implemented by a public information office. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.

Considering Mitigation Best Practices

Catalogs of hazard mitigation best practices were developed that present a broad range of alternatives to be considered for use in the mitigation strategies, in compliance with 44 CFR Section 201.6(c)(3)(ii). One catalog was developed for each hazard of concern evaluated in this plan. The catalogs present alternatives that are categorized based on the following considerations:

- Who would have responsibility for implementation:
  - Individuals—personal scale
  - Businesses—corporate scale
  - Government—government scale
- What the alternatives would do:
  - Manipulate the hazard
  - Reduce vulnerability to the hazard
  - Reduce impacts from the hazard
  - Build local capacity to respond to or be prepared for the hazard

The alternatives presented include actions that will mitigate current risk from hazards and actions that will help reduce risk from changes in the impacts of these hazards resulting from changing conditions. The catalogs provide a baseline of mitigation alternatives that are backed by a planning process, are consistent with the established goals and objectives, and are within the capabilities of the Planning Partners to implement. Some of these actions may not be feasible based on the selection criteria identified for this plan. The purpose of the catalogs was to provide a list of what could be considered to reduce risk from natural hazards within the planning area. Appropriate hazard mitigation actions were selected from among the alternatives in the catalogs for inclusion in the mitigation strategies. Actions in the catalog that are not included for the partnership's mitigation strategy were not selected for one or more of the following reasons:

- The action is not feasible
- The action is already being implemented
- There is an apparently more cost-effective alternative
- The action does not have public or political support.

The catalogs are included in Appendix B.

17.3 MITIGATION STRATEGY EVALUATION

17.3.1 Prioritization

Section 201.c.3.iii of 44 CFR establishes how mitigation strategies are to be prioritized, implemented, and administered by local jurisdictions. For this HMP update, each mitigation strategy was prioritized using criteria suitable for evaluating hazard mitigation strategies. This method provided a systematic approach that considered the opportunities and constraints of implementing each mitigation action. The Steering Committee chose the following evaluation criteria for this process:

- Life Safety—How effective will the action be at protecting lives and preventing injuries? Will the proposed action adversely affect one segment of the population?

- Property Protection—How significant will the action be at eliminating or reducing damage to structures and infrastructure? For example: development in the floodplain or high-risk areas?
- Cost-Effectiveness—Are the costs to implement the action commensurate with the benefits achieved?
- Political—Is there overall public support for the action? Is there the political will to support it? Is the action at odds with development pressures?
- Legal—Does the jurisdiction have the authority to implement the action?
- Fiscal—Can the action be funded under existing program budgets (i.e., is this action currently budgeted for)? Or would it require a new budget authorization or funding from another source such as grants?
- Environmental—What are the potential environmental impacts of the action? Will it comply with environmental regulations? Are there co-benefits of this action?
- At-Risk Populations—Does the action benefit at-risk populations and underserved communities? Additional considerations can include appropriate numerical measures of populations at risk.
- Administrative—Does the jurisdiction have the personnel and administrative capabilities to implement the action and maintain it or will outside help be necessary? Does the scale and scope of the action align with the jurisdiction's capabilities?
- Hazards of Concern—Does the action address one or more of the jurisdiction's high-ranked hazards?
- Changing Conditions—Does the action incorporate future projections? Is the action designed to withstand/address long-term conditions?
- Timeline—Can the action be completed in less than five years?
- Community Lifelines—Does this action benefit community lifelines?
- Other Local Objectives—Does the action advance other local objectives, such as capital improvements, economic development, environmental quality, or open space preservation? Does it support the policies of other plans and programs?

Planning Partners were asked to use these criteria to prioritize their identified mitigation actions. For each mitigation action, the jurisdictions assigned a numeric score for each of the 14 evaluation criteria:

- 1 = Highly effective or feasible
- 0 = Neutral
- -1 = Ineffective or not feasible

Jurisdictions were asked to provide a brief summary of the rationale behind the numeric rankings assigned. The numerical results were totaled and then used by each jurisdiction to help prioritize the action or strategy as *low*, *medium*, or *high*. Actions that had a numerical value between 0 and 6 were categorized as *low priority*; actions with numerical values between 7 and 10 were categorized as *medium priority*; and actions with numerical values between 11 and 14 were categorized as *high priority*. While this provided a consistent, systematic methodology to support the evaluation and prioritization of mitigation actions, jurisdictions may have additional considerations that could influence their overall prioritization of mitigation actions.

It is noted that jurisdictions may be carrying forward mitigation actions from prior mitigation strategies that were prioritized using a different, but not inherently contrary, approach. At their discretion, jurisdictions carrying forward prior actions were encouraged to re-evaluate their priority, particularly if conditions that would affect the prioritization criteria had changed.

For the HMP update there has been an effort to develop more clearly defined and action-oriented mitigation strategies. These local strategies include actions that are seen by the community as the most effective approaches to advance their local mitigation goals and objectives within their capabilities. In addition, each Planning Partner was asked to develop problem statements. The partners were able to develop action-oriented and achievable mitigation strategies. For that reason, many of the actions in the updated mitigation strategy were ranked as *high* or *medium* priority, as reflective of the community's clear intent to implement them, available resources not-withstanding. In general, actions that would have had *low* priority rankings were screened out during the action evaluation process.

17.3.2 Benefit/Cost Review

Section 201.6.c.3iii of 44 CFR requires the prioritization of the mitigation strategy to emphasize a benefit/cost comparison of the proposed actions. For all actions identified in the local strategies, jurisdictions identified the associated costs and benefits as follows:

- **Costs** presented include the total project estimation. This can include administrative, construction (engineering, design, and permitting), and maintenance costs.
- **Benefits** are the savings from losses avoided through project implementation. These can include life safety, structure and infrastructure damage, loss of service or function, and economic and environmental damage and losses.

When possible, jurisdictions were asked to identify the actual or estimated dollar costs and associated benefits. Where estimates of costs and benefits were available, the ratings were defined follows:

Low < = $10,000 Medium = $10,000 to $100,000 High > = $100,000

Where numerical costs or benefits could not be quantified, jurisdictions were asked to evaluate project cost-effectiveness using qualitative *high*, *medium*, and *low* ratings based on the following definitions:

- Costs
  - High—Existing funding levels are not adequate to cover the costs of the proposed project, and implementation would require an increase in revenue through an alternative source (e.g., bonds, grants, and fee increases).
  - Medium—The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
  - Low—The project could be funded under the existing budget. The project is part of or can be part of an existing, ongoing program.
- Benefits
  - High—Project will have an immediate impact on the reduction of risk exposure to life and property.
  - Medium—Project will have a long-term impact on the reduction of risk exposure to life and property or will provide an immediate reduction in the risk exposure to property.
  - Low—Long-term benefits of the project are difficult to quantify in the short-term.

Using this approach, projects with positive benefit versus cost ratios (such as high over high, high over medium, medium over low, etc.) are considered cost-effective.

For some of the Sullivan County actions identified, the Planning Partnership may seek financial assistance under FEMA's Hazard Mitigation Assistance (HMA) programs. These programs require detailed benefit/cost analysis as part of the application process. The benefit/cost review for the prioritization of actions in this update did not include the level of detail required by FEMA for project grant eligibility under HMA grant programs. These analyses will be performed when funding applications are prepared, using FEMA's Benefit-Cost Analysis model.

The Planning Partnership is committed to implementing mitigation strategies with benefits that exceed costs. For projects not seeking financial assistance from grant programs that require this sort of analysis, the Planning Partnership reserves the right to define benefits according to parameters that meet its needs and the goals and objectives of this plan.

PART 5: PLAN MAINTENANCE

18. PLAN MAINTENANCE AND IMPLEMENTATION PROCEDURES

This chapter details the formal process that will ensure that the hazard mitigation plan remains an active and relevant document and that the Planning Partnership maintains its eligibility for applicable funding sources. The plan maintenance process includes a schedule for monitoring and evaluating the HMP annually and producing an updated plan every five years. In addition, this chapter describes how public participation will be integrated throughout the plan maintenance and implementation process. It explains how the mitigation strategies outlined in this HMP update will be incorporated into existing planning mechanisms and programs, such as comprehensive land use planning processes, capital improvement planning, and building code enforcement and implementation.

18.1 HMP COORDINATOR AND JURISDICTION POINTS OF CONTACT

The HMP Coordinator is assigned to manage the maintenance and update of the HMP during its approval period (the five-year period between FEMA's approval of the HMP and its expiration), with the following responsibilities:

- Convene the Planning Partnership
- Be the prime point of contact for questions regarding the HMP and its implementation
- Coordinate the incorporation of additional information into the plan
- Manage the monitoring, evaluation, and updating responsibilities identified in this section

Currently, the Sullivan County HMP Coordinator is designated as:

Heather Brown, Commissioner
Sullivan County Division of Planning, Community Development and Environmental Management
100 North Street, PO Box 5012
Monticello, NY 12701
(845) 807-0527
Email: Heather.Brown@sullivanny.gov

Primary and secondary mitigation planning representatives (points of contact) as of the date of this HMP are identified in each jurisdictional annex in Volume II. It will be the responsibility of each jurisdiction and its representatives to inform the HMP Coordinator of any changes in representation.

18.2 MAINTENANCE AND IMPLEMENTATION TASKS

The plan maintenance matrix shown in Table 18-1 provides a synopsis of responsibilities for plan monitoring, integration, evaluation, and update, which are discussed in further detail in the sections below.

Table 18-1. Plan Maintenance Matrix

Task	Approach	Timeline	Lead Responsibility	Support Responsibility
Monitoring	Planning partners to recommend update of mitigation strategies, progress toward implementation of actions, identification of new actions, and update of information on funding opportunities.	Each June or after the occurrence of a federally declared disaster	Jurisdictional points of contact identified in Volume II	Jurisdictional implementation lead identified in Volume II
Integrating	Distribute the safe growth worksheet (see Table 18-2) for annual review and update by all Planning Partners.	June each year with interim email reminders to address integration in county and municipal activities	HMP Coordinator and jurisdictional points of contact identified in Volume II	Alternate jurisdictional points of contact
Evaluating	Review the status of previous actions, as submitted by the monitoring task lead, and assess the effectiveness of the plan; compile and finalize update of mitigation strategy.	Updated progress report completed by September 30 of each year	Jurisdictional points of contact identified in Volume II	Alternate jurisdictional points of contact
Updating	Reconvene the Planning Partners to guide a comprehensive update to review and revise the plan.	Every 5 years or upon major update to Comprehensive Plan or after the occurrence of a major disaster	HMP Coordinator	Jurisdictional points of contacts identified in Volume II
Grant Monitoring	Notify Planning Partners about grant opportunities, maintain a list of eligible jurisdiction-specific projects for funding consideration, and notify Planning Partners of fiscal year mitigation priorities.	Continuously and as grant opportunities are identified	HMP Coordinator	Jurisdictional points of contacts identified in Volume II
Public Involvement	Maintain the HMP, inform the public of hazard events via social media outlets, promote educational workshops on hazard topics, and track and file public comments received regarding the HMP.	Continuously	HMP Coordinator and jurisdictional points of contact identified in Volume II	Alternate jurisdictional points of contact

18.2.1 Monitoring

The Planning Partnership will be responsible for monitoring and documenting annual progress on the plan. Each year, beginning one year after plan development, Sullivan County and local Planning Partnership representatives will collect and process information from the persons responsible for initiating or overseeing the mitigation projects in each department, agency, and organization involved in implementing mitigation actions identified in their jurisdictional annexes. In the first year of the approval period, this will be accomplished using an online performance progress reporting system, which will enable each Planning Partner to:

- Directly access mitigation actions
- Easily update the status of each project
- Document successes or obstacles to implementation
- Add or delete projects to maintain mitigation strategy implementation

Participating partners will be prompted by the tool to update progress on a quarterly basis, encouraging them to refresh their mitigation strategies and to continue implementation of actions. This reporting system facilitates the

sorting and prioritization of projects and will support the submittal of an increased number of project grant fund applications. Planning Partnership representatives will be expected to document the following:

- Progress on the implementation of mitigation actions
- Obstacles or impediments to implementation of actions
- Any grant applications filed on behalf of any of the Planning Partners
- Hazard events and losses occurring in their jurisdiction
- Additional mitigation actions believed to be appropriate and feasible
- Public and stakeholder input.

Plan monitoring for years 2 through 4 of the approval period will be addressed via the online performance progress reporting system or manually.

18.2.2 Integrating the HMP into Municipal Planning Mechanisms

Hazard mitigation is sustained action taken to reduce or eliminate the long-term risk to human life and property from natural hazards. Integrating hazard mitigation into a community's existing plans, policies, codes, and programs leads to development patterns or redevelopment that reduce risk from known hazards. The Planning Partnership was tasked with identifying how hazard mitigation is integrated into existing planning mechanisms. The jurisdictional annexes in Volume II describe how this is done for each Planning Partner. During this process, many partners recognized the importance and benefits of incorporating hazard mitigation into future local planning and regulatory processes.

Effective mitigation is achieved when hazard awareness and risk management approaches and strategies become an integral part of public activities and decision-making. Within the County, there are many existing plans and programs that support hazard risk management, and it is critical that this HMP integrate and coordinate with and complement those existing plans and programs.

The capability assessment (Chapter 16) provides a summary and description of the existing plans, programs, and regulatory mechanisms at all levels of government (federal, state, county, and local) that support hazard mitigation within the County. In the jurisdictional annexes in Volume II, each Planning Partner identified how it has integrated hazard risk management into its existing planning, regulatory, and administrative framework ("existing integration") and how they intend to promote this integration further ("opportunities for future integration").

It is the intention of Planning Partnership representatives to incorporate mitigation planning as an integral component of daily government operations. Planning Partnership representatives will work with local government officials to integrate the newly adopted hazard mitigation goals and actions into the general operations of government and partner organizations. The sample adoption resolution (Appendix A – Adoption Resolution) includes a resolution item stating the intent of the local governing body to incorporate mitigation planning as an integral component of government and partner operations. By doing so, the Planning Partnership anticipates that:

- Hazard mitigation planning will be formally recognized as an integral part of overall emergency management efforts.
- The HMP, comprehensive plans, emergency management plans and other relevant planning mechanisms will become mutually supportive documents that work in concert to meet the goals and needs of county residents.

Other planning processes and programs to be coordinated with the recommendations of the HMP include the following:

- Emergency response plans
- Training and exercise of emergency response plans
- Debris management plans
- Recovery plans
- Capital improvement programs
- Municipal codes
- Community design guidelines
- Water-efficient landscape design guidelines
- Stormwater management programs
- Water system vulnerability assessments
- Community wildfire protection plans
- Comprehensive flood hazard management plans
- Resiliency plans
- Community Development Block Grant Disaster Recovery action plans
- Public information and improved public participation
- Educational programs
- Continued interagency coordination

During the HMP annual review process, Planning Partners will be asked to document how they are utilizing and incorporating the HMP into their day-to-day operations and planning and regulatory processes. Each municipality will identify additional policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions and include these findings and recommendations in the annual HMP progress report. The checklist in Table 18-2, adapted from FEMA's 2013 Local Mitigation Handbook, will help a community analyze how hazard mitigation is integrated into local plans, ordinances, regulations, and policies. Completing the checklist will help jurisdictions identify areas that currently integrate hazard mitigation and where to make improvements and reduce vulnerability to future development.

Table 18-2. Safe Growth Check List

Planning Mechanisms	Yes	No	How is it being done or how will this be utilized in the future?
Operating, Municipal, and Capital Improvement Program Budgets			
When constructing upcoming budgets, are hazard mitigation actions funded as budget allows?			
Are construction projects evaluated to see if they meet the hazard mitigation goals?			
Does the municipality review mitigation actions when allocating funding during annual budget adoption processes?			
Do budgets limit expenditures on projects that would encourage development in areas vulnerable to natural hazards?			
Do infrastructure policies limit extension of existing facilities and services that would encourage development in areas vulnerable to natural hazards?			
Do budgets provide funding for hazard mitigation projects identified in the HMP?			
Human Resource Manual			
Do any job descriptions specifically include identifying and/or implementing mitigation projects/actions or other efforts to reduce natural hazard risk?			
Building and Zoning Ordinances			
Prior to zoning changes or development permitting, does the municipality review the HMP and other hazard analyses to ensure consistent and compatible land use?			
Does the zoning ordinance discourage development or redevelopment within natural areas, including wetlands, floodways, and floodplains?			
Does the zoning ordinance contain natural overlay zones that set conditions?			
Does the zoning ordinance require developers to take additional actions to mitigate natural hazard risk?			
Do rezoning procedures recognize natural hazard areas as limits on zoning changes that allow greater intensity or density of use?			
Does the zoning ordinance prohibit development within or filling of wetlands, floodways, and floodplains?			
Subdivision Regulations			
Do the subdivision regulations restrict the subdivision of land within or adjacent to natural hazard areas?			
Do the regulations provide for conservation subdivisions or cluster subdivisions in order to conserve environmental resources?			
Do the regulations allow density transfers where hazard areas exist?			

Planning Mechanisms	Yes	No	How is it being done or how will this be utilized in the future?
Comprehensive Plan			
Are the goals and policies of the plan related to those of the HMP?			
Does the future land use map clearly identify natural hazard areas?			
Does the plan provide adequate space for expected future growth in areas located outside natural hazard areas?			
Land Use			
Does the future land use map clearly identify natural hazard areas?			
Do the land use policies discourage development or redevelopment in natural hazard areas?			
Transportation Plan			
Does the transportation plan limit access to hazard areas?			
Is transportation policy used to guide growth to safe locations?			
Are transportation systems designed to function under disaster conditions (e.g., evacuation)?			
Environmental Management			
Are environmental systems that protect development from hazards identified and mapped?			
Do environmental policies maintain and restore protective ecosystems?			
Do environmental policies provide incentives to development located outside protective ecosystems?			
Grant Applications			
Are data and maps used as supporting documentation in grant applications?			
Municipal Ordinances			
Is hazard mitigation a priority when updating municipal ordinances?			
Economic Development			
Does the local economic development group take into account information regarding identified hazard areas when assisting new businesses in finding a location?			
Public Education and Outreach			
Does the municipality have any public outreach mechanisms/ programs in place to inform citizens on natural hazards, risk, and ways to protect themselves during such events?			

18.2.3 Evaluating

Evaluation of the mitigation plan is an assessment of whether the planning process and actions have been effective, whether the HMP goals are being achieved, and whether changes are needed. The HMP Coordinator will consult with the Planning Partnership members to evaluate the effectiveness of the plan implementation and to reflect changes that could affect mitigation priorities or available funding.

The status of the HMP will be discussed and documented at an annual plan review meeting of the Planning Partnership to be held either in person or via teleconference approximately one year from the date of local adoption of this update and successively thereafter. The HMP Coordinator will be responsible for calling participants and coordinating the annual plan review meeting and soliciting input regarding progress toward meeting plan goals and objectives. At least two weeks before the annual plan review meeting, the HMP Coordinator will advise Planning Partnership members of the meeting date, agenda, and expectations of the members. These evaluations will assess whether:

- Goals and objectives address current and expected conditions
- The nature or magnitude of the risks has changed
- Current resources are appropriate for implementing the HMP and if different or additional resources are now available
- Actions were cost effective
- Schedules and budgets are feasible
- Implementation problems are present, such as technical, political, legal, or coordination issues with other agencies
- Outcomes have occurred as expected
- Changes in local resources impacted plan implementation (e.g., funding, personnel, and equipment)
- New agencies, departments, and staff are included, involving other local governments as defined under 44 CFR 201.6.

Specifically, the Planning Partnership will review the mitigation goals, objectives, and activities using performance-based indicators, including:

- New agencies/departments
- Project completion
- Underspending/overspending
- Achievement of the goals and objectives
- Resource allocation
- Timeframes
- Budgets
- Lead/support agency commitment
- Resources
- Feasibility

Finally, the Planning Partnership will evaluate how other programs and policies have conflicted with or augmented planned or implemented mitigation actions and will identify policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions. Other programs and policies can include those that address:

- Economic development
- Environmental preservation
- Historic preservation
- Redevelopment

- Health and safety
- Recreation
- Land use and zoning
- Public education and outreach
- Transportation

To assist in the evaluation process, Planning Partners should review evaluation forms in the FEMA 386-4 guidance document (Worksheets #2 and #4; see Appendix F – Plan Review Tools) as well as any deliverables developed as a part of the HMP review processes for previous HMPs in the county.

The HMP Coordinator will be responsible for preparing an annual HMP progress report for each year of the approval period based on the information provided by the Planning Partners and other information as appropriate. These annual reports will provide data for the five-year update of this HMP and will assist in pinpointing any implementation challenges. By monitoring the implementation of the HMP, the Planning Partnership will be able to assess which actions are completed, which are no longer feasible, and which require additional funding.

Following any major disasters, the HMP will be evaluated and revised to determine if the recommended actions remain relevant and appropriate. The risk assessment will also be revisited to see if any changes are necessary based on the pattern of disaster damage or if data listed in the hazard profiles of this HMP has been collected to facilitate the risk assessment. This is an opportunity to increase the community's disaster resistance and build a better and stronger community.

18.2.4 Updating

44 CFR 201.6.d.3 requires that local hazard mitigation plans be reviewed, revised as appropriate, and resubmitted for approval to remain eligible for benefits awarded under the DMA. It is the intent of the Sullivan County HMP Planning Partnership to update this HMP on a five-year cycle from the date of initial plan adoption.

To facilitate the update process, the HMP Coordinator, with support of the Planning Partnership, will use the second annual Planning Partnership meeting to develop and commence the implementation of a detailed plan update program. Prior to the five-year update, the HMP Coordinator will invite representatives from the New York State DHSES to provide guidance on plan update procedures. At a minimum, this will establish who will be responsible for managing and completing the HMP update effort, items that need to be included in the updated plan, and a detailed timeline with milestones to ensure that the update is completed according to regulatory requirements. At this meeting, the project team will determine what resources will be needed to complete the update and seek to secure these resources.

Following each 5-year update of the HMP, the updated plan will be distributed for public comment. After all comments are addressed, the HMP will be revised and distributed to all Planning Partners.

18.2.5 Grant Monitoring and Coordination

The Department of Grants Administration staff will work with the Planning Commissioner in addressing requests for assistance. As part of grant monitoring and coordination, Sullivan County intends to provide the following:

- Notification to Planning Partners about impending grant opportunities
- A current list of eligible, jurisdiction-specific projects for funding pursuit consideration

- Notification about mitigation priorities for the fiscal year to assist the Planning Partners in the selection of appropriate projects.

18.2.6 Continued Public Involvement

The Planning Partners are committed to the continued involvement of the public in the hazard mitigation process. This HMP update will continue to be posted online at the following links:

- Sullivan County Website: https://www.sullivanny.gov/Departments/PlanningEnvironmental/PlansandStudies/HazardMitigationPlan
- MitigateNY: sullivan.hazardmitigation.ny.gov

In addition, public outreach and dissemination of the HMP will include the following:

- Links to the HMP on local websites of each jurisdiction with capability
- Continued utilization of existing social media outlets (Facebook, X) to inform the public of natural hazard events, such as floods and severe storms; the public can be educated via the jurisdictional websites on how these applications can be used in an emergency situation
- Promotion of articles or workshops on hazards to educate the public and keep them aware of the dangers of hazards

The HMP Coordinator will be responsible for receiving, tracking, and filing public comments regarding this HMP. The public will have an opportunity to comment on the HMP via the hazard mitigation website at any time. The HMP Coordinator will ensure that:

- Public and stakeholder comments and input on the plan, and hazard mitigation in general, are collected, recorded, and addressed as appropriate.
- The Sullivan County HMP website is maintained and updated as appropriate.
- Copies of the latest approved plan are available for review at appropriate county facilities, along with instructions to facilitate public input and comment on the plan.
- Public notices, including media releases, are made (as appropriate) to inform the public of the availability of the plan, particularly during plan update cycles.

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ACRONYMS AND DEFINITIONS

ACS— American Community Survey

APA— Approval Pending Adoption

AVAIL— Albany Visualization and Informatics Labs

BCA— Benefit Cost Analysis

BFE— Base Flood Elevation

BOCES— Board of Cooperative Educational Services

CCAHA— Conservation Center of Art and Historic Artifacts

CDBG— Community Development Block Grant

CDC— Centers for Disease Control

CEDAR— Code Enforcement Disaster Assistance Response

CERCLIS— Comprehensive Environmental Response, Compensation and Liability Information System

CFR— Code of Federal Regulations

CMP— Coastal Management Program

COPD— Chronic Obstructive Pulmonary Disease

COVID— Corona Virus Disease

CRRA— Community Risk and Resiliency Act

CRS— Community Rating System

CSC— Climate Smart Communities

CWSRF— Clean Water State Revolving Fund

DBSC— Division of Building Standards and Codes

DEC— Department of Environmental Conservation

DFIRM— Digital Flood Insurance Rate Map

DGA— Department of Grants Administration

DHSES— Division of Homeland Security and Emergency Services

DMA— Disaster Mitigation Act

DMV— Department of Motor Vehicles

DOH— Department of Health

DOT— Department of Transportation

DPW— Department of Public Works

DR— Major Disaster Declaration (FEMA)

EAP— Emergency Action Plan

EF— Enhanced Fujita Scale

EM— Emergency Declaration (FEMA)

EMS— Emergency Medical Services

EOC— Emergency Operation Center

EPA— Environmental Protection Agency

EPF— Environmental Protection Fund

ESD— Empire State Development

ESF— Emergency Support Function

EWP— Emergency Watershed Protection

FDRA— Fire Danger Rating Areas

FEMA— Federal Emergency Management Agency

FERC— Federal Energy Regulatory Commission

FHWA— Federal Highway Administration

FIA— Flood Insurance Administration

FIRM— Flood Insurance Rate Map

FIS— Flood Insurance Study

FM— Fuel Moisture

FMA— Flood Mitigation Assistance

FPI— Fire Potential index

FTA— Federal Transit Administration

GIS— Geographic Information System

HHPD— High Hazard Potential Dams

HMA— Hazard Mitigation Assistance

HMGP— Hazard Mitigation Grant Program

HMP— Hazard Mitigation Plan

HSGP— Homeland Security Grant Program

HUD— Housing and Urban Development

HVAC— Heating, Ventilation, and Air Conditioning

KBDI— Keetch-Bryam Drought Index

LAL— Lightning Activity Level Guide

LWCF— Land and Water Conservation Fund

LWRP— Local Waterfront Revitalization Program

MMI— Modified Mercalli Intensity

MRLC— Multi-Resolution Land Characteristics

MRP— Mean Return Period

MSGP— Multi-Sector General Permits

NAS— National Academy of Sciences

NASA— National Aeronautics and Space Administration

NCEI— National Centers for Environmental Information

NDMC— National Drought Mitigation Center

NEHRP— National Earthquake Hazard Reductions Program

NFDRS— National Fire Danger Rating System

NFIP— National Flood Insurance Program

NHC— National Hurricane Center

NIDIS— National Integrated Drought Information System

NIFC— National Interagency Fire Center

NLCD— National Land Cover Database

NOAA— National Oceanic and Atmospheric Administration

NPDP— National Performance of Dams Program

NPS— National Park Service

NRCC— Northeast Regional Climate Center

NRCS— Natural Resources Conservation Service

NRDC— Natural Resources Defense Council

NSIDC— National Snow and Ice Data Center

NSSL— National Severe Storms Library

NWIS— National Water Information System

NWMP— Neversink Watershed Management Plan

NWP— Nationwide Permit

NWS— National Weather Service

NY— New York

NYC— New York City

NYCDEP— New York City Department of Environmental Protection

NYCEM— New York City Emergency Management

NYCOEM— New York City Office of Emergency Management

NYCRR— New York Codes, Rule, and Regulations

NYDOS— New York State Department of State

NYPA— New York Power Authority

NYS— New York State

NYSDEC— New York State Department of Environmental Conservation

NYSDOL— New York State Department of Labor

NYSDOT— New York State Department of Transportation

NYSEG— New York State Electric and Gas

NYSERDA— New York State Energy Research and Development Authority

NYSHC— new York State Health Connector

OEM— Office of Emergency Management

PA— Pennsylvania

PA— Public Assistance

PDM— Pre-Disaster Mitigation Program

PDSI— Palmer Drought Severity Index

PGA— Peak Ground Acceleration

PPD— Presidential Policy Directive

PTSD— Post-Traumatic Stress Disorder

RCV— Replacement Cost Value

RL— Repetitive Loss

RSI— Regional Snowfall Index

SARS— Severe Acute Respiratory Syndrome

SBA— Small Business Administration

SFHA— Special Flood Hazard Area

SILVIS— Spatial Analysis for Conservation and Sustainability

SPC— Storm Prediction Center

SRL— Severe Repetitive Loss

SUNY— State University of New York

SVI— Social Vulnerability Index

TBD— To Be Determined

THIRA— Threat Hazard Identification and Risk Assessment

US— United States

USACE— United States Army Corps of Engineers

USBR— United States Bureau of Reclamation

USDA— United States Department of Agriculture

USDM— United States Drought Monitor

USDOT— United States Department of Transportation

USEDA— United States Economic Development Administration

USFS— United States Forest Service

USGS— United States Geological Survey

USSD— United States Society on Dams

VT— Vermont

WFAS— Wildland Fire Assessment System

WFPI— Wildfire Fire Potential Index

WHO— World Health Organization

WMA— Wildlife Management Area

WNV— West Nile Virus

WQIP— Water Quality Improvement Project

WUI— Wildland/Urban Interface