

GENESEE COUNTY

MULTI-JURISDICTIONAL ALL HAZARDS MITIGATION PLAN

2025 Update

**Volume I
Basic Plan**

*Prepared for:
Genesee County
Office of Emergency Management
7690 State St. Rd., Batavia, NY 14020*

July 2025



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Genesee 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.

Genesee County has developed a hazard mitigation plan (HMP) to reduce risks from disasters to the people, property, economy, and environment within the County's planning area. The County and 21 participating local jurisdictions (the Planning Partners) prepared this plan as an update to the 2019 Genesee County HMP. The updated 2025 HMP (also referred to as "the plan") includes countywide analysis and assessment of hazards, risk, and capabilities.

The plan 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. FEMA has issued guidelines for the development of multi-jurisdictional HMPs. The federal Disaster Mitigation Act of 2000 requires state and local entities to implement pre-disaster mitigation planning and develop HMPs. The New York State Division of Homeland Security and Emergency Services (NYS DHSES) supports plan development for jurisdictions in the State of New York.

The Planning Process

This HMP update documents the process and outcomes of the Planning Partners' mitigation planning efforts. 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 2019 Genesee County HMP
- Identified hazards of concern 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 2019 Genesee County 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 plan update process
- Developed plan maintenance procedures to be executed after obtaining approval of the plan from NYS DHSES and FEMA



Involvement by Stakeholders and the Public

The Planning Partners kept stakeholders and the general public informed throughout the planning process and provided opportunities for public comment and input. In addition, numerous agencies and stakeholders participated as core or support members of the Steering Committee or Planning Partnership, providing input and expertise throughout the planning process.

Participating Jurisdictions Involved in the Mitigation Planning Effort

The local jurisdictions that participated as Planning Partners in this HMP update are as follows:

- Town of Alabama
- Town of Alexander
- Village of Alexander
- Village of Attica
- City of Batavia
- Town of Batavia
- Town of Bergen
- Village of Bergen
- Town of Bethany
- Town of Byron
- Village of Corfu
- Town of Darien
- Town of Elba
- Village of Elba
- Town of LeRoy
- Village of LeRoy
- Town of Oakfield
- Village of Oakfield
- Town of Pavilion
- Town of Pembroke
- Town of Stafford

The participating jurisdictions provided significant input into the preparation of the plan, particularly the preparation of jurisdiction-specific annexes included in Volume II.

Multiple Agency Support for Hazard Mitigation

Primary responsibility for the development and implementation of mitigation strategies and policies lies with local jurisdictions. However, local governments are not alone; various partners and resources at the regional, state, and federal levels are available to assist communities in the development and implementation of mitigation strategies. In the State of New York, NYS DHSES is the lead agency providing hazard mitigation planning assistance to local jurisdictions. In addition, FEMA provides grants, tools, guidance, and training to support mitigation planning.

In updating the HMP, the participating jurisdictions fully coordinated with and solicited participation from county and local governments, relevant organizations and groups, state and federal agencies, and the general public. This coordination ensured that stakeholders had established communication channels and relationships to support mitigation planning and mitigation actions included in the plan.

Additional input and support for this planning effort was obtained from a wide range of agencies as well as through public involvement. Under the project management of the Genesee County Office of Emergency Management (OEM), the Genesee County Hazard Mitigation Steering Committee provided oversight for the preparation of this plan. The Steering Committee includes representatives from the following:

- Genesee County Legislature
- Genesee County Manager's Office
- Genesee County Emergency Management Services
- Genesee County Health Department
- Genesee County Highway Department



- Genesee County Department of Planning
- Genesee County Department of Social Services/Youth Bureau
- Genesee County Soil and Water Conservation District
- City of Batavia

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 Genesee County are presented in Table ES-1.

Table ES-1. Countywide Ranking for Genesee County Hazards of Concern

Hazard of Concern	Hazard Ranking
Civil Unrest	Low
Dam Failure	Medium
Drought	Medium
Earthquake	Low
Epidemic	Medium
Extreme Temperature	Medium
Flood	Medium
Hazardous Materials	Medium
Severe Storm	High
Severe Winter Storm	High
Terrorism	Low
Transportation Accident	High
Utility Interruption	High
Wildfire	Medium

Capability Assessment and Plan Integration into Other Local Mechanisms

Effective mitigation is achieved when hazard awareness and risk management approaches and strategies become an integral part of public activities and decision-making. Within Genesee County, there are many existing plans and programs that support hazard risk management. It is critical that this HMP integrate, complement, and reference 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 participating jurisdiction. 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 Genesee County. In the jurisdictional annexes,



each participating jurisdiction 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

HMP Goals and Objectives

It is a federal requirement for hazard mitigation plans to include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards of concern.

The Genesee County HMP planning process included a review and update of mitigation goals and objectives that were previously established to guide the selection of mitigation actions addressing all hazards of concern. Mitigation goals 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 State of New York HMP as well as other relevant county and local planning documents.

2025 Genesee County HMP Goals

Goal 1: Reduce the likelihood and impacts of hazards on life, property, and the environment.

Goal 2: Protect life, property, critical infrastructure, the environment, and the economy from the impacts of natural, technological, and human-caused disasters.

Goal 3: Educate the public, officials, and other stakeholders about the hazards they face and what can be done to mitigate hazard impacts.

Goal 4: Reduce the risk of natural, technological, and human-caused hazards for socially vulnerable populations.

Goal 5: Address long-term vulnerabilities from hazardous dams.

Implementation of the 2019 HMP

The status of the mitigation projects identified in the 2019 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 re-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.

2025 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

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1. INTRODUCTION

Genesee County and 21 participating local jurisdictions (the Planning Partners) developed this hazard mitigation plan (HMP or “the plan”) to reduce risks from disasters to the people, property, economy, and environment within the County’s planning area. The 2025 Genesee County HMP updates the 2019 Genesee County HMP and includes countywide analysis and assessment of hazards, risk, and capabilities.

1.1 OVERVIEW OF 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 an HMP 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 better prepare for and respond to disasters. 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), six dollars is saved by not having to perform post-disaster repairs.

1.1.2 Regulatory Framework

In the early 1990s, a new federal disaster policy began to evolve. Rather than simply reacting whenever disasters strike communities, the federal government began encouraging communities to assess their vulnerability to various hazards before disaster strikes and then take actions to reduce or eliminate potential risks. The policy is based on the logic that a disaster-resistant community can rebound from a natural disaster with less loss of property or human injury, at much lower cost and, consequently, more quickly. Moreover, other costs associated with disasters are minimized, such as the time lost from productive activity by businesses and industries.

The federal Disaster Mitigation Act of 2000 (DMA 2000) encouraged states, tribes, and local governments to take a new and revitalized approach to mitigation planning. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by repealing the previous law’s mitigation planning provisions (Section 409) and replacing them with a new set of requirements (Section 322). Under the new Section 322, communities seeking certain hazard-related federal funding must have a plan that identifies actions to mitigate hazards, risks, and vulnerabilities and establishes a strategy to implement those actions.



Regulations implementing the intent and requirements of DMA 2000 are included in Title 44 of the Code of Federal Regulations, Section 201 (44 CFR 201). In New York, responsibility for fulfilling the requirements of DMA 2000 and 44 CFR 201 and administering the FEMA Hazard Mitigation Program has been delegated to the New York State Division of Homeland Security and Emergency Services (DHSES).

The federal regulations require that states and local governmental agencies update HMPs on a five-year basis to prepare for and reduce the potential impacts of natural hazards. Each local jurisdiction must identify potential natural hazards to the health, safety, and well-being of its residents and identify and prioritize actions that can be taken by the community to mitigate those hazards before disaster strikes. To be eligible for hazard mitigation assistance from the federal government, communities must prepare, maintain, and update an HMP.

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.

Table 1-1 summarizes the 44 CFR 201 requirements and where each is addressed in this HMP.

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)	Chapter 2; Appendix A
Compliance with NYS DHSES Hazard Mitigation Planning Standards	Appendix I
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 6–19
Assessing Vulnerability: Overview: §201.6(c)(2)(ii)	Chapter 3; Chapters 6–19
Assessing Vulnerability: Identifying Structures: §201.6(c)(2)(ii)(A)	Chapter 3; Chapters 6–19
Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)	Chapter 3; Chapters 6–19
Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)	Chapter 3; Chapters 6–19; Volume II
Mitigation Strategy	
Local Hazard Mitigation Goals: §201.6(c)(3)(i)	Chapter 22; Volume II
Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)	Chapter 22; Volume II
Implementation of Mitigation Actions: §201.6(c)(3)(iii)	Chapter 22; Volume II
Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)	Chapter 22; Volume II
Plan Maintenance Process	
Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(i)	Chapter 23
Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)	Chapter 23; Volume II Annexes
Continued Public Involvement: §201.6(c)(4)(iii)	Chapter 23



1.1.3 Specialized Terms and Concepts

Like any technical field, the hazard mitigation field has its own set of terms and concepts with particular meanings. The list below provides a quick reference for specialized terms used in this HMP:

- **Adaptive capacity:** The ability of a human or natural system to adjust to climate change by moderating potential damage, taking advantage of opportunities, or coping with the consequences (EPA 2023).
- **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) (FEMA 2023).
- **Capability assessment:** An evaluation of which authorities, policies, programs, funding, and resources a participant has on hand to carry out the actions described in the plan and increase resilience (FEMA 2023).
- **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 (National Academies of Sciences, Engineering, and Medicine 2022).
- **Community lifelines:** The most fundamental services in a community that, when stabilized, enable all other aspects of society to function (FEMA 2023).
- **Extent:** The range of anticipated intensities of the identified hazards within a community, most commonly expressed using various scientific scales (FEMA 2022).
- **Hazard profile:** A description of a hazard's location, extent, previous occurrences, and probability of future events within a community (FEMA 2023).
- **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 (FEMA 2023).
- **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 (FEMA 2022).
- **Mitigation action:** Measures, projects, plans, or activities proposed to reduce the current and future vulnerabilities identified in the risk assessment (FEMA 2023).
- **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 (FEMA 2023).
- **Natural hazard:** A source of harm or difficulty created by a meteorological, environmental, or geological event (FEMA 2023).
- **Plan maintenance:** Monitoring and updating an HMP as warranted by changing conditions, availability of new information, and progress on the proposed mitigation actions (FEMA 2023).
- **Planning process:** The procedures used to develop an HMP with broad acceptance across the community
- **Risk:** The potential for damage or loss when natural hazards interact with people or assets (FEMA 2023).
- **Risk assessment:** A data-driven analysis to find where a local jurisdiction is vulnerable to hazards (FEMA 2023).



- **Social vulnerability:** 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 incident (FEMA 2023).
- **Stakeholder:** Individuals or groups that a mitigation action or policy affects, including businesses, private organizations, and residents (FEMA 2023).
- **Vulnerability:** A description of which assets within locations identified to be hazard-prone are at risk from the effects of the hazard (FEMA 2023).

1.2 HISTORY OF HAZARD MITIGATION PLANNING IN GENESEE COUNTY

1.2.1 Previous Genesee County HMPs

Genesee County has been included in 25 federal hazard-related declarations (major disaster, fire management, and emergency) since 1954. Following the adoption of DMA 2000 and the new national focus on mitigating hazards through advance planning, the County prepared and adopted its first HMP in 2008. The HMP has been updated since then, with an update adopted in 2019.

1.2.2 Key Changes in the Current Update

The following are the key changes reflected in the 2025 HMP update:

- The 2025 HMP includes discussions on socially vulnerable populations, and the planning process included outreach to socially vulnerable populations to gather their input.
- The Steering Committee decided that the dam failure hazard should be separate from the flood hazard profile.
- In the 2019 HMP, the capability assessment section was presented in Section 6 as part of the mitigation strategy. In the 2025 HMP update, the capability assessment was expanded and is presented as a stand-alone chapter. The discussion of capabilities in each jurisdictional annex has also been expanded (Volume II).

1.3 PLAN ORGANIZATION

The Genesee County HMP provides a detailed review and analysis of each hazard of concern, resources, and relevant statistical information for the Planning Partners. The plan is organized into two volumes: Volume I includes all information that applies to the entire planning area (Genesee County); and Volume II includes specific information for each participating jurisdiction.

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 plan 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 plan will be incorporated into existing programs. Information regarding the adoption of the plan by each participating jurisdiction.
- Chapter 3: County Profile: An overview of Genesee 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 6–19: 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 20: Hazard Ranking: Description and summary of the hazard ranking process.
- Part 3: Capability Assessment
 - Chapter 21: 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 22: Mitigation Strategy: Information regarding the mitigation goals and objectives identified by the Steering Committee in response to priority hazards of concern, and the process by which County and local mitigation strategies have been developed or updated.
- Part 5: Plan Maintenance
 - Chapter 23: Plan Maintenance Procedures: A system to continue to monitor, evaluate, maintain, and update the plan.

Volume II consists of annexes for each participating jurisdiction. 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 include the following:

- Appendix A: Sample Resolution of Plan Adoption: Documentation that supports the plan approval signatures included in Chapter 2 of this plan.
- 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 web pages, informational materials, public and stakeholder meetings and presentations, surveys, and other methods used to receive and incorporate public and stakeholder comment and input into the plan 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: Risk Assessment Supplementary Data: Details regarding past hazard events since those documented in the 2019 plan.
- Appendix I: Mitigation Strategy Supplementary Data: Summaries of additional activities and resources provided to plan participants to support the update of the mitigation strategy
- Appendix J: NYS DHSES Planning Standards: Includes planning standards and guidelines for hazard mitigation planning.

DRAFT



2. PLANNING PROCESS

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

- The plan will be multi-jurisdictional, including all municipalities in the County. Genesee County invited all jurisdictions in the County to join in the planning process. To date, all local jurisdictions in the County (the Planning Partnership) have participated in the 2025 planning process:
 - Genesee County
 - Town of Alabama
 - Town of Alexander
 - Village of Alexander
 - Village of Attica
 - City of Batavia
 - Town of Batavia
 - Town of Bergen
 - Village of Bergen
 - Town of Bethany
 - Town of Byron
 - Village of Corfu
 - Town of Darien
 - Town of Elba
 - Village of Elba
 - Town of Le Roy
 - Village of Le Roy
 - Town of Oakfield
 - Village of Oakfield
 - Town of Pavilion
 - Town of Pembroke
 - Town of Stafford
- The format of this plan is such that other entities can easily join at a later date as part of the regulatory five-year planning process.
- The plan 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 plan 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 plan 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 (HMP) was prepared in accordance with the following regulations and guidance:

- FEMA Mitigation Planning How-to Series (FEMA 386-1 through 4, 2002)
- FEMA How-to Guide for Using Hazus for Risk Assessment FEMA Document No. 433, February 2004
- FEMA Local Mitigation Plan Review Guide, October 1, 2011
- FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards, January 2013
- FEMA Integrating Hazard Mitigation into Local Planning, March 1, 2013
- FEMA Plan Integration: Linking Local Planning Efforts, July 2015
- FEMA Local Mitigation Planning Policy Guide, April 19, 2022
- FEMA Local Mitigation Planning Handbook, May 2023
- DMA 2000 (Public Law 106-390, October 30, 2000)



- 44 CFR 201 and 206 (including: Feb. 26, 2002, Oct. 1, 2002, Oct. 28, 2003, and Sept. 13, 2004, Interim Final Rules)
- NYS DHSES Hazard Mitigation Planning Standard, 2022
- NYS DHSES Hazard Mitigation Plan, 2023

2.2 ORGANIZATION OF PLANNING PROCESS

2.2.1 Planning Process Participants

Project Management and Planning Consultant

Project management was the responsibility of the Genesee County Office of Emergency Management. A contract planning consultant (Tetra Tech) was tasked with the following:

- Assisting with the organization of a Steering Committee and the Planning Partnership
- Assisting with the development and implementation of a public and stakeholder outreach program
- Data collection
- Facilitation and attendance at meetings (Steering Committee, municipal, stakeholder, public, and other)
- Review and update of the hazards of concern, hazard profiling, and risk assessment
- Assistance with the review and update of mitigation planning goals and objectives
- Assistance with the review of past mitigation strategy progress
- Assistance with the screening of mitigation actions and the identification of appropriate actions
- Assistance with the prioritization of mitigation actions
- Authoring of the draft and final plan documents

Planning Partnership

In January 2024, the County notified all municipalities of the pending planning process and invited them to formally participate. All participating jurisdictions, including the County, are recognized as Planning Partners and belong to the Planning Partnership for this HMP. Members of the Planning Partnership 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 plan update, including the use of previously developed reports and data
- Supporting and 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 integration of prior or existing HMPs into other planning processes and municipal operations
- Supporting and developing a jurisdictional annex



- Reviewing, amending, and approving all sections of the plan update
- Adopting, implementing, and maintaining the plan update

Table 2-1 shows the primary and secondary points of contact for the participating jurisdictions in the Planning Partnership as of the time of publication of the 2025 HMP update.

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

Jurisdiction ^a	Primary Point of Contact	Title	Alternate Point of Contact	Title
Genesee County	Tim Yaeger	Emergency Management Coordinator	Gary Patnode	Deputy Emergency Management Coordinator
Alabama (T)	Robert Crossen	Town Supervisor	Mike Morris	Zoning/Code Enforcement Officer
Alexander (T)	David Miller	Town Supervisor	Brian Farnsworth	Highway Superintendent
Alexander (V)	Jason Breton	Mayor	Danielle Riggs	Clerk, Treasurer
Attica (V)	Brenda Beck	Administrator, Clerk	Julie Cook	Deputy Clerk, Treasurer
Batavia (C)	Joshua Graham	Fire Chief/Emergency Manager	Rachel Tabelski	City Manager
Batavia (T)	Gregory Post	Town Supervisor	Steven Mountain	Town Engineer
Bergen (T)	Ernie Haywood	Town Supervisor	Teresa Robinson	Town Clerk
Bergen (V)	Joseph Chimino	Mayor	Cortney W. Gale	Administrator, Clerk
Bethany (T)	Carl Hyde	Town Supervisor	Shauna Klump	Town Clerk
Byron (T)	Candace Hensel	Town Supervisor	Kristy Murphy	Town Clerk
Corfu (V)	Thomas Sargent	Mayor	Jennifer Eck	Village Clerk
Darien (T)	Steve Ferry	Town Supervisor	Alice Calmes	Town Clerk, Tax Collector
Elba (T)	Donna Hynes	Town Supervisor	Trisha Werth	Town Clerk, Tax Collector
Elba (V)	Norm Itjen	Mayor	Jerah Augello	Village Clerk
LeRoy (T)	James Farnholz	Town Supervisor	Mike Risewick	Code Enforcement Officer
LeRoy (V)	Greg Kellogg	Police Chief	Mike Risewick	Code Enforcement Officer
Oakfield (T)	Matthew Martin	Town Supervisor	Melissa Haacke	Town Clerk
Oakfield (V)	David Boyle	Mayor	Mike Morris	Zoning/Code Enforcement Officer
Pavilion (T)	James Thater	Town Supervisor	Lucinda Starr	Town Clerk
Pembroke (T)	Thomas Schneider	Town Supervisor	Nicole Begin	Town Clerk
Stafford (T)	Robert Clement	Town Supervisor	Barbara Radley	Town Clerk

a. (C) indicates cities; (T) indicates towns; (V) indicates villages

The various jurisdictions in Genesee County have differing levels of capabilities and resources available to apply to the planning process, as well as differing levels of vulnerability to and impacts from the natural hazards being considered in this plan. It was Genesee 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 have included establishing a Steering Committee, engaging a contract consultant to assume certain elements of the planning 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.

Appendix D (Participation Matrix) identifies how each individual who represented the jurisdictions during this effort contributed to the planning process.

It is noted that all municipalities in the County actively participate in the National Flood Insurance Program and have a designated NFIP floodplain administrator. All floodplain administrators have been informed of the planning process, reviewed the plan documents, and provided direct input to the plan 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 and Appendix D (Participation Matrix).

After completion of the plan, implementation and ongoing maintenance will become a function of the Planning Partnership as described in Chapter 23 (Plan Maintenance). 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 5-year plan updates.

Steering Committee

Genesee County developed a Steering Committee to provide guidance and direction to the plan update effort, and to ensure that the resulting document will be embraced by local government leaders as well as all who live and work within the planning area. 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 planning 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 NYDHSES and FEMA

The Steering Committee provided guidance, leadership, and oversight of the planning process and acted as the point of contact for all participating jurisdictions and various interest groups in the planning area. Table 2-2 lists the members of the Steering Committee.



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

Affiliation	Name	Title
Genesee County Economic Development Corporation	Mark Masse	Senior VP of Operations
Genesee County Office of Emergency Management	Tim Yaeger	Coordinator
Genesee County Office of Emergency Management	Elizabeth Allen	Financial Management Assistant
Genesee County Office of Emergency Management	Gary Patnode	Deputy Coordinator
Genesee County Highway Department	Craig Smith	Deputy Highway Superintendent
Genesee County Highway Department	Tim Hens	Highway Superintendent
Genesee County Highway Department	Laura Wadhams	Assistant County Engineer
Genesee County Legislature	Rochelle Stein	Chair
Genesee County Manager's Office	Matt Landers	County Manager
Genesee County Manager's Office	Tammi Ferringier	Deputy County Manager
Genesee County Planning Department	Felipe Oltramari	Director
Genesee County Planning Department	Julie Boasi	Senior Planner
Genesee County Public Health	Paul Pettit	Public Health Director
Genesee County Public Health	David Bell	Public Health Emergency Preparedness Coordinator
Genesee County Sheriff's Office	Frank Riccobono	Director of Emergency Communications
Genesee County Sheriff's Office	Joseph Graff	Chief Deputy
Genesee County Sheriff's Office	Brian Frieday	Chief Deputy
Genesee County Social Services and Youth Bureau	Carla Mindler	Commissioner
Genesee County Soil and Water Conservation District	Jared Elliott	District Field Manager
Genesee County Soil and Water Conservation District	Laura Bestehorn	Clerk/Treasurer
City of Batavia	Erik Fix	Assistant City Manager
City of Batavia	Rachel Tabelski	City Manager

2.2.2 Planning Activities

Members of the Planning Partnership (individually and as a whole) and 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.) can be found in Appendix B (Meeting Documentation).

Table 2-3 identifies only formal meetings and milestone events in the planning process. In addition to these meetings, 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 / Efforts

Date	44 CFR 201 Requirement	Description of Activity	Participants
August 15, 2023	2	Project Start Up Meeting: Discuss proposed planning process and scope of work including documenting participation, schedule, and public and stakeholder outreach and involvement	Genesee County Office of Emergency Management, Tetra Tech
November 2, 2023	1b, 2, 3a, 3b, 3c, 4a, 5c	SC Kickoff Meeting: Review project schedule; review municipal participation, discuss municipal Kick Off meeting and local data collection; review and discuss sources and availability of County and regional data; discuss public and stakeholder outreach efforts	See Appendix D
January 15, 2024	2	All municipalities invited to participate in the planning process	-
January 2024	2, 3c	GIS data collection meeting	Genesee County Office of Emergency Management, Genesee County GIS Operations, Tetra Tech
January 25, 2024	2	Public project website developed: www.geneseecountynyhmp.com	Planning Team, Contract Planner
February 7, 2024	1b, 2, 3a, 3b, 3c, 4a	Planning Partnership Kickoff Meeting: Complete overview of planning process, plan participant expectations, review of hazards and hazards of concern identification, discussion of data needs and data collection process explaining all provided worksheets, discussion of public and stakeholder outreach efforts	County and municipal representatives and stakeholders. See Appendix D
March 7, 2024	2	Online public hazard preparedness and mitigation survey developed and deployed	Planning Team, Contract Planner
March 7, 2024	2	Online stakeholder hazard mitigation surveys developed and deployed	Planning Team, Contract Planner
March 7, 2024	2	Online neighboring county mitigation survey developed and deployed	Planning Team, Contract Planner
December 9, 2024	2, 3c, 3d, 3e, 4a, 4b, 5	Steering Committee Meeting: Project report and status review, public and stakeholder outreach, risk assessment overview, plan maintenance, next steps	See Appendix D



Date	44 CFR 201 Requirement	Description of Activity	Participants
December 10, 2024	2, 3c, 3d, 3e, 4a, 4b	Planning Partnership Meeting: Project report and status review, public and stakeholder outreach, risk assessment overview, next steps	County and municipal representatives and stakeholders. See Appendix D
March 18, 2025	2, 3c, 3d, 3e, 4a, 4b, 5	Planning Partnership Meeting: Project report and status review, public and stakeholder outreach, mitigation strategy overview, mitigation action development, review of goals and objectives, next steps	County and municipal representatives and stakeholders. See Appendix D
Wednesday, July 30	1b, 2, 3, 4, 5	Draft Plan Review Meeting (afternoon): Overview of entire plan and sections; confirmed plan maintenance schedule; public invited to attend.	County and municipal representatives and stakeholders. See Appendix D
Wednesday, July 30	1b, 2, 3, 4, 5	Draft Plan Review Meeting (evening): Overview of entire plan and sections; confirmed plan maintenance schedule; public invited to attend.	County and municipal representatives and stakeholders. See Appendix D
Thursday, July 31	2	Draft plan posted to public project website	Public and Stakeholders
TBD	1b, 2	Public and stakeholder comments to draft plan received and incorporated into final plan	Public and Stakeholders
Thursday, July 31	All requirements	Plan submitted to NYS DHSES	NYS DHSES
TBD	1b, 2	NYS DHSES comments on draft plan received and incorporated into final plan	NYS DHSES, Planning Team, Contract Planner
TBD	All requirements	Final plan submitted to FEMA Region 2	FEMA Region 2
TBD	1b, 2	FEMA Region 2 comments on draft plan received and incorporated into final plan	FEMA Region 2
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.

Numbers in column 2 identify specific federal requirements, as follows:

1a – Prerequisite – Adoption by the Local Governing Body

1b – Public Participation

2 – Planning Process – Documentation of the Planning Process

3a – Risk Assessment – Identifying Hazards

3b – Risk Assessment – Profiling Hazard Events

3c – Risk Assessment – Assessing Vulnerability: Identifying Assets

3d – Risk Assessment – Assessing Vulnerability: Estimating Potential Losses

3e – Risk Assessment – Assessing Vulnerability: Analyzing Development Trends

4a – Mitigation Strategy – Local Hazard Mitigation Goals

4b – Mitigation Strategy – Identification and Analysis of Mitigation Measures

4c – Mitigation Strategy – Implementation of Mitigation Measures

5a – Plan Maintenance Procedures – Monitoring, Evaluating, and Updating the Plan

5b – Plan Maintenance Procedures – Implementation through Existing Programs

5c – Plan Maintenance Procedures – Continued Public Involvement



2.3 STAKEHOLDER OUTREACH AND INVOLVEMENT

The Genesee County 2025 HMP update was developed using the best available information obtained from a wide variety of sources. Throughout the planning process, a concerted effort was made to gather information from municipal and regional agencies and staff as well as stakeholders, federal and state agencies, and the residents of Genesee County. A Steering Committee solicited information from local agencies and individuals with specific knowledge of certain natural hazards and past historical events. In addition, the Steering Committee and Planning Partnership considered planning and zoning codes, ordinances, and recent land use planning decisions.

This section details the outreach to and involvement of the many agencies, departments, organizations, non-profits, districts, authorities, and other entities that have a stake in managing hazard risk and mitigation, commonly referred to as stakeholders.

Diligent efforts were made to ensure broad regional, county, and local representation in this planning process. A comprehensive list of stakeholders was developed with the support of the Steering Committee and Planning Partnership. Stakeholder outreach was performed early and throughout the planning process, including mass media notification efforts. Identified stakeholders were invited to attend the Planning Partnership risk assessment meeting, and key stakeholders were requested to participate in the Steering Committee and/or Planning Partnership. Information and input provided by these stakeholders has been included throughout this plan.

The following sections list the stakeholders who were invited to participate in the development of this plan and describe how they contributed to the plan. This summary information demonstrates the scope and breadth of the stakeholder outreach efforts during the planning process. Beyond those described here, many stakeholders were aware of and/or contributed to this plan through formal and informal outreach efforts by the Planning Partners involved in the plan update.

2.3.1 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 agency participated.

Table 2-4. Participation of Federal and State Agencies

Agency	Participation
FEMA Region 2	Provided updated planning guidance; provided summary and detailed NFIP data for planning area; presented preliminary regulatory flood products to municipalities and the public; conducted plan review.
- National Centers for Environmental Information (NCEI) - National Hurricane Center (NHC) - 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 plan update was requested and received or incorporated by reference.



Agency	Participation
NYS DHSES: Headquarters and Region II	Administered planning grant and facilitated FEMA review; provided planning guidance; attended meetings; participated in the Mitigation Strategy Workshop, provided review of draft plan and final plan.
New York State Department of Environmental Conservation (NYSDEC)	Provided data and information on various hazards. Provided dates of most recent Community Assistance Visits and Community Assistance Contacts for municipalities enrolled in the NFIP.

2.3.2 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 agency participated.

Table 2-5. County and Regional Agencies

Agency	Participation
• Genesee County Sheriff's Office • Genesee County Public Health • Genesee County Office of Emergency Management • Genesee County Manager's Office • Genesee County Planning Department • Genesee County Highway Department • Genesee County Legislature • Genesee County Social Services and Youth Bureau • Genesee County Soil and Water Conservation District	Served on Steering Committee, attended meetings, completed hazard of concern exercise, goals and objectives exercise, and reviewed draft plan.
• Tonawanda Seneca Nation • Erie County Water Authority • Monroe County Water Authority	Invited to take the stakeholder survey and review the draft plan.

2.3.3 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 participating jurisdictions were asked to invite their internal agencies associated with community lifeline categories to complete a stakeholder survey. This section describes outreach to and participation by other stakeholders in the planning process associated with FEMA's eight designated community lifeline categories. More detailed information about community lifelines in the planning area is provided in Section 3.9.

Safety and Security

Law Enforcement

Many municipalities directly involved police and other law enforcement representatives in the planning process. 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:

- Village of Attica Police Department
- City of Batavia Police Department



- Village of Corfu Police Department
- Village of LeRoy Police Department

Fire Districts and Fire Departments

Many jurisdictions directly involved fire district/department, hazardous materials (hazmat) teams, and rescue team representatives in the planning process. Jurisdictions were asked to invite their fire departments to complete a stakeholder survey. The following fire districts or departments, hazmat teams, and rescue teams were invited to complete a stakeholder survey and review the draft plan:

- Town of Alabama Fire Department
- Town of Alexander Fire Department
- Village of Attica Fire Department
- City of Batavia Fire Department
- Town of Batavia Fire Department
- Town of Byron Fire Department
- Village of Corfu Fire Department
- Town of Darien Fire Department
- Town of Elba Fire Department
- East Pembroke Fire Department
- Indian Falls Fire Department
- Le Roy Fire Department
- Oakfield Fire Department
- Pembroke Fire Department
- Town of Pavilion Fire Department
- South Byron Fire Department
- Town of Stafford Volunteer Fire Department

Dams

To address High Hazard Potential Dams, outreach was conducted with dam owners and/or the dam safety agency. 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 climate 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

No responses were received. Information related to dams was sourced from the NYS DEC database and the USACE NID. Additional information was obtained from the approved list of critical facilities provided by the County



as well as online mapping tools used to identify nearby roadways and other facilities that may be at risk in the event of a dam failure.

Food, Hydration, Shelter

Jurisdictions were asked to invite their emergency management-related agencies to provide information on shelters and sheltering procedures. The following stakeholders that provide food, hydration, shelter, and agricultural activities in Genesee County were invited to complete a stakeholder survey and review the draft plan:

- Agricultural and Farmland Protection Board
- Soil and Water Conservation District
- Cornell Cooperative Extension
- Genesee County Office for the Aging
- Pavilion Community Food Pantry
- The City Church
- The Salvation Army of Batavia
- Genesee County Department of Social Services

Health and Medical

Hospitals and Healthcare Facilities

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

- Genesee and Orleans County Health Departments (GO Health)
- Oak Orchard Health
- Oakfield Family Pharmacy
- The Manor House
- Well Now Urgent Care
- VA Medical Center
- Rochester Regional Health / United Memorial Community Care

Ambulance/Emergency Medical Services

Jurisdictions were asked to invite their ambulance and emergency medical service providers to complete a stakeholder survey. In addition, the following ambulance and emergency medical service providers were invited to complete a stakeholder survey and review the draft plan:

- Town of Alabama Fire Department
- Town of Alexander Fire Department
- Village of Attica Fire Department
- City of Batavia Fire Department
- Town of Batavia Fire Department
- Town of Byron Fire Department



- Village of Corfu Fire Department
- Town of Darien Fire Department
- Town of Elba Fire Department
- East Pembroke Fire Department
- Indian Falls Fire Department
- Le Roy Fire Department
- Oakfield Fire Department
- Pembroke Fire Department
- Town of Pavilion Fire Department
- South Byron Fire Department
- Town of Stafford Volunteer Fire Department
- Mercy EMS
- LeRoy Ambulance

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:

- Batavia Power Plant

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:

- AT&T
- Frontier
- Verizon

Transportation

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

- Regional Transit Service (RTS) Genesee

Hazardous Materials

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

- Attica Wastewater Treatment Plant
- Batavia Wastewater Treatment Plant
- LeRoy Sewage Treatment Plant
- LeRoy Water Treatment Plant



Water Systems

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

- Attica Wastewater Treatment Plant
- Batavia Wastewater Treatment Plant
- Bergen Sewage Treatment Plant
- Corfu Wastewater Treatment Plant
- LeRoy Sewage Treatment Plant
- LeRoy Water Treatment Plant
- Erie County Water Authority
- Monroe County Water Authority

2.3.4 Additional Stakeholder Groups

Additional stakeholder outreach was made to academia and organizations that support socially vulnerable populations and underserved populations, as listed in the sections below.

School Districts and Other Academic Institutions

jurisdictions were asked to invite representatives of their local schools to complete a stakeholder survey. Additionally, the following school districts, colleges, and academic organizations were invited to complete a stakeholder survey and review the draft plan:

- Alexander School District
- Batavia City School District
- Byron Bergen School District
- Elba Central School District
- LeRoy School District
- Oakfield/Alabama Central School District
- Pavilion School District
- Pembroke School District

Groups Supporting Socially Vulnerable Populations and Underserved Communities

The following groups and agencies that provide support to and work with socially vulnerable populations and underserved communities were invited to complete a stakeholder survey and review the draft plan:

- Genesee County Youth Bureau
- Genesee County Veterans Service Agency
- Genesee County Department of Social Services
- Genesee County Mental Health Department
- Genesee County Office for the Aging



- AmeriCorps Senior

2.3.5 Adjacent Jurisdictions

Genesee County kept surrounding jurisdictions apprised of the project, 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 February 2024 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:

- Erie County (NY)
 - Department of Homeland Security and Emergency Services
 - Department of Environment and Planning
- Livingston County (NY)
 - Office of Emergency Management
 - Planning Department
- Monroe County (NY)
 - Office of Emergency Management
 - Planning and Development Department
- Niagara County (NY)
 - Office of Emergency Services
 - Department of Economic Development
- Orleans County (NY)
 - Emergency Management Office
 - Planning and Development Department
- Wyoming County (NY)
 - Office of Emergency Services
 - Planning and Development Department

2.3.6 Stakeholder and Neighboring Community Survey Summaries

This section summarizes the results and feedback received from those who completed the stakeholder and neighboring community surveys. Feedback was reviewed by the Steering Committee and integrated where appropriate in the plan.

Stakeholder Survey

The stakeholder survey was designed to identify general needs for hazard mitigation and resiliency within Genesee 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. No responses were received.



Neighboring Community Survey

The neighboring community survey was sent to the County and municipal governments that border Genesee County due to their proximity to the County and because the effects of hazard events that impact Genesee County would be similar to that of their neighbors. As of July 1, 2025, two counties submitted the survey (Orleans and Wyoming Counties).

The Neighboring Community Survey was broken down into four sections: Emergency Operations and Continuity of Operations Planning, Information Sharing, Projects, Grants, Education and Outreach, and Evacuation and Sheltering, each detailed below.

Emergency Operations and Continuity of Operations Planning

Respondents indicate there are shared service agreements in place with Genesee County for emergency staffing for evacuations and disaster response, animal sheltering, development of Community Organizations Active in Disaster (COAD), and being a member with Genesee County on the Hazardous Materials Consortium.

Both respondents noted that Genesee County and/or its local jurisdictions are involved in their county's emergency operations planning and vice versa. One respondent noted that Genesee County and/or its local jurisdictions are involved in their county's continuity of operations planning and vice versa, while the second respondent indicated they are not involved.

Information Sharing

Respondents noted information sharing primarily occurs via routine meetings, special events or activity meetings, regular conversations, and training exercises with Genesee County Office of Emergency Management staff. Both respondents have the contact information for the Emergency Operations Center in Genesee County.

One respondent indicated they share risk and vulnerability assessments with Genesee County and that information regarding mitigation is shared during the planning and implementation phases of projects.

Projects, Grants, Education, and Outreach

Respondents noted hazard risks they share with Genesee County including:

- Flooding in swamps
- Damage to radio system infrastructure
- Tonawanda Creek flooding
- Flooding in the Village of Attica
- Problems surrounding the water treatment plant in the Village of Attica

Respondents identified there are projects requiring cross-collaboration between county boundaries including the Tonawanda Creek flood project, updating flood maps, and the STAMP project. One respondent indicated they have collaborated with Genesee County on grant applications.

One respondents is aware of organizations that support socially vulnerable or underserved populations in their county and Genesee County. Similarly, one respondent was aware of organizations that carry out education and outreach regarding hazards in their jurisdiction and Genesee County.



Evacuation and Sheltering

One participant indicated collaboration with Genesee County and/or its local jurisdictions is not taken when establishing evacuation routes or making evacuation decisions; however, the second respondent identified they collaborate when needed, but most evacuation routes are defined by New York State. One respondent noted collaboration with Genesee County and/or its local jurisdictions is taken when establishing shelters or making sheltering decisions when needed. Both respondents are unsure if evacuation routes maintained to the same level of protection across jurisdictional lines.

Both respondents indicated they collaborate with Genesee county and/or its local jurisdictions on establishing shelters and before making sheltering decisions that would impact their jurisdiction and Genesee County. No shared spaces for temporary housing were identified.

2.3.7 Public Outreach

To facilitate better coordination and communication between the Planning Partnership and all community members and to involve the public in the planning process, draft documents were made available to the public through a variety of venues, including printed and online formats. The Steering Committee and Planning Partnership made the following efforts toward public participation in the development and review of the HMP:

- The public was informed of the hazard mitigation planning effort commencement at the kickoff meeting and through press releases and public service announcements released throughout the planning process. Copies of these announcements can be found in Appendix C.
- A public website is being maintained as another way to facilitate communication between the Steering Committee, Planning Partnership, public, and stakeholders (www.geneseecountynyhmp.com). The public website includes a project overview, county and local contact information, access to the public and stakeholder surveys, and access to sections of the HMP for public review and comment. Physical copies of the outreach surveys were available upon request and at in-person County events.
- All participating jurisdictions have been encouraged to distribute press releases on the project, including links to the project web page and public and stakeholder surveys.
- To facilitate coordination and communication between the Planning Partnership and citizens, and involve the public in the planning process, a printed version of the plan will be maintained at the Genesee County Office of Emergency Management.
- An online natural hazards preparedness public survey was developed to gauge household preparedness that may impact Genesee County and to assess the level of knowledge of tools and techniques to assist in reducing risk and loss of those hazards. The questionnaire asks quantifiable questions about citizen perception of risk, knowledge of mitigation, and support of community programs. The questionnaire also asks several demographic questions to help analyze trends. Physical copies of the questionnaire were available upon request and were provided at County community events.
- The questionnaire was posted on the Genesee County website on March 7, 2024, and was available for public input through July 1, 2025. All participating jurisdictions have been requested to advertise the availability of the survey via local home page links and other available public announcement methods (e.g., Facebook, X, email blasts, etc.). Roughly 15 responses have been collected. A summary of survey results is provided later in this section, with full results provided in Appendix C of this plan. Physical copies of the questionnaire were available upon request and were provided at County community events.
- Directed response surveys were distributed to academia, fire departments, EMS, hospitals and healthcare organizations, business and commercial interests, utilities, and law enforcement stakeholders as detailed



in the Stakeholder Outreach and Involvement subsection of this chapter. A summary of survey results is provided later in this section, with full results provided in Appendix C of this plan. Physical copies of the questionnaire were available upon request and were provided at County community events.

- Planning Partnership meetings were advertised as open to the public to provide information on the planning process. Virtual options were held on February 7, 2024, and December 10, 2024.
- The draft plan was posted to the public website on July 31, 2025, for public review and comment. All public comments were directed to the Genesee County Office of Emergency Management for collection and review by the Steering Committee. All public comments received were forwarded to the appropriate jurisdiction and/or agency and incorporated into the final plan, as appropriate.
- Once submitted to NYS DHSES/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 following locations, as identified in Chapter 23, Plan Maintenance.

Examples of virtual outreach via websites and social media are provided in Figure 2-1 and Figure 2-2.

Public Survey Summary

The public survey was developed to assess the level of knowledge of tools and techniques to assist in reducing risk and loss associated with hazards. It asked quantifiable questions about citizen perception of risk, knowledge of mitigation, and support of community programs. The County advertised the survey on their website and social media accounts. As of July 1, 2025, the survey received 15 responses.

Demographically, survey respondents were from ten municipalities within Genesee County, with 57.14 percent having lived in the County for 20 years or more. The most common (57.14 percent) age of respondents was over the age of 60. Eleven respondents (84.62 percent) receive information concerning hazards through a mass notification system. Eight respondents (61.54 percent) receive information utilizing social media and six respondents (46.15 percent) noted the rely on police, fire, EMS, 9-1-1 for information.

Survey respondents identified the following as the top six most frequently occurring natural hazard events within Genesee County in the past 10 years, as shown in Figure 2-3:

- Extreme Wind (66.67 percent)
- Lightning (66.67 percent)
- Severe Storms—Thunderstorms, Hail (53.33 percent)
- Winter Storms (46.67 percent)
- Extreme Temperature (33.33 percent)
- Drought (33.33 percent)

Respondents identified the following as priorities regarding planning for hazards:

- Strengthening emergency services (e.g., police, fire, EMS) (76.92 percent)
- Promoting cooperation among public agencies, residents, non-profit organizations, and local businesses (76.92 percent)
- Protecting critical facilities and community lifelines (61.54 percent)
- Protecting and reducing damages to utilities (53.85 percent)
- Disclosing hazard risks during real estate transactions (53.85 percent)



Respondents were asked which activities have been performed to mitigate hazard impacts to their homes. 100 percent of the 13 respondents to this question have installed smoke detectors; roughly 84.62 percent have talked with other household members about what to do in case of a natural disaster or emergency; 92.31 percent have become trained in first aid and/or CPR; 53.85 percent have attended meetings or received information on natural disasters or emergency preparedness; 46.15 percent have prepared a disaster supply kit; and 69.23 percent have developed an emergency plan for the household to decide what will be done in the event of a disaster or emergency.

Respondents were also asked about their property's location within the floodplain, and if they have flood insurance. Of the 15 respondents who answered this question, only one (6.67 percent) indicated that their property is located in a designated floodplain. However, four respondents (26.67 percent) indicated their home is covered by flood insurance.

The most self-selected jurisdictions respondents indicated that they live in, include the City of Batavia (21.43 percent) and the Village of Oakfield (14.29 percent).

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



Figure 2-1. Genesee County HMP Web page and Online Outreach



Genesee County Hazard Mitigation Plan Update - Public Survey

Genesee County has assembled a team to update our hazard mitigation plan which addresses hazards that impact our county and municipalities, school districts, and other jurisdictions. Please help us plan for future disasters by completing this survey regarding hazards in Genesee County.

This survey is designed to gather information from around Genesee County to help us better coordinate activities and reduce the risk of injury or property damage. These questions are for information-gathering only and do not necessarily reflect any intent or future priorities of any governing body. This information will be shared with municipal, state, federal, and county entities for planning purposes only.

Please help us be more resilient to future disasters by completing this survey.

OK

NEXT



HAZARD MITIGATION PLAN UPDATE

Genesee County is making efforts to build a stronger community and could really use your assistance! Would you mind taking a quick survey below and letting us know how you keep yourself safe when natural disasters strike? Scan the QR code to take the survey.



<https://www.surveymonkey.com/r/GeneseePublicSurvey>

WANT TO LEARN MORE? CHECK OUT THE HMP WEBSITE!

<https://www.geneseecountynyhmp.com/>



Figure 2-2. Genesee County HMP Web Page and Local Online Outreach





Figure 2-3. Most Frequently Experienced Natural Hazard Events in Genesee County

	YES, IN THE PAST YEAR.	YES, IN THE PAST FIVE (5) YEARS.	YES, MORE THAN FIVE (5) YEARS AGO.	NEVER	TOTAL
Dam Failure	0.00% 0	0.00% 0	0.00% 0	100.00% 15	15
Disease/Pandemic Outbreak	0.00% 0	86.67% 13	13.33% 2	0.00% 0	15
Drought	33.33% 5	13.33% 2	6.67% 1	46.67% 7	15
Earthquake	0.00% 0	13.33% 2	26.67% 4	60.00% 9	15
Extreme Temperature (heat and cold)	33.33% 5	40.00% 6	6.67% 1	20.00% 3	15
Extreme Wind	66.67% 10	20.00% 3	0.00% 0	13.33% 2	15
Flooding - Street/Land	20.00% 3	6.67% 1	33.33% 5	40.00% 6	15
Flooding - Stormwater	6.67% 1	20.00% 3	13.33% 2	60.00% 9	15
Flooding - Basement	6.67% 1	20.00% 3	0.00% 0	73.33% 11	15
Flooding - 1st floor or above.	0.00% 0	7.14% 1	0.00% 0	92.86% 13	14
Hazardous Materials	6.67% 1	6.67% 1	6.67% 1	80.00% 12	15
Ice Jam	13.33% 2	13.33% 2	13.33% 2	60.00% 9	15
Landslide	0.00% 0	6.67% 1	0.00% 0	93.33% 14	15
Lightning	66.67% 10	20.00% 3	0.00% 0	13.33% 2	15
Severe Storms (thunderstorms/hail)	53.33% 8	26.67% 4	13.33% 2	6.67% 1	15
Tornado	13.33% 2	6.67% 1	13.33% 2	66.67% 10	15
Wildfire	6.67% 1	6.67% 1	6.67% 1	80.00% 12	15
Winter Storm	46.67% 7	40.00% 6	6.67% 1	6.67% 1	15
Civil Unrest	0.00% 0	6.67% 1	0.00% 0	93.33% 14	15
Terrorism	0.00% 0	6.67% 1	0.00% 0	93.33% 14	15
Transportation Accident	6.67% 1	26.67% 4	33.33% 5	33.33% 5	15

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

The Genesee 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 Genesee County, participating jurisdictions, and stakeholders involved in the planning effort. Detailed sources of technical data and information used are listed in the References section.

The asset inventory data used for the risk assessment is presented in the County Profile (Chapter 3). Details of the source of this data, along with technical information on how the data was used to develop the risk assessment, are presented in Chapter 4, as well as throughout the hazard profiles in this HMP. The County and participating jurisdictions 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 22.2)
- 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 community program
- CRS
- New York State Hazard Mitigation Plan, 2023

Genesee County and participating jurisdictions were tasked with updating the assessment of their planning and regulatory capabilities (see the 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 jurisdictional annexes. These tables list plan types, names, and dates as well as a summary of how each plan supports mitigation and resilience.

2.5 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 integrates, coordinates with, and complements those existing plans and programs.



The capability assessment presented in Chapter 21 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 participating jurisdiction 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”).

2.6 PLAN ADOPTION

Adoption by the local governing bodies of each participating jurisdiction 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.

All participating jurisdictions will proceed with formal adoption proceedings. Each jurisdiction must submit a copy of its formal adoption resolution or other legal instrument to the Genesee County HMP Coordinator in the Genesee County Emergency Management Services. Genesee County will forward the executed resolutions to NYS DHSES, after which NYS DHSES will forward the adoptions to FEMA for the record. FEMA allows two options for submitting adoption resolutions:

In addition to being required by DMA 2000, adoption of the HMP is necessary because:

- 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).

- **Submittal of adoption resolutions with plan:** All participating jurisdictions provide documentation of plan adoption when the plan is initially submitted to the state for review. After receiving the draft plan from NYS DHSES, FEMA conducts its review and will approve the plan if it meets all requirements.
- **Approvable pending adoption:** A draft HMP is submitted to NYS DHSES and FEMA for approval prior to adoption by the jurisdictions. When FEMA determines that the plan as a whole and each participating jurisdiction have met all the requirements except adoption, FEMA will inform the NYS DHSES that the plan 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 plan to apply for and receive funding assistance.

FEMA will transmit acknowledgment of verification of formal plan adoption and the official approval of the plan to the Genesee County HMP Coordinator. The plan approval date begins the five-year approval period and sets the expiration date for the plan. All participating jurisdictions 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.



2.7 CONTINUED PUBLIC INVOLVEMENT

The Planning Partners are committed to the continued involvement of the public in the hazard mitigation process. This plan update will be posted online (currently at www.geneseecountynyhmp.com), and jurisdictions will be encouraged to maintain links to the plan website. Further, the County will make hard copies of the plan available for review at public locations as identified on the public plan website.

A notice regarding annual updates of the plan and the location of plan copies will be publicized annually after the Planning Partnership's annual evaluation and posted on the public website (currently at www.geneseecountynyhmp.com).

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

The public will have an opportunity to comment on the plan 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 five-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 with 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 plan 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 plan and the location of plan copies will be publicized annually after the HMP Committee's annual evaluation and posted on the public website.

Mr. Timothy Yaeger of the Genesee County Office of Emergency Management has been identified as the ongoing County HMP Coordinator (see Chapter 23) and is responsible for receiving, tracking, and filing public comments regarding this plan update. The contact information is:

Mailing Address: Genesee County Office of Emergency Management
7690 State St. Rd.
Batavia, NY 14020

Contact Name: Mr. Timothy Yaeger
Email Address: tim.yaeger@geneseeny.gov
Telephone: (585) 344-0078

Further details regarding continued public involvement are provided in Chapter 23.



3. COUNTY PROFILE

The planning area for this hazard mitigation plan (HMP) includes of the entirety of Genesee County. This chapter presents general information about the land, people, and assets of Genesee 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

Genesee County is located in western New York, midway between the Cities of Rochester and Buffalo. The County is bordered on the north by Orleans County, on the east by Monroe and Livingston Counties, on the south by Wyoming County, and on the west by Erie and Niagara Counties.

Genesee County is roughly rectangular in shape and covers 501 square miles. It is primarily rural, with the major exception of the City of Batavia and its surrounding suburbanized areas. The northeastern Towns of Bergen and LeRoy are currently experiencing some residential growth as a result of the ongoing expansion of metropolitan Rochester (Camoin Associates 2015). A similar situation is occurring in the County's western end, where the Town of Pembroke has recently experienced residential growth as a result of the ongoing expansion of metropolitan Buffalo. Figure 3-1 shows Genesee County and its municipalities.

3.2 JURISDICTIONS WITHIN THE COUNTY

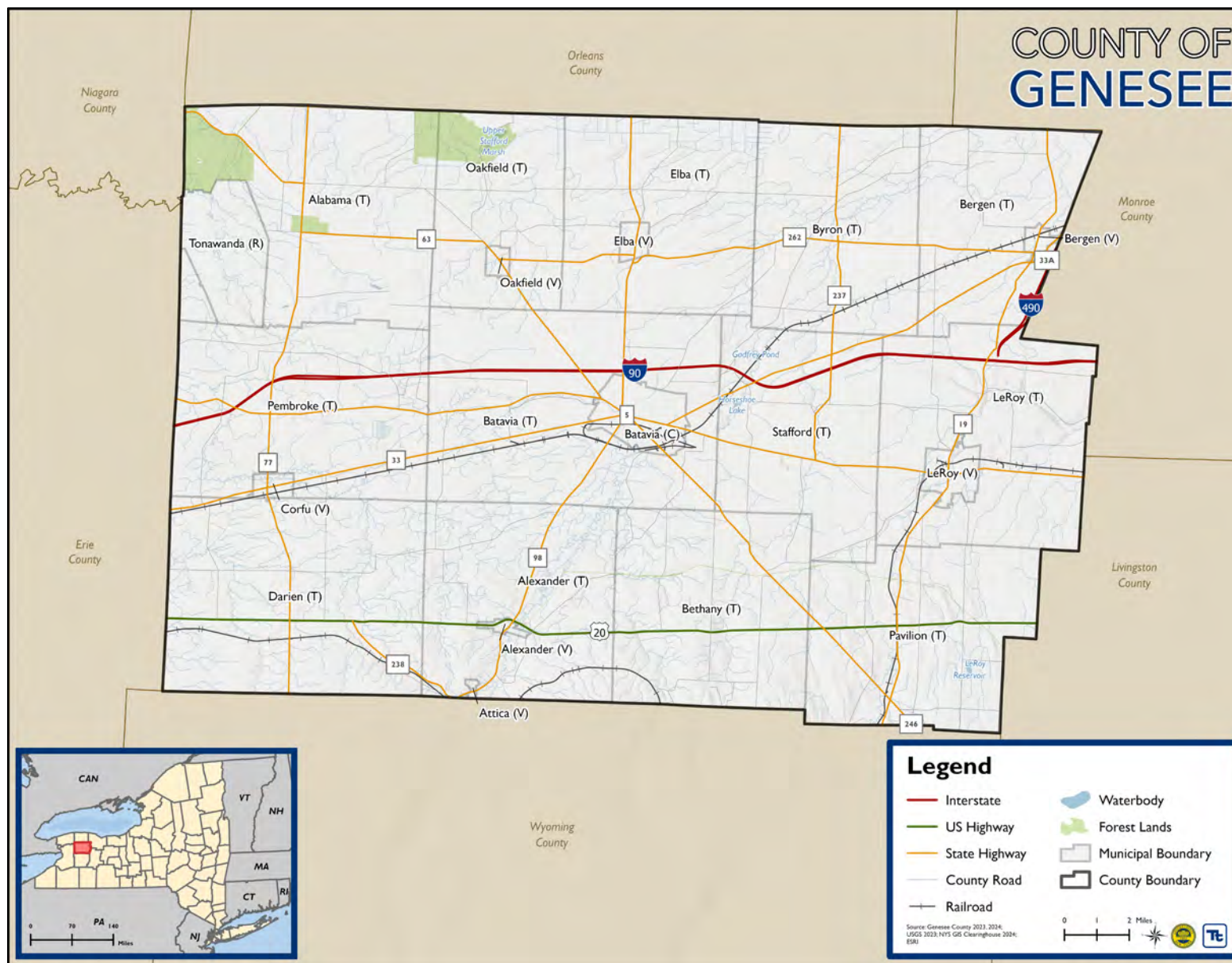
Today, the County consists of 19 municipalities: 1 city, 11 towns, and 7 villages, as listed in Table 3-1.

Table 3-1. Genesee County Municipalities

City	Village	
City of Batavia	Village of Alexander Village of Attica Village of Bergen Village of Corfu	Village of Elba Village of LeRoy Village of Oakfield
Towns		
Town of Alabama Town of Alexander Town of Batavia Town of Bergen	Town of Bethany Town of Byron Town of Darien Town of Elba	Town of LeRoy Town of Oakfield Town of Pavilion



Figure 3-1. Genesee County Hazard Mitigation Plan Area





3.3 HISTORY

Genesee County is a predominantly rural and agricultural county centrally located in western New York State. It is known as the “Mother of Counties” because all the western New York counties between the Genesee River and Lake Erie were carved out of it between 1806 and 1841.

Genesee County was formed on March 30, 1802. The County originally encompassed a vast area of western New York, including (in addition to the current Genesee County) what are now Erie, Niagara, Orleans, Wyoming, Allegany, Cattaraugus, and Chautauqua Counties as well as parts of Monroe and Livingston Counties. The County’s name is derived from a Seneca Indian term meaning “Beautiful Valley,” a reference to the Genesee River valley. Ironically, the County no longer includes land that is within the Genesee Valley (Genesee County n.d.).

Historically, the County was strongly influenced by its rich agricultural land, proximity to the Erie Canal, rivers and streams that offered early settlers waterpower for mills, and location astride key transportation routes. The area was inhabited by the Seneca tribe of the Iroquois Confederacy for several centuries prior to the arrival of European settlers. Perhaps the greatest Seneca influence remaining on the County’s landscape are Routes 5, 33, 63, and 98, all of which were once trails through the wilderness that were adopted and developed by settlers. The earliest settlers in what would later become Genesee County arrived in LeRoy in 1797.

In 1792, the Holland Land Company, a consortium of Dutch financiers interested in developing frontier lands in North America, obtained title to an immense 3.3 million-acre tract in western New York. In 1797, once it had secured title to the land, the company hired an experienced surveyor, Joseph Ellicott (1760–1826), to serve as its chief surveyor and land sales agent. Under his able oversight, a team of surveyors delineated a grid pattern of townships that remains visible on the County’s landscape today. Land sales began in November 1800. Many municipal boundaries and County roads follow the surveyor’s grid laid out more than two centuries ago (New York Heritage n.d.).

Given the area’s remote and primitive condition, the Holland Land Company was forced to invest considerable resources in surveying, road building, advertising, and other measures to attract settlers to the area. Ellicott and his surveyors kept detailed notes on the area’s topography, geology, plant and animal life, and soil conditions that were invaluable to later settlers. Ellicott took decisive steps to shape the pattern of settlement in the future county by surveying town lines, laying out key roadways, and attracting skilled workers such as millers, blacksmiths, innkeepers, and other artisans to establish the nucleus of future settlements. He oversaw the settlement and development of the company’s holdings from the Holland Land Company office in Batavia. When Ellicott retired from his post in 1821, he had effectively laid the foundations of Genesee County’s future growth and development (New York Heritage n.d.).

During the mid and late nineteenth centuries, Genesee County functioned as both an agricultural and industrial community. After an initial boom in wheat, farmers turned to corn and dairying and eventually began farming the rich muckland soils in the north of the County. The City of Batavia grew from its origins as a milling settlement into a major regional manufacturing center, although since the 1970s, many industries have closed or moved out of Batavia. The County long benefited from its position on the New York Central Railroad System’s mainline, which funneled considerable commercial traffic through the County. Today, it benefits from its position astride the New York State Thruway (I-90), the state’s principal east/west transportation artery, which may be likened to the New York Central mainline of old (Cambridge University Press 2009).



3.4 PHYSICAL SETTING

3.4.1 Hydrography and Hydrology

Hydrology is the study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks (groundwater), and in the atmosphere (USGS 2019). A complete description of Genesee County hydrology would include profiles of the numerous ponds, lakes, creeks, and rivers which make up the waterscape of the County, including characteristics of the water flowing through those waterways, as well as providing details on all other factors that influence the hydrologic cycle including climate, geology, land use/cover, and vegetation. Many of these aspects of Genesee County's hydrology will be discussed in more detail later in this plan, relative to specific areas of known hazards.

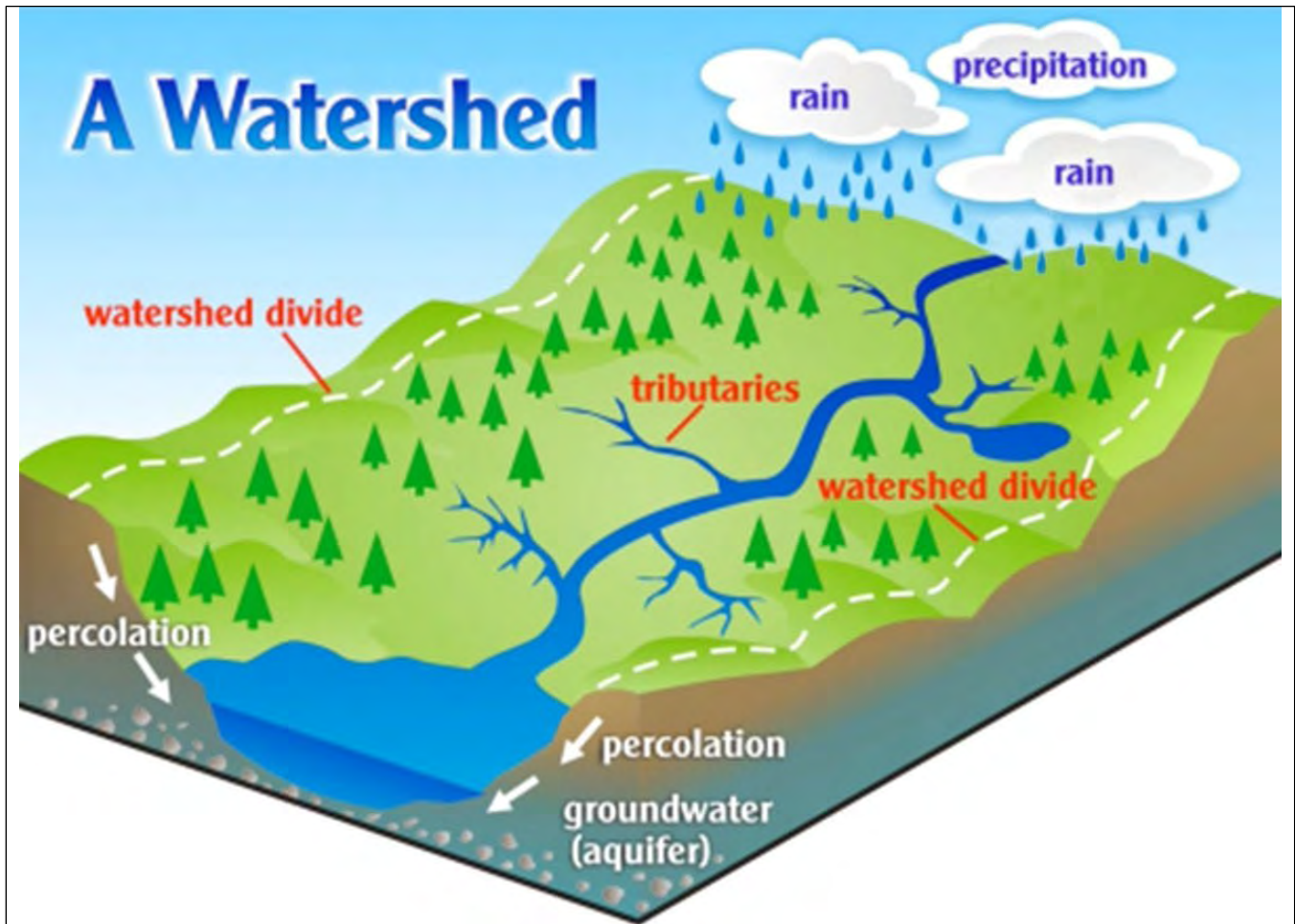
Numerous ponds, lakes, creeks, and rivers make up the waterscape of Genesee County. The major waterways within the County include: Ledge Creek, Spring Creek, Black Creek, Oak Orchard Creek, Robins Brook, Bigelow Creek, Crooked Creek, Murder Creek, Huron Creek, Bowen Creek, Little Tonawanda Creek, Tonawanda Creek, Whitney Creek, Phelps Pond, Divers Lake, Indian Falls Lake, Parkers Pond, Darien Lake, Horseshoe Lake, Chapin Pond, LeRoy Reservoir, White Creek, Mud Creek, and Black Creek (Genesee County n.d.).

3.4.2 Watersheds

A watershed is the area of land that drains into a body of water, such as a river, lake, stream, or bay. It is separated from other systems by high points in the area, such as hills or slopes. It includes not only the waterway itself but also the entire land area that drains to it. For example, the watershed of a lake would include not only the streams entering the lake but also the land area that drains into those streams. Drainage basins generally refer to large areas that encompass the watersheds of many smaller rivers and streams. Figure 3-2 depicts the hydrologic system of a watershed (NYCDEP 2015). Watersheds can cross municipal and county boundaries. New York State's waters (lakes, rivers, and streams) fall within one of 17 major watersheds (or drainage basins).

Genesee County lies within the Niagara River/Lake Erie and Genesee River watersheds. The Genesee River Watershed is almost entirely within New York State, except for the upper 15 miles of the river and its drainage, originating in the Allegheny Plateau of Northern Pennsylvania. The Genesee River flows north for about 140 miles before emptying into Lake Ontario at Rochester. The Niagara River/Lake Erie Watershed is composed of the Niagara River that flows north from Lake Erie into Lake Ontario and forms part of the border between New York and Ontario, Canada. The watershed includes historical landmarks like the Erie Canal and Niagara Falls (NYSDEC n.d.). Figure 3-3 shows the location of watersheds in the State of New York, with Genesee County's location indicated.

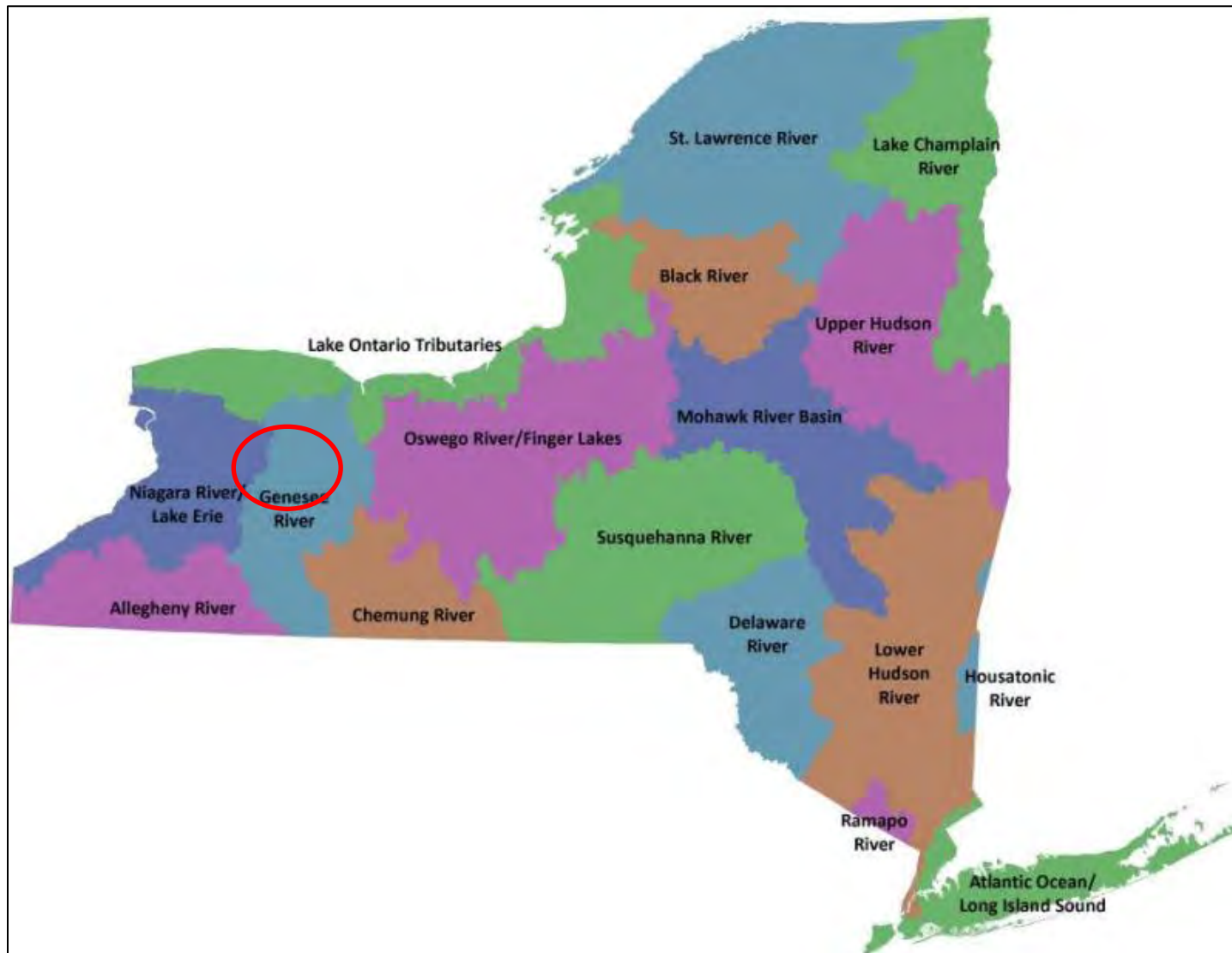
Figure 3-2. Watershed



Source: Riverside-Corona Resource Conservation District 2022



Figure 3-3. Watersheds in Genesee County



Source: NYSDEC n.d.

Notes: Approximate location of Genesee County is indicated by the red circle.



3.4.3 Topography and Geology

Topography ranges from flat, low-lying muckland in the north to hills and valleys in the south. The northern three-fourths of the County lie within the Erie-Ontario sub-zone of the Great Lakes Plain. This section is characterized by terrain that is relatively flat and level and gently undulating in some areas. The land elevation of this section ranges from 500 to 1,000 feet above sea level. The southernmost section of the County, along the border with Wyoming County, lies within the Cattaraugus Highlands of the Appalachian Plateau. The topography of this area is dominated by a range of hills extending northward from Wyoming County. These hills vary in elevation from 1,000 to 1,420 feet (Crabb 1910).

Bedrock is mainly shale in the southern third of the County, predominantly limestone in the central third, and alternating limestone and shale formations, mostly calcareous, in the northern third. Most soils are glacial till that form undulating to rolling terrain. Some coarse-textured soils, such as sand and gravel, are found in the west-central areas. Alluvial soils are found in valley bottoms in the south-central area. Soil quality varies throughout the County but is generally good enough to support agricultural activities (Wishart n.d.).

3.4.4 Climate

Genesee County's climate is classified as humid continental, with hot, humid summers and cold winters and an average yearly temperature of 49°F. According to the local Cornell Cooperative Extension, the County's average growing season ranges from May 6 to October 8 for a total of 155 days (Cornell Cooperative Extension n.d.). Mean January temperatures tend to fall in the mid-20s°F, with nighttime lows of around 0°F possible. Mean July temperatures tend to fall between the high 60s°F and the low 70s°F, with the occasional daytime high of about 90°F. The highest temperature ever recorded in the County was 104°F (July 9, 1936). The lowest temperature ever recorded in the County was -24°F (February 9, 1934). Temperature differences are generally due to differences in elevation (NOAA 2023).

The climate of Genesee County is fairly humid and can be influenced by its proximity to Lake Ontario and the other Great Lakes. Precipitation is regularly distributed across all seasons in terms of quantity, although the frequency of storms is much greater in the winter months when heavy snowfall events occur at highly irregular intervals over varied distances. On average, annual precipitation is 35.34 inches of yearly. (National Weather Service, Buffalo Office 2015). The most significant and potentially dangerous weather patterns affecting the area typically occur in the winter and early spring. Higher than average snowfall in a short period of time occasionally results in dangerous road conditions, sometimes forcing motorists off the roads and disrupting normal daily activities. Severe weather events occasionally force the closure of major roads, including the NYS Thruway. In addition, sudden spring thawing sometimes results in flooding conditions along major waterways such as the Tonawanda and Oatka Creeks (NOAA 2023).

Climate Change Projections

Climate change affects the State of New York's residents and resources. Annual average temperatures are projected to increase across New York State by 2.5°F to 4.4°F by the 2030s, 3.8°F to 6.7°F by the 2050s, 5.1°F to 10.9°F by the 2080s, and 5.6°F to 15.3°F by 2100, relative to the 1981–2010 base period. The warming is projected to be the greatest in the northern regions of the state, and projections suggest that each season will experience a comparable amount of warming in the future relative to the baseline period.



Precipitation is projected to decrease by 2 percent or increase by up to 11 percent by the 2030s, decrease by 2 percent or increase by up to 14 percent by the 2050s, increase by 1 to 22 percent by the 2080s, and decrease by 4 percent or increase by 30 percent by 2100 (Stevens & Lamie 2024).

In Genesee County and the Great Lakes region, temperatures are estimated to increase by 3.5°F to 7.4°F by the 2050s, 5.1°F to 12.4°F by the 2080s, and 5.6°F to 14.5°F by 2100, relative to the 1981–2010 base period. Precipitation totals are estimated to decrease by 1 percent or increase by up to 11 percent by the 2050s, increase by 2 to 17 percent by the 2080s, and decrease by 4 percent or increase by up to 23 percent by 2100, relative to the 1981–2010 base period (Stevens & Lamie 2024).

3.4.5 Land Cover

As shown in Table 3-2 and Figure 3-4, the most common land cover in Genesee County is agricultural, with 54.1 percent of all land cover (171,676 acres), followed by wetland (63,536 acres or 20 percent of all land cover) and forest (51,612 acres or 16.3 percent of all land cover).

According to the Genesee County Agricultural and Farmland Protection Plan, approximately 57 percent of the acreage in the County is cultivated crop land and/or pastures. Every town in the County has significant areas of cultivation in one of these two categories. Forested lands are concentrated in the Town of Darien and the Tonawanda Seneca Indian Reservation, but there are pockets of woodlands throughout the County. Approximately 16 percent of the County's land is classified as forests. There are also areas of wetlands and emergent herbaceous wetlands throughout the County, with large wetlands in the Towns of Oakfield and Alabama in the northwest (Oak Orchard State Wildlife Management Area and Iroquois National Wildlife Refuge) and northeast (Byron-Bergen Swamp) portions of the County (Genesee County 2017). The Land Cover map produced for the Genesee County Agricultural and Farmland Protection Plan is seen in Figure 3-5.

Table 3-2. Genesee County Land Use

Land Use Category	Area in Category (as of 2021)	
	Acreage	% of County Total Area
Agriculture	171,676	54.1%
Barren Land	885	0.3%
Forest	51,612	16.3%
Rangeland	1,325	0.4%
Urban Area	26,511	8.4%
Water	1,664	0.5%
Wetland	63,536	20.0%
Genesee County Total	317,209	100.0%

Source: CONUS 2021



Figure 3-4. Genesee County Land Use and Land Cover

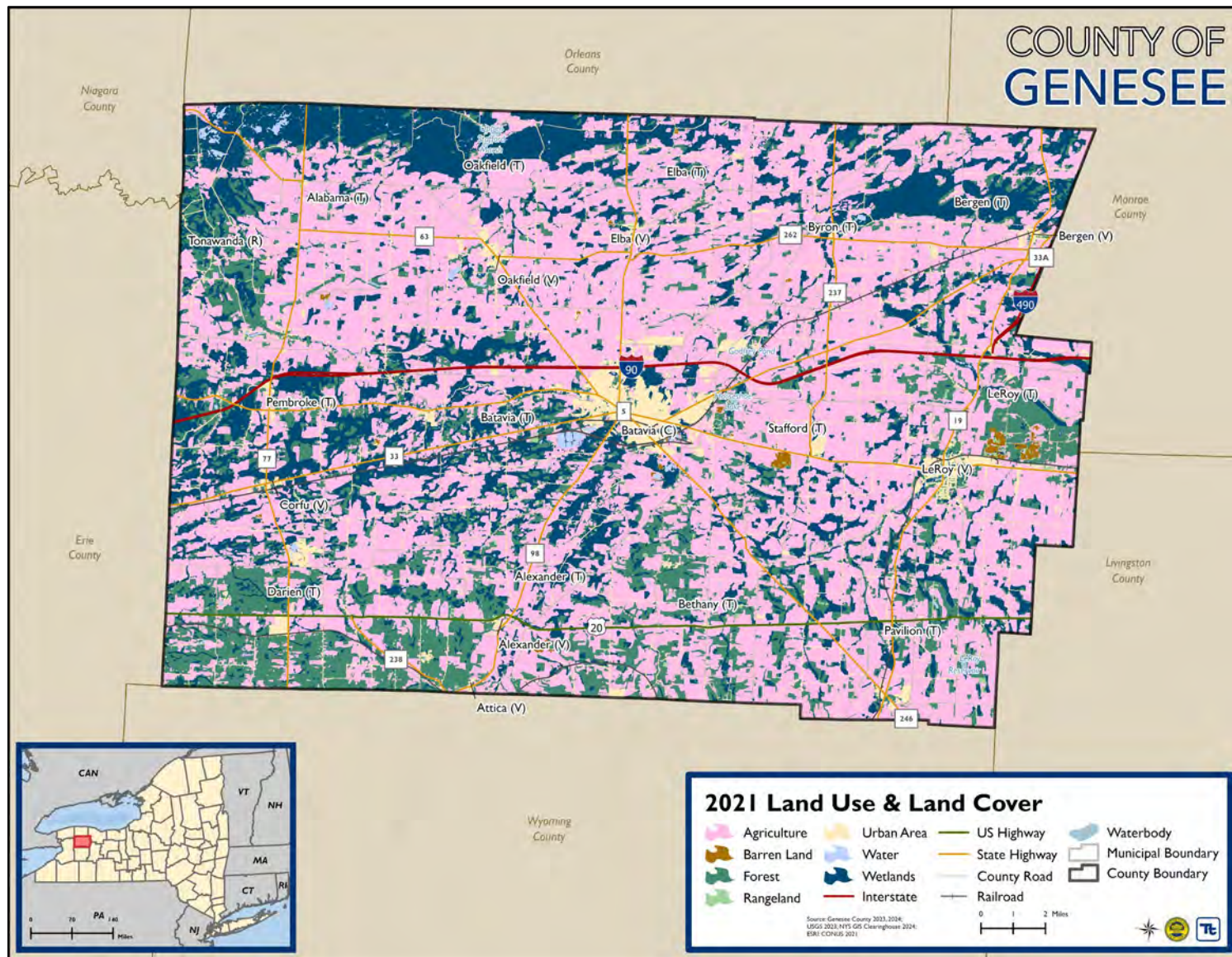
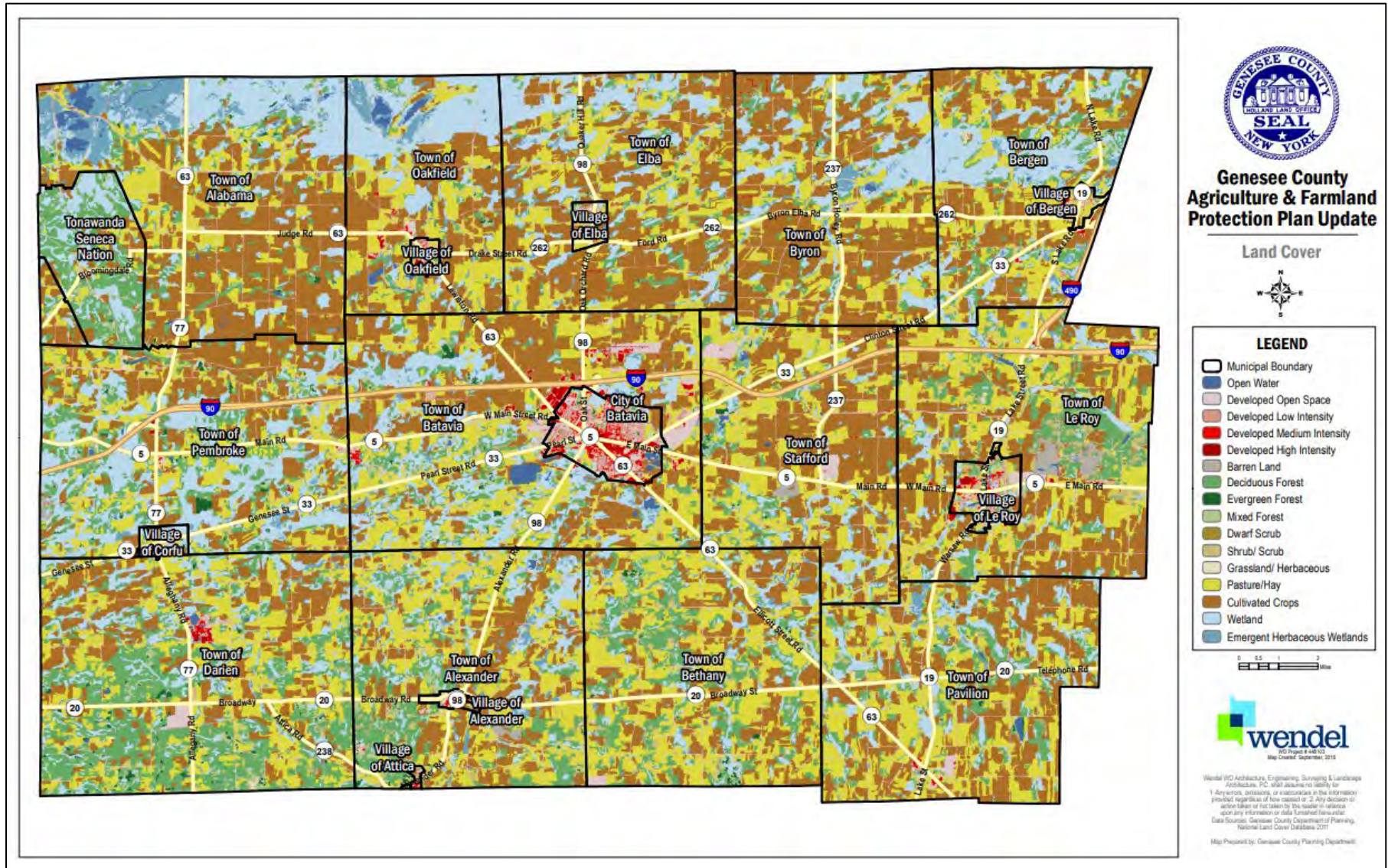




Figure 3-5. Genesee County Land Cover



Source: Genesee County 2017



3.5 LAND USE

3.5.1 Current Land Use

Federal regulations for hazard mitigation planning require communities to consider 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 various hazards and the potential impacts from hazard events. In New York State, land use regulatory authority is vested in towns, villages, and cities, although many development issues transcend local political boundaries. The dominant land uses in Genesee County are rural and small-town settings, farmlands, and open space.

3.5.2 Land Use Trends

In New York State, land use regulatory authority is vested in towns, villages, and cities. However, many development and preservation issues transcend local political boundaries. 44 CFR 201 requires that communities consider 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 various 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.

Genesee County was first settled in 1793 near the present Village of LeRoy. The County originally included most of the area of the state west of the Genesee River as well as land east of the Genesee River in what are now Livingston and Allegany Counties. As neighboring counties were formed in the early 1900s, Genesee County was reduced in size. The first road through the County was built in 1798. The construction of the Erie Canal, located north of Genesee County, stimulated growth in the 1820s (Genesee County n.d.). The following provides land use trends for Genesee County.

Commercial and Industrial Development

Commercial development, including retail stores, restaurants, offices, hotels, and service establishments, is concentrated in the City of Batavia and in the surrounding areas of the Town of Batavia. A significant commercial corridor is located along Main Street in the City of Batavia, extending east for 1 mile into the Town of Batavia and west along West Main Street Road to Kelsey Road (Town of Batavia 2017).

In the Town of Batavia, commercial use areas are located along Park Road and NYS Route 98 North to Saile Drive. A relatively large-scale commercial development is located between Lewiston Road, Park Road, and the NYS Thruway (Town of Batavia 2017).

In the Village of LeRoy, there are a number of commercial businesses. In the Town of Darien, Darien Lake amusement park is located along Alleghany Road. It is the largest water park and theme park in New York State.

Industrial development is concentrated in the City of Batavia. The City is home to the Batavia Industrial Park, located off Pearl Street. Another industrial park is located along Route 98, adjacent to the NYS Thruway. Other industrial centers are located in the Town and Village of LeRoy, the Town and Village of Oakfield, the Town of Pembroke, and the Town of Batavia (Genesee County 2019).



Conservation and Recreation

There are two county parks located in Genesee County: Genesee County Park and Forest in East Bethany and DeWitt Recreation Area in Batavia (Genesee County n.d.). There is one state park, Darien Lakes State Park, located in Darien Lake. In addition to state parks, there are three wildlife management areas (WMA) in Genesee County: the John White WMA, Tonawanda WMA, and Oak Orchard WMA (NYSDEC 2025, NYSDEC 2024). Iroquois National Wildlife Refuge is located in the Town of Alabama and managed by the U.S. Fish and Wildlife Service (USFWS n.d.).

The Bergen Swamp is primarily owned and operated by a private conservation organization and is located in the Towns of Bergen and Byron (Bergen Swamp Preservation Society n.d.).

Agriculture

Article 25AA of the New York State Agriculture and Markets Law, titled Agricultural Districts, provides counties with the opportunity to create agricultural districts for the purpose of protecting and promoting the agriculture industry (see Figure 3-6). Once created, the law requires that each district must be reviewed on an eight-, ten-, or twelve-year basis to see if it is still achieving its intended purpose. In Genesee County, districts are reviewed every eight years.

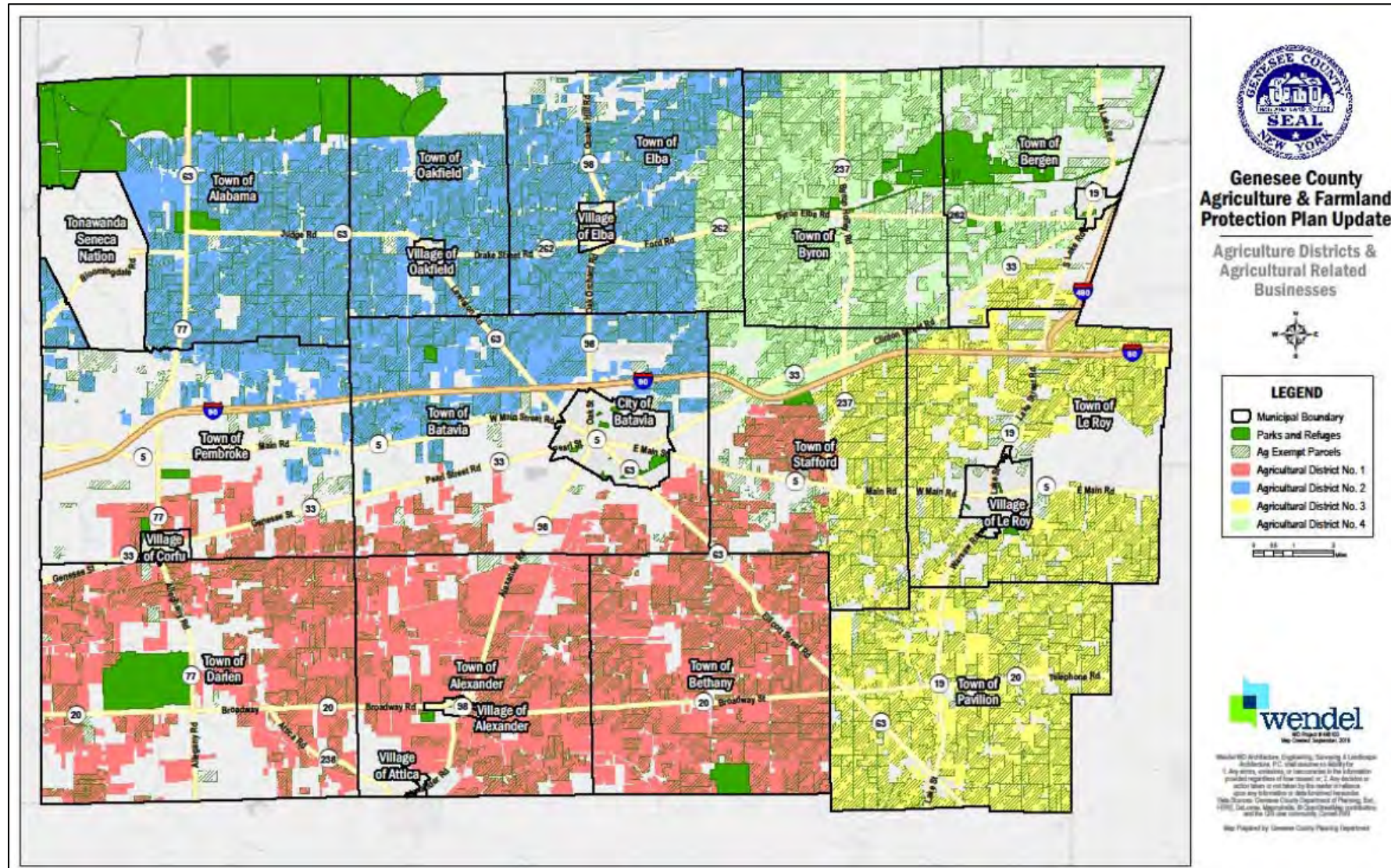
Genesee County has four agricultural districts, and the majority of the County's lands fall within District 1, which covers the Towns of Alexander, Batavia, Bethany, Darien, Pembroke, and Stafford. All the agricultural districts make up 201,948 total acres, with 161,842 acres that are farmed. Lands outside agricultural districts in the County tend to be concentrated along the New York State Thruway, particularly in Pembroke, Batavia, and LeRoy, where there are Thruway exits. Overall, however, 64 percent of the County's acres are protected by an Agricultural District (Genesee County 2017).

Genesee County has been successful at keeping land in agricultural use. Currently, the County ranks fifth in farm gate sales across New York State, with annual sales estimated at \$359.6 million. A large proportion of land in Genesee County is devoted to farmland; however, the total available farmland has been slowly decreasing in Genesee County. In 2022, there were 176,887 acres of farmland in the County, which was reduced from the reported 176,943 acres in 2017. The number of farms in Genesee County decreased by 10 percent, while the average size of farms increased by 11 percent (Census of Agriculture 2017, Census of Agriculture 2022).

In 2022, the top crop items, by sale, in Genesee County included: vegetables, melon, potatoes, and sweet potatoes (\$61.5 million) and grains, oilseeds, dry beans, and dry peas (\$51.6 million). The County is the number one producer of vegetables, melons, potatoes, and sweet potatoes in the state and is number 72 in the US. The top commodities sold in Genesee County also included milk from cows (\$193.8 million) (Census of Agriculture 2017, Census of Agriculture 2022).



Figure 3-6. Genesee County Agricultural Districts



Source: Genesee County 2017



3.6 POPULATION AND DEMOGRAPHICS

3.6.1 Current Population

According to the 2020 U.S. Census, Genesee County has a population of 60,838, with a distribution among municipalities as shown in Table 3-3.

Table 3-3. 2020 Population for Genesee County and Municipalities

Jurisdiction	Total Population (2020 Decennial Census)
Alabama (T)	1,602
Alexander (T)	1,973
Alexander (V)	518
Attica (V)	2,450
Batavia (C)	15,600
Batavia (T)	6,293
Bergen (T)	1,912
Bergen (V)	1,208
Bethany (T)	1,780
Byron (T)	2,302
Corfu (V)	689
Darien (T)	3,010
Elba (T)	1,606
Elba (V)	558
LeRoy (T)	3,362
LeRoy (V)	4,300
Oakfield (T)	1,333
Oakfield (V)	1,812
Pavilion (T)	2,290
Pembroke (T)	3,575
Stafford (T)	2,424
Tonawanda (R)	241
Genesee County	60,838

Source: U.S. Census Bureau 2020 Decennial Total Population

Note: Alexander (V) is 100% within Alexander (T); Bergen (V) is 100% within Bergen (T); Elba (V) is 100% within Elba (T); LeRoy (V) is 100% within LeRoy (T); Oakfield (V) is 100% within Oakfield (T); Corfu (V) is 100% within Pembroke (T).

Subtracted village totals from town to assign correct town totals.

Note: (C) City; (T) Town; (V) Village



3.6.2 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 shown in Table 3-4, Genesee County's population has fluctuated since 2000. While the overall population of Genesee County has increased by approximately 1.26 percent since 2010, this decline is not geographically uniform throughout the County, with some areas having experienced a decrease in population. Population projections for Genesee County from Cornell University for the next two decades anticipate a continuing decrease in population (Cornell University 2018).

Table 3-4. Historical and Projected Population Change in Genesee County

Historical Genesee County Population							Projected Genesee County Population	
1960	1970	1980	1990	2000	2010	2020	2030	2040
53,994	58,722	59,400	60,060	60,370	60,079	60,838	56,077	54,128

Source: Cornell University 2018; Genesee County 2019

3.6.3 Socially Vulnerable Populations

Federal guidance requires that HMPs consider socially vulnerable populations. These populations can be more susceptible to hazard events based on several factors, including their physical and financial ability to react during a hazard and the location and construction quality of their housing. Populations with a higher level of vulnerability can be more seriously affected during an emergency or disaster. They have unique needs that need to be considered by public officials to help ensure the safety of demographics with a higher level of risk. Identifying concentrations of vulnerable populations can assist communities in targeting preparedness, response, and mitigation actions. The vulnerable populations for this HMP include the following:

- Persons 65 years of age or older
- Persons 5 years of age or younger
- Non-English speakers
- Persons with physical or mental disability
- Persons living below the poverty threshold (as defined by the U.S. Census Bureau)

Table 3-5 presents the population statistics for each municipality in the County based on the 2020 Census data; vulnerable population data is based on the 2022 ACS. Figure 3-7 shows the distribution of socially vulnerable populations in Genesee County.



Table 3-5. Genesee County Population and Demographic Statistics 2020 Census, American Community Survey 5-Year Estimates

	Total	65 and Older		5 and Younger		Non-English-Speaking		Disability		Below Poverty Level	
	Population	Population	% of Total	Population	% of Total	Households	% of Total	Population	% of Total	Population	% of Total
Alabama (T)	1,602	255	12.5%	86	4.2%	9	0.5%	231	11.3%	176	8.6%
Alexander (T)	1,973	231	10.7%	305	14.1%	0	0.0%	225	10.4%	74	3.4%
Alexander (V)	518	51	10.1%	19	3.7%	0	0.0%	55	10.8%	61	12.0%
Attica (V)	2,450	407	19.1%	112	5.2%	28	1.3%	211	9.9%	148	6.9%
Batavia (C)	15,600	3,274	21.1%	548	3.5%	133	0.9%	2,950	19.0%	1,991	12.8%
Batavia (T)	6,293	1,735	27.5%	273	4.3%	0	0.0%	1,065	16.9%	720	11.4%
Bergen (T)	1,912	292	14.7%	104	5.2%	0	0.0%	319	16.0%	86	4.3%
Bergen (V)	1,208	159	14.1%	41	3.6%	0	0.0%	106	9.4%	153	13.6%
Bethany (T)	1,780	264	15.9%	74	4.5%	19	1.1%	193	11.6%	203	12.2%
Byron (T)	2,302	294	15.1%	192	9.8%	0	0.0%	242	12.4%	87	4.5%
Corfu (V)	689	197	23.1%	22	2.6%	0	0.0%	111	13.0%	40	4.7%
Darien (T)	3,010	646	21.5%	169	5.6%	0	0.0%	450	15.0%	40	1.3%
Elba (T)	1,606	231	14.0%	159	9.7%	84	5.1%	180	10.9%	126	7.7%
Elba (V)	558	72	14.7%	28	5.7%	0	0.0%	61	12.4%	28	5.7%
LeRoy (T)	3,362	532	16.2%	103	3.1%	0	0.0%	285	8.7%	48	1.5%
LeRoy (V)	4,300	890	20.5%	332	7.7%	42	1.0%	880	20.3%	582	13.4%
Oakfield (T)	1,333	269	18.4%	11	0.8%	37	2.6%	256	17.6%	363	24.9%
Oakfield (V)	1,812	225	13.4%	109	6.5%	0	0.0%	190	11.3%	254	15.1%
Pavilion (T)	2,290	392	17.3%	150	6.6%	0	0.0%	253	11.2%	259	11.4%
Pembroke (T)	3,575	740	21.8%	108	3.2%	37	1.1%	486	14.3%	436	12.8%
Stafford (T)	2,424	420	18.9%	154	6.9%	0	0.0%	213	9.6%	171	7.7%
Tonawanda (R)	241	162	49.2%	13	4.0%	35	10.7%	102	31.0%	76	23.1%
Genesee County	60,838	11,738	19.5%	3,112	5.2%	426	0.7%	9,064	15.0%	6,122	10.1%

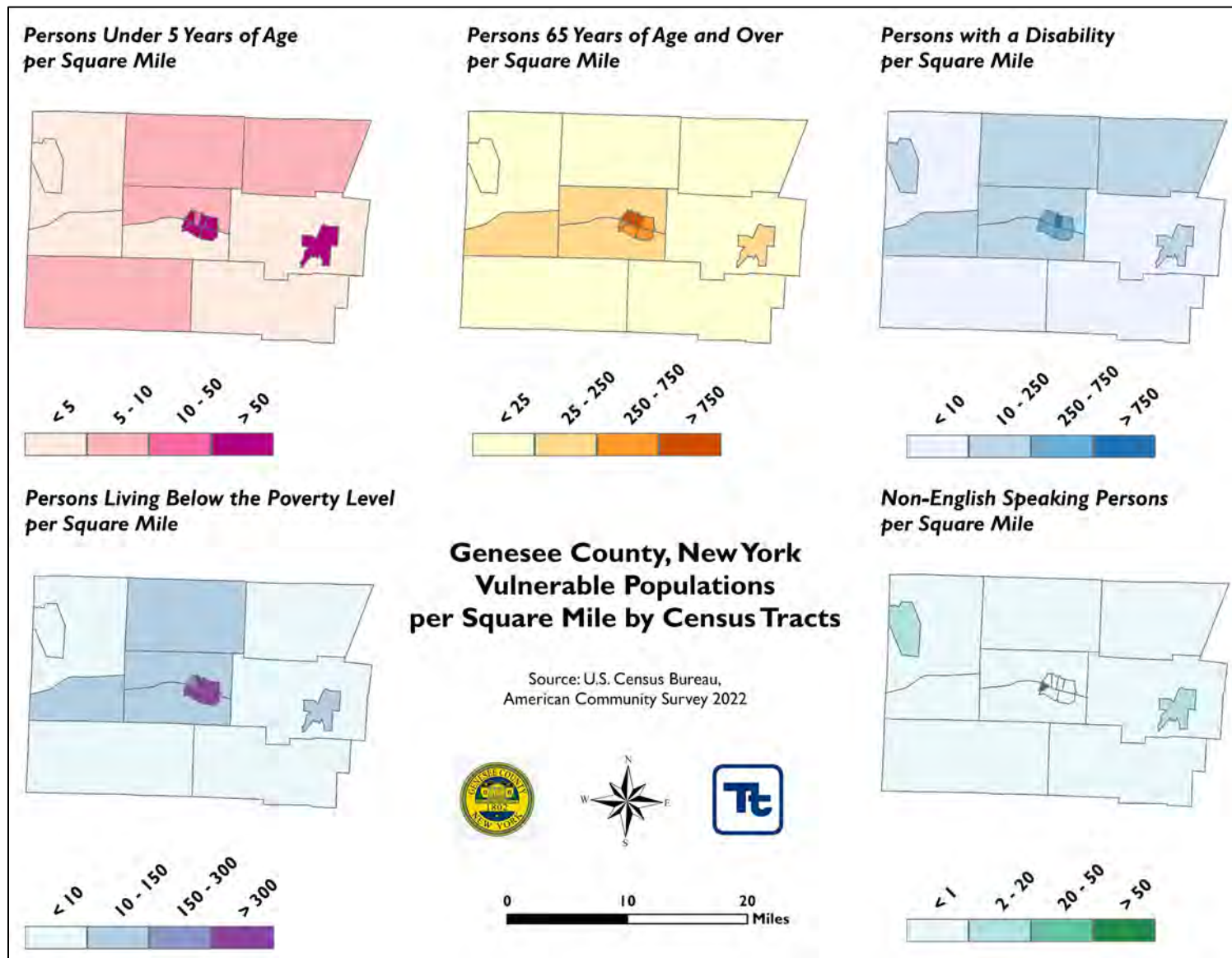
Source: U.S. Census Bureau 2020 Decennial Total Population

Source: U.S. Census Bureau 2022 ACS Vulnerable Population Totals

Note: Alexander (V) is 100% within Alexander (T); Bergen (V) is 100% within Bergen (T); Elba (V) is 100% within Elba (T); LeRoy (V) is 100% within LeRoy (T); Oakfield (V) is 100% within Oakfield (T); Corfu (V) is 100% within Pembroke (T). Subtracted village totals from town to assign correct town totals.



Figure 3-7. Genesee County Socially Vulnerable Populations





Age

Older adults are more vulnerable than other age groups before and after disasters. Factors include a greater prevalence of chronic conditions, multi-morbidity, cognitive impairment, medication concerns, greater dependence on assistive devices (i.e., walkers, glasses), support requirements from caregivers and others, and likelihood of social isolation. Children are vulnerable to hazard events because they are dependent on others to access resources during emergencies and may experience increased health risks (American Red Cross 2020). The 2022 ACS reports 5.2 percent of the population of Genesee County is under age 5, and 19.5 percent of the population is age 65 and older.

Language

Individuals who are not fluent or do not have a working proficiency in English are vulnerable because they can have difficulty understanding information being conveyed to them. Cultural differences also can add complexity to how information is being conveyed to populations with limited English proficiency (CDC 2021). According to the 2022 ACS Estimates, less than 1 percent of Genesee County's population speaks a language other than English.

Physical or Mental Disability

A disability is a condition of the body or mind that makes it more difficult to do certain activities and interact with the world (CDC 2020). Cognitive impairments can increase the level of difficulty that individuals face during an emergency and reduce an individual's capacity to receive, process, and respond to emergency information or warnings. Individuals with a physical or sensory disability can face issues of mobility, sight, hearing, or reliance on specialized medical equipment. According to the 2022 ACS, 15 percent of Genesee County's population lives with a disability.

Income

Of the total population, economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions based on the major economic impact to their family and may not have funds to evacuate. The U.S. Census Bureau identifies households with two adults and two children with an annual household income below \$25,926 per year as low income (Census 2021). The 2022 ACS indicates that 10.1 percent of persons in Genesee County live below the poverty level (compared to the state average of 14 percent).

While the poverty threshold is typically used as a standard for identifying low-income populations, the Steering Committee noted that households may be above the poverty threshold but still struggle financially, making them socially vulnerable to hazard events. The County also used data available from United for ALICE. ALICE stands for Asset Limited, Income Constrained, Employed. This dataset is meant to identify households with income above the federal poverty threshold but below the basic cost of living. This represents the growing number of families who are unable to afford the basics of housing, childcare, food, transportation, health care, and technology (United For ALICE 2025). Costs associated with hazard events could exceed the financial capacity of these households, making them highly vulnerable to hazard events. In 2022, 26 percent of the 24,416 households in Genesee County had incomes below the ALICE thresholds (less than the statewide average of 46 percent). See Table 3-6 for ALICE data by jurisdiction.



Table 3-6. Genesee County ALICE Data for 2022

Jurisdiction	Total Households	Percent Below ALICE Threshold
Alabama (T)	722	31
Alexander (T)	917	27
Batavia (C)	7,370	45
Batavia (T)	2,764	42
Bergen (T)	1,181	29
Bethany (T)	659	36
Byron (T)	673	20
Darien (T)	1,064	32
Elba (T)	760	27
LeRoy (T)	3,286	35
Oakfield (T)	1,263	40
Pavilion (T)	886	29
Pembroke (T)	1,794	33
Stafford (T)	883	24
Tonawanda Reservation	194	54
Genesee County	24,416	26

Source: United For ALICE 2025

Note: Village household statistics are unavailable.

Low Internet Access

Throughout the State of New York, particularly in the more rural counties, including portions of Genesee County, there is low access to internet. This lack of access can cause detriment to informing the public about hazard risks and ways to mitigate the identified risks. According to the 2023 ACS 5-Year estimates, the Tonawanda Reservation has the greatest number of households that lack internet access, followed by the Village of LeRoy, as shown in Table 3-7 (American Community Survey 2023).

Table 3-7. Genesee County Internet Access by Jurisdiction

Jurisdiction	Total Households	Households with an Internet Subscription	Households without an Internet Subscription	Percent Households without an Internet Subscription
Alabama (T)	719	682	37	5.15
Alexander (T)	877	783	94	10.72
Alexander (V)	174	150	24	13.79
Attica (V)	916	795	121	13.21
Batavia (C)	7,456	6,498	958	12.85
Batavia (T)	2,812	2,606	206	7.33
Bergen (T)	1,235	1,114	121	9.80
Bergen (V)	455	383	72	15.82
Bethany (T)	712	627	85	11.94
Byron (T)	669	646	23	3.44



Jurisdiction	Total Households	Households with an Internet Subscription	Households without an Internet Subscription	Percent Households without an Internet Subscription
Corfu (V)	326	297	29	8.90
Darien (T)	1,041	966	75	7.20
Elba (T)	840	780	60	7.14
Elba (V)	209	181	28	13.40
LeRoy (T)	3,409	2,892	517	15.17
LeRoy (V)	2,125	1,679	446	20.99
Oakfield (T)	1,247	1,100	147	11.79
Oakfield (V)	624	584	40	6.41
Pavilion (T)	896	783	113	12.61
Pembroke (T)	1,801	1,644	157	8.72
Stafford (T)	882	830	52	5.90
Tonawanda Reservation	173	83	90	52.02
Genesee County	24,769	22,034	2,735	11.04%

Source: American Community Survey 2023

3.7 ECONOMY

Genesee County Economic Development Center (GCEDC) is the primary economic development agency in Batavia and Genesee County, New York. GCEDC's mission is to foster community economic success, facilitate new business attraction, and build a sustainable long-term economy. Genesee County, a micropolitan region located in western New York State, is primarily rural, with the main population center being the small City and Town of Batavia. Genesee County is approximately equidistant from the second and third largest cities in New York State: Buffalo and Rochester (Genesee Economic Development Center 2019).

3.7.1 Primary Industries and Employment

Manufacturing is the largest private-sector employment, and healthcare is the next largest. Those two are followed by retail and accommodation and food services. The retail trade industry has the greatest number of establishments in the County, with 195. This is followed by the construction industry with 154 establishments, and the "other services (except public administration)" with 150 establishments (U.S. Census 2021). The U.S. Census 2020 County Business Patterns Survey data identified 1,226 business establishments in Genesee County employing 16,067 (U.S. Census 2021). Top employment sectors in the County are shown in Table 3-8.

Table 3-8. Genesee County Top Employment Sectors

Sector	Number of Establishments	Total Employees
Manufacturing	87	3,650
Healthcare and Social Assistance	122	2,755
Retail Trade	195	2,583
Accommodation and Food Services	130	1,774
Wholesale Trade	75	1,157
Arts, Entertainment, and Recreation	26	739



Sector	Number of Establishments	Total Employees
Construction	154	721
Other services (except Public Administration)	150	686
Administrative and Support and Waste Management and Remediation Services	49	455
Transportation and Warehousing	35	349

Source: U.S. Census 2021

Genesee County's 435 farms identified in the U.S. Department of Agriculture (USDA) 2022 Census of Agriculture generate \$359.6 million per year in sales, an increase of 53 percent from 2017 to 2022. These revenues support an extensive array of local suppliers and service providers, including machinery dealers, crop and nutrient management specialists, meat processors, veterinarians, and animal feed distributors. Farms in Genesee County have on-farm hired workers, including paid family members, who contribute to farm operations (Census of Agriculture 2022, Census of Agriculture 2017).

3.7.2 Income

Median household income in Genesee County, according to the U.S. Census Bureau's 2023 American Community Survey (ACS) 5-year estimates, was \$72,055, which is below the state (\$84,578) and national (\$78,538) averages (American Community Survey 2023). Table 3-9 shows median household income in the County from 2018 to 2023.

Table 3-9. Genesee County Median Household Income, 2018–2023

Year	Genesee County Median Household Income	New York Median Household Income	National Median Household Income
2018	\$59,338	\$65,323	\$60,293
2019	\$60,524	\$68,486	\$62,843
2020	\$60,635	\$71,117	\$64,994
2021	\$63,734	\$75,157	\$69,021
2022	\$68,178	\$81,386	\$75,149
2023	\$72,055	\$84,578	\$78,538

Source: American Community Survey 2023; American Community Survey 2022; American Community Survey 2021; American Community Survey 2020; American Community Survey 2019; American Community Survey 2018

3.7.3 Economic Trends

Genesee County is in the center of two innovative and entrepreneurial regions — Buffalo and Rochester — with proximity to Cornell University in Ithaca, New York. A century of innovation history in the region has developed the infrastructure required to launch and grow high-tech companies. Well-positioned geographically, GCEDC is able to assist companies as they transition from prototyping to establishing larger-scale manufacturing facilities (Genesee Economic Development Center 2019).

GCEDC is one of the most active industrial development agencies (IDAs) in the state. With 76 active projects, it ranks eighth among county IDAs and, when adjusted for population, GCEDC ranks third. GCEDC's attraction efforts to date have targeted multiple industries, which will support a diverse economy capable of sustaining changes in business cycles (Genesee Economic Development Center 2019).



3.8 GENERAL BUILDING STOCK

3.8.1 Existing Development

For this HMP update, a customized general building stock inventory was created using building footprint and parcel data from tax records and spatial data. Contents are valued at 50 percent of the structure value for residential structures and 100 percent of the structure value for non-residential facilities. Table 3-10 presents building stock statistics by occupancy class. Replacement cost value density for residential, commercial, and industrial properties are shown in Figure 3-8 through Figure 3-10. Key numbers from the inventory include the following:

- The inventory contains 32,918 structures with a replacement cost value of \$19.3 billion.
- The value of contents in the inventoried structures is \$9 billion.
- Residential housing accounts for 61.9 percent of the total number of buildings in the County and 28.6 percent of the total building stock value.

The U.S. Census Bureau's 2023 American Community Survey (ACS) 5-year estimates identified 26,090 housing units in the County, including 1,321 vacant housing units. 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 (American Community Survey 2023).



Table 3-10. Building Stock Count and Replacement Cost Value (RCV) by Occupancy Class

	Residential		Commercial		Industrial		Other ^a	
	Count	Total Replacement Cost Value	Count	Total Replacement Cost Value	Count	Total Replacement Cost Value	Count	Total Replacement Cost Value
Alabama (T)	704	\$173,003,937	574	\$437,793,043	4	\$9,256,853	33	\$101,986,197
Alexander (T)	735	\$204,569,991	657	\$338,975,417	1	\$345,439	30	\$66,772,351
Alexander (V)	149	\$35,300,708	60	\$42,879,065	0	\$0	4	\$29,227,414
Attica (V)	23	\$11,961,587	26	\$50,309,669	0	\$0	3	\$3,677,984
Batavia (C)	4,488	\$1,279,804,641	919	\$1,720,814,969	66	\$1,230,757,412	75	\$591,159,708
Batavia (T)	2,328	\$696,481,208	1,263	\$1,276,353,034	13	\$73,591,266	76	\$400,703,289
Bergen (T)	760	\$214,610,969	469	\$254,717,098	6	\$101,200,364	13	\$21,081,627
Bergen (V)	399	\$96,994,056	109	\$53,150,593	2	\$3,690,111	1	\$2,223,818
Bethany (T)	665	\$175,476,905	640	\$409,283,875	2	\$2,333,984	23	\$41,212,703
Byron (T)	858	\$191,931,416	683	\$341,962,513	3	\$36,802,366	34	\$87,640,331
Corfu (V)	248	\$62,087,143	112	\$85,501,969	0	\$0	0	\$0
Darien (T)	1,156	\$350,323,738	1,237	\$801,399,943	3	\$14,107,586	38	\$120,016,169
Elba (T)	654	\$178,832,247	541	\$475,459,337	3	\$10,669,231	32	\$88,174,545
Elba (V)	253	\$56,239,246	117	\$64,247,449	0	\$0	3	\$4,562,678
LeRoy (T)	1,236	\$346,534,057	920	\$669,545,506	17	\$149,363,646	69	\$299,991,645
LeRoy (V)	1,346	\$334,392,526	367	\$344,752,894	9	\$357,040,456	20	\$91,926,337
Oakfield (T)	533	\$125,416,791	459	\$349,345,440	0	\$0	10	\$15,782,609
Oakfield (V)	539	\$114,014,345	175	\$101,863,464	12	\$123,192,944	9	\$34,995,471
Pavilion (T)	930	\$233,596,892	587	\$392,711,427	9	\$13,847,540	51	\$158,762,476
Pembroke (T)	1,403	\$434,887,674	917	\$520,176,731	6	\$14,045,017	47	\$110,319,356
Stafford (T)	971	\$240,834,696	656	\$423,816,005	15	\$22,628,331	26	\$88,327,250
Tonawanda (R)	7	\$1,697,970	277	\$146,697,184	0	\$0	0	\$0
Genesee County	20,385	\$5,558,992,743	11,765	\$9,301,756,625	171	\$2,162,872,545	597	\$2,358,543,954

Source: Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; RS Means 2024

Notes: (C) city; (T) town; (V) village

^a Other = Government, Religion, Agricultural, and Education buildings



Figure 3-8. Distribution of Residential Building Stock and Value Density in Genesee County

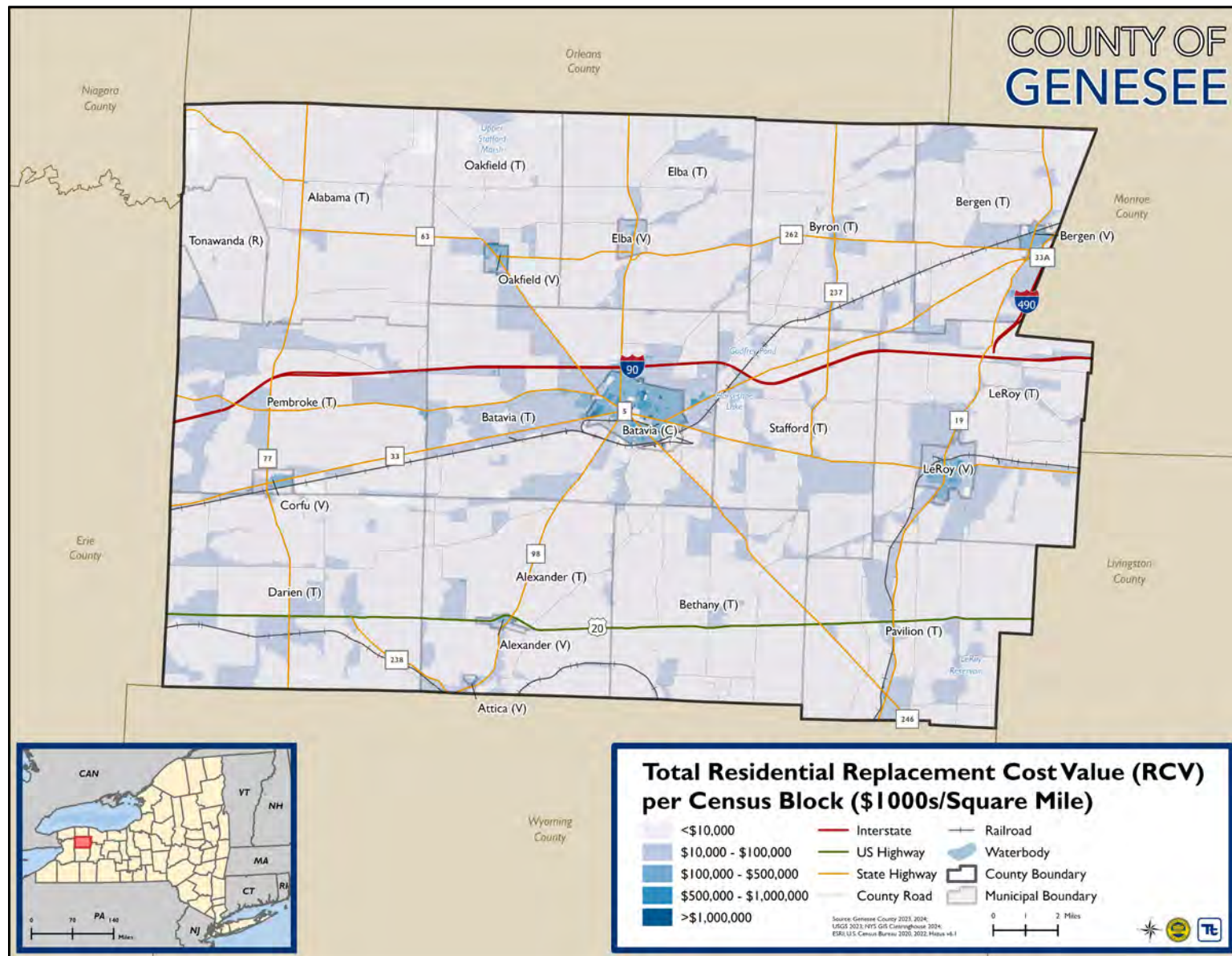
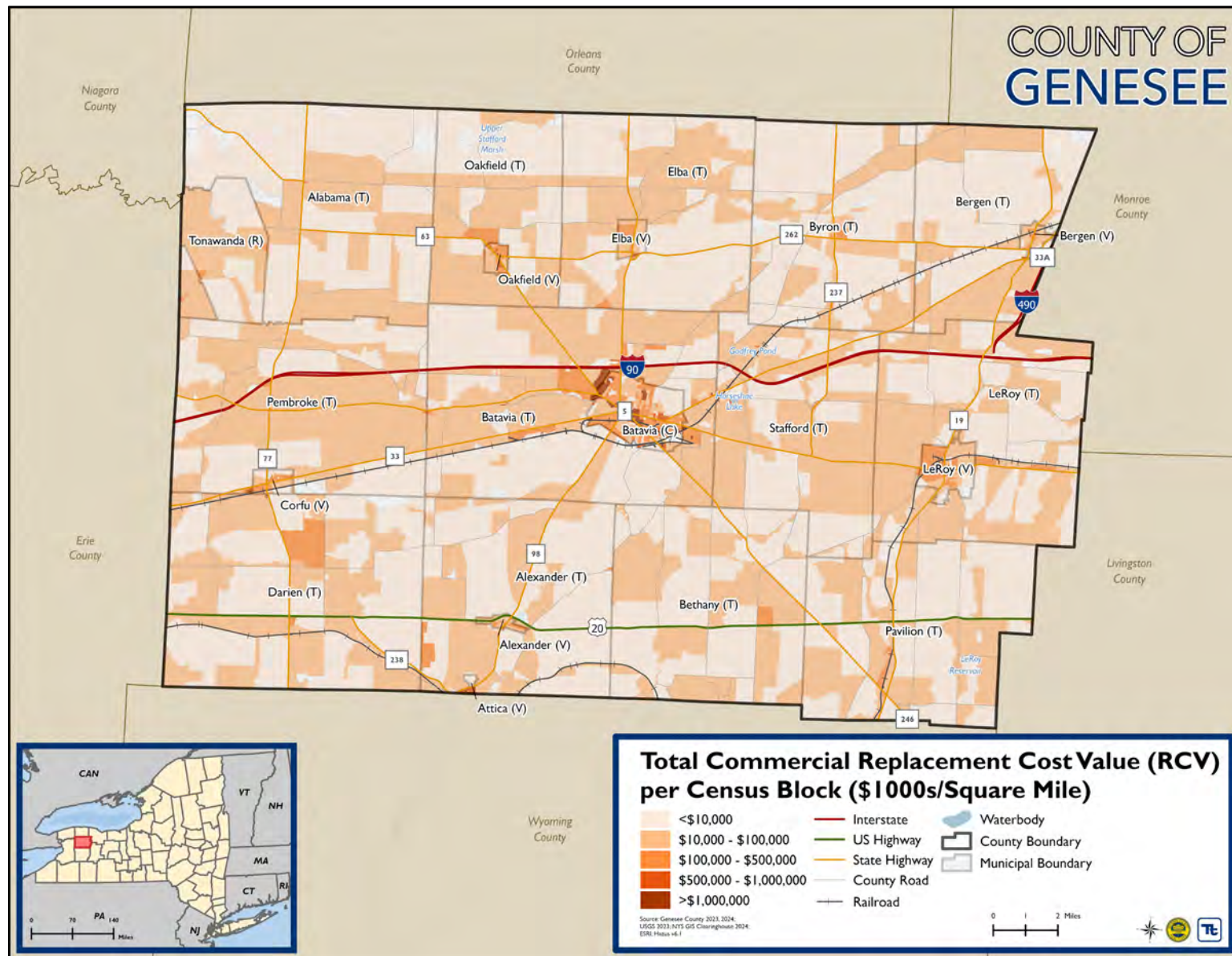




Figure 3-9. Distribution of Commercial Building Stock and Value Density in Genesee County





COUNTY OF GENESEE

Orleans County
Niagara County
Erie County
Livingston County

Towns/Villages: Tonawanda (R), Alabama (T), Oakfield (T), Elba (T), Byron (T), Bergen (T), Oakfield (V), Elba (V), Bergen (V), Batavia (T), Batavia (C), Stafford (T), LeRoy (T), Corfu (V), LeRoy (V), Darien (T), Alexander (T), Bethany (T), Pavilion (T), Attica (V), Alexander (V).

Roads: 63, 77, 33, 98, 20, 238, 262, 237, 33A, 19, 246.

Water Bodies: Upper Scaevon Marsh, Gaifford Pond, Littleton Lake, LeRoy Reservoir.

Total Industrial Replacement Cost Value (RCV) per Census Block (\$1000s/Square Mile)

- <\$10,000
- \$10,000 - \$100,000
- \$100,000 - \$500,000
- \$500,000 - \$1,000,000
- >\$1,000,000

Legend:

- Interstate
- US Highway
- State Highway
- County Road
- Railroad
- Waterbody
- County Boundary
- Municipal Boundary

Scale: 0 1 2 Miles

Source: Genesee County 2023, 2024
ESRI; U.S. Census Bureau 2020, 2022; Mapas v5.1

Inset Map: CAN, VT, NH, MA, CT, RI, NJ, PA, NY



3.8.2 New Development

For new development, the County uses best available data to avoid potential exposure of development to hazard events where possible. Additionally, the County intends to (1) discourage development within vulnerable areas, areas with high population density, and the Special Flood Hazard Area; and (2) encourage higher regulatory standards at the local level.

New development over the previous several years (2016 to 2024) and known or anticipated development within the next five years is discussed in the jurisdictional annexes found in Volume II.

3.9 COMMUNITY LIFELINES

Critical facilities are those that are essential to the health and welfare of the population. These facilities are especially important after any hazard event. Critical facilities are those that maintain essential and emergency functions and are typically defined to include police and fire stations, schools, and emergency operations centers. They also include infrastructure such as roads and bridges that provide access to those in need and utilities that provide water, electricity, and communication services. Also included are facilities that use or store hazardous materials (FEMA 1997).

Critical facilities include services that FEMA defines as “community lifelines.” These represent the fundamental services in a community that, when stabilized, enable all other aspects of society. Following a disaster event, intervention is required to stabilize lifelines. Lifelines are divided into eight categories (FEMA 2023):

- Safety and Security
- Food, Hydration, Shelter
- Health and Medical
- Energy
- Communications
- Transportation
- Hazardous Materials
- Water Systems

A comprehensive inventory of community lifelines in Genesee 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, the lifeline facilities identified for this planning effort have been categorized according to their primary function.

3.9.1 Safety and Security



The safety and security community lifeline category includes law enforcement, security, fire services, search and rescue services, government services, and community safety (e.g., dams). Figure 3-11 shows the location of safety and security facilities and Table 3-11 lists the number of each facility type.



Table 3-11. Genesee County Safety and Security Lifeline Facilities

Facility Type	Number of Facilities
College/University	1
Correctional Institution	3
County Building	21
Dam	61
DMV	1
DOT Facility	5
Emergency Operations Center	1
Fire Station	20
Municipal Hall	19
Police Station	5
Primary Education Facility	23
Public Health Department	1
Public Works	19
Secondary Education Facility	11
Tier II Facility	2
Total	193

Note: The identified lifeline facilities may not include all facilities within the County. It is recognized that facilities may have been missed in the information-gathering process.

Emergency Facilities

The Genesee County Office of Emergency Management is responsible for the overall coordination of 17 volunteer fire departments, emergency medical services (EMS), and one career department. The office also serves as the liaison between local governments and state and federal agencies during natural disasters and/or man-made emergencies. Additionally, the Genesee County Emergency Management Services Office provides numerous Fire/EMS training programs required by the NYS Office of Fire Prevention and Control and the NYS Department of Health to our local emergency responders. The office is also responsible for updating and revising emergency response plans and regulations that are used to assist local jurisdictions during emergency events. Additionally, the office assists local jurisdictions with specialized response teams to prevent the municipalities from exhausting their resources and provides emergency preparedness notification systems to ensure that the entire County can be notified of emergency events (Genesee County n.d.).

Police enforcement and public safety are maintained by the New York State Police Department, Genesee County Sheriff's Office, and local town and village police departments. The Sheriff's Office is divided into three divisions: Police Bureau, Civil Bureau, and 9-1-1 Dispatch Center (Genesee County n.d.).

Dams and Levees

According to the NYSDEC Division of Water Bureau and Flood Protection and Dam Safety, there are three hazard classifications of dams in New York State. The dams are classified in terms of potential for downstream damage if the dam were to fail. The hazard classifications are as follows (NYS DEC n.d.):



- **Low Hazard (Class A)** is a dam located 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 would result in no probable loss of human life. Losses are principally limited to the owner's property.
- **Intermediate Hazard (Class B)** is a dam located in an area where failure may damage isolated homes, main highways, and minor railroads; interrupt the use of relatively important public utilities; and cause significant economic loss or serious environmental damage. Failure or misoperation would result in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. Class B dams are often located in rural areas but could be located in areas with population and significant infrastructure.
- **High Hazard (Class C)** is a dam located in an area where failure may cause loss of human life; cause serious damage to homes, industrial or commercial buildings, important public utilities, main highways, or railroads; and 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) would occur as a direct result of dam failure.

According to the New York State Department of Environmental Conservation (NYSDEC), there are 60 dams present throughout Genesee County. Most of these dams pose little risk; however, eight are listed as intermediate hazards. There are no dams listed as high hazard in Genesee County (NYS GIS Data 2024).

3.9.2 Food, Hydration, and Shelter



The food, hydration, and shelter community lifeline category includes agricultural lifelines. Table 3-12 lists the number of each facility type. Figure 3-12 shows the location of food, hydration, and shelter facilities.

Table 3-12. Genesee County Food, Hydration, Shelter Lifeline Facilities

Facility Type	Number of Facilities
Food Service	6
Tier II Facility	6
Total	12

Note: The identified lifeline facilities may not include all facilities within the County. It is recognized that facilities may have been missed in the information-gathering process.

Shelters

The American Red Cross (ARC) maintains a list of facilities in Genesee County that can be used as temporary shelters for people displaced by an emergency. Compliance with the Americans with Disabilities Act (ADA) is included in the criteria that the ARC uses to approve a facility to serve as a shelter, as is the requirement that facilities must be outside of the Special Flood Hazard Area (SFHA) (Genesee County Office of Emergency Management n.d.).

With support and cooperation of the ARC and local jurisdictions, Genesee County references an inventory of suitable shelter locations and can assist with the coordination and communication of shelter availability as necessitated by the execution of local municipal emergency operation plans. Countywide sheltering policies and procedures are documented in the following plans, which are maintained by the Genesee County OEM:



- Genesee County Comprehensive Emergency Management Plan
- Red Cross Sheltering Plan
- Genesee County Fire Mutual Aid Plan
- Genesee County EMS Mutual Aid Plan

During an incident, Genesee County's emergency management structure will establish a Human Needs resources group to address medical needs, access and functional needs, compliance with the ADA, and other issues that arise during an evacuation (Genesee County Office of Emergency Management n.d.).

Schools

Genesee County has 21 public schools and private schools (Genesee Intermediate School District n.d.). Genesee Community College is located within the City of Batavia and is affiliated with the State University of New York (SUNY) System (SUNY GCC n.d.). In times of need, schools can function as shelters and are an important resource to the community. For information regarding shelters, see the Shelters subsection above.

Socially Vulnerable Populations and Underserved Community Support Facilities

Genesee County and partnering agencies offer assistance to socially vulnerable populations and underserved communities. The list below identifies these agencies:

- Private Agencies
 - AmeriCorps
 - Ask Marshall
- County Agencies
 - Genesee County Justice for Children Advocacy Center
 - Genesee County Mental Health Department
 - Genesee County Office for the Aging
 - Genesee and Orleans County Health Department
 - Genesee County Department of Social Services
 - Genesee County Veterans Service Agency
 - Genesee County Youth Bureau
- State Agencies
 - New York State Central Register of Child Abuse and Maltreatment
 - New York State Office for the Aging
 - New York State Office of Children and Family Services
 - New York State Office of Temporary and Disability Assistance



Figure 3-11. Safety and Security Facilities in Genesee County

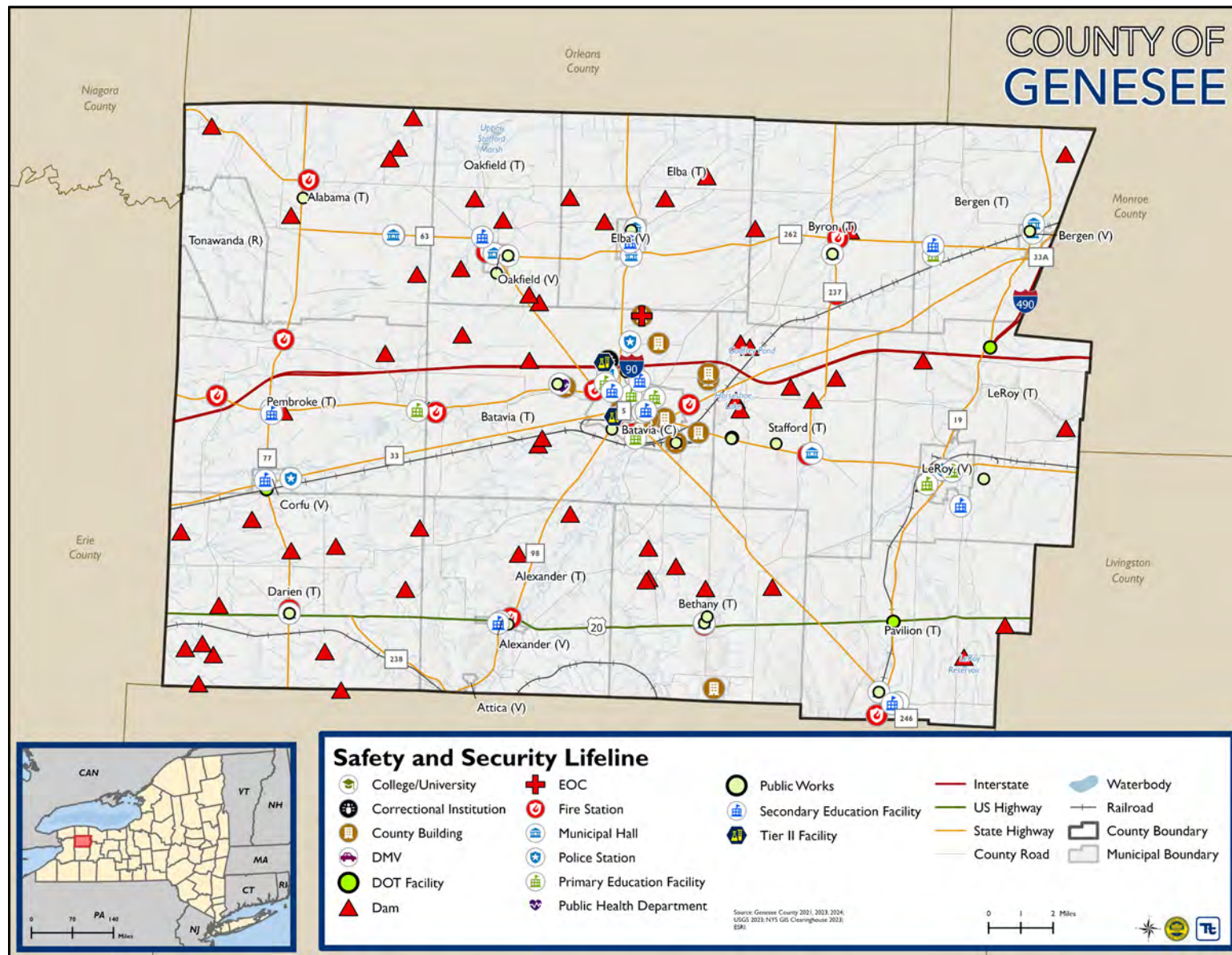
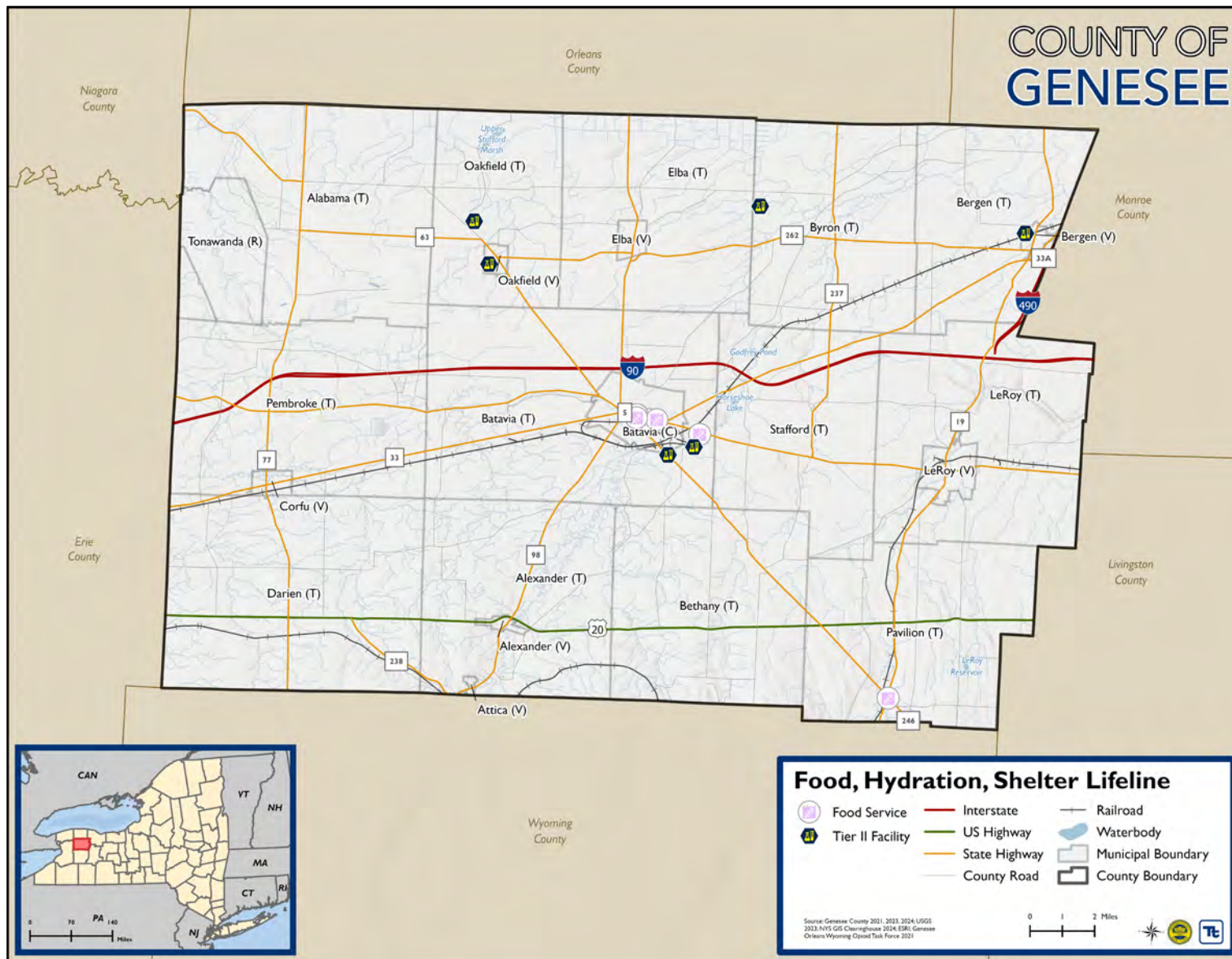




Figure 3-12. Food, Hydration, and Shelter Facilities in Genesee County





3.9.3 Health and Medical



The health and medical community lifeline category includes medical care, public health, patient movement, medical supply chain, and fatality management. Table 3-13 lists the number of each facility type. Figure 3-13 shows the location of health and medical facilities,

Table 3-13. Genesee County Health and Medical Lifeline Facilities

Facility Type	Number of Facilities
Drug/Alcohol Treatment	6
EMS	23
Healthcare Facility	23
Hospital	2
Nursing Home	4
Pharmacy	10
Tier II Facility	1
Urgent Care	2
Total	71

Note: The identified lifeline facilities may not include all facilities within the County. It is recognized that facilities may have been missed in the information-gathering process.

Hospitals and Medical Facilities

There are three hospitals located in the County that serve the entirety of the population. Genesee County residents can receive medical care at the United Memorial Medical Center in Batavia, which has two branches, along with hospital-affiliated clinics and other facilities in neighboring counties. United Memorial is the result of a merger between Genesee Memorial Hospital and St. Jerome Hospitals in January of 2000. United Memorial has a general surgery facility, a 24-hour emergency room, acute care unit, laboratory, medical imaging, other various medical services, and 131 hospital beds; it is affiliated with the Rochester Regional Health System (Rochester Regional Health n.d.). United Memorial also operates an urgent care facility and a series of associated clinics and primary care offices throughout the County. Also located within Genesee County is the VA Western New York Health System with facilities located in Batavia and Buffalo to guide the needs of veterans and their families and caregivers (U.S. Department of Veterans Affairs n.d.).

As previously noted, ambulance services operate out of many Genesee County towns and villages to respond to emergencies. When local municipal ambulances are not able to assist, private providers fill in. Medical Transport offers contractual ambulance service and advanced lifesaving support with the Medic-700 Response fly-car. For medical emergencies requiring medical transport, Mercy Flight offers helicopter transport from their bases in Batavia (Mercy Flight n.d.).

For non-emergency health care needs, a number of urgent care centers are located throughout the County. Some of these clinics are open 24 hours per day, and most have evening and weekend hours.

Senior Care and Living Facilities

The Genesee County Office for the Aging (OFA) prioritizes the well-being of County residents who are age 60 and over. The office offers assistance regarding adult day services and also in referring adequate caregivers. The office



also offers support in financial assistance and newsletters that advertise older adult services, activities, and programs, including a menu for Meals on Wheels (Genesee County n.d.). According to the 2019 update of the Services Directory for Older Adults, Persons with Disabilities, and Their Caregivers, there are four skilled nursing facilities and 10 housing alternatives (Genesee County Office for the Aging 2019).

3.9.4 Energy



The energy community lifeline category includes power grids and fuel supplies. Table 3-14 lists the number of each facility type. Figure 3-14 shows the location of energy facilities.

Table 3-14. Genesee County Energy Lifeline Facilities

Facility Type	Number of Facilities
Electric Substation	21
Electrical Facility	20
Oil Gas Well	871
Petroleum Bulk Storage	168
Tier II Facility	6
Total	1,086

Note: The identified lifeline facilities may not include all facilities within the County. It is recognized that facilities may have been missed in the information-gathering process.

Gas and electric power in Genesee County are transmitted and distributed by three main companies and three municipal providers: Rochester Gas and Electric Corporation (RG&E), National Fuel, and National Grid; as well as the Village of Bergen being the sole municipal provider in the County.

Homes in the County are heated by many different sources, with a large majority using utility gas (15,151 housing units). The second most frequent source of home heating is electricity (3,074 housing units), followed by bottled, tank, or liquefied petroleum gas (2,959 housing units), as some areas are dependent on residential propane tanks for gas service (American Community Survey 2023).

Communications



The communications community lifeline category includes communications infrastructure; responder communications; alerts, warnings, and messages; finance; 911; and dispatch. Table 3 16 lists the number of each facility type. Figure 3-15 shows the location of communications facilities.

Table 3-15. Genesee County Communication Lifeline Facilities

Facility Type	Number of Facilities
AM Transmission Tower	1
Communication Tower	41
Communications	5
Tier II Facility	9
Total	56



Note: The identified lifeline facilities may not include all facilities within the County. It is recognized that facilities may have been missed in the information-gathering process.

Emergency Warnings and Responder Communications

Genesee County Sheriff's Office operates the 9-1-1 Dispatch Center. The Dispatch Center provides centralized public safety communications to participating police, fire, and EMS within Genesee County. The Dispatch Center is responsible for performing the following activities:

- Answer, process, and maintain the County's Enhanced 9-1-1 Emergency Telephone System.
- Operate the County's 800 MHz trunked radio system, which includes assigning radio numbers, dynamic incident regrouping, maintaining the computerized radio subscriber list, and handling routine traffic on the system itself.
- Answer telephone communications for the Genesee County Sheriff's Office and the Batavia City Police Department and redirect these communications accordingly.

Internet and Wireless Communications

Genesee County is served by a variety of communications systems, including traditional land line, fiber optic, broadband, and cellular service provided by multiple companies, such as Frontier and Verizon. Much of the high-speed internet and data capacity throughout the County has been developed and expanded by the private sector and through public-private partnerships. Each carrier has individual plans for emergency situations during hazard events and post-disaster recovery efforts. In addition to landline, fiber optic, and cellular communications systems, Genesee County has an extensive radio communications network that is utilized by emergency services agencies, hospitals, law enforcement, public works, transportation, and other supporting organizations.

Internet service is expanding in the County. Genesee County is a recipient of funding from the State of New York for internet improvement projects. This project is intended to increase the availability and coverage of high-speed internet access to rural areas with lesser coverage (NYS 2022).



Figure 3-13. Health and Medical Facilities in Genesee County

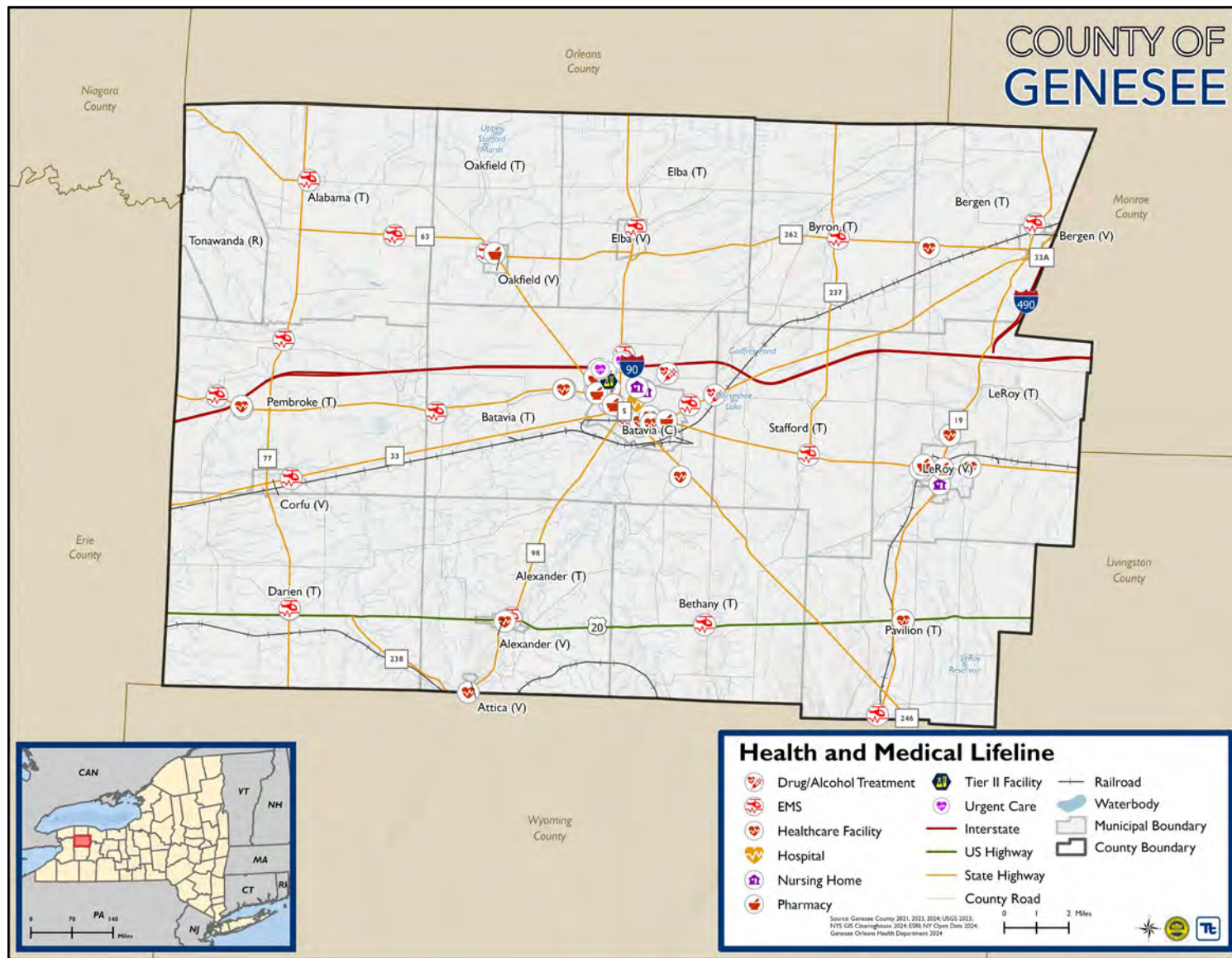
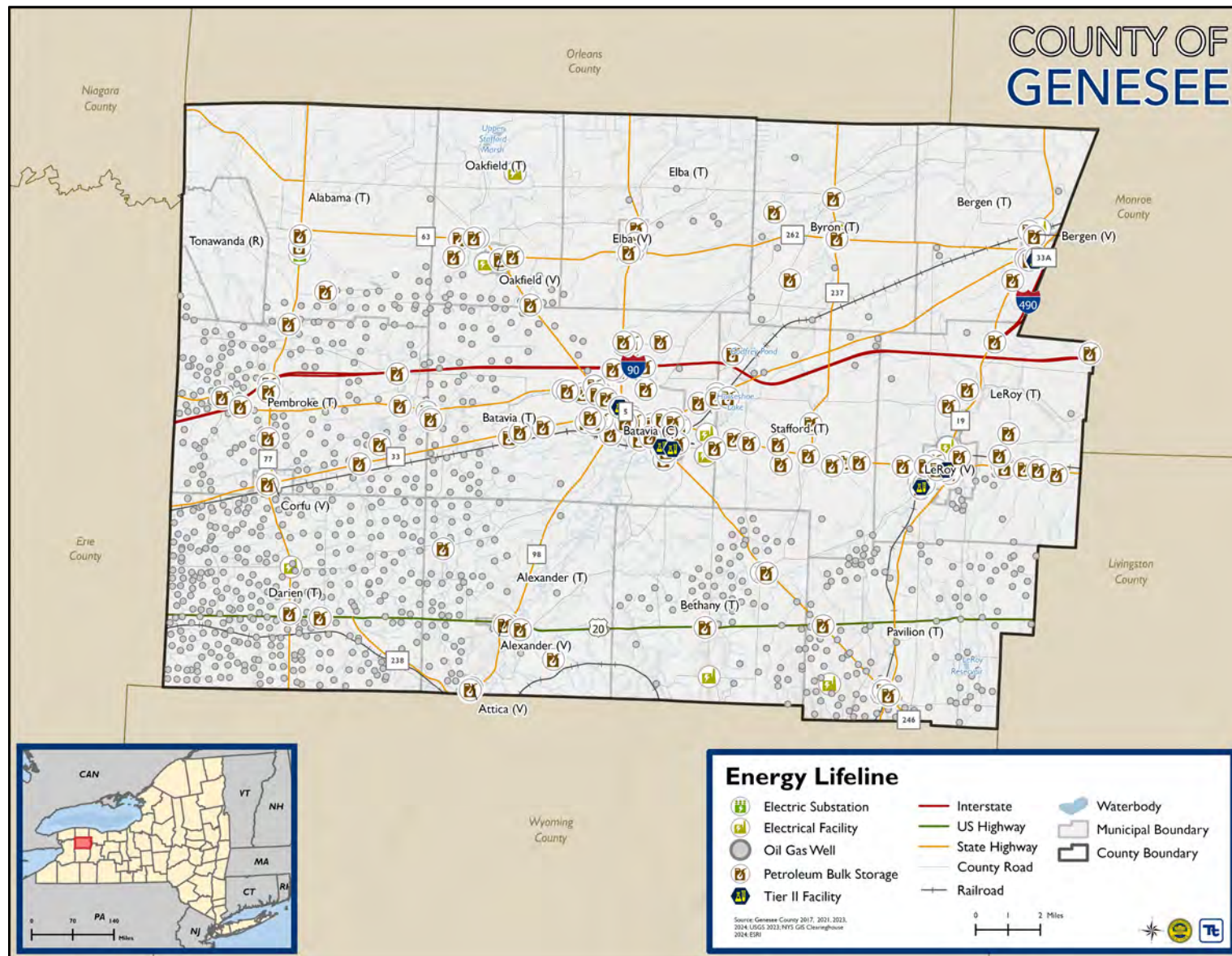




Figure 3-14. Energy Facilities in Genesee County





**COUNTY OF
GENESEE**

Orleans County

Niagara County

Monroe County

Erie County

Livingston County

Wyoming County

Communications Lifeline

- AM Transmission Tower
- Communication Tower
- Tier II Facility
- Interstate
- US Highway
- State Highway
- County Road
- Railroad
- Waterbody
- County Boundary
- Municipal Boundary

Source: Genesee County 2017, 2023, 2024;
USGS 2023; NYS GIS Clearinghouse 2024
ESRI

0 1 2 Miles



3.9.5 Transportation



The transportation community lifeline category includes highway, roadway, and motor vehicle networks; mass transit; railways; aviation; and maritime facilities. Table 3-16 lists the number of each facility type. Figure 3-16 shows the location of transportation facilities in Genesee County.

Table 3-16. Genesee County Transportation Lifeline Facilities

Facility Type	Number of Facilities
Airport	5
Bridge	168
Bus Facility	2
Railroad Bridge	47
Railroad Facility	1
Thruway Service Area	2
Tier II Facility	4
Total	229

Note: The identified lifeline facilities may not include all facilities within the County. It is recognized that facilities may have been missed in the information-gathering process.

Genesee County has an interconnected highway system that includes interstate and state roads, county highways, and city and village streets. This system is owned and maintained by New York State, Genesee County, and its municipalities. The details of the system are as follows:

- 216 miles owned by New York State
- 260 miles owned by Genesee County
- 379 Bridges and Culverts
- 459 miles owned by local government (towns and villages)

The network of highways in Genesee County provides good transportation connections through each municipality. The state system provides direct access from all directions in the County to the City of Batavia. The major arterials through Genesee County are under the jurisdiction of New York State Department of Transportation (NYS DOT) and are primarily Routes 5, 20, 33, 63, 19, 98, and 77.

The Genesee County Highway Department maintains road systems, small bridges, culverts, drainage ditches, and shoulders. The Highway Department also provides equipment rental and use of the County's motor pool repairs for local community equipment. The Department also provides, upon request, sign-making for local roads, towns, and villages. Additionally, the Highway Department provides snow removal services on county roads and some local roads where municipalities need assistance. Finally, the Highway Department provides engineering services for improvements to local road systems as well as the design and replacement of small bridges and culverts.

Local governments provide road and street maintenance to local roads as well as snow removal for their systems and assist local school districts with removing snow from their parking areas.

NYS DOT Region 4 provides highway maintenance for their state system located in Genesee County. The Thruway Authority provides maintenance for I-90. NYS DOT also provides road signage for local governments and sharing



of services. They also provide administrative support, training for safety and highway maintenance, and new techniques for the preservation of highways.

Evacuation Routes

The County has identified evacuation zones for severe weather and can assist with the coordination and communication of evacuation routing as necessitated by the execution of local municipal emergency operation plans. Evacuation will be ordered by the Incident Commander or their designee for localized incidents and will be determined at the time of the incident. Emergency responders will identify the major roads leading away from the evacuated areas at the time of the incident and response agency personnel and OEM staff will notify the affected population of the need to evacuate and the routes they can take (Genesee County Office of Emergency Management n.d.).

Bus and Other Transit Facilities

RTS Genesee offers transportation throughout Genesee County. Service is available Monday through Saturday. Countywide Runner is another service offered in the County, Monday–Friday, that focuses on countywide and medical appointments. The Batavia Bus Service serves the City of Batavia. It is owned by the Regional Transit Company and provides public transportation for residents and school children. There is also a fleet of buses for the ARC and a limited taxi service that primarily serves the City of Batavia (Genesee County n.d.).

Railroad Facilities

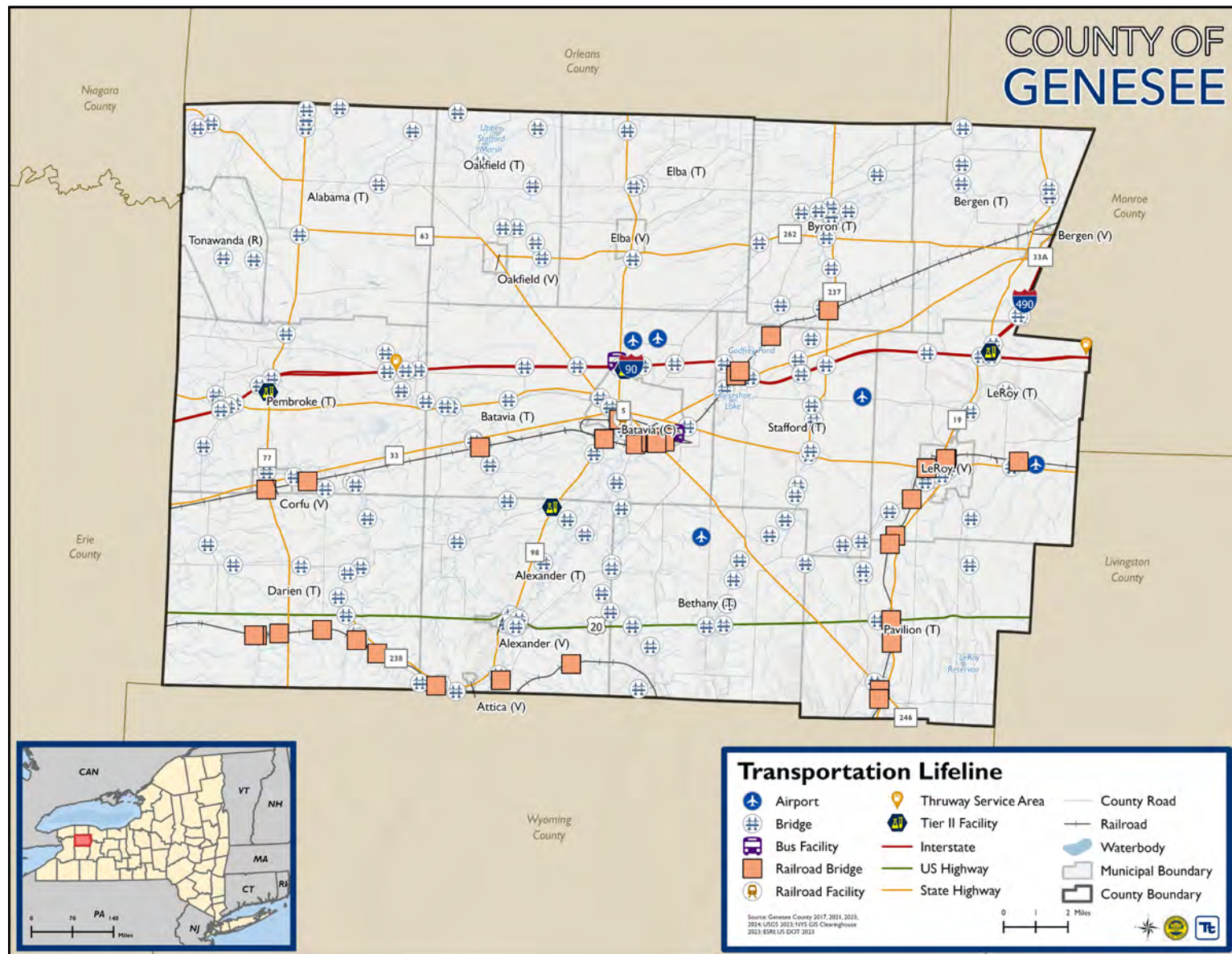
Genesee County is served by Conrail, the Lehigh Valley, Depew Lancaster & Western, and Erie Lackawanna railroads. The system is primarily used for freight traffic. There are no passenger terminals located within the County. The rail network in Genesee County consists of two main lines. The one line runs from the Village of Bergen, through the City of Batavia, to the Village of Corfu. The other line enters the eastern border of the County and goes through LeRoy, turns south through the Town of Pavilion, and then connects to the Villages of Attica and Alexander.

Airports

There are two airports located in Genesee County: Genesee County Airport and LeRoy Airport. Genesee County Airport is the major airport located in the Town of Batavia. It is a County-owned, public use airport. In August 2018, the airport received federal funding to reconstruct its taxiways and taxiway lighting (Genesee County n.d.). The LeRoy Airport is a privately owned, public use airport located in the Town of LeRoy. It is a designated general aviation reliever airport for the Greater Rochester International Airport (LeRoy Airport n.d.).



Figure 3-16. Transportation Facilities in Genesee County





3.9.6 Hazardous Materials



The hazardous materials community lifeline category includes hazardous materials facilities, pollutants, and contaminants. Due to heightened security concerns, local hazardous materials lifeline data sufficient to complete the analysis has only partially been obtained. Table 3-17 lists the number of each facility type. Figure 3-17 shows the location of hazardous material facilities in Genesee County.

Table 3-17. Genesee County Hazardous Materials Lifeline Facilities

Facility Type	Number of Facilities
Chemical Bulk Storage	34
Tier II Facility	3
Total	37

Note: The identified lifeline facilities may not include all facilities within the County. It is recognized that facilities may have been missed in the information-gathering process.

Hazardous Materials Facilities

A Superfund site consists of land in the United States that has been contaminated by hazardous waste and identified by the U.S. Environmental Protection Agency (EPA) as a candidate for cleanup because it poses a risk to human health and/or the environment. These sites are placed on the National Priorities List (NPL). The NPL is the list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The NPL is intended primarily to guide the EPA in determining which sites warrant further investigation.

Abandoned hazardous waste sites placed on the federal NPL include those that the EPA has determined present “a significant risk to human health or the environment,” with the sites being eligible for remediation under the Superfund Trust Fund Program.

Superfund sites are contaminated locations requiring a long-term response to clean up hazardous materials; NPL sites are included. The EPA Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) (Superfund) Public Access Database (CPAD) reports that there are currently three Superfund sites located in Allegany County (CERCLIS 2013). Three Superfund sites have been identified by the EPA. These Superfund sites include the Batavia Landfill in Batavia, Byron Barrel & Drum in Byron Township, Lehigh Valley Railroad in LeRoy. Byron Barrel & Drum and the Lehigh Valley Railroad facilities are listed on the NPL (CERCLIS 2023).

In addition to the hazardous waste sites, there are numerous hazardous facilities in Genesee County cataloged by the NYSDEC’s Bulk Storage Program Database. The Bulk Storage Program includes three types of facilities – Petroleum Bulk Storage (PBS), Major Oil Storage Facilities (MOSF), and Chemical Bulk Storage (CBS). Registration with NYSDEC is mandatory for all PBS facilities with a total storage capacity of 1,100 gallons or more; all CBS underground tanks and all stationary aboveground tanks with a capacity of 185 gallons or more; and all MOSF sites storing more than 400,000 gallons of petroleum products. As of September 2023, 401 sites are listed in the NYSDEC’s Bulk Storage Program Database in Genesee County, New York (New York State Department of Environmental Conservation (NYS DEC 2023).



3.9.7 Water Systems



The water system community lifeline category includes potable water and wastewater infrastructure. Due to heightened security concerns, local utility lifeline data sufficient to complete the analysis has only partially been obtained. Table 3-18 lists the number of each facility type. Figure 3-18 shows the location of water system facilities in Genesee County.

Table 3-18. Genesee County Water System Lifeline Facilities

Facility Type	Number of Facilities
Pump Station	7
Sewer Pump Station	54
Tier II Facility	1
Wastewater Facility	23
Water Storage Tank	11
Water Treatment Plant	2
Water Well	830
Total	928

Note: The identified lifeline facilities may not include all facilities within the County. It is recognized that facilities may have been missed in the information-gathering process.

Potable Water

In Genesee County, water is provided primarily through public water supply, though a significant portion of the County is served by private wells. Genesee County has an agreement with the Monroe County Water Authority (MCWA) to serve as Genesee County's exclusive water provider. Genesee County is currently undergoing Phase 3 of a major expansion of the County's public water infrastructure, which involves an increase of 7.6 million gallons per day. The MCWA uses the water treatment plant in the City of Batavia to serve the Town of Alexander, Village of Alexander, City of Batavia, Town of Batavia, Village of Elba, and Town of Oakfield, but plans are in place to close that water treatment plant as the system is developed (Genesee County Water Supply 2021).

MCWA's water supply comes from Lake Ontario, two of the Finger Lakes (Hemlock Lake and Canadice Lake), and private wells (Monroe County Department of Health 2019). The MCWA is the third-largest water supplier in New York State and produces and delivers an average of 20 billion gallons of drinking water every year (MCWA 2021).

Wastewater Facilities

The Genesee County sewer system is spread throughout municipalities, with 13 sewer systems currently in operation. These systems are operated, maintained, and funded by the following municipalities:

- Village of Alexander
- Village of Attica
- City of Batavia
- Village of Bergen
- Town of Byron – 3 Systems
- Village of Corfu
- Town of Darien
- Village of Elba
- Village of LeRoy
- Village of Oakfield
- Town of Pavilion



Sewer service is dependent on the size of the treatment plant, age of the infrastructure, and quantity being produced compared to the discharge point. There are also numerous individual sewage disposal systems located throughout the County. Municipalities with sewer service are the Town of Byron, Village of Corfu, Village of LeRoy, Town of Bergen, Village of Bergen, Village of Oakfield, Town of Pavilion, Town of Darien, and Town of Batavia.

3.10 OTHER CRITICAL FACILITIES

Some facilities identified as critical for hazard mitigation in Genesee County do not fit in any of FEMA's community lifeline categories. The Planning Committee identified additional facilities (user-defined facilities) as critical facilities. Some of these fall under categories previously defined above, as well as under other critical categories, including libraries, major employers, mobile home parks, polling places, post offices, courts, and daycares. These facilities were included in the risk assessment conducted for the County. Table 3-19 lists the number of each facility type. Figure 3-19 shows the location in Genesee County of these other critical facilities.

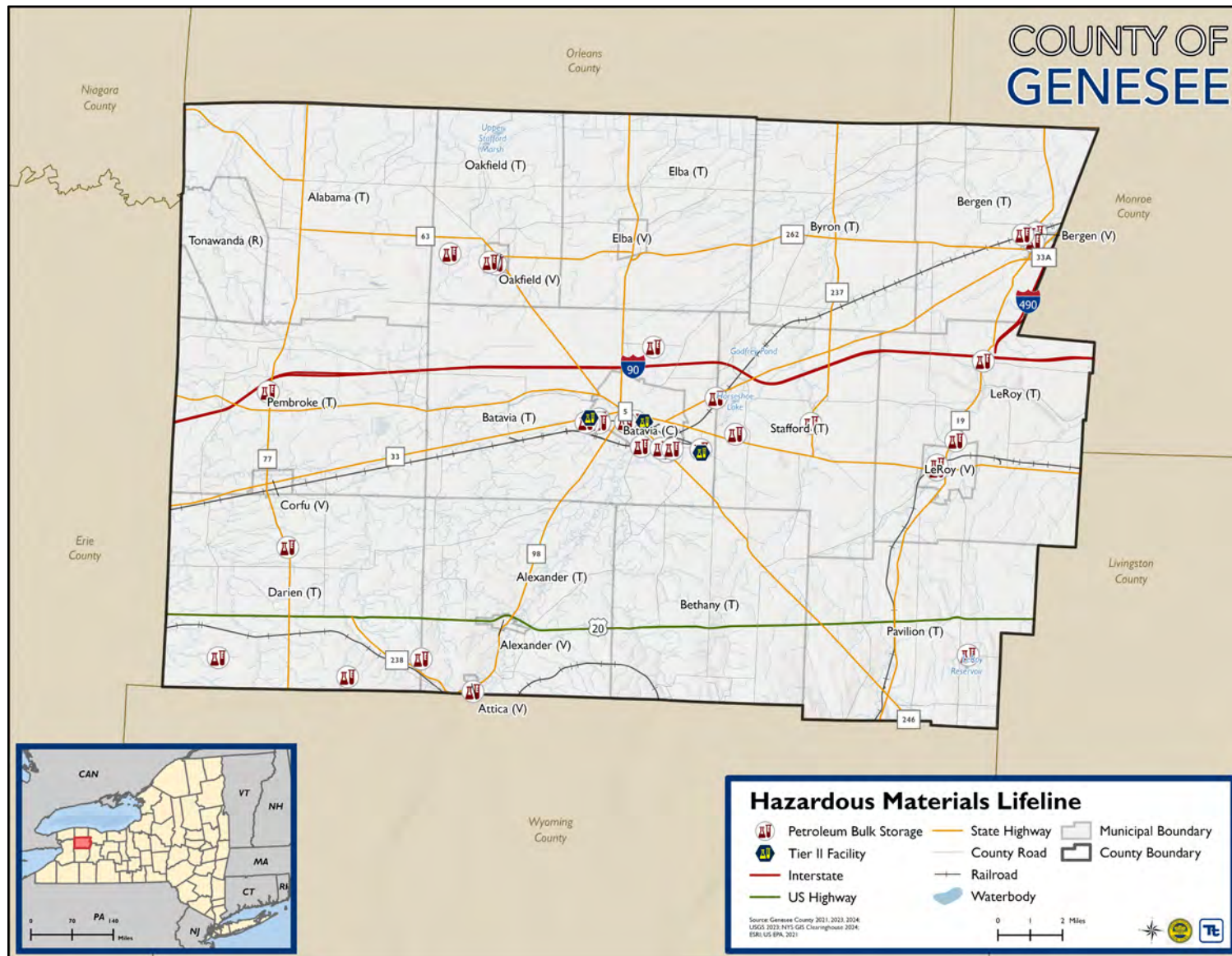
Table 3-19. Genesee County Other Critical Facilities

Facility Type	Number of Facilities
Childcare Center	26
Church	84
Historic Site	16
Housing Service	6
Library	6
Major Employer	24
Mobile Home Park	21
Polling Site	24
Post Office	13
Tier II Facility	30
Total	250

Note: The identified lifeline facilities may not include all facilities within the County. It is recognized that facilities may have been missed in the information-gathering process.



Figure 3-17. Hazardous Materials Facilities in Genesee County





**COUNTY OF
GENESEE**

Orleans County

Niagara County

Monroe County

Livingston County

Erie County

Water Systems Lifeline

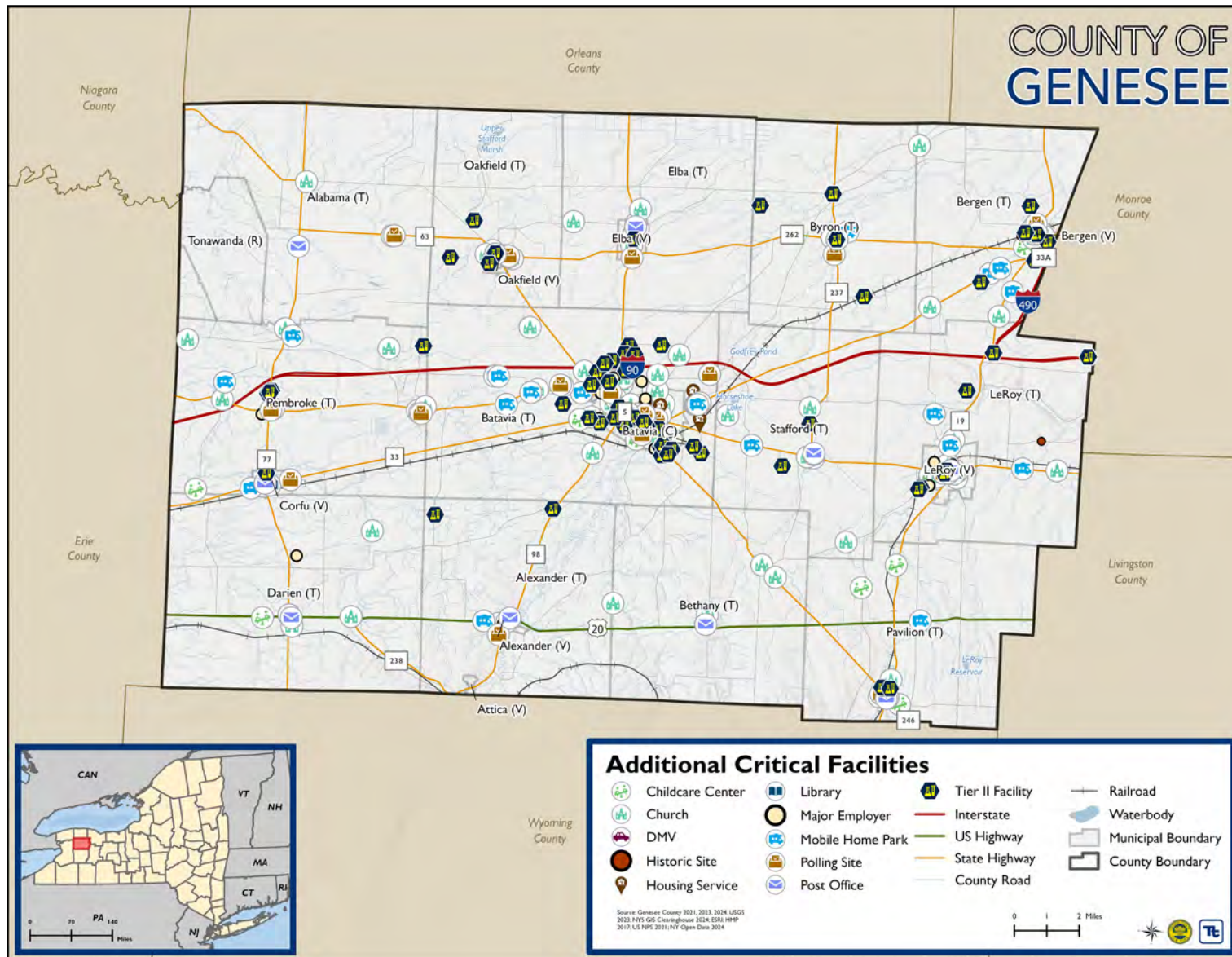
- Pump Station
- Sewer Pump Station
- Tier II Facility
- Wastewater Facility
- Water Storage Tank
- Water Treatment Plant
- Water Well
- Interstate
- US Highway
- State Highway
- County Road
- Railroad
- Waterbody
- Municipal Boundary
- County Boundary

Source: Genesee County 2021, 2023, 2024.
USGS 2023 NHD Plus Channelflow 2021, 2023.
2024 ESRI, Clark Patterson Lee Inc. 2024

0 1 2 Miles



Figure 3-19. Other Critical Facilities in Genesee County



PART 2:

RISK ASSESSMENT

DRAFT



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 enables 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. Past, present, and future conditions must be evaluated to assess risk most accurately for the County and participating jurisdictions. 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:
 - Extent: The potential severity of each hazard
 - Location: Geographic area most likely to be affected by the hazard
 - Previous occurrences and losses
 - Impacts of climate change
 - Probability of future hazard events
- **Assess Risk:** Use all available information to estimate to what extent populations and assets may be adversely affected by a hazard:
 - 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: Assess the impact of hazard events on the people, property, economy, and lands of the region, including estimates of the cost of 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 climate change impacts can alter current vulnerability and potential impacts.

The Genesee County risk assessment was updated using the following best-available information:

- A new building stock inventory was generated using 2023 building footprints sourced from NYS Geographic Information System (GIS) Clearinghouse, 2023 tax assessor and parcel data provided by Genesee County Planning; and 2024 RS Means cost adjustment values.
- 2020 Decennial Census Population data and 2018–2022 American Community Survey five-year Population Estimates were utilized.
- Critical facilities were updated and reviewed by the Planning Partnership and Genesee County jurisdictions.
- Lifelines were identified in the critical facility inventory to align with FEMA's community lifeline definition.
- FEMA's Hazus program was used to estimate potential impacts from the flood, wind, and seismic hazards.
- Best-available hazard data were used, as described in this section.



4.1 ASSET INVENTORIES

Genesee County assets were identified to assess potential vulnerability and impacts associated with the hazards of concern. For this hazard mitigation plan (HMP) update, Genesee County assessed vulnerability and potential hazard impacts for the following types of assets: population, buildings, critical facilities, community lifelines, the environment, and new development. Some assets may be more susceptible to impacts because of their physical characteristics or socioeconomic uses. 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 personal or public properties.

4.1.1 Population

Statistics from the 2020 Decennial Census Population estimate and 2018–2022 American Community Survey (ACS) five-year estimate were used to estimate the vulnerability of and potential impacts on the County's population. To determine population statistics for villages and towns, village population totals were subtracted from the total town population. 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 using only census block or census tract boundaries. Limitations of these analyses are recognized, and thus, the results are used only to provide a general estimate for planning purposes.

The risk assessment included the collection and use of an expanded and enhanced asset inventory to estimate hazard vulnerability and impacts.

FEMA's Hazus program was used to model estimated potential losses to flood, seismic, and wind hazards, as discussed further later in this section. Hazus still contains 2020 U.S. Census data and was used to estimate sheltering and injuries as part of the hazard analysis.

As discussed in Chapter 3, County Profile, research has shown that some populations are at greater risk from hazard events because of decreased resources or physical abilities. Vulnerable populations in Genesee County included in the risk assessment are children, the elderly, the population below the poverty level, non-English speaking individuals, persons with a disability, and persons living below the poverty threshold (as defined by the U.S. Census Bureau).

4.1.2 Buildings

For this HMP update, the default general building stock in Hazus was updated and replaced with a custom building inventory for Genesee County at the aggregate and structure levels. The building stock update was performed using the most current parcel and tax assessor data, which was provided by Genesee County Planning, and building footprint data sourced from NYS GIS Clearinghouse. The tax assessment data was joined to the spatial layer of structure footprints, also provided by the County. The replacement cost value was calculated using the square footage value of each building and RS Means 2024 data.

Attributes provided in the associated files were used to further define each structure, such as year built, number of stories, basement type, occupancy class, and square footage. The centroid of each building footprint was used to estimate the building location. Structural and content replacement cost values (RCV) were calculated for each building using the available assessor data, the building footprint, and RS Means 2024 values. The analysis used a location factor associated by location zip-code, which produced the following location factors:



- 140-141: Residential – 1.06; Non-Residential – 1.04
- 144-145: Residential – 1.02; Non-Residential – 1.01

RCV is the current cost of returning an asset to its pre-damaged condition using present-day cost of labor and materials. Total RCV consists of both the structural cost to replace a building and the estimated value of the contents of a building. The occupancy classes available in Hazus were condensed into the categories of residential, commercial, industrial, agricultural, religious, governmental, and educational to facilitate analysis and presentation of results. Residential loss estimates addressed both multi-family and single-family dwellings.

4.1.3 Critical Facilities and Community Lifelines

A critical facility inventory, which includes essential facilities, utilities, transportation features, and user-defined facilities, was created by the Planning Partnership and County jurisdictions. The development involved a review 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 (refer to Appendix G, Critical Facilities). To protect individual privacy and the security of assets, information is presented in aggregate, without details about specific individual properties or facilities.

A lifeline provides indispensable service that enables the continuous operation of critical business and government functions, and is critical to human health and safety, or economic security (FEMA).

4.1.4 Environment and Land Use

National land use land cover data created by the U.S. Geological Survey (USGS) in 2021 was used to assess land use characteristics of Genesee County. This dataset 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 wetland land use categories.

4.1.5 New Development

In addition to assessing the vulnerability of the built environment, Genesee County examined recent development over the last five years and anticipated new development in the next five years. Each jurisdiction was asked to provide a list by address of major development that has taken place within these timeframes. The location of new development projects was submitted via ArcGIS Survey123.

New development was identified as (1) anticipated in the next five years and (2) recently developed over the last five years. An analysis was conducted in GIS to determine hazard exposure of these development sites. Identifying these changes and integrating new development into the risk assessment provides communities with information to consider when developing the mitigation strategy to reduce these vulnerabilities in the future (one tool in the Mitigation Toolbox discussed in Section 6, Mitigation Strategy).



4.2 METHODOLOGY

Genesee 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:

- **Historical Occurrences and Qualitative Analysis:** 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 extent and locations, on asset mapping in GIS to determine which assets are located in the impact area of the hazard.
- **Loss Estimation:** The FEMA Hazus modeling software was used to estimate potential losses for the following hazards: flood, earthquake, and hurricane.

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

Table 4-1. Summary of Risk Assessment Analyses

Hazard	Population	General Building Stock	Critical Facilities	New Development
Civil Unrest	Q	Q	Q	Q
Dam Failure	Q	Q	Q	Q
Drought	Q	Q	Q	Q
Earthquake	V, H	V, H	V, H	V
Epidemic	Q	Q	Q	Q
Extreme Temperature	Q	Q	Q	Q
Flood	V, H	V, H	V, H	V
Hazardous Materials	V	V	V	V
Severe Storm	H	H	H	Q
Severe Winter Storm	Q	Q	Q	Q
Terrorism	Q	Q	Q	Q
Transportation Accident	Q	Q	Q	Q
Utility Interruption	Q	Q	Q	Q
Wildfire	V	V	V	V

Notes: V = Vulnerability analysis; H = Hazus analysis; Q = Qualitative analysis

4.2.1 Hazus

Hazus is a GIS-based software tool developed by FEMA that applies engineering and scientific risk calculations, which have been developed by hazard and information technology experts, to provide defensible damage and loss estimates. These methodologies are accepted by FEMA and provide a consistent framework for assessing risk across a variety of hazards. The GIS framework also supports the evaluation of hazards and assessment of inventory and loss estimates for these hazards.



Hazus uses GIS technology to produce detailed maps and analytical reports that estimate a community's direct physical damage to building stock, critical facilities, transportation systems, and utility systems. To generate this information, Hazus uses default data for inventory, vulnerability, and hazards; this default data can be supplemented with local data to provide a more refined analysis. Damage reports can include induced damage (inundation, fire, threats posed by hazardous materials and debris) and direct economic and social losses (casualties, shelter requirements, and economic impact), depending on the hazard and available local data. Hazus' open data architecture can be used to manage community GIS data in a central location. The use of this software also promotes consistency of data output now and in the future and standardization of data collection and storage. More information on Hazus is available at <http://www.fema.gov/hazus>.

In general, modeled losses were estimated in the program using a depth grid for the flood analysis and probabilistic analyses were performed to develop expected or estimated distribution of losses (mean return period losses) for hurricane wind and seismic hazards. The probabilistic model generates estimated damages and losses for specified return periods (e.g., 100- and 500-year). Table 4-2 displays the levels of analysis that can be conducted using the Hazus software.

Table 4-2. Summary of Hazus Analysis Levels

Level 1	Hazus provides hazard and inventory data with minimal outside data collection or mapping.
Level 2	Analysis involves augmenting the Hazus-provided hazard and inventory data with more recent or detailed data for the study region, referred to as "local data".
Level 3	Analysis involves adjusting the built-in loss estimation models used for the hazard loss analyses. This level is typically done in conjunction with the use of local data.

4.2.2 Hazard-Specific Methodologies

Civil Unrest

All of Genesee County is at risk from the impacts of civil unrest events. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

Dam Failure

To assess the vulnerability of Genesee County to dam failure and its associated impacts, a qualitative review was conducted.

Drought

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

Earthquake

A probabilistic assessment was conducted for Genesee County for the 500-year mean return period event through a Level 2 analysis in Hazus to analyze the earthquake hazard and provide a range of loss estimates. The probabilistic method uses information from historical earthquakes and inferred faults, locations, and magnitudes, and computes the probable ground shaking levels that may be experienced during a recurrence period by census tract.



As noted in the Hazus Earthquake User Manual, *“Although the software offers users the opportunity to prepare comprehensive loss estimates, it should be recognized that uncertainties are inherent in any estimation methodology, even with state-of-the-art techniques. Any region or city studied will have an enormous variety of buildings and facilities of different sizes, shapes, and structural systems that have been constructed over a range of years under diverse seismic design codes. There are a variety of components that contribute to transportation and utility system damage estimations. These components can have differing seismic resistance”* (FEMA 2020). However, Hazus’ potential loss estimates are acceptable for the purposes of this HMP.

Ground shaking is the primary cause of earthquake damage to built structures, and soft soils amplify ground shaking. One contributor to the site amplification is the velocity at which the rock or soil transmits shear waves (S-waves). The National Earthquake Hazard Reduction Program (NEHRP) has developed five soil classifications defined by their shear-wave velocity that impact the severity of an earthquake. The soil classification system ranges from A to E, where A represents hard rock that reduces ground motions from an earthquake and E represents soft soils that amplify and magnify ground shaking and increase building damage and losses. Class D and E NEHRP soils are the two classes most susceptible to amplified ground motion 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 sourced from New York Homeland Security and Emergency Services. The vulnerability analysis focused on soil types that would experience amplified ground motion during an earthquake (i.e., Class D and E). Assets with their centroid in the hazard areas were totaled to estimate the numbers and values vulnerable to these soil types.

Default NEHRP soils data in Hazus were used. Groundwater was set at a depth of 5 feet (default setting). The default assumption is a magnitude 7.0 earthquake for all return periods. Although damages are estimated at the census tract level, results were presented at the municipal level. Because there are multiple census tracts that contain more than one jurisdiction, an area analysis was used to extract the percentage of each tract that falls within individual jurisdictions. The percentage was multiplied against the results calculated for each tract and summed for each jurisdiction.

Damage estimates are calculated for losses to buildings (structural and non-structural) and contents; structural losses include load-carrying components of the structure, and 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.

Epidemic

All of Genesee County is at risk from the impacts of epidemic events. A qualitative analysis was conducted to assess the County’s vulnerability to this hazard of concern.

Extreme Temperature

All of Genesee County is at risk from the impacts of extreme temperature events. A qualitative analysis was conducted to assess the County’s vulnerability to this hazard of concern.

Flood

The 1 percent and 0.2 percent annual chance flood events were examined to evaluate the County’s risk from the flood hazard. These flood events are generally those considered by planners and evaluated under federal programs such as NFIP.



The Genesee County Q3 Flood Data and depth grids developed from the 2019 HMP were used to evaluate vulnerability and determine potential future losses for this plan update. The Genesee County Q3 Flood Data was used to evaluate vulnerability and determine potential future losses. The depth grid generated using the Q3 Flood Data was integrated into the Hazus riverine flood model and used to estimate potential losses for the 1 percent annual chance flood event.

To estimate vulnerability to the 1 percent and 0.2 percent annual chance flood events, the Q3 Flood Data boundaries were overlaid on the centroids of updated assets (population, building stock, critical facilities, and new development). Centroids that intersected the flood boundaries were totaled to estimate the building RCV and population vulnerable to the flood inundation areas. A Level 2 Hazus riverine flood analysis was performed. Both the critical facility and building inventories were formatted to be compatible with Hazus and its Comprehensive Data Management System (CDMS). Once updated with the inventories, the Hazus riverine flood model was run to estimate potential losses in Genesee County for the 1 percent annual chance flood event. A user-defined analysis was also performed for the building stock. Buildings located within the floodplain were imported as user-defined facilities to estimate potential losses to the building stock at the structural level. Hazus calculated the estimated potential losses to the population (default 2020 U.S. Census data across dasymetric blocks), potential damages to the general building stock, and potential damages to critical facility inventories based on the depth grid generated and the default Hazus damage functions in the flood model.

Hazardous Materials

Hazardous materials were quantitatively analyzed using three risk assessment exposure analyses on varying types of infrastructure: major roadways, rail lines, and SARA sites. These infrastructure datasets were provided by Genesee County, and a 0.5-mile buffer was applied to the major roadways and rail lines, while the SARA sites had varying buffer delineations applied, dependent on the particular chemical. To determine what assets are exposed to hazardous materials, the buffered infrastructure datasets were overlaid with the asset inventories. Assets with their centroid located in the hazard area were totaled to estimate the totals and values at risk from the impacts of a hazardous materials release event.

Severe Storm

A Hazus probabilistic analysis was performed to analyze the wind hazard losses for Genesee County for the 500-year mean return period event. The probabilistic Hazus hurricane model activates a database of thousands of potential storms that have tracks and intensities reflecting the full spectrum of Atlantic hurricanes observed since 1886 and identifies those with tracks associated with Genesee County. Hazus contains data on historical hurricane events and wind speeds. It also includes surface roughness and vegetation (tree coverage) maps for the area. Surface roughness and vegetation data support the modeling of wind force across various types of land surfaces. Default demographic and updated building and critical facility inventories in Hazus were used for the analysis. Although damages are estimated at the census tract level, results were presented at the municipal level. Because there are multiple census tracts that contain more than one jurisdiction, a density analysis was used to extract the percent of building structures that fall within 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 Genesee County is exposed and vulnerable to the severe 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.



Terrorism

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

Transportation Accident

All of Genesee County is at risk from the impacts of transportation accident events. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

Utility Interruption

All of Genesee County is at risk from the impacts of utility interruption events. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

Wildfire

The Wildland-Urban Interface (WUI) (Interface and Intermix) obtained through the SILVIS Laboratory, Department of Forest Ecology and Management, University of Wisconsin – Madison, was referenced to delineate wildfire hazard areas. The University of Wisconsin – Madison wildland fire hazard areas are based on the 2020 Census and 2021 National Land Cover Dataset and the Protected Areas Database. For this risk assessment, the high-, medium-, and low-density interface areas were combined and used as the "Interface" hazard area, and the high, medium-, and low-density intermix areas were combined and used as the "Intermix" hazard areas.

To determine what assets are exposed to wildfire, the WUI hazard boundaries were overlaid with the asset inventories. Assets with their centroid located in the hazard area were totaled to estimate the totals and values at risk from the impacts of a wildfire event.

4.3 RATING PROBABILITY OF 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. These ratings were assigned as follows:

- **Unlikely:** Not likely to occur or less than 1 percent annual chance of occurring
- **Rare:** Between 1 and 10 percent annual chance of occurring
- **Occasional:** Between 10 and 100 percent annual chance of occurring
- **Frequent:** 100 percent chance occurring; occurs multiple times a year

4.4 DATA SOURCE SUMMARY

Table 4-3 summarizes the data sources used for the risk assessment for this plan.

Table 4-3. Risk Assessment Data Documentation

Data	Source	Date	Format
Population data	U.S. Census Bureau; American Community Survey five-year Estimates	2020; 2022	Comma-Separated Value (.csv) format



Data	Source	Date	Format
Building Inventory	Genesee County GIS Planning; NYS GIS Clearinghouse; RS Means	2023, 2024; 2023; 2024	Digital (GIS) format
Critical Facilities and Lifelines	Genesee County Planning Partnership and County Jurisdictions; Genesee County; NYS GIS Clearinghouse; Genesee Orleans Wyoming Opioid Task Force; Genesee Orleans Health Department; NY Open Data; US DOT; Clark Patterson Lee Inc; US EPA; HIFLD; US NPS; USGS	2024; 2017, 2021, 2023, 2024; 2021, 2023, 2024; 2021; 2024; 2024; 2023; 2024; 2021; 2021; 2021; 2023	Digital (GIS) format
Q3 Flood Data	Genesee County 2019 Hazard Mitigation Plan	2019	Digital (GIS) format
Wildfire Hazard Data	University of Wisconsin-Madison, MRLC Consortium, U.S. Census Bureau	2023, 2021, 2020	Digital (GIS) format
NEHRP Soil	NYSDHES	n.d.	Digital (GIS) format
Road Network	Genesee County	2017	Digital (GIS) format
Rail Network	Genesee County	2017	Digital (GIS) format
New Development Data	Genesee County Planning Partnership and County Jurisdictions	2024	Digital (GIS) Format

Notes:*HIFLD = Homeland Infrastructure Foundation-Level Data**NPS = National Parks Service**MRLC = Multi-Resolution Land Characteristics Consortium**NEHRP = National Earthquake Hazards Reduction Program**NYSDHES = New York State Department of Homeland and Emergency Services**NYSGIS = New York State Geographic Information Systems**US EPA = United States Environmental Protection Agency**US DOT = United States Department of Transportation**USGS = United States Geological Survey*

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
- The unique nature, geographic extent, and severity of each hazard
- Mitigation measures already employed by the participating jurisdictions
- The amount of advance notice residents have to prepare for a specific hazard event
- Uncertainty of climate change projections

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, Genesee 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. Genesee 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 the tourism and real estate markets, were not analyzed.

4.6 CONSIDERATIONS FOR MITIGATION AND NEXT STEPS

The following items should be considered for the next HMP update to enhance the risk assessment:

- All Hazards
 - Create an updated user-defined general building stock dataset using up-to-date parcels, footprints, and RS Means values.
 - Utilize updated and current demographic data.
 - Utilize the best-available hazard data.
- Dam Failure
 - Should Dam Inundation spatial data become available, perform a quantitative risk assessment for the Dam Failure hazard, if applicable.
- 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.
 - Perform an additional Mean Return Period analysis in Hazus.
- Extreme Temperature
 - Track extreme temperature data for injuries, deaths, shelter needs, pipe freezing, agricultural losses, and other impacts to determine distributions of most at-risk areas.
- 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 becomes 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.
- Hazardous Materials
 - Use best-available data to update critical infrastructure used for this quantitative analysis.
- 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.

DRAFT



5. IDENTIFICATION OF HAZARDS OF CONCERN

To provide a strong foundation for mitigation actions in this plan, Genesee 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 (NYS HMP)
- Review of the 2019 Genesee County Hazard Mitigation Plan (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 study area's assets to them

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

Natural Hazards are those hazards that are a source of harm or difficulty 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.



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

Hazard	May Occur in the County?	Poses Significant Threat to the County?	Why was this determination made?	Sources
Avalanche	No	No	The 2023 New York State Hazard Mitigation Plan (NYS HMP) identifies Avalanche as a hazard of concern and there have been occurrences in the state; however, there were no occurrences in Genesee County. The topography and climate of Genesee County does not support the occurrence of an avalanche. The Steering Committee and Planning Partnership do not consider the hazard to be a significant concern.	NYSDHSES Input from Steering Committee and Planning Partnership
Civil Unrest	Yes	Yes	The 2023 NYS HMP does not identify Civil Unrest as a hazard of concern for New York State. The Steering Committee and Planning Partnership identified Civil Unrest as a hazard of concern for Genesee County.	Input from Steering Committee and Planning Partnership
Coastal Hazards	No	No	The NYS 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. Genesee County has no coastline. The Steering Committee and Planning Partnership did not identify Coastal Hazards as a hazard of concern. For the Hurricane/Tropical Cycle hazard, please see Severe Storm.	NYSDHSES Input from Steering Committee and Planning Partnership
Dam Failure	Yes	Yes	The 2023 NYS 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 60 dams within Genesee County, as shown in Chapter 6. Of these 50 dams in Genesee County: 52 low hazard, 8 intermediate hazard, 0 high hazard, and 2 negligible or no hazard classification code (NYS GIS Data 2024). The Steering Committee and Planning Partnership determined that Dam Failure should be addressed in a hazard profile separate from the Flood hazard profile	NYSDHSES NYSDEC NYS GIS Input from Steering Committee and Planning Partnership
Drought	Yes	Yes	The NYS HMP identifies Drought as a hazard of concern for the state. Genesee County has been impacted by several drought events that have occurred in New York State. Agriculture is a substantial industry in Genesee County. Drought conditions would severely impact the County's economy.	NYSDHSES USDA



5. Identification of Hazards of Concern

Hazard	May Occur in the County?	Poses Significant Threat to the County?	Why was this determination made?	Sources
			Genesee County was included in one drought-related U.S. Department of Agriculture (USDA) disaster declaration between 2019 and 2024: S5653—2023 Drought The Steering Committee and Planning Partnership has identified Drought as a hazard of concern for Genesee County.	Input from Steering Committee and Planning Partnership
Earthquake	Yes	Yes	The NYS 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); Genesee County was not included in this declaration. From 2017 to 2023, there have been no significant earthquakes with epicenters in Genesee County. Based on input from the Steering Committee and Planning Partnership, Earthquake was identified as a hazard of concern for Genesee County.	NYSDHSES U.S. Geological Survey (USGS) – Earthquake Hazards Program, Review of USGS Seismic Maps Input from Steering Committee and Planning Partnership
Extreme Temperature	Yes	Yes	The NYS HMP identified Extreme Temperature as a hazard of concern for New York State. Extreme Temperature includes both hot and cold weather events that can have a significant impact on human health and commercial/agricultural businesses, and primary and secondary effects on infrastructure (such as burst pipes and power failure). Based on input from the Steering Committee and Planning Partnership, Extreme Temperature was identified as a hazard of concern for Genesee County.	NYSDHSES Input from Planning Partnership NOAA-NCEI MRCC USDA
Flood (riverine, flash flooding, stormwater/urban flooding, ice jam, and dam failure flooding)	Yes	Yes	The NYS HMP identifies Flood as a hazard of concern for New York State. Between 1956 and 2024, Genesee County was included in seven flood-related declarations. DR-367; March 21, 1973; High Winds, Wave Action, Flooding DR-494; March 19, 1976; Ice Storm, Severe Storms, and Flooding DR-1196; January 6, 1998; Severe Storms and Flooding DR-1233; June 25–July 10, 1998; Severe Storms and Flooding DR-1534; May 13–June 17, 2004; New York Severe Storms and Flooding DR-1665; October 12–25, 2006; Severe Storms and Flooding DR-4204; November 17–26, 2014; Severe Winter Storms, Snowstorm, and Flooding Historically, 12 ice jams have been reported in Genesee County.	NYSDHSES NOAA-NCEI USACE CRREL Ice Jam Database FEMA Input from Steering Committee and Planning Partnership



5. Identification of Hazards of Concern

Hazard	May Occur in the County?	Poses Significant Threat to the County?	Why was this determination made?	Sources
			Based on the history of flooding and its impacts on Genesee County and input from the Steering Committee and Planning Partnership, Flood has been identified as a hazard of concern for the County.	
Hail	Yes	Yes	Please see Severe Storm.	
Hazardous Materials	Yes	Yes	Genesee County has many roadways, railways, and pipelines that may carry hazardous materials through the County. The NYSDEC Spill Incidents Database lists 365 spill incidents throughout the County from January 2019, through December 2023. Based on input from the Steering Committee and Planning Partnership, Hazardous Materials was identified as a hazard of concern for Genesee County.	NYSDEC Input from Steering Committee and Planning Partnership
Hurricane	Yes	Yes	Please see Severe Storm. In 2012, Superstorm Sandy brought strong winds and heavy rains to Genesee County, which downed trees and power lines.	
Ice Jams	Yes	Yes	Please see Flood.	
Ice Storm	Yes	Yes	Please see Severe Winter Storm.	
Landslide	No	No	The 2023 NYS 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; however, there were six occurrences according to NOAA's NCEI Storm Events Database. None of these events occurred in Genesee County. The Steering Committee and Planning Partnership did not identify Landslide as a hazard of concern for Genesee County.	NYSDHSES NOAA-NCEI FEMA Input from Steering Committee and Planning Partnership
Lightning	Yes	Yes	Please see Severe Storm.	
Pandemic	Yes	Yes	The 2023 NYS HMP does not identify Pandemic as a hazard of concern for New York State. Genesee 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	NYSDHSES FEMA Input from Steering Committee and Planning Partnership



5. Identification of Hazards of Concern

Hazard	May Occur in the County?	Poses Significant Threat to the County?	Why was this determination made?	Sources
			The Steering Committee and Planning Partnership identified Epidemic (rather than Pandemic) as a hazard of concern for Genesee County.	
Severe Storm (thunderstorms, lightning, hailstorms, high winds, tornadoes, and hurricanes/tropical cyclones)	Yes	Yes	The NYS 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: coastal hazards, hail, hurricane, lightning, tornado, and high winds. For the Genesee County HMP, the hazards were combined into one profile. Between 1954 and 2023, Genesee County was included in six severe storm-related declarations: DR-367; March 21, 1973; High Winds, Wave Action, and Flooding DR-1233; June 25–July 10, 1998; New York Severe Storms and Flooding DR-1534; May 13–June 17, 2004; New York Severe Storms and Flooding EM-3262; August 29–October 1, 2005; New York Hurricane Katrina Evacuation DR-1665; October 12–25, 2006; Severe Storms and Flooding EM-3351; October 27–November 8, 2012; Hurricane Sandy in New York Based on previous occurrences and input from the Steering Committee and Planning Partnership, Severe Storm is identified as a hazard of concern for Genesee County.	NYSDHSES FEMA NOAA-NCEI Input from Steering Committee and Planning Partnership
Severe Winter Storm (heavy snow, sleet, blizzards, ice storms)	Yes	Yes	The NYS HMP identifies Ice Storms and Snowstorms as hazards of concern for New York State. According to the 2023 NYS HMP, Genesee County experienced four ice storm events with losses of \$1,865,000 and 87 snowstorm events with losses of over \$7 million. Genesee County was included in six severe winter storm-related disaster declarations: DR-494; March 19, 1976; Ice Storm, Severe Storms, and Flooding DR-527; February 5, 1977; Snowstorms DR-898; March 3NYS HMP4, 1990; Severe Winter Storm DR-1467; April 3NYS HMP5, 2003; Ice Storm DR-4202; November 17NYS HMP26, 2014; Severe Winter Storm, Snowstorm, and Flooding DR-4694; December 23NYS HMP28, 2022; Severe Winter Storm and Snowstorm Based on previous occurrences and input from the Steering Committee and Planning Partnership, Severe Winter Storm is identified as a hazard of concern for Genesee County.	NYSDHSES FEMA NOAA-NCEI Input from Steering Committee and Planning Partnership
Snowstorm	Yes	Yes	Please see Severe Winter Storm.	
Terrorism	Yes	Yes	The 2023 NYS HMP does not identify Terrorism as a hazard of concern for New York State.	Input from Steering Committee and Planning Partnership



5. Identification of Hazards of Concern

Hazard	May Occur in the County?	Poses Significant Threat to the County?	Why was this determination made?	Sources
			The Steering Committee and Planning Partnership identified Terrorism as a hazard of concern for Genesee County.	
Tornado	Yes	Yes	Please see Severe Storm.	
Transportation Accident	Yes	Yes	The 2023 NYS HMP does not Identify Transportation Accidents as a hazard of concern for New York State. Between 2014 and 2024, Genesee County has recorded nearly 22,000 transportation accidents. The Steering Committee and Planning Partnership identified Transportation Accident as a hazard of concern for Genesee County.	NTSB USDOT Federal Railroad Administration Input from Steering Committee and Planning Partnership
Utility Interruption	Yes	Yes	The 2023 NYS HMP does not identify Utility Interruption as a hazard of concern for New York State. Genesee 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. Genesee County was included in one utility interruption-related disaster declaration: EM-3186; August 14-16, 2003; New York Widespread Power Outage. The Steering Committee and Planning Partnership consider Utility Interruption its own hazard but understand it may also be a cascading impact of severe storm, severe winter storm, and flooding events.	NYSDHSES NOAA-NCEI Input from Steering Committee and Planning Partnership
Wildfire	Yes	Yes	The NYS HMP identifies Wildfire as a hazard of concern for New York State. Genesee County was not included in any FEMA wildfire-related disaster declarations. Wildfires have occurred within Genesee County. The County's agriculture industry could be severely impacted by a large wildfire. The Steering Committee and Planning Partnership identified Wildfire as a hazard of concern for Genesee County.	NYSDHSES FEMA Input from Steering Committee and Planning Partnership
Wind	Yes	Yes	Please see Severe Storm.	

CRREL Cold Regions Research and Engineering Laboratory
DR Presidential Disaster Declaration Number
EM Presidential Disaster Emergency Number
FEMA Federal Emergency Management Agency
NCEI National Centers for Environmental Information



5. Identification of Hazards of Concern

NOAA	<i>National Oceanic and Atmospheric Administration</i>
NRCC	<i>Northeast Regional Climate Center</i>
NTSB	<i>National Transportation Safety Board</i>
NYSDEC	<i>New York State Department of Environmental Conservation</i>
NYSDHSES	<i>New York State Division of Homeland Security and Emergency Services</i>
NYS HMP	<i>New York State Hazard Mitigation Plan</i>
SPC	<i>Storm Prediction Center</i>
USDA	<i>U.S. Department of Agriculture</i>
USDOT	<i>U.S. Department of Transportation</i>
USGS	<i>United States Geologic Survey</i>



Based on the review of potential hazards of concern, 14 hazards of concern were identified as significant hazards affecting the entire County, to be addressed at the County level in this plan (shown here in alphabetical order):

- Civil Unrest
- Dam Failure
- Drought
- Earthquake
- Epidemic
- Extreme Temperature
- Flood
- Hazardous Materials
- Severe Storm
- Severe Winter Storm
- Terrorism
- Transportation Accident
- Utility Interruption
- Wildfire

Other natural and human-caused hazards of concern have occurred within Genesee 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.

5.1 HAZARD GROUPINGS

These hazard groupings are the same as those provided by FEMA (*FEMA 386-2 Understanding Your Risks, Identifying Hazards and Estimating Losses; Multi-Hazard Identification and Risk Assessment – The Cornerstone of the National Mitigation Strategy; Local Mitigation Planning Handbook*) and consider the hazard grouping in the NYS HMP.

The Steering Committee approved the use of the following hazard groupings:

- **Civil Unrest** is a broad term typically used by law enforcement to describe one or more forms of unrest that may include peaceful demonstrations or acts of violence. A civil disturbance can be an individual or collective action seriously interfering with peace, security, and/or functioning of a community.
- The **Dam Failure** hazard profile includes the description, location, extent, previous occurrences and losses, probability of future occurrences, impact of climate change, and vulnerability assessment for the hazards posed by dams in Genesee County
- A **Drought** is a period characterized by long durations of below normal precipitation. Drought is a temporary irregularity that can affect agriculture, water supply, aquatic ecology, wildlife, and plant life.
- 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 man-made activities that cause geologic stresses.



- The **Epidemic** 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. An aggregation of cases in a given area over a particular period, regardless of the number of cases, is called a cluster. In an outbreak or epidemic, it is presumed that the cases are related to one another or that they have a common cause.
- The **Extreme Temperature** hazard includes both heat and cold events, which can have a significant impact on human health, commercial/agricultural businesses, and primary and secondary effects on infrastructure (e.g., burst pipes and power failure). What constitutes extreme cold or extreme heat can vary across different areas of the country based on what the population is accustomed to. The 2025 HMP considers the heat island effect that occurs within developed areas.
- The **Flood Hazard** includes riverine flooding, lakeshore, 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 **Hazardous Materials** profile includes materials and wastes that are considered severely harmful to human health and the environment, as defined by the U.S. Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (also known as Superfund). Many hazardous materials are commonly used substances, which are harmless in their normal uses but are quite dangerous if released.
- The **Severe Storm** hazard includes windstorms that often entail a variety of other influencing weather conditions, including thunderstorms, hail, lightning, and tornadoes. Tropical disturbances (hurricanes, tropical storms, and tropical depressions) are often identified as a type of severe storm. For this HMP update, Severe Storm includes thunderstorms, hail, lightning, tornadoes, hurricanes, and tropical storms.
- The **Severe Winter Storm** hazard includes blizzards, ice storms, snowstorms, sleet, and freezing rain.
- **Terrorism** is the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives. Acts of terrorism include threats of terrorism, assassinations, kidnappings, hijackings, bomb scares and bombings, cyber-attacks, and use of chemical, biological, nuclear, and radiological weapons.
- The **Transportation Accidents** hazard is composed of car, rail, and air accidents that impact people and the environment that surrounds them.
- The **Utility Failure** hazard is composed of all power/cell failure and pipe breaks/leaks that occur and impact continuity of operations.
- The **Wildfire** hazard can be defined as any non-structural fire that occurs in the wildland. Three distinct types of wildland fires have been defined and include naturally occurring wildfire, human-caused wildfire, and prescribed fire. They may be highly destructive and become difficult to control. 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. CIVIL UNREST

6.1 HAZARD PROFILE

6.1.1 Hazard Description

Civil unrest is a broad term typically used by law enforcement to describe one or more forms of unrest that may include peaceful demonstrations or acts of violence. A civil disturbance can be an individual or collective action seriously interfering with peace, security, and/or functioning of a community (e.g., riot). Demonstrations, civil unrest, public disorder, and riots happen for a number of reasons that include economic hardships, social injustices, ethnic differences, objections to world organizations or certain governments, political grievances, and terrorist acts. An incident can be triggered by a single cause or a combination of causes (U.S. Army 2005).

Civil disturbances can take the form of small gatherings or large groups blocking or impeding access to a building or disrupting normal activities by generating noise and intimidating people. Demonstrations can range from a peaceful sit-in to a full-scale riot, during which a mob destroys property and terrorizes individuals. Even in its more passive forms, group blockage of roadways, sidewalks, or buildings interferes with public order. Many protests intended to be peaceful demonstrations to the public and the government can escalate into general chaos.

Two types of large gatherings are typically associated with civil disturbances: a crowd and a mob.

A crowd can be identified as casual, sighting, agitated, or mob-like. Definitions of each of these types of crowds are listed below (University of Minnesota 2016, U.S. Army 2005):

- **Casual Crowds:** Casual crowds are individuals or small groups with nothing in common to bind them together. If each has an agenda, it is their own. Casual crowds are made up of individuals or small groups occupying the same common place.
- **Sighting Crowds:** Sighting crowds are similar to casual crowds; however, they gather for an event. People migrating as a crowd to sporting events, a group of people attracted to fires and accidents, and those attending music concerts are all types of sighting crowds. Individuals or small groups gather at these events for the same purpose. It is the event and/or individuals' curiosity that compels a crowd to come together.
- **Agitated Crowds:** Agitated crowds add responses based on the elements (people, space, and event). Individuals with strong emotional feelings within a crowd can quickly spread and infect the rest of the crowd. As more people within the crowd become emotionally involved, a sense of unity may develop, causing changes in the overall demeanor of the crowd. Yelling, screaming, and name-calling are all associated with an agitated crowd.
- **Mob-Like Crowds:** Mob-like crowds have all the elements of crowd types described above, in addition to aggressive, physical, and sometimes violent actions. Under these conditions, individuals within a crowd will often say or do things they usually would not do. These consist of or involve elements of people and groups mixing together and becoming fluid.

A mob can be defined as a large, disorderly crowd or throng. Mobs are usually emotional, loud, tumultuous, violent, and lawless. Similar to crowds, mobs have different levels of commitment and can be classified into the following four categories (Alvarez 2013):

- **Aggressive Mob:** An aggressive mob attacks, riots, and terrorizes. The object of violence may be a person, property, or both. An aggressive mob is distinguished from an aggressive crowd only by lawless activity.



Examples of aggressive mobs are inmate mobs in prisons and jails, mobs that act out their frustrations after political defeat, or violent mobs at political protests or rallies.

- **Escape Mob:** An escape mob is attempting to flee from something such as a fire, bomb, flood, or other catastrophe. Members of escape mobs are generally difficult to control and can be characterized by unreasoning terror.
- **Acquisitive Mob:** An acquisitive mob is one motivated by a desire to acquire something. Riots caused by other factors often turn into looting sprees. This mob exploits an authority's lack of control in safeguarding property.
- **Expressive Mob:** An expressive mob is one that expresses fervor or revelry following some sporting event, religious activity, or celebration. Members experience a release of pent-up emotions in highly charged situations.

Civil unrest and disturbances affect the following factions of society (Alvarez 2013):

- **The Public:** The general population could serve as participants or targets in actions of civil unrest. Widespread unrest could cause fear among the populace and cause them to be absent from school or work activities. Bystanders could be harmed.
- **Responders:** Responses to civil unrest incidents are generally handled at the local level. Response to a large event of this type may exceed the resources of a local jurisdiction. In this instance, State resources would be activated to fill the need. During an event, responders may become targets, which could hamper their effectiveness.
- **Continuity of Operations, Including Delivery of Services:** An outbreak of widespread rioting or looting could impact the State's and County's ability to provide services and conduct normal operations. Protesters could occupy government buildings and interrupt normal functions of government, or targeted attacks on government facilities could halt operations entirely.
- **Property:** Private property often serves as a target in instances of civil unrest. Businesses can be targeted for looting or vandalism. If an event is particularly large, damage could reach millions of dollars and recovery could take years.
- **Facilities:** Often in acts of civil unrest, government facilities become foci of protests or targets for vandalism. Damage during an event or inability of workers to enter a facility may greatly reduce a facility's effective capacity or close it completely.
- **Infrastructure:** Similar to government facilities, public and private infrastructure can become targets of civil unrest. Damage to transportation, communications, or utilities infrastructure could further exacerbate the situation.
- **Environment:** Normally, civil unrest would minimally impact the environment. However, if petroleum or other chemical facilities become targets for vandalism or large-scale fires occur, effects on the environment could be significant.
- **Economic Condition of the County:** Civil unrest could prove economically crippling to Genesee County. Large-scale events are usually accompanied by widespread absenteeism and damage to private property.
- **Public Confidence in the County's Governance:** If an event becomes prolonged or is perceived to be mismanaged, it could greatly decrease public confidence in the governance of the County. If the response is seen to be inadequate, individuals may attempt to protect their properties by their own means and further exacerbate the situation.

Civil disturbances often occur with little to no warning; however, certain events may trigger riots. Riots can occur as a result of controversial court rulings, unfair working conditions, or general unrest. Riots can also be triggered as a



result of favorable or unfavorable sports outcomes. Thus, generally, a certain degree of warning time precedes a riot; however, predicting with certainty that an incident is imminent is not possible.

Civil disorder can result in numerous secondary hazards. Depending on the size and scope of the incident, civil unrest may lead to widespread urban fire, utility failure, transportation interruption, and environmental hazards. The most significant impact of civil unrest is interrupted continuity of government, which can also lead to other secondary hazards listed above. The extent of secondary hazards will vary significantly based on the extent and nature of the civil unrest.

6.1.2 Location

Government facilities, landmarks, prisons, and universities are common sites where crowds and mobs may gather. The dense concentration of buildings in the City of Batavia could be a potential target for civil disturbances. Additionally, educational institutions throughout the County, including Genesee Community College in the Town of Batavia, may also be at risk. The Darien Lake theme park, which features amusement rides, concert venues, and camping facilities and attracts approximately 1.5 million visitors each year, may also be a target. Other types of institutions, such as correctional facilities, treatment units, and youth development centers, may be targets for civil unrest.

6.1.3 Extent

The magnitude or severity of a civil unrest event depends on the nature of the disturbance. A disturbance can take the form of a small gathering or a large group blocking access to buildings or disrupting normal activities. Civil unrest events can range from peaceful sit-ins to full-scale riots.

6.1.4 Previous Occurrences

Federal Emergency Management Agency (FEMA) Major Disaster and Emergency Declarations

Between 1954 and 2024, New York State had no federally declared disasters (DR) nor were there any emergency disaster declarations (EM) that involved Genesee County (FEMA 2024).

U.S. Department of Agriculture (USDA) Declarations

The 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. Between 2017 and 2024, Genesee County was not included in any civil unrest-related agricultural disaster declarations (USDA 2024).

Previous Events

Many sources provided historical information regarding previous occurrences and losses associated with civil unrest events throughout Genesee County. The 2019 Hazard Mitigation Plan (HMP) details information from the Genesee County Historian's Office. The most notable occurrence of civil unrest in the County's history was in 1836 when farmers marched on Batavia to protest the Holland Land Company's changes to the fiscal policies regarding land holdings. There have been four occurrences of protests between the years 2012 and 2017, as described below (Genesee County 2019):



- **April 13, 2012:** Protesters spoke out against an unfair labor practice from the PepsiCo Project Wave site in Batavia. The protesters accused PepsiCo and Project Wave of taking millions in taxpayer dollars through tax incentives, while giving nothing back to the local community by finding labor workers from other states and regions to work on the project.
- **January 12, 2014:** “The Shot Heard Round New York” was an organized protest in opposition to New York State’s Secure Ammunition and Firearms Enforcement (SAFE) Act. The protest involved gun owners gathering at gun clubs around the state and firing a single shot at noon. In Genesee County, the protest occurred at the Northwoods Sportsman Club on Gulf Road in LeRoy.
- **January 18, 2014:** Over 100 gun rights advocates protested the SAFE Act at the New York State Police barracks in the Town of Batavia. The protest followed comments made by Governor Cuomo that were perceived as dismissive of the protesters’ concerns.
- **April 8, 2017:** About 40 members from Citizens against Collins, GLOW Progressives, Le Roy Voices for Change, Metro Justice, and Stronger Together WNY gathered to protest “Coffee with Collins.” This was a fundraiser held by Congressman Chris Collins at Miss Batavia Diner in the City of Batavia, in which tickets to the event were \$55 each. The protesters expressed frustration over their attempts to meet with the Congressman to discuss various issues and his lack of interest in holding an open town hall meeting. They perceived the fundraiser as an example of “pay to play.”

6.1.5 Probability of Future Occurrences

Due to their unpredictability and spontaneous nature, civil unrest events are quite difficult to predict. However, when they do occur, these types of man-made hazards can be quite disruptive and difficult to control. For Genesee County, it remains possible that the planning area could experience future occurrences of civil unrest incidents, including marches, protests, demonstrations, and gatherings.

In Chapter 20, the identified hazards of concern for Genesee County were ranked. 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 civil unrest events in the County is considered “rare”.

Climate Change Projections

Climate change can have a direct impact on civil unrest by impacting a large quantity of people in the community and even a region. The increase in severity and frequency of natural hazard events due to climate change has the potential to result in civil unrest, protests, and even cause panic during natural disaster events. Because climate change factors will continue to increase with global warming and emissions, civil unrest will likely increase due to the climate stressors and impacts felt by the entire group. Socially vulnerable populations and underserved communities are more vulnerable to climate change due to medical needs and lack of resources to respond to natural hazards. These groups may be at high risk for civil unrest as a response to climate stressors on their daily lives.

6.1.6 Cascading Impacts on Other Hazards

Civil unrest has the potential to impact and exacerbate other human-caused hazard events identified in this plan. For example, civil unrest can lead to various criminal activities such as looting, burglary, arson, car theft, and more. These activities not only pose immediate threats to public safety but can also strain emergency services and disrupt community lifelines.



6.2 VULNERABILITY AND IMPACT ASSESSMENT

To understand risk, a community must evaluate exposed or vulnerable assets within the identified hazard area. For the civil unrest hazard, all of Genesee County has been identified as the hazard area. Therefore, all assets in the County (population, structures, critical facilities, and lifelines) as described in the County Profile (Chapter 3) are vulnerable to civil unrest. Overall, potential losses of civil unrest are difficult to quantify due to the many variables and human elements.

6.2.1 Life, Health, and Safety

Overall Population

The entire County is considered vulnerable to this hazard. Potential losses from civil unrest incidents include human health and life and property resources. Civil disorder incidents can lead to injury and/or death for both the involved persons and innocent bystanders. If a civil disturbance turns violent, it can lead to injury and/or death for personnel responding to the incident. The number of people exposed to a civil disturbance depends on population density. Increases in population or hosting of major political, economic, or social events could increase the likelihood and severity of a civil unrest incident.

Socially Vulnerable Population

Civil unrest events can disproportionately impact socially vulnerable or socially disadvantaged populations. These populations include low-income individuals, racial and ethnic minorities, the elderly, persons with disabilities, and others who are marginalized or have fewer resources.

- **Access to Services:** During civil unrest, public services such as healthcare, transportation, and law enforcement may be disrupted. Socially vulnerable populations often rely more on these services. For instance, if medical facilities are overwhelmed or inaccessible, individuals with chronic health issues may suffer disproportionately.
- **Economic Impact:** Civil unrest often leads to temporary business closures or disruptions in the local economy. Low-income individuals and families are less likely to have savings or alternative income sources, making them particularly vulnerable to economic instability caused by civil unrest. This can lead to job losses, reduced access to essential goods, and heightened economic strain.
- **Food and Housing Security:** Socially vulnerable populations, including those experiencing food insecurity or homelessness, may face even greater challenges during unrest. Grocery stores or food pantries may close or experience shortages, while unstable housing situations may be exacerbated by increased tension and potential displacement.
- **Law Enforcement and Safety:** Socially vulnerable populations may face greater risks of violence, both from civil unrest itself and from law enforcement responses. For instance, racial and ethnic minorities may be more likely to experience excessive force or discriminatory treatment in high-tension situations. Furthermore, individuals without strong social networks may find it harder to ensure their personal safety.
- **Psychological Impacts:** Vulnerable populations, particularly those already dealing with stressors like poverty, health issues, or discrimination, are likely to experience heightened psychological distress during times of unrest. The trauma from witnessing or experiencing violence, uncertainty about the future, and disruption of daily life can lead to long-term mental health challenges.



- **Social Fragmentation:** Civil unrest can deepen pre-existing divisions in the community, further isolating socially vulnerable populations. Marginalized groups may become scapegoats or targets during periods of unrest, increasing their social exclusion and vulnerability.

6.2.2 General Building Stock

The general building stock of Genesee County may be damaged or destroyed during a civil unrest incident. Depending on the scale of the incident, damage could range from broken windows to destruction of major pieces of infrastructure.

6.2.3 Community Lifelines and Other Critical Facilities

Critical facilities may be targets of civil unrest disturbances. Chapter 3, County Profile, summarizes the number and types of critical facilities in Genesee County. Disruptions to critical facilities may have cascading secondary effects such as power outages and utility failure. Because critical facilities are vulnerable to civil unrest and may serve as focal points during a protest, these facilities must be protected during incidents.

6.2.4 Economy

Civil unrest incidents can have negative economic and social effects on Genesee County as a whole. Economic conditions could be adversely affected, depending on the duration and extent of cleanup efforts and any associated investigations. For example, an incident at the Darien Lake theme park would likely result in a temporary closure of the park, resulting in significant economic loss. Some incidents may target the business sector, impacting the economy of the municipality where the incident occurs. For this assessment, all of Genesee County's economy is exposed to the effects of civil unrest incidents.

6.2.5 Natural, Historic and Cultural Resources

Natural Resources

Civil unrest can lead to physical damage to parks, forests, waterways, and recreational areas due to vandalism, littering, or fires. Genesee County's natural attractions, like the Iroquois National Wildlife Refuge or Darien Lake State Park, might be vulnerable if unrest spills over into public spaces. Large gatherings or protests can result in pollution from litter or chemical runoff (e.g., tear gas, fire retardants). These pollutants can damage local ecosystems, affect water quality, or harm wildlife habitats. Civil unrest could divert public attention and funding from ongoing environmental protection and conservation efforts. Projects designed to preserve the County's natural resources might face delays or cutbacks, impacting long-term environmental sustainability.

Historic Resources

Genesee County is home to various historic sites, such as the Holland Land Office Museum, which holds significance in the County's history. During civil unrest, historic landmarks and monuments could be vandalized or damaged, either intentionally or as collateral damage. Graffiti, arson, and other forms of destruction can undermine the preservation of these sites. If unrest leads to the destruction of historic landmarks, it can erode a community's sense of identity and continuity. Historic sites represent the cultural heritage of a region, and their loss can disconnect future generations from the past. Civil unrest often discourages tourism, which is important for the local



economy. Reduced foot traffic to historic sites or cultural landmarks can lead to a decrease in revenue, undermining efforts to maintain and promote these resources.

Cultural

Museums, libraries, theaters, and other cultural institutions might face temporary closures due to civil unrest, either because of security concerns or physical damage. In Genesee County, places like the Batavia Muckdogs' Dwyer Stadium or the Genesee County History Department could be affected if unrest disrupts community life. Public art installations, murals, and memorials can be at risk of defacement or destruction. Civil unrest might lead to the targeting of certain symbols or structures that are seen as representing authority or specific ideologies, putting public art in vulnerable positions.

Civil unrest can create an environment of fear or instability, causing local cultural practices, rituals, and celebrations to be disrupted. This can have long-term consequences for community cohesion and the preservation of intangible cultural heritage. Genesee County's cultural life relies heavily on community involvement and shared values. Civil unrest can erode trust within the community, leading to the fragmentation of groups and a weakening of social bonds, especially in the cultural sphere.

Other cultural events, such as community festivals, performances, and other events celebrating the County's heritage can be impacted. For example, annual festivals and events may be postponed, reducing opportunities for cultural exchange and community engagement.

6.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure the establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

6.3.1 Potential or Planned Development

Future development within the planning area could see impacts from civil unrest incidents. Increases in development across Genesee County could increase the impacts observed from civil unrest incidents.

6.3.2 Projected Changes in Population

According to the 2020 Census, the population of the County has increased by approximately 2.85 percent since 2010. Population projections from Cornell University reveal the County's population is anticipated to continue decreasing. The population is projected to decline to 56,077 persons in 2030 and to 54,128 by 2040 (Cornell University 2018). Civil unrest has the potential to impact a population by increasing vulnerability through large public events such as public spaces, concerts, schooling, and more. Further mitigation and planning mechanisms for safety and emergency personnel on how to prevent and respond to civil unrest should be implemented within the County to combat these impacts on residents.



6.3.3 Climate Change

Although it is unknown the amount of impact climate change will have on the severity and frequency of civil unrest events, it can be assumed that climate change can have a negative impact, as it increases civil unrest and can cause panic through natural disasters, which may leave a community more vulnerable to incidents.

6.3.4 Changes Since the 2019 HMP

Overall, the County's vulnerability has not changed since the 2019 HMP, and the entire County will continue to be exposed and vulnerable to civil unrest events.

DRAFT



7. DAM FAILURE

7.1 HAZARD PROFILE

7.1.1 Hazard Description

A dam is an artificial barrier allowing storage of water, wastewater, or liquid-borne materials for many reasons (flood control, human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation, or pollution control). Many dams fulfill a combination of these stated functions (Association of State Dam Safety Officials n.d.). Water stored behind a dam represents potential energy that can endanger life and property located downstream.

The risks associated with dams must always be minimized through proper maintenance and management. This includes conducting safety inspections, performing technical reviews for proposed new dams, monitoring and enforcing dam safety criteria, and ensuring emergency preparedness. These activities are overseen and tracked by the New York State Department of Environmental Conservation (NYSDEC) (NYSDEC n.d.).

Man-made dams can be classified according to the type of construction material used; methods applied in construction, slope, or cross-section of the dam; how a dam resists forces of water pressure behind it; means used to control seepage; and occasionally, the purpose of the dam. Materials used for the construction of dams include earth, rock, tailings from mining or milling, concrete, masonry, steel, timber, miscellaneous materials (plastic or rubber), and any combination of these materials (Association of State Dam Safety Officials n.d.). Dams are built for power production, agriculture, water supply, recreation, and flood protection. Dam failure is any malfunction or abnormality outside of the design that adversely affects a dam's primary function of impounding water and potentially leads to a sudden, rapid, and uncontrolled release of water (USSD 2023).

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.

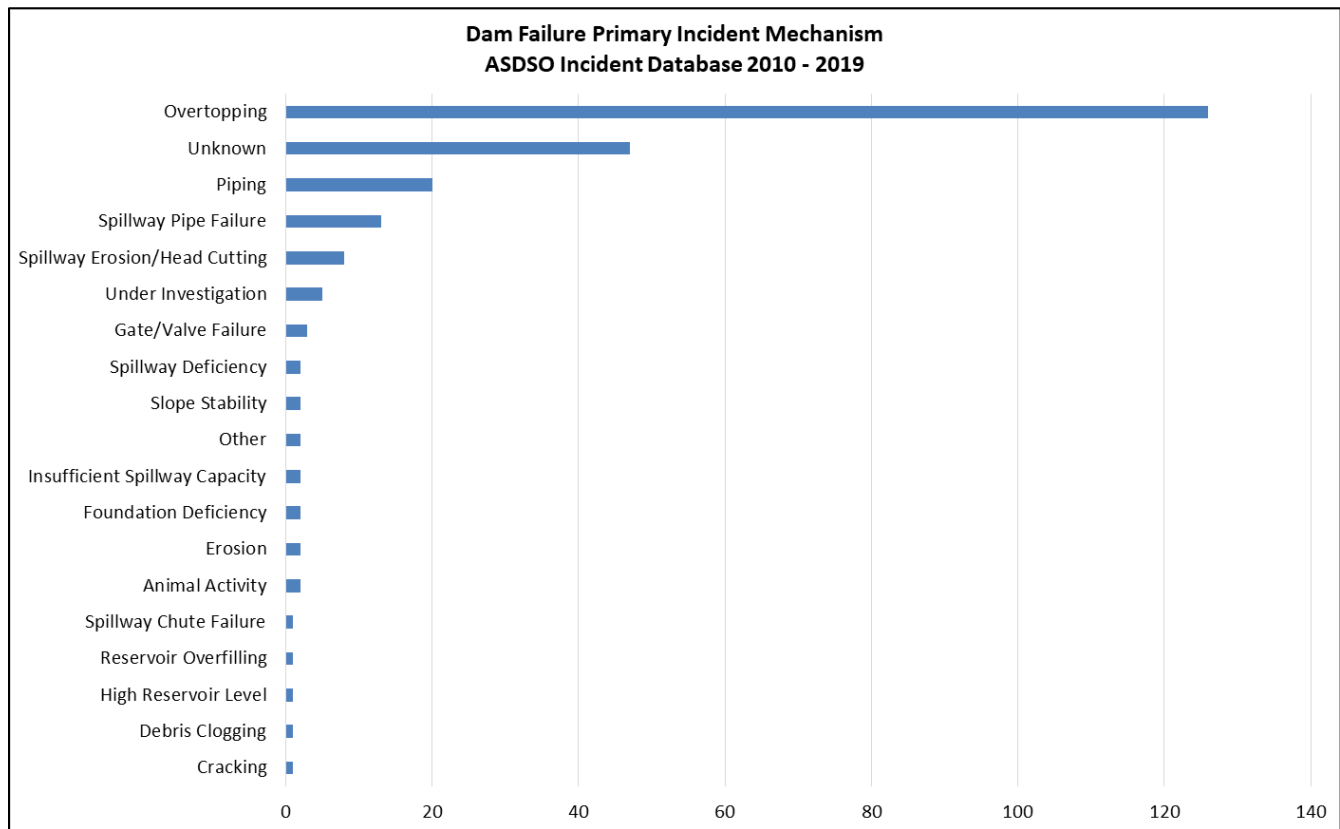
Dams typically fail when spillway capacity is inadequate and excess flow overtops the dam or when internal erosion (piping) through the dam or foundation occurs. Complete failure occurs if internal erosion or overtopping results in a complete structural breach, releasing a high-velocity wall of debris-filled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

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

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



Figure 7-1. Dam Failure Causes



Source: Association of State Dam Safety Officials 2023

Regulatory Oversight of Dams

The potential for catastrophic flooding caused by dam failures led to the passage of the National Dam Safety Act (Public Law 92-367). For 30 years, the National Dam Safety Program (NDSP) has protected Americans from dam failure. NDSP is a partnership among the states, federal agencies, and other stakeholders that encourages individual and community responsibility for dam safety. Under FEMA's leadership, state assistance funds have allowed all 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. Grant assistance from FEMA provides support for the improvement of dam safety programs that regulate most dams in the United States (FEMA 2023).

New York State has a comprehensive dam safety program through which three governmental authorities regulate dam safety throughout the state:

8. New York State Department of Environmental Conservation (NYSDEC) – Environmental Conservation Law (ECL) Article 15, Part 673
9. Federal Energy Regulatory Commission (FERC) – 18 *Code of Federal Regulations* (CFR) 12.22-24
10. U.S. Army Corps of Engineers (USACE) – EP 1110-2-13, Dam Safety Preparedness

Dam safety emergency action plans (EAP) are formal dam failure procedures written by the dam owner/operator. EAPs are site-specific plans and relate only to the facility's procedures to prevent/mitigate the occurrence of a catastrophic dam failure. USACE is responsible for submitting an EAP for each dam it owns, operates, and



maintains. EAPs for hydroelectric dams fall under the purview of FERC, and NYSDEC regulates dam safety and EAPs for all dams in NYS (USACE 2014).

New York State Department of Environmental Conservation

NYSDEC's 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 U.S. Army Corps of Engineers (USACE) and are operated and maintained by NYSDEC (in some cases with local municipal partners).

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.).

U.S. Army Corps of Engineers Dam Safety Program

USACE is responsible for safety inspections of some federal and non-federal 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).

Federal Energy Regulatory Commission Dam Safety Program

The 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 and, more recently, homeland security. FERC staff inspect hydroelectric projects on an unscheduled basis to investigate the following (FERC 2023):

11. Potential dam safety problems
12. Complaints about constructing and operating a project
13. Safety concerns related to natural disasters
14. 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).

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).

7.1.2 Location

In the State of New York, there are 400 high hazard dams and 700 intermediate hazard dams that pose a threat to jurisdictions in the event of a dam failure. There are 60 dams present throughout Genesee County. Most of these dams pose little risk; however, eight are listed as intermediate hazards. Table 7-1 is a complete list of dams in Genesee County listed as intermediate to low hazard. There are no dams in Genesee County listed as high hazard (NYS GIS Data 2024).

Table 7-2. Dams in Genesee County

Dam	Dam Height (ft.)	Hazard Ranking	Municipality	Date Last Inspected
Intermediate Hazard Dams				
Byron Pond Dam	10	Intermediate Hazard	Byron (T)	March 30, 2023
Darien Lake Fun Country Dam	15	Intermediate Hazard	Darien (T)	November 15, 2022
Jericoh Lake Dam	11	Intermediate Hazard	Darien (T)	May 12, 2022
Darien Lake State Park Dam	12	Intermediate Hazard	Darien (T)	May 12, 2022
U S Gypsum Reservoir Dam	20	Intermediate Hazard	Oakfield (T)	March 30, 2023
Leroy Reservoir Dam	17	Intermediate Hazard	Pavilion (T)	September 23, 2022
Horseshoe Lake Dam	20	Intermediate Hazard	Stafford (T)	March 3, 2020
Oatka Creek Dam	15	Intermediate Hazard	Le Roy (V)	September 23, 2022
Low Hazard Dams				
Batavia Municipal Dam	8	Low Hazard	Batavia (C)	September 28, 1977
Kloback Pond Dam	15	Low Hazard	Alabama (T)	December 31, 1901
Oak Orchard Education Center Dam	5	Low Hazard	Alabama (T)	-
Iroquois National Refuge Dam Site #3	10	Low Hazard	Alabama (T)	December 31, 1901
Long Marsh Dam	11	Low Hazard	Alabama (T)	December 31, 1901
John White Farm Pond Dam	7	Low Hazard	Alabama (T)	January 31, 2003
Tonawanda Wildlife Management Area Dam	-	Low Hazard	Alabama (T)	March 31, 2008
Tonnewanta Marsh Dam & Dikes	4	Low Hazard	Alexander (T)	June 16, 1986
Genesee-Wyoming Co Boces Dam	4	Low Hazard	Batavia (T)	December 31, 1901
Edwin Chase Pond Dam	7	Low Hazard	Batavia (T)	February 19, 2003
Edwin Chase Farm Pond Dam	9	Low Hazard	Batavia (T)	February 19, 2003
Clemens & Diegelman Dam	8	Low Hazard	Batavia (T)	February 19, 2003



Dam	Dam Height (ft.)	Hazard Ranking	Municipality	Date Last Inspected
Horace Blood Marsh Dam	5	Low Hazard	Batavia (T)	January 31, 2003
A Foltman Marsh Dam	6	Low Hazard	Bergen (T)	February 24, 2003
Pixley & Sons Dam	11	Low Hazard	Bethany (T)	February 19, 2003
Robert Barie Dam	13	Low Hazard	Bethany (T)	February 24, 2003
Edgar Hollwedel Dam	13	Low Hazard	Bethany (T)	February 24, 2003
Kistner Main Pond Dam	13	Low Hazard	Bethany (T)	-
John Gardner Wildlife Dam	7	Low Hazard	Bethany (T)	February 19, 2003
Kistner Settlement Pond Dam	28	Low Hazard	Bethany (T)	-
Harold Sheppard Dam	17	Low Hazard	Byron (T)	February 19, 2003
Wiktorski Marsh Dam	4	Low Hazard	Darien (T)	January 31, 2003
Covert Dam	7	Low Hazard	Darien (T)	January 31, 2003
Marquart Dam	7	Low Hazard	Darien (T)	January 31, 2003
Reynolds Wildlife Dam	5	Low Hazard	Darien (T)	January 31, 2003
Tuchols Wildlife Pond Dam #2	8	Low Hazard	Darien (T)	January 31, 2003
Tuchols Wildlife Pond Dam #1	7	Low Hazard	Darien (T)	January 31, 2002
Kurnik Pond Dam	9	Low Hazard	Darien (T)	January 31, 2003
Kubik Wildlife Dam	10	Low Hazard	Darien (T)	September 17, 1969
Weaver Wildlife Dam	4	Low Hazard	Darien (T)	January 31, 2003
Muskrat Marsh Dam	6	Low Hazard	Elba (T)	February 19, 2003
Rv Call Pond Dam	6	Low Hazard	Elba (T)	February 19, 2003
Zambito Bros Pond Dam	10	Low Hazard	Elba (T)	February 19, 2003
Call Farm Pond Dam	12	Low Hazard	Elba (T)	February 19, 2003
Donald Woodward Dam	8	Low Hazard	Le Roy (T)	February 24, 2003
J Charmichael Farm Pond Dam	9	Low Hazard	Oakfield (T)	June 3, 2021
Charles Dickens Dam	10	Low Hazard	Oakfield (T)	February 19, 2003
Oakfield Rod & Gun Club Dam	8	Low Hazard	Oakfield (T)	January 31, 2003
Norman Gray Dam	7	Low Hazard Dam	Oakfield (T)	January 31, 2003
Indian Falls Lake Dam	17	Low Hazard	Pembroke (T)	August 10, 2009
Crawford Dam	9	Low Hazard	Pembroke (T)	July 30, 2002
Smith Dam	6	Low Hazard	Pembroke (T)	January 31, 2003
Barley Wildlife Dam	9	Low Hazard	Pembroke (T)	January 31, 2003
Eddy Robertson Dam	7	Low Hazard	Stafford (T)	February 19, 2003



Dam	Dam Height (ft.)	Hazard Ranking	Municipality	Date Last Inspected
Wendell Call Pond Dam	12	Low Hazard	Stafford (T)	February 19, 2003
George Oderkirk Pond Dam	11	Low Hazard	Stafford (T)	February 19, 2003
Godfreys Pond Dam	20	Low Hazard	Stafford (T)	May 19, 2008
LI Mulcahy Jr Pond Dam	7	Low Hazard	Stafford (T)	February 19, 2003
Byron Meadows Golf Course Dam	14	Low Hazard	Stafford (T)	February 19, 2003
Oatka Creek Dam	12	Low Hazard	Le Roy (V)	December 31, 1901

Source: (NYS GIS Data 2024)

Note: "-" indicates not listed.

7.1.3 Extent

Dam failures can occur suddenly, without warning, and under normal operating conditions. This is referred to as a "sunny-day" failure. Dam failures may also occur during a large storm event. Significant rainfall can quickly inundate an area and cause floodwaters to overwhelm a reservoir. If the spillway of the dam cannot safely pass the resulting flows, water will begin flowing in areas not designed for such flows, and a failure may occur. New York has undergone significant property damage, including damage or loss of dams, bridges, roads, and buildings as a result of storm events and dam failures.

According to the NYSDEC Division of Water Bureau of Flood Protection and Dam Safety, the hazard classification of a dam is assigned according to the potential impacts of a dam failure under 6 NYCRR Part 673.3 (NYSDEC date unknown) (N.Y. Comp. Codes R. & Regs. Tit. 6 § 673.3 - General provisions n.d.). Dams are classified in terms of potential for downstream damage if the dam were to fail. These hazard classifications are identified and defined below (NYSDEC n.d.):

- **Low Hazard (Class A)** is a dam located 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 would result in no probable loss of human life. Losses are principally limited to the owner's property.
- **Intermediate Hazard (Class B)** is a dam located in an area where failure may damage isolated homes, main highways, and minor railroads; interrupt the use of relatively important public utilities; and/or cause significant economic loss or serious environmental damage. Failure or misoperation would 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)** is a dam located 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) would occur as a direct result of dam failure.
- **Negligible or No Hazard (Class D)** is a dam that has been breached or removed, has failed, or otherwise no longer materially impounds waters, or a dam that was planned but never constructed. Class "D" dams are defunct dams posing negligible or no hazard. NYSDEC may retain pertinent records regarding such dams.



7.1.4 Previous Occurrences

Federal Emergency Management Agency (FEMA) Major Disaster and Emergency Declarations

Between 1954 and 2024, Genesee County was not included in any major disaster (DR) or emergency (EM) declarations for dam failure-related events (FEMA 2024).

U.S Department of Agriculture (USDA) Declarations

The 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. Between 2017 and 2024, Genesee County was not included in any dam failure-related agricultural disaster declarations (USDA 2024).

Previous Events

There are no known dam failure events that impacted Genesee County between January 2017 and December 2024. For events prior to 2019, refer to the 2019 Genesee County HMP.

7.1.5 Probability of Future Occurrences

Information on previous dam failure occurrences in the County was used to calculate the probability of future occurrence of such events. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 20, the identified hazards of concern for Genesee County were ranked. Based on historical records and input from the Steering Committee, the probability of occurrence for dam failure in the County is considered “occasional”.

Dam and levee failure events are infrequent and usually coincide with events that cause them, such as earthquakes, landslides, and excessive rainfall and snowmelt. As noted, dam failures typically occur in the State of New York as a result of heavy rains or other precipitation. There is a “residual risk” associated with dams. Residual risk is the risk that remains after all mitigation actions and risk reduction actions have been completed. However, with regard to dams, FEMA defines it as the risk that remains after decisions related to a specific dam safety issue are made and prudent actions have been taken to address this risk (FEMA 2018).

No dam failure events have been recorded in Genesee County.

Climate Change Projections

Climate change can impact stored water systems as increased rainfall accumulations can cause dams to overtop. Dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. Increased precipitation may result in overtopping, as the hydrographs are based off historical events (USBR 2003). The overtopping of a dam can lead to areas downstream to become inundated with flood waters that would otherwise be safely stored.

Warming atmospheric temperatures influence ocean temperatures. With the projected increase in temperature, it is anticipated that ocean waters will increase as well due to thermal expansion, which is where ocean temperatures rise, and water expands. Additionally, this is causing ice sheets and glaciers to melt, further increasing the level of the ocean's waters. Sea level rise can impact the amount of water in the County's lakes and rivers, impacting not only bordering communities, but inland communities as well (NASA n.d.).



7.1.6 Cascading Impacts on Other Hazards

Dam failure can cause severe downstream flooding, depending on the magnitude of the failure. Other potential secondary hazards of dam or levee failure are landslides around the reservoir perimeter, bank erosion on the rivers, and destruction of downstream habitat. Dam failures can occur because of structural failures, such as progressive erosion of an embankment or overtopping and breaching by a severe flood (FEMA 2013).

Cascading impacts of flooding and dam failure inundation may also include exposure to pathogens such as mold. 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. The degree of impact will vary and is not strictly measurable. Mold spores can grow in as short a period as 24–48 hours in wet and damaged areas of buildings that have not been properly cleaned. Very small mold spores can easily be inhaled, creating the potential for allergic reactions, asthma episodes, and other respiratory problems. Buildings should be properly cleaned and dried out to prevent mold growth (CDC 2015).

Additionally, floodwaters following a dam failure can be contaminated by pollutants such as sewage, human and animal feces, pesticides, fertilizers, oil, asbestos, and rusting building materials. Common public health risks associated with flood events also include:

15. Unsafe food
16. Contaminated drinking and washing water and poor sanitation
17. Mosquitos and animals
18. Carbon monoxide poisoning
19. Secondary hazards associated with re-entering/cleaning flooded structures
20. Mental stress and fatigue

7.2 VULNERABILITY AND IMPACT ASSESSMENT

To understand risk, a community must evaluate assets exposed to and vulnerable to the identified hazard. The dam failure hazard is significant for Genesee County due to the presence of 60 dams within its boundaries. While none of these dams are classified as high hazard, eight are classified as intermediate hazard by NYSDEC (Table 7-1). Dam failure events are frequently associated with other natural hazard events such as earthquakes, landslides, or severe weather, which limits their predictability and compounds the hazard.

7.2.1 Life, Health, and Safety

Overall Population

Warning time for dam failure is often limited. These events are frequently associated with other natural hazard events such as earthquakes, landslides, or severe weather, limiting their predictability and compounding the hazard. Populations without adequate warning of the event are highly vulnerable to this hazard. Direct and indirect losses associated with dam failures include injury and loss of life, damage to structures and infrastructure, agricultural losses, utility failure (power outages), and stress on community resources.

As mentioned in the earlier sections, dam failure can cause, in the most extreme case, loss of life and extensive property damage, or in the least extreme case, no loss of life or significant property damage. Dam failure can cause persons to become displaced if flooding of structures occurs. Dam failure may mimic flood events, depending on



the size of the dam reservoir and breach. Understanding the potential outcomes of flooding for each dam in Genesee County would require intensive hydraulic modeling.

Additionally, the impact of dam failure on life, health, and safety is dependent on several factors such as the area that the dam is protecting, the location, capacity, structural integrity, and the proximity of structures, infrastructure, and critical facilities downstream of the failure inundation area. According to the U.S. Army Corps of Engineers, the level of impact that a dam failure would have can be predicted based on the hazard potential classification (USACE 2020). Table 7-2 outlines the recommended hazard classifications.

Table 7-3. United States Army Corps of Engineers Hazard Potential Classification for Dams

Urgency of Action	Actions for Dams in This Class	Characteristics of This Class
Very High (1)	Take immediate action to avoid failure. Communicate findings to sponsor, local, state, Federal, Tribal officials, and the public. Implement interim risk reduction measures, including operational restrictions. Ensure the emergency action plan is current and functionally tested for initiating events. Conduct heightened monitoring and evaluation. Expedite investigations to support remediation using all resources and funding necessary. Initiate intensive management and situation reports.	Critically near failure: The Dam is almost certain to fail under normal operations to within a few years without intervention. OR Extremely high incremental risk: Combination of life or economic consequences with the likelihood of failure is very high. USACE considered this level of life risk to be unacceptable except in extraordinary circumstances.
High (2)	Communicate findings to sponsor, local, state, Federal, Tribal officials, and the public. Implement interim risk reduction measures, including operational restrictions as warranted. Ensure the emergency action plan is current and functionally tested for initiating events. Conduct heightened monitoring and evaluation. Expedite confirmation of classification. Give very high priority to investigations to support the need for remediation.	Failure initiation foreseen: For confirmed and unconfirmed dam safety issues, failure could begin during normal operations or be initiated as a consequence of an event. The likelihood of failure from one of these occurrences, before remediation, is too high to assure public safety. OR Very high incremental risk: the combination of life or economic consequences with the likelihood of failure is high. USACE considered this level of life risk to be unacceptable except in extraordinary circumstances.
Moderate (3)	Communicate findings to sponsor, local, state, Federal, Tribal officials, and the public. Implement interim risk reduction measures, including operational restrictions as warranted. Ensure the emergency action plan is current and functionally tested for initiating events. Conduct heightened monitoring and evaluation. Prioritize investigations to support the need for remediation informed by consequences and other factors.	Moderate to high incremental risk: For confirmed and unconfirmed dam safety issues, the combination of life, economic, or environmental consequences with the likelihood of failure is moderate. USACE considers this level of life risk to be unacceptable except in unusual circumstances.
Low (4)	Communicate findings to sponsor, local, state, Federal, Tribal officials, and the public. Conduct elevated monitoring and evaluation. Give normal priority to investigations to validate classification, but do not plan for risk reduction measures at this time.	Low incremental risk: For confirmed and unconfirmed dam safety issues, the combination of life, economic, or environmental consequences with the likelihood of failure is low to very low and the dam may not meet all essential USACE guidelines. USACE considers this level of life risk



Urgency of Action	Actions for Dams in This Class	Characteristics of This Class
		to be in the range of tolerability, but the dam does not meet all essential USACE guidelines.
Normal (5)	Continue routine dam safety activities and normal operations, maintenance, monitoring, and evaluation.	Very low incremental risk: The combination of life, economic, or environmental consequences with the likelihood of failure is low to very low and the dam meets all essential USACE guidelines. USACE considers this level of life-safety risk to be tolerable.

Source: USACE 2020

Socially Vulnerable Population

The entire population residing within a dam failure inundation zone is considered exposed and vulnerable. Of the population exposed, the most vulnerable include the economically disadvantaged and the population over the age of 65. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on the net economic impact on their family. The population over the age of 65 is also highly vulnerable because they are more likely to seek or need medical attention that may not be available because of isolation during a flood event, and they may have more difficulty evacuating.

Older adults and young children may be more at risk due to limited mobility, communication, and dependency on others. Cascading impacts of dam failure, such as mold, may affect those who have compromised immune systems (EPA 2023).

7.2.2 General Building Stock

Buildings located downstream of a dam are at risk of damage should there be a failure. Downstream inundation areas were not available to quantify any potential losses to structures. Properties located closest to the dam inundation area have the greatest potential to experience the largest, most destructive surge of water. The overall impact of flooding damages caused by dam failure will vary depending on the depth of flooding and velocity of the surge.

Dam failures can cause severe downstream flooding and may transport large volumes of sediment and debris, depending on the magnitude of the event. Widespread damage to buildings and infrastructure affected by an event would result in large costs to repair these locations. In addition to physical damage costs, businesses can be closed while flood waters retreat, and utilities are returned to a functioning state.

7.2.3 Community Lifelines and Other Critical Facilities

All buildings and infrastructure located in the dam failure inundation zone are considered exposed and vulnerable. Property located closest to the dam inundation zone has the greatest potential to experience the largest, most destructive surge of water. All transportation infrastructures within the dam failure inundation zone are vulnerable to damage. Damage to these infrastructures could cut off evacuation routes, limit emergency access, and create isolation issues. Utilities such as overhead power, cable, and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation zones.



7.2.4 Economy

The impact of a dam failure on the economy and estimated dollar losses are difficult to measure. Dam failures can exert direct and indirect effects on society. Direct costs include actual damage sustained by buildings, property, and infrastructure. Direct building losses are estimated costs to repair or replace damaged buildings. Losses to Genesee County's building inventory would impact Genesee County's tax base and the local economy. Indirect costs, such as clean-up costs, business interruption, loss of tax revenues, reduced property values, and loss of productivity, are difficult to measure.

7.2.5 Natural, Historic, and Cultural Resources

Natural

Dams themselves can block fish from migrating, which affects some fish spawning sites. In some cases, large dams have been responsible for the extinction of fish and other marine life. Dams also tend to lead to a buildup of sediment, which can block necessary nutrients from reaching downstream, which may contribute to erosion of the riverbed/bank. Dam failure can drastically impact an environment, especially when an ecosystem and habitats are destroyed from water flooding after a dam fixture breaks (International Rivers n.d.).

The environment is vulnerable to several risks in the event of a dam failure. Water releases from dams usually contain very little suspended sediment; this can lead to scouring of riverbeds and banks. 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 subsequent rush of water downstream can rapidly increase flow rate and turbidity of streams and rivers in minor dam failures or overwhelm terrestrial habitat with floodwaters in severe dam failure events.

Dam failures can often result in the release of hazardous materials, either 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. After the flood waters subside, contaminated and flood-damaged building materials and contents must be properly disposed. Contaminated sediment must be removed from buildings, yards, and properties.

Dam failures may result in significant water quality and debris disposal issues. Flood waters can back up sanitary sewer systems and inundate wastewater treatment plants, causing raw sewage to contaminate residential and commercial buildings and the flooding waterway. The contents of unsecured containers of oil, fertilizers, pesticides, and other chemicals get added to flood waters. Water supplies and wastewater treatment could be offline for weeks. After the flood waters subside, contaminated and flood damaged building materials and contents must be disposed of properly.

Historic

Dam failures may impact historic resources by the resulting flood waters. Historic buildings and structures, sites, monuments, districts, and historic documents are often irreplaceable, and may become damaged or destroyed in the flood waters following a dam failure. The loss of these resources is all the more painful as residents rely on the presence of these resources to reinforce connections with neighbors and the larger community, and to seek comfort in the aftermath of a disaster. Historic structures may be more prone to greater damage than more recent infrastructure due to updated building codes and standards.



Cultural

Cultural resources include “movable heritage,” such as collections of artifacts, statuary, artwork, and important documents or repositories. These resources are housed in libraries, museums, archives, historical repositories, or historic properties. Flood waters following a dam failure creates the largest risk to these resources. Like historic resources, residents may rely on the presence of cultural resources to reinforce connections with neighbors and the larger community, and to seek comfort in the aftermath of a disaster.

7.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that may affect vulnerability can assist in planning for future development and ensure the establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

7.3.1 Potential or Planned Development

Any areas of growth could be potentially impacted by a dam failure event if the structures are located within the flood protection area and mitigation measures are not considered. Therefore, it is the intention of the County and all participating municipalities to discourage development in vulnerable areas or to encourage higher regulatory standards at the local level.

Any areas of growth could be potentially impacted by a dam or levee failure event if the structures are located within the flood protection area and mitigation measures are not considered. Therefore, it is the intention of the County and all participating municipalities to discourage development in vulnerable areas or to encourage higher regulatory standards at the local level. Due to the sensitive nature of dam locations and downstream inundation zones, an assessment to determine the proximity of these new development sites to potential dam inundation cannot be performed at this time.

7.3.2 Projected Changes in Population

According to the 2020 Census, the population of the County has increased by approximately 1.26 percent since 2010. Population projections from Cornell University reveal the County's population is anticipated to continue decreasing. The population is projected to decline to 56,077 persons in 2030 and to 54,128 by 2040 (Cornell University 2018). Any changes in the density of population can impact the number of persons exposed to the probable maximum flood inundation hazard areas. Higher density can not only create issues for local residents during evacuation of a dam failure event but can also have an effect on commuters that travel into and out of the County for work. Refer to Chapter 3 (County Profile) for more information about population trends in the County.

7.3.3 Climate Change

As discussed above, most studies project that the State of New York will see an increase in average annual precipitation. An increase in annual precipitation amounts in the region, primarily in the form of heavy rainfalls, will have the potential to increase the potential for dam failure events. Increases in precipitation may stress the dam wall. Further, existing dams may not be able to retain and manage increases in water flow from more frequent, heavy rainfall events. Heavy rainfalls may result in more frequent overtopping of these dams and flooding of the County's assets in adjacent inundation areas. However, the probable maximum flood used to design each dam may be able to accommodate changes in climate.



7.3.4 Change of Vulnerability Since 2019 HMP

Overall, Genesee County remains potentially vulnerable to the dam failure hazard. To estimate losses to these elements in the future, dam inundation areas and depths of flooding may be used to analyze exposure and generate depth grids. Hazus could be implemented to estimate potential losses for Genesee County.

DRAFT



8. DROUGHT

8.1 HAZARD PROFILE

8.1.1 Hazard Description

Drought is a period characterized by long durations of below-normal precipitation. Drought is a temporary irregularity and differs from aridity since the latter is restricted to low-rainfall regions and is a permanent feature of climate. Drought conditions occur in virtually all climatic zones, yet its characteristics vary significantly from one region to another, since it is relative to the normal precipitation in that region. Drought can affect agriculture, water supply, aquatic ecology, wildlife, and plant life.

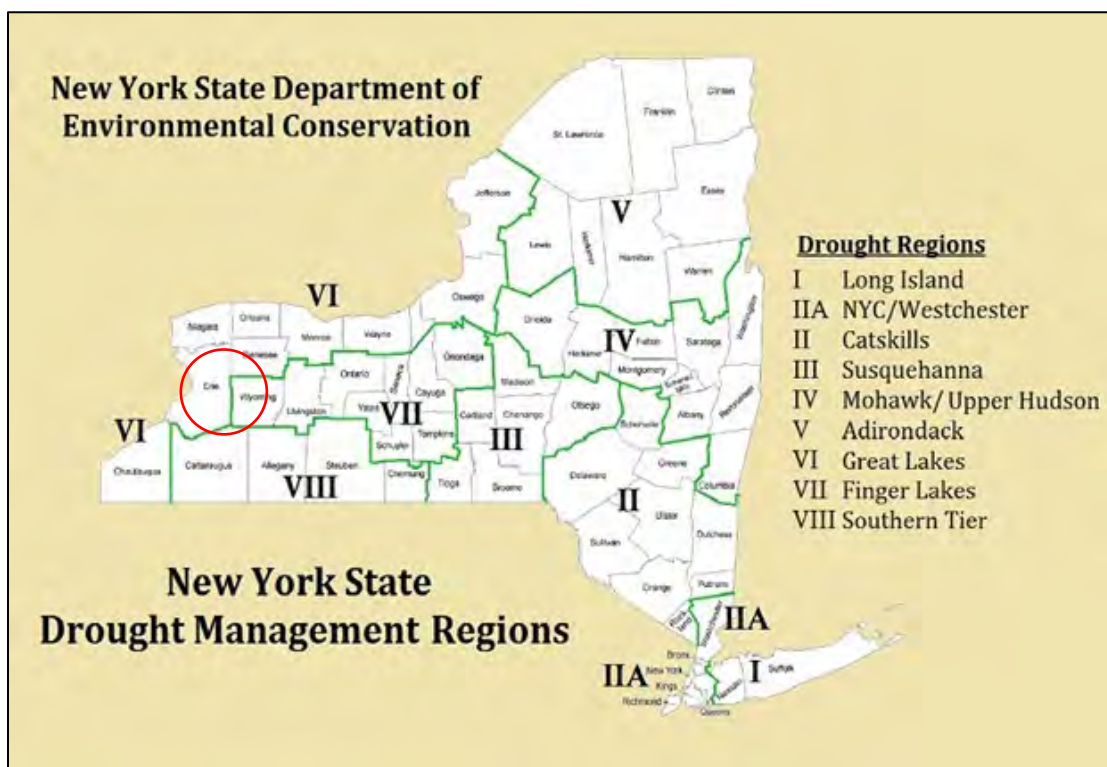
There are four different ways that drought can be defined or grouped (NDMC 2013):

- **Meteorological** drought is a measure of the departure of precipitation from normal. It is defined solely by the relative degree of dryness. Due to climatic differences, what might be considered a drought in one location of the country may not be a drought in another location.
- **Agricultural** drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced groundwater or reservoir levels, and other parameters. It occurs when there is not enough water available for a particular crop to grow at a particular time. Agricultural drought is defined in terms of soil moisture deficiencies relative to water demands of plant life, primarily crops.
- **Hydrological** drought is associated with the effects of periods of precipitation shortfalls (including snowfall) on surface or subsurface water supply. It occurs when these water supplies are below normal. It is related to the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
- **Socioeconomic** drought is associated with the supply and demand of an economic good with elements of meteorological, hydrological, and agricultural drought. This differs from the aforementioned types of droughts because its occurrence depends on the time and space processes of supply and demand to identify or classify droughts. The supply of many economic goods depends on the weather (for example water, forage, food grains, fish, and hydroelectric power). Socioeconomic drought occurs when the demand for an economic good exceeds the supply as a result of a weather-related shortfall in the water supply.

8.1.2 Location

New York State is divided into nine drought management regions based roughly on drainage basins and county lines. New York State Department of Environmental Conservation (NYSDEC) monitors precipitation, lake and reservoir levels, stream flow, and groundwater levels every month within each region, and more frequently during periods of drought. NYSDEC uses these data to assess the condition within each region, which can range from “normal” to “drought disaster” (NYSDEC 2022). Genesee County is identified as NYSDEC Drought Management Region 6, the Great Lakes (Figure 8-1).

Figure 8-1. NYSDEC Drought Management Regions of New York State



Source: NYSDEC 2022

Note: The red circle indicates the approximate location of Genesee County.

When a drought occurs, the agricultural industry is most at risk in terms of economic impact and damage. According to the 2022 Census of Agriculture, Genesee County is home to 435 farms, covering 176,887 acres. Only 2 percent of that land is irrigated (USDA 2022).

8.1.3 Extent

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts (NOAA 2022). The NYSDEC and the New York State Drought Management Task Force identify droughts in the following four stages (NYSDEC n.d.):

- **Normal** is considered the standard moisture soil levels found throughout New York State.
- **Drought Watch** is the first stage of drought. This stage is declared by the NYSDEC and is intended to give advance notice of a developing drought. At this stage, the general public is urged to conserve water. Public water purveyors and industries are urged to update and begin to implement individual drought contingency plans.
- **Drought Warning** is the second stage of drought. This stage is also declared by the NYSDEC and is a notice of impending and imminent severe drought conditions. A warning declaration includes stepping up public awareness and increasing voluntary conservation. Public water supply purveyors and industries are urged to continue to implement local drought contingency plans. Federal, state, and local water resources agencies are notified to prepare for emergency response measures.



- **Drought Emergency** is the third stage of drought. This stage is declared by the NYSDHSES, based upon the recommendation of the Task Force. It is a notice of existing severe and persistent drought conditions. An emergency declaration is a notice for local water resources agencies to mandate conservation and implement other emergency response measures. A continuing and worsening drought emergency may result in the New York State governor declaring a drought disaster. It is a notice of the most severe and persistent drought conditions. At this stage, a significant proportion of communities in the impacted area likely are unable to respond adequately.

New York State uses two methodologies to determine the different drought stages. The most commonly used indicator is the Palmer Drought Severity Index (PDSI), which is primarily based on soil conditions. Soil with decreased moisture content is the first indicator of an overall moisture deficit. These values range from -1 to +5 with positive values indicating wetter conditions and negative values representing drier conditions. The second methodology applied in New York State, created by the NYSDEC, is known as the State Drought Index (SDI) (NYSDEC n.d.).

Table 8-1 lists the PDSI classifications. According to the National Integrated Drought Information System (NIDIS), the PDSI was developed in 1965, and indicates prolonged and abnormal moisture deficiency or excess. It uses temperature and precipitation data to calculate water supply and demand, incorporates soil moisture, and is considered most effective for assessing moisture conditions in unirrigated cropland. The PDSI primarily indicates long-term drought and has been used extensively as a signal to initiate drought relief (NIDIS 2015).

Table 8-1. PDSI Classifications

Palmer Classifications	
4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.5 to -0.99	Incipient dry spell
-1.0 to -1.99	Mild drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

Source: NDMC 2013

The SDI evaluates drought conditions more comprehensively by determining whether numerous indicators reach dire thresholds. It compares the following four parameters to historical or “normal” values to evaluate drought conditions: stream flows, precipitation, lake and reservoir storage levels, and groundwater levels. The State’s Drought Management Task Force uses those factors along with water use, duration of the dry period, and season to assess drought within different areas of the State. The data acquired are compared to critical threshold values to indicate a normal or changeable drought condition. The indicators are weighted regionally to reflect the different circumstances within each drought management region (NYSDEC n.d.). Table 8-2 lists the SDI index range within the Normal stage and the three drought stages.



Table 8-2. SDI Range of Values

Drought Stage	Drought Index Range
Normal	100 to 150
Watch	75 to 100
Warning	50 to 70
Emergency	0 to 50

Source: NYS DHSES 2014

8.1.4 Previous Occurrences

Federal Emergency Management Agency (FEMA) Major Disaster and Emergency Declarations

Between 1954 and 2024, Genesee County was not included in any major disaster (DR) or emergency (EM) declarations for drought-related events (FEMA 2024).

U.S. Department of Agriculture (USDA) Declarations

The 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. Between 2017 and 2024, Genesee County was not included in the any USDA-designated agricultural disasters that included or may have included losses due to drought (USDA 2024).

Previous Events

Known hazard events that impacted Genesee County between January 2017 and December 2024 are discussed in Table 8-3. For events prior to 2017, refer to the 2017 Genesee County HMP.

Table 8-3. Drought Events in Genesee County (2017 to 2024)

Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
December 27, 2016–February 13, 2017	N/A	N/A	Countywide	The U.S. Drought Monitor reported a moderate drought across the County and abnormally dry conditions.
July 17–September 10, 2018	N/A	N/A	Countywide	The U.S. Drought Monitor reported a moderate drought across the County and abnormally dry conditions.
March 30–May 3, 2021	N/A	N/A	Countywide	The U.S. Drought Monitor reported a moderate drought across the entire County.
July 12–September 5, 2022	N/A	N/A	Countywide	The U.S. Drought Monitor reported a moderate drought across the County and abnormally dry conditions.



Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
June 13–August 14, 2023	N/A	N/A	Countywide	The U.S. Drought Monitor reported a moderate drought across the County and abnormally dry conditions.
August 22–October 2, 2023	N/A	N/A	Countywide	The U.S. Drought Monitor reported a moderate drought across the County and abnormally dry conditions.
October 3–December 12, 2023	N/A	N/A	Countywide	The U.S. Drought Monitor reported a severe drought across the County and abnormally dry conditions.
December 13, 2023–January 15, 2024	N/A	N/A	Countywide	The U.S. Drought Monitor reported a severe drought across the County and abnormally dry conditions.
January 16, 2024–April 15, 2024	N/A	N/A	Countywide	The U.S. Drought Monitor reported abnormally dry conditions across the County.
October 8, 2024–December 31, 2024	N/A	N/A	Countywide	The U.S. Drought Monitor reported abnormally dry conditions across the County.

Sources: NOAA-NCEI 2024; USDA 2024; U.S. Drought Monitor 2024

8.1.5 Probability of Future Occurrences

Based upon risk factors and past occurrences, it is likely that droughts will occur across New York State and Genesee County in the future. In addition, as temperatures increase (see climate change impacts), the probability of future droughts will likely increase as well. Therefore, it is likely that droughts will occur in the State and County of varied severity in the future.

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

The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 20, the identified hazards of concern for Genesee County were ranked. Based on historical records and input from the Steering Committee, the probability of occurrence for drought in the County is considered “occasional.”

Climate Change Projections

Overall, from 1895 to 2022, the state has become slightly wetter but has continued to experience short-term droughts, especially in the summer months. Long, multiyear droughts are not expected to increase in New York State, however, short-term seasonal droughts lasting weeks or months could increase, especially in the summer. This is because of precipitation falling in more intense bursts with longer dry spells in between as well as higher temperatures in the summer, causing more water to evaporate. Reduced snow cover may also play a role, as soils dry out sooner because snow is melting earlier. The potential increase of short-term droughts may impact water systems with less storage, resulting in water shortages, which will impact crop yields (Stevens & Lamie 2024).



In the Great Lakes region, the number of days per year with maximum temperatures over 90°F to 95°F and the total number of heat waves per year are expected to increase into the 2070s (Stevens & Lamie 2024). These increases in temperature have the potential to worsen drought conditions, elevating the risk of adverse impacts for the County.

8.1.6 Cascading Impacts on Other Hazards

Drought may trigger wildfires in the County. As discussed in earlier sections, drought can lead to increasing temperatures and evaporation of moisture, which are ideal dry conditions for wildfire events to occur. Dry, hot, and windy weather, along with dry vegetation, increases the risk of wildfires when exposed to sparks from human activities or natural events, such as lightning (National Integrated Drought Information System 2020). Refer to Chapter 19 for more information on wildfire risk. Drought may also increase the spread of certain insect infestations due to droughts changing the environment.

8.2 VULNERABILITY AND IMPACT ASSESSMENT

Drought is a significant concern to Genesee County, mainly due to its impact on public health, natural resources, and agriculture. Estimated losses are difficult to quantify; however, drought events can impact Genesee County's population and economy. Assets at particular risk would include areas used for agricultural purposes (farms and cropland). In addition, water supply resources could be impacted by extended periods of below-average rain. Particularly susceptible to the drought hazard and cascading impacts are populations vulnerable because of age, health conditions, limited ability to mobilize to shelter, and limited accessibility to cooling and medical resources.

Potential drought impacts are agricultural, hydrologic, and socioeconomic. The sequence of these impacts highlights the differences among them. When a drought begins, the agricultural sector is typically the first to be affected due to its heavy dependence on stored soil water. During dry periods, soil water can deplete quickly. If precipitation deficiencies continue, people who depend on other sources of water will begin to feel the impacts of the shortage. Those who rely on surface water (for example, reservoirs and lakes) and subsurface water (for example, groundwater) are usually the last to be affected. A short-term drought that persists for 3 to 6 months may have little impact on these sectors, depending on characteristics of the hydrologic system and intensity of water use (NYS DHSES 2014).

Because agriculture and related sectors, including forestry, fisheries, and water activities, rely on surface and subsurface water supplies, they are vulnerable to numerous economic impacts. Droughts often result in loss of crop yields and livestock production, increased issues with insect infestations, increased forest diseases, and reduced growth. Forest and grass fires also increase substantially during extended drought periods, posing higher levels of risk to human and wildlife populations as well as to property (NYS DHSES 2014).

Loss of income is another factor in assessing the impacts of drought. Examples of income loss include reduced income for farmers and for retailers and others who provide goods and services to farmers. The recreation and tourism industries may also undergo a loss of income because of increased costs of food, energy, and other products as supplies decrease. Some local shortages of certain goods trigger the need to import goods from outside the affected region. Reduced water supply affects the use of rivers and other water bodies. Hydropower production may also be impacted by drought (NYS DHSES 2014).

Environmental losses from drought include damage to plant and animal species, wildfire habitat, and air and water quality; forest and grass fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some impacts may be short-term, and others may linger for longer periods of time. If changes in climate intensify, environmental impacts and losses may become more significant. Wildfire habitat may be degraded through loss of wetlands, lakes,



and vegetation. Increased soil erosion can lead to a more permanent loss of the biological productivity of landscapes. However, quantifying environmental losses is difficult (NYS DHSES 2014).

Social impacts primarily involve public safety, health, conflicts among water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. Many economic and environmental effects induce social impacts as well (NYS DHSES 2014).

To understand risk, a community must evaluate what assets are exposed or vulnerable within the identified hazard area. Regarding the drought hazard, all of Genesee County has been identified as the hazard area. Therefore, all assets within the County (population, structures, critical facilities, and lifelines), as described in the County Profile (Chapter 3), are vulnerable to a drought.

8.2.1 Life, Health, and Safety

Overall Population

The entire population of Genesee County is vulnerable to drought events. Drought conditions can affect people's health and safety, including health problems related to low water flows and poor water quality, and health problems related to dust. Droughts also can lead to loss of human life (NDMC 2013). Other possible impacts on health from drought include increased recreational risks; effects on air quality; diminished living conditions related to energy, air quality, and sanitation and hygiene; compromised food and nutrition; and increased incidence of illness and disease. Health implications of drought are numerous. Some drought-related health effects are short-term, while others can be long-term (CDC 2012).

As previously stated, drought conditions can cause shortages of water for human consumption. Droughts can also lead to reduced local firefighting capabilities. The drought hazard is a concern for Genesee County because some of the rural populations within the County rely upon private water supply from local groundwater resources.

Socially Vulnerable Population

Socially vulnerable populations are susceptible to drought events based on factors including their physical and financial ability to react or respond during a drought. Vulnerable populations include homeless persons, elderly people (over 65 years old), low income or linguistically isolated populations, people with life-threatening illnesses, and residents who may have limited access to water as is. The population over the age of 65 may require extra water supplies or need assistance to obtain water and is more likely to need medical attention.

The municipalities with the highest and lowest numbers and percentages in each social vulnerability category are listed in Table 8-4. The Social Vulnerability Index (SVI) for Genesee County is identified as "very low."

Table 8-4. Municipalities With Highest and Lowest Socially Vulnerable Populations

Category	Municipality Highest in Category		Municipality Lowest in Category	
	Number	Percent	Number	Percent
Population Over 65	Batavia (C)	Tonawanda (R)	Alexander (V)	Alexander (V)
	3,274	49.2%	51	10.1%
Population Under 5	Batavia (C)	Alexander (T)	Oakfield (T)	Oakfield (T)
	548	14.1	11	0.8%
	Batavia (C)	Tonawanda (R)	-	-



Category	Municipality Highest in Category		Municipality Lowest in Category	
	Number	Percent	Number	Percent
Non-English-Speaking Population	133	10.7%	-	-
Population With Disability	Batavia (C)	Tonawanda (R)	Alexander (V)	Le Roy (T)
	2,950	31%	55	8.7%
Population Below Poverty Level	Batavia (C)	Oakfield (T)	Elba (V)	Darien (T)
	1,991	24.9%	28	1.3%

Source: U.S. Census Bureau 2022 ACS Vulnerable Population Totals

8.2.2 General Building Stock

A drought event is not expected to directly affect any structures. However, droughts contribute to conditions conducive to wildfires and reduce firefighting capabilities. Risk to life and property is greatest where forested areas adjoin urbanized areas (high-density residential, commercial, and industrial).

8.2.3 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 water used for firefighting 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. Reduced replenishment of groundwater also 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 stream flows are lowest.

8.2.4 Economy

Drought can produce a range of impacts that span many economic sectors and can reach beyond an area experiencing physical drought. Water withdrawals are used for drinking water and for use in the commercial/industrial/mining sectors and power generation.

When drought conditions persist with little to no relief, water restrictions may be put into place by local or state governments. These restrictions may include placing limitations on lawn watering, car washing services, or any other commercial or recreational outdoor use of water supplies (NC State University 2013).

Industries that rely on water for business (e.g., landscaping businesses) could be impacted the most. Although most businesses will still be operational, they may be impacted aesthetically. These aesthetic impacts are most significant within the recreation and tourism industry. Moreover, droughts in another area can impact the food supply and price of food for residents of the County.

Drought causes many economic impacts on agriculture and related sectors (forestry, fisheries, and waterborne activities). In addition to losses in yields in crop and livestock production, drought is associated with increased insect



infestations, plant diseases, and wind erosion. Drought can lead to other losses across multiple sectors, including decreased income for farmers and reduced business for retailers and other providers of goods and services to the agricultural community. This leads to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue. Prices for food, energy, and other products may also increase as supplies decrease. Economic impacts that could occur from drought include the following (NYS DHSES 2023):

- Decreased land prices
- Loss to industries directly dependent on agricultural production (machinery, fertilizer manufacturers, food processors, dairies, etc.)
- Unemployment from drought-related declines in production
- Strain on financial institutions (foreclosures, more credit risk, capital shortfalls)
- Revenue losses to federal, state, and local governments (from reduced tax base)
- Reduction of economic development
- Fewer agricultural producers (due to bankruptcies, new occupations)
- Rural population loss

The primary direct economic impact of drought in the agricultural sector is crop failure and pasture losses. These costs are often passed on to consumers through increased prices or they may be offset through government disaster assistance programs. Indirect impacts of drought in the sector can include reduced supplies to associated industries, such as food processors, and reduced demand for input such as fertilizer and farm labor.

Based on the 2022 Census of Agriculture, 435 farms were present in Genesee County, encompassing 176,887 acres of total farmland. The average farm size was 407 acres. Genesee County farms had a total market value of products sold of over \$359 million. Table 8-5 lists the acreage of agricultural land exposed to the drought hazard (USDA 2022).

Table 8-5. Agricultural Land in Genesee County in 2022

Number of Farms	Land in Farms (acres)	Total Cropland (acres)	Total Pastureland (acres)	Acres Irrigated
435	176,887	141,047	6,241	4,364

Source: USDA 2022

Loss of income is another factor in assessing the impacts of drought. Examples of income loss include reduced income for farmers and for retailers and others who provide goods and services to farmers. The recreation and tourism industries may undergo a loss of income because of increased costs of food, energy, and other products as supplies decrease. Some local shortages of certain goods trigger the need to import goods from outside the affected region. Reduced water supply affects the use of rivers and other water bodies. Hydropower production may be impacted (NYS DHSES 2023).

8.2.5 Natural, Historic, and Cultural Resources

Natural

Drought can impact the environment because it can trigger wildfires, increase insect infestations, and exacerbate the spread of disease (CDC 2020). 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 because they are dependent on steady water levels and soil moisture availability to sustain growth (NIDIS 2023).

Historic

The primary impacts on historic resources from drought would be an increased risk of wildfires, which could threaten these assets, and impacts on structural foundations from the shrink-swell cycle of expansive soils.

Cultural

The primary impacts on cultural resources from drought would be an increased risk of wildfires, which could threaten these assets, and impacts on structural foundations from the shrink-swell cycle of expansive soils.

Droughts may impact the traditional and customary practices of indigenous persons, who rely on healthy terrestrial ecosystems. These practices may include the collection of plants, animals, and minerals and other practices. Drought and its secondary impacts on watersheds and nearshore waters may impair, diminish, or impede the exercise of traditional and customary practices.

Drought impacts on agriculture in the County could also negatively impact events associated with agriculture, including farmers' markets and harvest festivals.

8.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

8.3.1 Potential or Planned Development

Chapter 3 identifies areas targeted for future growth and development across the County. Any areas of growth located in the County could be susceptible to drought. Specific areas of recent and new development are indicated in tabular form and/or on the hazard maps included in Volume II (Jurisdictional Annexes) of this plan.

8.3.2 Projected Changes in Population

Genesee County has experienced an increase in its population since 2010. According to the U.S. Census Bureau, the County's population increased by 1.26 percent between 2010 and 2020 (U.S. Census Bureau 2023). Cornell University's Program on Applied Demographics projects Genesee County will have a population of 57,176 by 2030 and 54,153 by 2040 (Cornell University 2018). Any changes in the distribution of the population can impact the source of water resources required to sustain the user demand of each household, agricultural operation, and business operation.

8.3.3 Climate Change

The State of New York is expected to observe a rise in average annual temperatures, fostering a heightened frequency of drought. Climate change exacerbates the likelihood and severity of drought events, prolonging their duration and intensifying their impact. Furthermore, it expedites the water cycle, resulting in consequential effects



such as soil desiccation, polar ice melt, and heightened frequency of extreme weather occurrences. 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).

8.3.4 Change in Vulnerability Since 2019 HMP

Overall, the County's vulnerability has not changed since the 2019 HMP, and the entire County will continue to be exposed and vulnerable to drought events.

DRAFT



9. EARTHQUAKE

9.1 HAZARD PROFILE

9.1.1 Hazard Description

An earthquake is the sudden movement of 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 manmade explosion (FEMA-NRI n.d.). Most earthquakes occur at the boundaries where the Earth's tectonic plates meet (faults); however, less than 10 percent of earthquakes occur within plate interiors. New York State is in an area where plate interior-related earthquakes occur. As plates continue to move and plate boundaries change over geologic time, weakened boundary regions become part of the interiors of the plates. These zones of weakness within the continents can cause earthquakes in response to stresses that originate at the edges of the plate or in the deeper crust (Shedlock and Pakiser 1997).

The location of an earthquake is commonly described by its focal depth and the geographic position of its epicenter. The focal depth of an earthquake is the depth from the Earth's surface to the region where an earthquake's energy originates (the focus or hypocenter). The epicenter of an earthquake is the point on the Earth's surface directly above the hypocenter (Shedlock and Pakiser 1997). Earthquakes usually occur without warning, and their effects can impact areas of great distance from the epicenter.

According to the U.S. Geological Society (USGS) Earthquake Hazards Program, an earthquake hazard is anything associated with an earthquake that may affect residents' normal activities (FEMA 2001). This includes surface faulting, ground shaking, landslides, liquefaction, tectonic deformation, tsunamis, and seiches. A description of each of these is provided below (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 20 kilometers.
- *Ground motion (shaking)*: The movement of the Earth's surface from earthquakes or explosions. Ground motion or shaking is produced by waves that are generated by sudden slip on a fault or sudden pressure at the explosive source and travel through the earth and along its surface.
- *Landslide*: A movement of surface material down a slope.
- *Liquefaction*: A process by which water-saturated sediment temporarily loses strength and acts as a fluid. This effect can be caused by earthquake shaking.
- *Tectonic Deformation*: A change in the original shape of a material due to stress and strain.
- *Tsunami*: A sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major submarine slides, or exploding volcanic islands.
- *Seiche*: The sloshing of a closed body of water from earthquake shaking.

9.1.2 Location

As noted in the 2019 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 (for example, hurricanes and floods) occur more frequently and because major hurricanes and floods have occurred more recently than a major earthquake event (NYS DHSES 2019). However, the potential for earthquakes exists across all of New York State



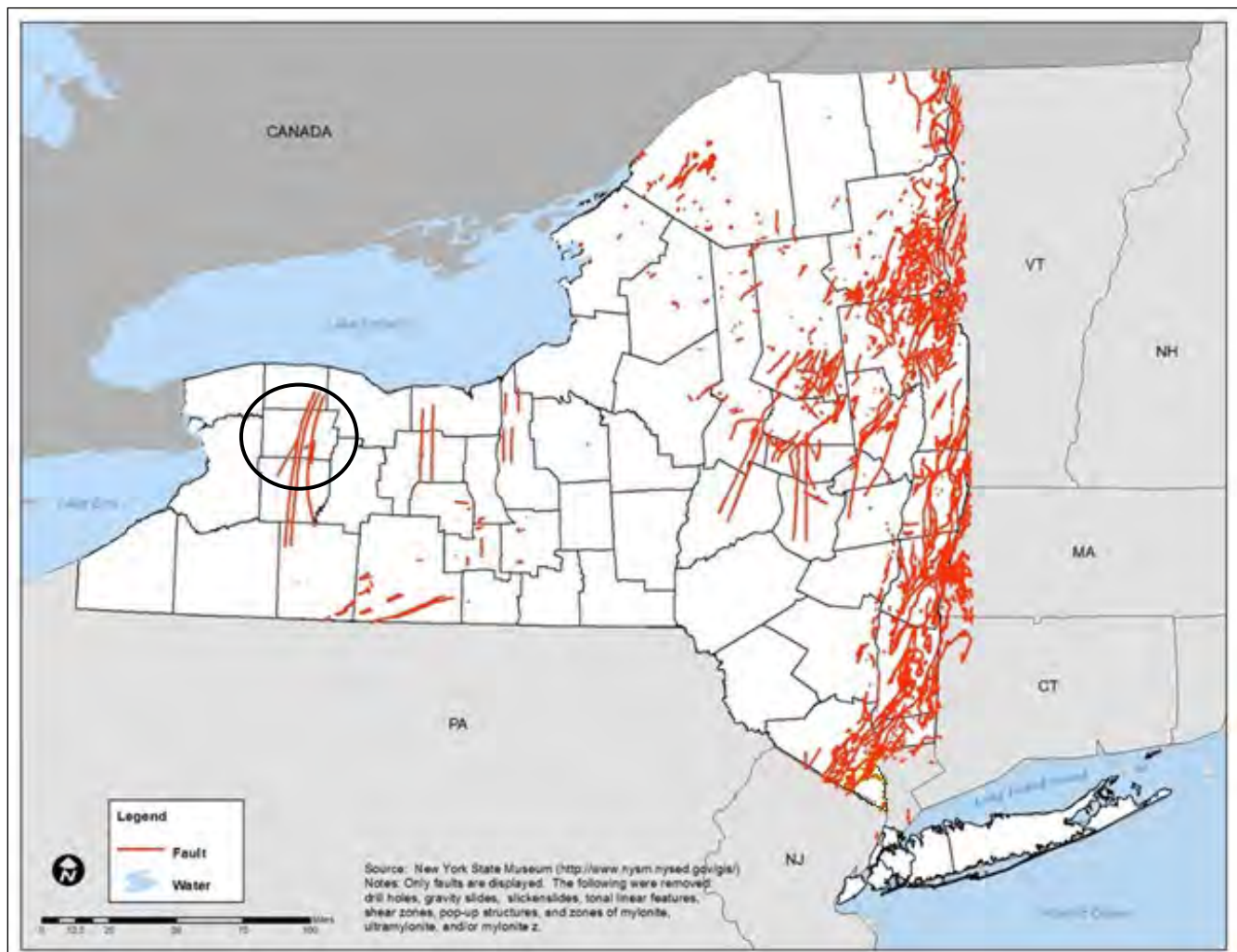
and the entire northeastern United States. The New York City Area Consortium for Earthquake Loss Mitigation (NYCEM) ranks New York State as having the third highest earthquake activity level east of the Mississippi River (Tantala 2003).

Three general regions in New York State have a higher seismic risk than other parts of the state. These regions are: (1) the north and northeast third of the state, which includes the North Country/Adirondack region and a portion of the greater Albany-Saratoga region; (2) the southeast corner, which includes the greater New York City area and western Long Island; and (3) the northwest corner, which includes Buffalo and its surrounding area. Overall, these three regions are the most seismically active areas of the state, with the north-northeast portion having the higher seismic risk, and the northwest corner of the state having the lower seismic risk (NYS DHSES 2014).

Fractures or fracture zones along with rocks on adjacent sides have broken and moved upward, downward, or horizontally are known as faults. Movement can take place at faults and cause an earthquake. The angle of the fault in respect to the surface and direction of slip are used to classify faults. Below are the different types of fault lines (USGS n.d.):

- *Normal Fault*: Where the block above the fault moves in a downward motion relative to the block below. This faulting occurs in response to extension and is commonly seen in Western United States Basins along the oceanic ridge system.
- *Reverse (thrust) Fault*: Where the block above the fault moves in an upward motion over the block below. This faulting occurs in areas of compression and is commonly seen in regions in which a tectonic plate is being subducted under another tectonic plate.
- *Strike-Slip Fault*: Where the two blocks slide past each other and can also be further characterized by a left-lateral strike-slip fault or a right-lateral strike-slip fault. An example of a right-lateral strike-slip fault would be the San Andreas Fault.

Figure 9-1. Faults in New York State



Source: New York State Museum 2023

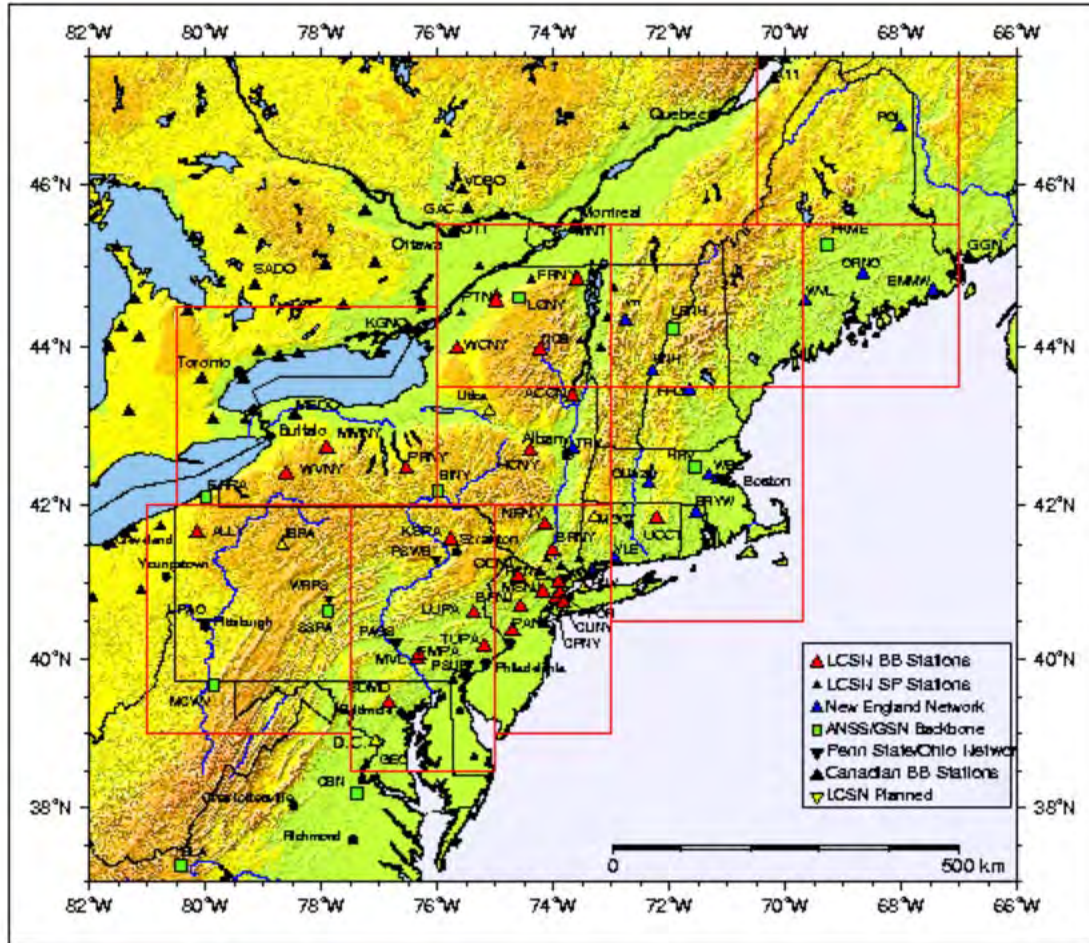
Note: Genesee County is located within the boldened, black circle.

The closest plate boundary to the East Coast is the Mid-Atlantic Ridge, which is approximately 2,000 miles east of New York. Over 200 million years ago, when the continent Pangaea rifted apart forming the Atlantic Ocean, the northeast coast of America was a plate boundary. Being at the plate boundary, many faults were formed in the region. Although these faults are geologically old and are contained in a passive margin, they act as pre-existing planes of weakness and concentrated strain. When a strain exceeds the strength of the ancient fault, it ruptures, causing an earthquake (NPS 2020).

The Lamont-Doherty Cooperative Seismographic Network (LCSN) monitors earthquakes that occur primarily in the northeastern United States. The goals of the monitoring project are to compile a complete earthquake catalog for this region, to assess the earthquake hazards, and to study the causes of the earthquakes in the region. The LCSN operates 40 seismographic stations in the following seven states: Connecticut, Delaware, Maryland, New Jersey, New York, Pennsylvania, and Vermont.

No seismographic stations are located in Genesee County; however, there are several within the vicinity of the County. Figure 9-2 shows the location of these stations in the eastern U.S. area (LCSN 2014).

Figure 9-2. Lamont-Doherty Seismic Station Locations in the New York State Area



Source: LCNS 2010

In addition to the Lamont-Doherty Seismic Stations, the USGS operates a global network of seismic stations to monitor seismic activity. While no seismic stations are located in New York State, nearby stations are positioned in State College, Pennsylvania, and Oak Ridge, Massachusetts. Figure 9-3 shows the locations of USGS seismic stations near New York State. (USGS 2024).

Figure 9-3. USGS Seismic Stations near New York State



Source: USGS 2015

Note: The red circle indicates the approximate location of Genesee County.

There have been multiple earthquakes originating outside New York's borders that have been felt within the state. These quakes have come from Quebec, Canada, and Massachusetts. According to the NYS HMP, such events are considered significant for hazard mitigation planning because they could produce damage within the state in certain situations.

9.1.3 Extent

An earthquake's magnitude and intensity are used to describe the severity and size of the event. Intensity describes the overall felt severity of shaking during the event, and magnitude describes the size at the focus of an earthquake. The earthquake's magnitude is a measure of the energy released at the source of the earthquake. Magnitude was formerly expressed by ratings on the Richter scale. It is now most commonly expressed using the moment magnitude (M_w) scale. This scale is based on the total moment release of the earthquake (the product of the distance a fault moved and the force required to move it). The scale is as follows:

- Great $M_w > 8$
- Major $M_w = 7.0 - 7.9$
- Strong $M_w = 6.0 - 6.9$
- Moderate $M_w = 5.0 - 5.9$
- Light $M_w = 4.0 - 4.9$



- Minor Mw = 3.0 – 3.9
- Micro Mw = 3.0 – 3.9

The most commonly used intensity scale is the Modified Mercalli Intensity (MMI) scale. Ratings of the scale, as well as the perceived shaking and damage potential for structures, are shown in Table 9-1. The MMI scale is generally represented visually using shake maps, which show the expected ground shaking at any given location produced by an earthquake with a specified magnitude and epicenter. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region. This shaking depends on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the Earth's crust. A USGS shake map shows the variation of ground shaking in a region immediately following significant earthquakes. Table 9-2 displays the MMI scale and its relationship to the areas peak ground acceleration.

Table 9-6. Modified Mercalli Intensity Scale

Mercalli Intensity	Shaking	Description
I	Not Felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing automobiles may rock slightly. Vibrations are similar to the passing of a truck. Duration estimated.
IV	Light	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 automobiles rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very Strong	Felt by all. 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	Felt by all. 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	Felt by all. 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	Felt by all. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: USGS 2014

Table 9-7. Modified Mercalli Intensity and Peak Ground Acceleration Equivalents

Modified Mercalli Intensity	Acceleration (%g) (PGA)	Perceived Shaking	Potential Damage
I	<.17	Not Felt	None
II	.17 – 1.4	Weak	None
III	.17 – 1.4	Weak	None



Modified Mercalli Intensity	Acceleration (%g) (PGA)	Perceived Shaking	Potential Damage
IV	1.4 – 3.9	Light	None
V	3.9 – 9.2	Moderate	Very Light
VI	9.2 – 18	Strong	Light
VII	18 – 34	Very Strong	Moderate
VIII	34 – 65	Severe	Moderate to Heavy
IX	65 – 124	Violent	Heavy
X	>124	Extreme	Very Heavy

Source: Freeman et al. (Purdue University) 2004

Note: PGA Peak Ground Acceleration

The ground experiences acceleration as it shakes during an earthquake. The peak ground acceleration (PGA) is a measure of how hard the earth shakes in a given geographic area. It is expressed as a percentage of the acceleration due to gravity (percent g). Horizontal and vertical PGA varies with soil or rock type. Earthquake hazard assessment involves estimating the annual probability that certain ground accelerations will be exceeded and then summing the annual probabilities over a period of interest (USGS 2019). Damage levels experienced in an earthquake vary with the intensity of ground shaking and with the seismic capacity of structures, as noted in Table 9-3. Figure 9-4 displays the 500-year PGA for Genesee County, revealing the event will not be felt. Horizontal and vertical PGA varies with soil or rock type.

Table 9-8. Damage Levels Experienced in Earthquakes

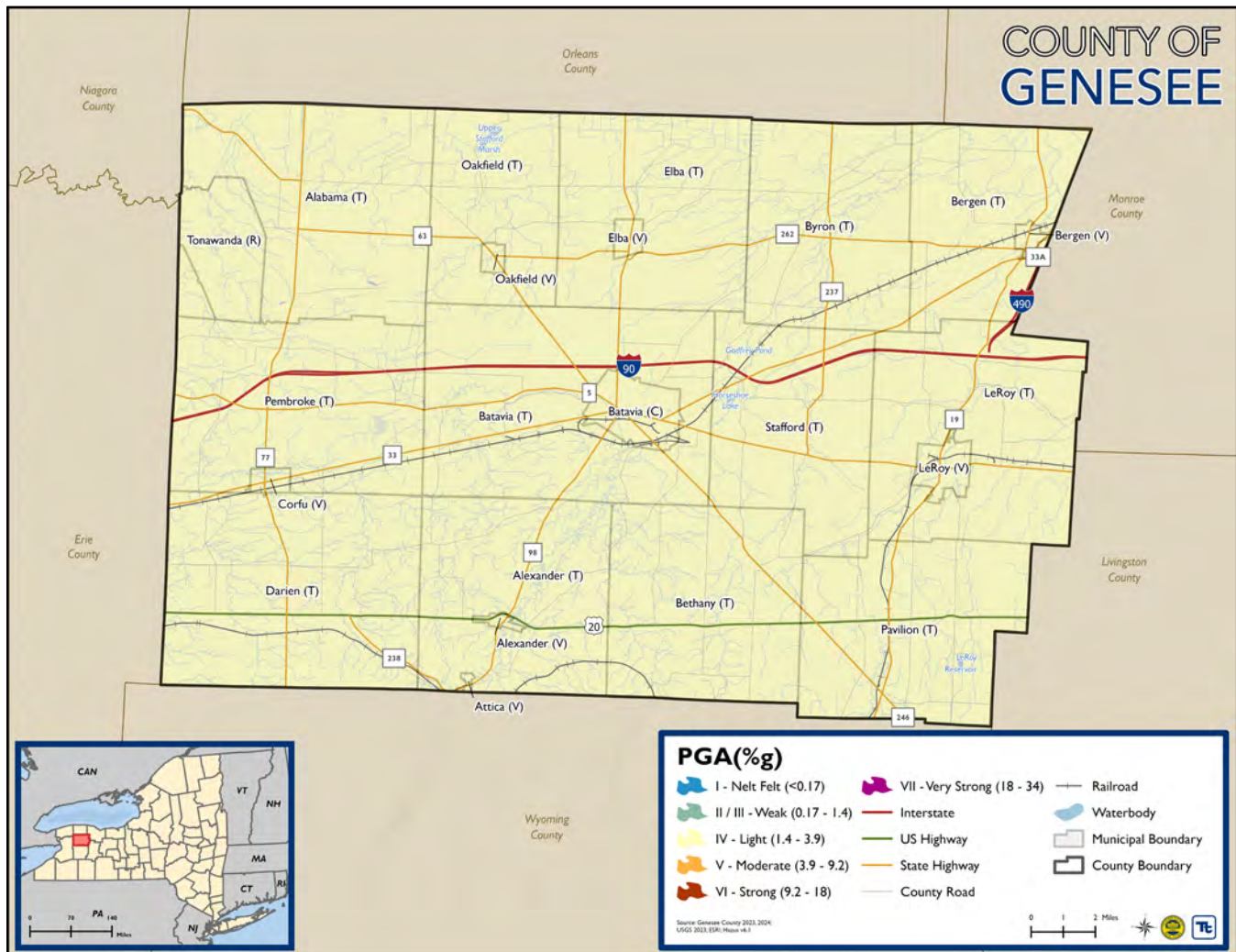
Ground Motion Percentage	Explanation of Damages
1–2%g	Motions are widely felt by people; hanging plants and lamps swing strongly, but damage levels, if any, are usually very low.
Below 10%g	Usually causes only slight damage, except in unusually vulnerable facilities.
10–20%g	May cause minor-to-moderate 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 cause higher levels of damage in many buildings, even those designed to resist seismic forces.

Source: USGS 2019

Note: %g Peak Ground Acceleration

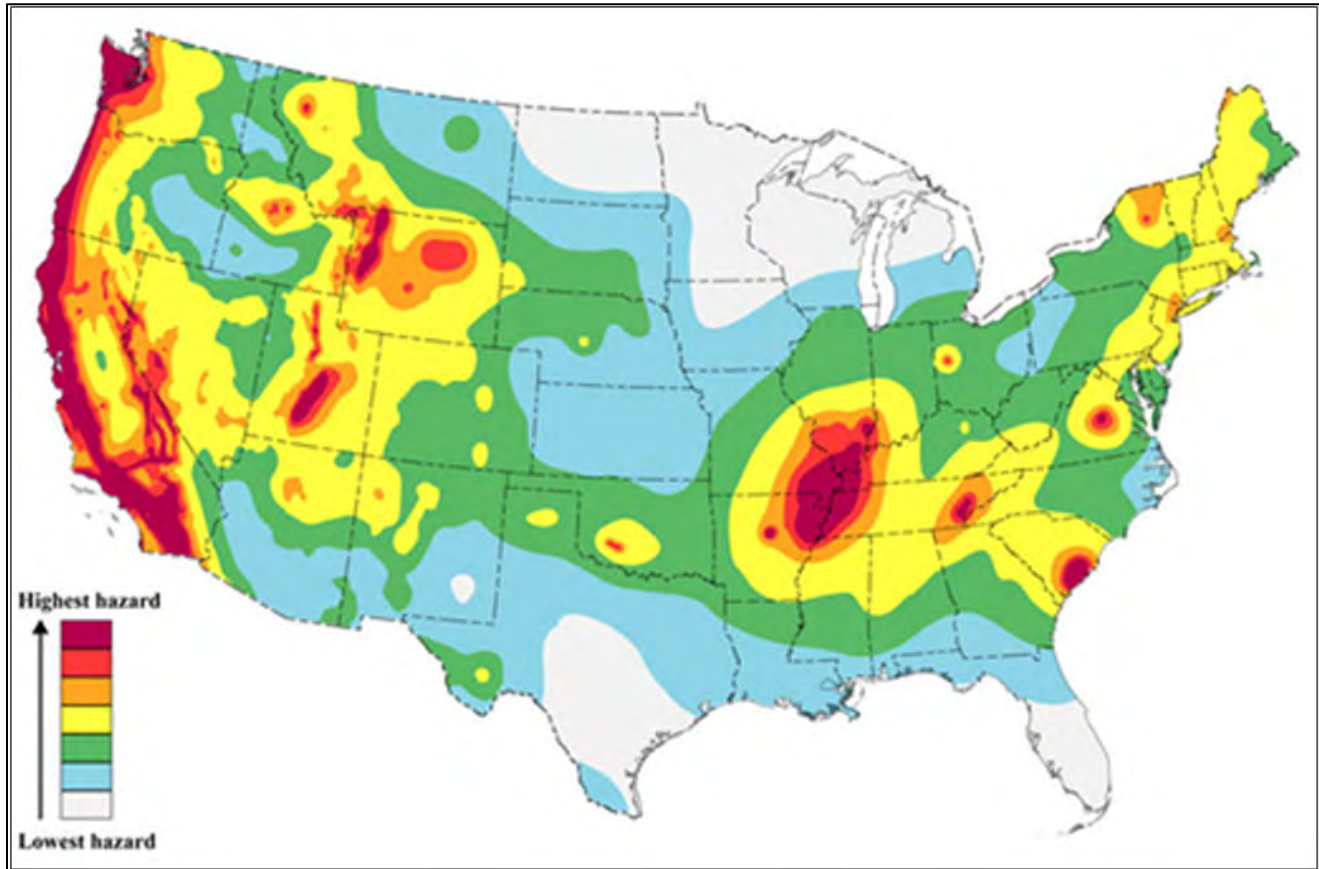


Figure 9-4. 500-Year Peak Ground Acceleration in Genesee County



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. New seismic, geologic, and geodetic information on earthquake rates and associated ground shaking were incorporated into these revised maps. Figure 9-5 illustrates the 2023 long-term NSHM of all 50 states and represents the best available data, as determined by the USGS (Earthquake Hazards Program 2024).

Figure 9-5. 2023 Long-Term National Seismic Hazard Map of All 50 States



Source: USGS 2024

The New York State Geological Survey conducted seismic shear-wave tests of the state's surficial geology (glacial deposits). Based on these test results, the surficial geologic materials of New York State were categorized according to the National Earthquake Hazard Reduction Program's (NEHRP) Soil Site Classifications (Table 9-4). The NEHRP developed five soil classifications defined by their shear-wave velocity that impact the severity of an earthquake. The soil classification system ranges from Class A to Class E, as noted in Table 9-4, where Class A represents hard rock that reduces ground motions from an earthquake and Class E represents soft soils that amplify and magnify ground shaking and increase building damage and losses. Class E soils include water-saturated mud and artificial fill. The strongest amplification of shaking due is expected for this soil type. Seismic waves travel faster through hard rock than through softer rock and sediments. As the waves pass from harder to softer rocks, the waves slow down, and 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-NRI n.d.). Figure 9-6 illustrates Class D and E soil in Genesee County.

Table 9-9. NEHRP Soil Classifications

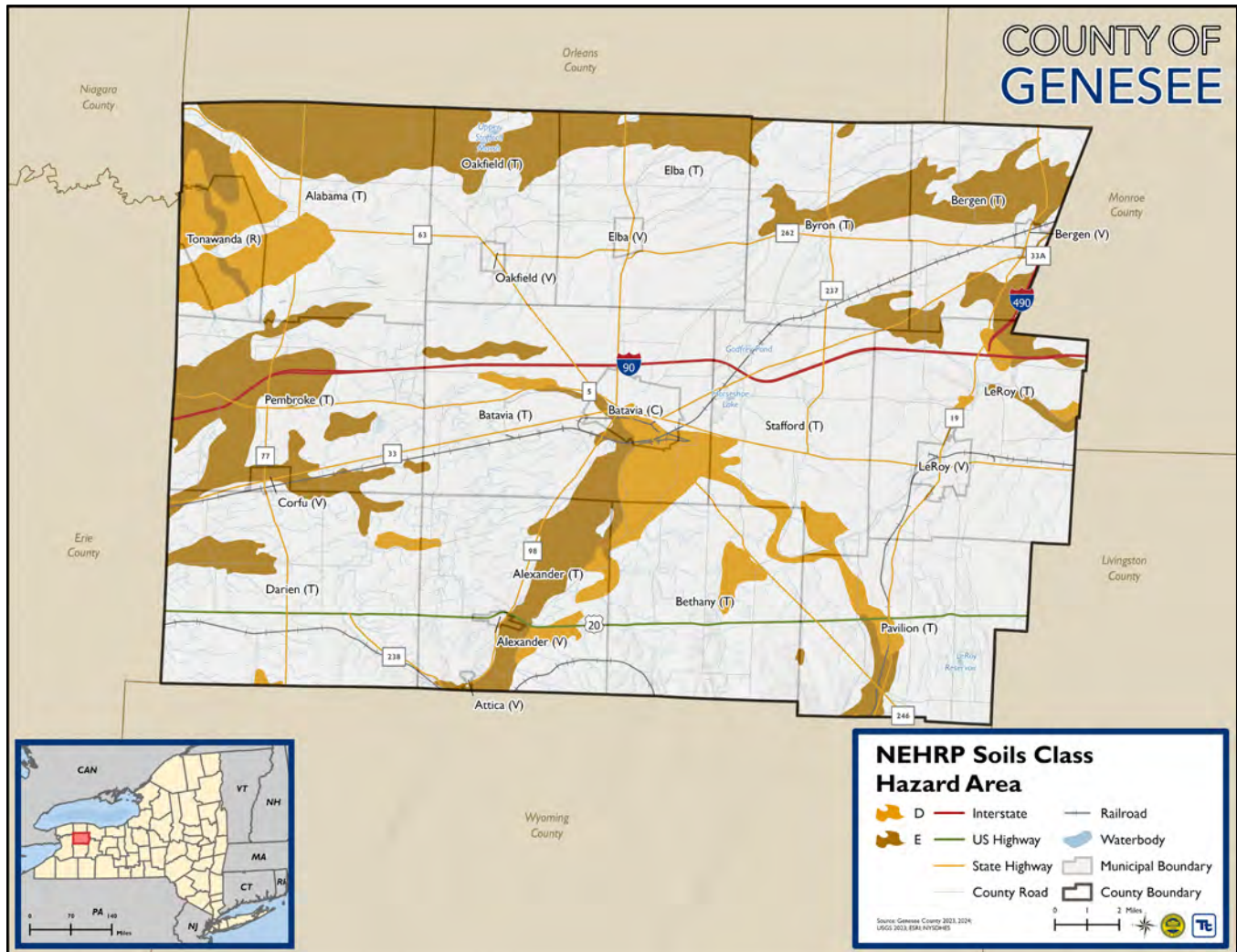
Soil Classification	Description
A	Hard rock
B	Rock
C	Very dense soil and soft rock



Soil Classification	Description
D	Stiff soils
E	Soft soils

Source: FEMA 2013

Figure 9-6. NEHRP Class D and E Soil in Genesee County



9.1.4 Previous Occurrences

Federal Emergency Management Agency (FEMA) Major Disaster and Emergency Declarations

Between 1954 and 2024, Genesee County was not included in any major disaster (DR) or emergency (EM) declarations for earthquake-related events (FEMA 2024).



U.S. Department of Agriculture Declarations

The 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. Between 2017 and 2024, Genesee County was not included in any USDA earthquake-related agricultural disaster declarations. For declarations that occurred between 2017 and 2024 (USDA 2024).

Previous Events

Known hazard events that impacted Genesee County between January 2017 and December 2024 are discussed in Table 9-5. For events prior to 2017, refer to the 2019 Genesee County HMP.

Table 9-10. Earthquake Events in Genesee County (2017 to 2024)

Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
April 10, 2017	N/A	N/A	4 km WSW of Pawling, New York	A 1.3-magnitude earthquake near Pawling, New York struck around 10:33 p.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
September 6, 2017	N/A	N/A	2 km SSW of Newfane, New York	A 1.9 magnitude earthquake near Newfane, New York struck around 7:00 a.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
September 14, 2017	N/A	N/A	3 km N of Sanborn, New York	A 1.1 magnitude earthquake near Sanborn, New York struck around 7:00 p.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
February 7, 2018	N/A	N/A	5 km NNW of Lake Mohegan, New York	A 2.17-magnitude earthquake near Lake Mohegan, New York struck around 11:14 p.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.



Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
June 12, 2018	N/A	N/A	8 km NNW of Ontario, New York	A 1.1 magnitude earthquake near Ontario, New York struck around 2:00 p.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
June 25, 2018	N/A	N/A	2 km NNW of Wanakah, New York	A 0.6 magnitude earthquake near Wanakah, New York struck around 12:37 a.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
December 18, 2019	N/A	N/A	13 km NNE of Sodus Point, New York	A 2.1 magnitude earthquake near Sodus Point, New York struck around 7:40 a.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
January 21, 2020	N/A	N/A	8 km ESE of Ransomville, New York	A 1.9 magnitude earthquake near Ransomville, New York struck around 4:00 p.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
May 19, 2020	N/A	N/A	1 km N of Wanakah, New York	A 2.3 magnitude earthquake near Wanakah, New York struck around 6:00 p.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
October 11, 2020	N/A	N/A	3 km SSE of Wilson, New York	A 1.5 magnitude earthquake near Wilson, New York struck around 6:25 a.m. according to the U.S. Geological Survey. The quake was



9. Earthquake

Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
				weakly felt in Genesee County.
October 22, 2020	N/A	N/A	9 km SE of Merritt Park, New York	A 2.2 magnitude earthquake near Merritt Park, New York struck around 4:23 p.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
February 9, 2021	N/A	N/A	6 km W of Bergen, New York	A 1.9 magnitude earthquake near Bergen, New York struck around 3:43 a.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
March 15, 2021	N/A	N/A	New York	A 2.4 magnitude earthquake near New York struck around midnight according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
August 15, 2022	N/A	N/A	6 km WNW of Le Roy, New York	A 1.2 magnitude earthquake near Le Roy, New York struck around 6:37 a.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
September 27, 2022	N/A	N/A	2 km E of Lackawanna, New York	A 1.4 magnitude earthquake near Lackawanna, New York struck around 8:54 a.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
January 15, 2023	N/A	N/A	6 km NNE of Fair Haven, New York	A 1.8 magnitude earthquake near Fair Haven, New York struck around 8:46 p.m. according to the U.S. Geological Survey. The quake was



Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
				weakly felt in Genesee County.
February 6, 2023	N/A	N/A	1 km NE of West Seneca, New York	A 3.8 magnitude earthquake near West Seneca, New York struck around 11:15 a.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
April 4, 2023	N/A	N/A	3 km SE of Weedsport, New York	A 1.2 magnitude earthquake near Weedsport, New York struck around 10:47 a.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
August 16, 2023	N/A	N/A	1 km SSW of Bowmansville, New York	A 1.5 magnitude earthquake near Bowmansville, New York struck around 1:21 p.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
August 17, 2023	N/A	N/A	6 km of NNW of Jordan, New York	A 1.1 magnitude earthquake near Jordan, New York struck around 8:56 a.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.
August 25, 2023	N/A	N/A	4 km ENE of Greece, New York	A 1 magnitude earthquake near Greece, New York struck around 9:09 a.m. according to the U.S. Geological Survey. The quake was weakly felt in Genesee County.

Sources: USGS 2024



9.1.5 Probability of Future Occurrences

The New York State Disaster Preparedness Commission (NYSDPC) indicates that the earthquake hazard in New York State is often understated because other natural hazards occur more frequently (such as hurricanes, tornadoes, and flooding) and are much more visible. However, the potential for earthquakes does exist across the entire northeastern United States, including New York State and Genesee County (NYS DHSES 2023). It is anticipated that the County will experience some direct and indirect impacts from earthquakes that may affect the general building stock and local economy and may induce secondary hazards such as igniting fires and causing utility failure.

The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 20, the identified hazards of concern for Genesee County were ranked. Based on historical records and input from the Steering Committee, the probability of occurrence for earthquakes in the County is considered “rare.”

Climate Change Projections

The impacts of global climate change on earthquake probability are still being studied, but earthquakes are thought to be affected by climate to some extent. As ice melts at a faster rate and water runs off, tremendous amounts of weight are shifted to the Earth’s crust. As newly freed crust returns to its original, pre-glacier shape, it could cause seismic plates to slip and stimulate volcanic activity, according to research into prehistoric earthquakes and volcanic activity. NASA and USGS scientists found that retreating glaciers in southern Alaska may be opening the way for future earthquakes (NASA 2024). However, given that glaciers are not located in New York State, these potential impacts are unlikely to be significant.

Secondary impacts of earthquakes could also become magnified by climate change. Soils saturated by repetitive storms could experience liquefaction during seismic activity due to the increased saturation. Dams storing increased volumes of water due to changes in the hydrograph could fail during seismic events; however, there are currently no models available to estimate these impacts. Additionally, droughts may impact faults due to stress load changes from the lack of water in Earth’s crust, which may trigger an earthquake (NASA 2024).

9.1.6 Cascading Impacts on Other Hazards

The Global Geoengineering Research Group in USGS has been investigating the relationship earthquakes have with ground failure and coastal erosion (USGS n.d.). As mentioned in earlier sections, soft and loose soils are more susceptible to earthquake events. Ground failure can become exacerbated due to earthquake events, causing land sliding and coastal erosion. Areas of steep slopes are at greater risk of ground failure and potential erosion during earthquakes (USGS n.d.). Further, residual impacts from earthquakes could alter the floodplain extent for the County if ground failure and erosion occur.

9.2 VULNERABILITY AND IMPACT ASSESSMENT

A probabilistic assessment was conducted for Genesee County for the 500-year Mean Return Period (MRP) event through a Level 2 analysis in Hazus to analyze the earthquake hazard and provide a range of loss estimates. The probabilistic method uses information from historical earthquakes and inferred faults, locations, and magnitudes, and computes the probable ground shaking levels that may be experienced during a recurrence period by census tract. A vulnerability analysis was conducted for the County’s assets (population, building stock, critical facilities, and new development) using NEHRP soil data sourced from New York Homeland Security and Emergency Services. The vulnerability analysis focused on soil types that would experience amplified ground motion during an



earthquake (i.e., Class D and E). Assets with their centroid in the hazard areas were totaled to estimate the numbers and values vulnerable to these soil types. Refer to Chapter 4 (Methodology and Tools) for additional details on the methodology used to assess earthquake risk.

9.2.1 Life, Health, and Safety

While the entire population of Genesee County can experience impacts from the earthquake hazard, those living in more vulnerable areas are more susceptible. The degree to which Genesee 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. Whether directly or indirectly impacted, residents could be faced with business closures, road closures that could isolate populations, and loss of function of critical facilities and utilities.

Overall Population

While the entire population of Genesee County can experience impacts from the earthquake hazard, those living in more vulnerable areas are more susceptible. An exposure analysis was performed using the NEHRP soils data and the 2020 Census population data. The sum of the population by census block within the NEHRP Class D and E soil types were calculated and summarized in Table 9-6 below. Overall, approximately 18.9 percent of the County's population is located on NEHRP Class D and E soil.

The impact of an earthquake on life, health, and safety is dependent upon the severity of the event. Risk to public safety and loss of life from an earthquake in the County is minimal. However, a higher risk would occur for those inside buildings, due to structural damage, or people walking below building ornamentation and chimneys that may be loose and fall as a result of the earthquake.

Table 9-11. Approximate Population Within NEHRP Class D and E Soil

Jurisdiction	Total Population (2020 Census)	Population Within NEHRP Class D and E Soil	
		Total Population Exposed	% of Population Exposed
Alabama (T)	1,602	568	35.5%
Alexander (T)	1,973	493	25.0%
Alexander (V)	518	111	21.4%
Attica (V)	2,450	106	4.3%
Batavia (C)	15,600	4,536	29.1%
Batavia (T)	6,293	1,013	16.1%
Bergen (V)	1,912	930	48.6%
Bergen (T)	1,208	0	0.0%
Bethany (T)	1,780	243	13.7%
Byron (T)	2,302	330	14.3%
Corfu (V)	689	338	49.1%
Darien (T)	3,010	359	11.9%
Elba (T)	1,606	85	5.3%
Elba (V)	558	0	0.0%



Jurisdiction	Total Population (2020 Census)	Population Within NEHRP Class D and E Soil	
		Total Population Exposed	% of Population Exposed
Le Roy (T)	3,362	242	7.2%
Le Roy (V)	4,300	0	0.0%
Oakfield (T)	1,333	182	13.7%
Oakfield (V)	1,812	0	0.0%
Pavilion (T)	2,290	551	24.1%
Pembroke (T)	3,575	1,136	31.8%
Stafford (T)	2,424	94	3.9%
Tonawanda (R)	241	206	85.5%
Genesee County (Total)	60,838	11,523	18.9%

Source: U.S. Census Bureau 2020 Decennial; Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; NYSDHES

Note: % = Percent

Note: Exposed population statistics are rounded down to the nearest whole number.

According to the 1999–2003 NYCEM Summary Report (*Earthquake Risks and Mitigation in the New York/New Jersey/Connecticut Region*), a strong correlation exists between structural building damage and the number of injuries and casualties from an earthquake event. Further, the time of day also exposes different sectors of the community to the hazard. For example, Hazus considers the residential occupancy at its maximum at 2:00 a.m., where the educational, commercial, and industrial sectors are at their maximum at 2:00 p.m., and peak commute time is at 5:00 p.m. 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. Table 9-7 summarizes the countywide injuries and casualties estimated for the 500-year MRP earthquake event.

Table 9-12. Estimated Number of Injuries and Casualties from the 500-Year MRP Earthquake Event

Level of Severity	Time of Day		
	2:00 a.m.	2:00 p.m.	5:00 p.m.
Injuries	1	2	1
Hospitalization	0	0	0
Casualties	0	0	0

Source: Hazus v6.1

Note: Hazus estimates the number of people who will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows:

- * Severity Level 1 (Injuries): Injuries will require medical attention, but hospitalization is not needed
- * Severity Level 2 (Hospitalizations): Injuries will require hospitalization but are not considered life-threatening
- * Severity Level 3 (Hospitalizations): Injuries will require hospitalization and can become life-threatening if not promptly treated
- * Severity Level 4 (Casualties): Victims are killed by the earthquake.



The casualty estimates are provided for three times of day: 2:00 a.m., 2:00 p.m., and 5:00 p.m. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 a.m. estimate considers that the residential occupancy load is maximum, the 2:00 p.m. estimate considers that the educational, commercial, and industrial sector loads are maximum, and 5:00 p.m. represents peak commute time.

Socially Vulnerable Population

Residents may be displaced or require temporary to long-term sheltering. The number of people requiring shelter is generally less than the number displaced as some displaced persons use hotels or stay with family or friends following a disaster event. An analysis was performed to estimate the number of households displaced, and population that may require short-term sheltering as a result of the 500-year MRP earthquake event; this event returned the result that there would be no displaced households or persons seeking short-term shelter.

Populations considered most vulnerable are located in the built environment, particularly near unreinforced masonry construction. Of these most vulnerable populations, socially vulnerable populations, including the elderly (persons over age 65) and individuals living below the poverty threshold are most susceptible. Factors leading to this higher susceptibility include decreased mobility and financial ability to react or respond during a hazard, and the location and construction quality of their housing.

Table 9-8 details the total number of vulnerable persons living in areas of Class D and E soil. The City of Batavia has the highest population over age 65 (951), the largest population under age 5 (159), the greatest non-English speaking population (38), the highest population of disabled persons (857), and the largest number individuals living in poverty (578).



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Table 9-13. Estimated Number of Vulnerable Persons Located in the NEHRP D&E Soils Hazard Area

Jurisdiction	American Community Survey 5-Year Population Estimates (2022)									
	Over 65		Under 5		Non-English-Speaking		Persons with a Disability		Below Poverty Level	
	Number	% of Jurisdiction	Number	% of Jurisdiction	Number	% of Jurisdiction	Number	% of Jurisdiction	Number	% of Jurisdiction
Alabama (T)	90	35.3%	30	34.9%	3	32.1%	82	35.5%	62	35.2%
Alexander (T)	57	24.7%	76	24.9%	0	0.0%	56	24.9%	18	24.3%
Alexander (V)	10	19.6%	4	21.1%	0	0.0%	11	20.0%	13	21.3%
Attica (V)	17	4.2%	4	3.6%	1	3.6%	9	4.3%	6	4.1%
Batavia (C)	951	29.0%	159	29.0%	38	28.5%	857	29.1%	578	29.0%
Batavia (T)	279	16.1%	43	15.8%	0	0.0%	171	16.1%	115	16.0%
Bergen (T)	142	48.6%	50	48.1%	0	0.0%	155	48.6%	41	47.7%
Bergen (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Bethany (T)	36	13.6%	10	13.5%	2	10.7%	26	13.5%	27	13.3%
Byron (T)	42	14.3%	27	14.1%	0	0.0%	34	14.0%	12	13.8%
Corfu (V)	96	48.7%	10	45.5%	0	0.0%	54	48.6%	19	47.5%
Darien (T)	77	11.9%	20	11.8%	0	0.0%	53	11.8%	4	10.0%
Elba (T)	12	5.2%	8	5.0%	4	4.7%	9	5.0%	6	4.8%
Elba (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Le Roy (T)	38	7.1%	7	6.8%	0	0.0%	4	1.4%	2	4.2%
Le Roy (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Oakfield (T)	36	13.4%	1	9.1%	5	13.4%	35	13.7%	49	13.5%
Oakfield (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Pavilion (T)	94	24.0%	36	24.0%	0	0.0%	60	23.7%	62	23.9%
Pembroke (T)	235	31.8%	34	31.5%	11	29.4%	154	31.7%	138	31.7%
Stafford (T)	16	3.8%	6	3.9%	0	0.0%	8	3.8%	6	3.5%
Tonawanda (R)	138	85.2%	11	84.6%	30	85.5%	87	85.3%	65	85.5%
Genesee County (Total)	2,366	20.2%	536	17.2%	94	22.1%	1,865	20.6%	1,223	20.0%

Source: U.S. Census Bureau 2022 ACS Vulnerable Population Totals; County Planning 2023, 2024 NYS GIS Clearinghouse 2023; NYSDHES

Note: % = Percent

Note: Exposed population statistics are rounded down to the nearest whole number.



9.2.2 General Building Stock

The entire County's general building stock is considered at risk and exposed to this hazard. As stated earlier, soft soils (NEHRP Class D and E Soil) can amplify ground shaking to damaging levels even in a moderate earthquake (Tantala 2003). Therefore, buildings located on NEHRP Class D and E Soil have an increased risk of damage from an earthquake. Table 9-9 summarizes the number and replacement cost value of buildings in Genesee County approximately located on NEHRP Class D and E Soil. There are an estimated 6,235 buildings within the NEHRP Soil Classes D and E Hazard Areas, representing approximately 18.9 percent of the County's total general building stock inventory replacement cost value. The City of Batavia has the greatest number of its buildings located in areas of Class D and E soils (1,727 buildings or 31.1 percent of its total building stock). Table 9-10 displays the buildings by general occupancy located within the NEHRP Class D and E soil hazard areas.

Table 9-14. Number and Replacement Cost Value of Buildings Located in NEHRP Class D and E Soil

Municipality	Total Number of Buildings	Total RCV (Structure and Contents)	Buildings Located in NEHRP Class D and E Soil			
			Number Exposed	% of Total Number	RCV Exposed	% of Total RCV
Alabama (T)	1,315	\$722,040,029	425	32.3%	\$168,518,231	23.3%
Alexander (T)	1,423	\$610,663,199	322	22.6%	\$152,265,098	24.9%
Alexander (V)	213	\$107,407,186	50	23.5%	\$55,001,509	51.2%
Attica (V)	52	\$65,949,240	26	50.0%	\$50,295,224	76.3%
Batavia (C)	5,548	\$4,822,536,729	1,727	31.1%	\$2,113,838,871	43.8%
Batavia (T)	3,680	\$2,447,128,797	576	15.7%	\$336,711,601	13.8%
Bergen (V)	1,248	\$591,610,057	522	41.8%	\$180,086,770	30.4%
Bergen (T)	511	\$156,058,577	0	0.0%	\$0	0.0%
Bethany (T)	1,330	\$628,307,466	178	13.4%	\$102,031,487	16.2%
Byron (T)	1,578	\$658,336,626	190	12.0%	\$60,603,090	9.2%
Corfu (V)	360	\$147,589,112	163	45.3%	\$64,304,585	43.6%
Darien (T)	2,434	\$1,285,847,435	273	11.2%	\$141,358,313	11.0%
Elba (T)	1,230	\$753,135,361	80	6.5%	\$123,731,400	16.4%
Elba (V)	373	\$125,049,373	0	0.0%	\$0	0.0%
Le Roy (T)	2,242	\$1,465,434,853	221	9.9%	\$124,157,195	8.5%
Le Roy (V)	1,742	\$1,128,112,213	0	0.0%	\$0	0.0%
Oakfield (T)	1,002	\$490,544,840	118	11.8%	\$42,592,964	8.7%
Oakfield (V)	735	\$374,066,224	0	0.0%	\$0	0.0%
Pavilion (T)	1,577	\$798,918,335	351	22.3%	\$195,620,728	24.5%
Pembroke (T)	2,373	\$1,079,428,778	686	28.9%	\$307,879,459	28.5%
Stafford (T)	1,668	\$775,606,282	67	4.0%	\$29,756,424	3.8%
Tonawanda (R)	284	\$148,395,154	260	91.5%	\$133,970,659	90.3%
Genesee County (Total)	32,918	\$19,382,165,867	6,235	18.9%	\$4,382,723,608	22.6%

Source: Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; RS Means 2024; NYSDHES

Note: % = Percent



Table 9-15. Buildings in the NEHRP Class D and E Soil Hazard Area by General Occupancy Class

Jurisdiction	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Alabama (T)	250	171	0	4
Alexander (T)	184	129	0	9
Alexander (V)	32	14	0	4
Attica (V)	1	22	0	3
Batavia (C)	1,305	361	37	24
Batavia (T)	375	189	6	6
Bergen (V)	370	148	2	2
Bergen (T)	0	0	0	0
Bethany (T)	91	84	0	3
Byron (T)	123	67	0	0
Corfu (V)	122	41	0	0
Darien (T)	138	132	0	3
Elba (T)	35	39	1	5
Elba (V)	0	0	0	0
Le Roy (T)	89	126	0	6
Le Roy (V)	0	0	0	0
Oakfield (T)	73	45	0	0
Oakfield (V)	0	0	0	0
Pavilion (T)	224	108	2	17
Pembroke (T)	446	233	0	7
Stafford (T)	38	29	0	0
Tonawanda (R)	6	254	0	0
Genesee County (Total)	3,902	2,192	48	93

Source: Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; NYSDHES

According to NYCEM, where earthquake risks and mitigation were evaluated in the New York, New Jersey, and Connecticut region, most damage and loss caused by an earthquake is directly or indirectly the result of ground shaking (Tantala 2003). There is a strong correlation between PGA and damage a building might undergo (NYCEM 2003). The Hazus model is based on best-available earthquake science and aligns with these statements. The Hazus probabilistic earthquake model was applied to analyze the effects of the earthquake hazard on the general building stock in Genesee County.

A building's construction determines how well it can withstand the force of an earthquake. The NYCEM report indicates that 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. Hazus considers building construction and age of the building as part of the analysis. Because a custom general building stock was used for this analysis, the building ages and building types from the inventory were incorporated into the Hazus model.



Potential building damage was evaluated by Hazus across the following damage categories (none, slight, moderate, extensive, and complete). Table 9-11 provides definitions of these five categories of damage for a light wood-framed building; definitions for other building types are included in Hazus technical manual documentation.

Table 9-16. Example of Structural Damage State Definitions for a Light Wood-Framed Building

Damage Category	Description
Slight	Small plaster or gypsum-board cracks at corners of door and window openings and wall-ceiling intersections; small cracks in masonry chimneys and masonry veneer.
Moderate	Large plaster or gypsum-board cracks at corners of door and window openings; small diagonal cracks across shear wall panels exhibited by small cracks in stucco and gypsum wall panels; large cracks in brick chimneys; toppling of tall masonry chimneys.
Extensive	Large diagonal cracks across shear wall panels or large cracks at plywood joints; permanent lateral movement of floors and roof; toppling of most brick chimneys; cracks in foundations; splitting of wood sill plates and/or slippage of structure over foundations; partial collapse of room-over-garage or other soft-story configurations.
Complete	Structure may have large permanent lateral displacement, may collapse, or be in imminent danger of collapse due to cripple wall failure or the failure of the lateral load resisting system; some structures may slip and fall off the foundations; large foundation cracks.

Source: HAZUS Technical Manual

Building damage as a result of the 500-year MRP earthquake events was estimated using Hazus. Damage loss estimates include structural and non-structural damage to the building and loss of contents. Table 9-12 summarizes the damage estimated for the 500-year MRP earthquake events. Damage loss estimates include structural and non-structural damage to the building and loss of contents. Hazus estimates that residential structures in the County will face the largest amount of damage from a 500-year earthquake event.

Table 9-17. Estimated Buildings Damaged by General Occupancy for 500-year MRP Earthquake Events

Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	Earthquake 100-Year	
			Building Count	Percent Buildings in Occupancy Class
Residential Exposure (Single and Multi-Family Dwellings)	20,385	None	20,192	99.1%
		Slight	164	0.8%
		Moderate	28	0.1%
		Extensive	1	<0.1%
		Complete Destruction	0	0.0%
Commercial Buildings	11,765	None	11,681	99.3%
		Slight	72	0.6%
		Moderate	12	0.1%
		Extensive	0	0.0%
		Complete Destruction	0	0.0%
Industrial Buildings	171	None	162	95.1%
		Slight	6	3.6%
		Moderate	2	1.4%
		Extensive	0	0.0%



Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	Earthquake 100-Year	
			Building Count	Percent Buildings in Occupancy Class
Government, Religion, Agricultural, and Education Buildings	597	Complete Destruction	0	0.0%
		None	586	98.1%
		Slight	9	1.6%
		Moderate	2	0.3%
		Extensive	0	0.0%
		Complete Destruction	0	0.0%

Source: Hazus v6.1, County Planning 2023; NY GIS Clearinghouse 2023

Note: The number of damaged buildings may overestimated or underestimated.

Table 9-13 summarizes estimated damages by the structural general occupancy class for each jurisdiction. Hazus estimated approximately \$5,062,321 in damage as a result of the 500-year earthquake event. This includes structural damage, non-structural damage, and loss of contents, representing less than 0.1 percent of the total replacement value for general building stock in Genesee County.

Table 9-18. Estimated Replacement Cost Value (Building and Contents) Damaged by the 500-Year MRP Earthquake Event

Jurisdiction	Total Replacement Cost Value (RCV)	500-Year MRP				
		Estimated Total Damage	Percent of Total Building and Contents Replacement Cost Value	Estimated Residential Damage	Estimated Commercial Damage	Estimated Damages for All Other Occupancies
Alabama (T)	\$722,040,029	\$100,834	0.0%	\$33,015	\$42,029	\$25,789
Alexander (T)	\$610,663,199	\$80,955	<0.1%	\$23,799	\$37,920	\$19,236
Alexander (V)	\$107,407,186	\$12,118	<0.1%	\$3,562	\$5,676	\$2,879
Attica (V)	\$65,949,240	\$2,958	<0.1%	\$870	\$1,386	\$703
Batavia (C)	\$4,822,536,729	\$2,148,295	<0.1%	\$426,968	\$415,538	\$1,305,790
Batavia (T)	\$2,447,128,797	\$644,924	<0.1%	\$171,893	\$203,015	\$270,016
Bergen (V)	\$591,610,057	\$150,817	<0.1%	\$48,764	\$47,794	\$54,259
Bergen (T)	\$156,058,577	\$61,753	<0.1%	\$19,967	\$19,569	\$22,217
Bethany (T)	\$628,307,466	\$66,957	<0.1%	\$18,414	\$20,068	\$28,475
Byron (T)	\$658,336,626	\$190,696	<0.1%	\$61,658	\$60,432	\$68,606
Corfu (V)	\$147,589,112	\$41,781	<0.1%	\$12,894	\$15,956	\$12,931
Darien (T)	\$1,285,847,435	\$138,471	<0.1%	\$40,708	\$64,861	\$32,902
Elba (T)	\$753,135,361	\$110,326	<0.1%	\$27,531	\$42,402	\$40,392
Elba (V)	\$125,049,373	\$33,456.61	<0.1%	\$8,349	\$12,859	\$12,249
Le Roy (T)	\$1,465,434,853	\$270,640.77	<0.1%	\$63,145	\$79,800	\$127,696
Le Roy (V)	\$1,128,112,213	\$330,057.62	<0.1%	\$51,675	\$46,799	\$231,584



Jurisdiction	Total Replacement Cost Value (RCV)	500-Year MRP				
		Estimated Total Damage	Percent of Total Building and Contents Replacement Cost Value	Estimated Residential Damage	Estimated Commercial Damage	Estimated Damages for All Other Occupancies
Oakfield (T)	\$490,544,840	\$89,875.41	<0.1%	\$22,428	\$34,542	\$32,905
Oakfield (V)	\$374,066,224	\$65,926.57	<0.1%	\$16,452	\$25,338	\$24,137
Pavilion (T)	\$798,918,335	\$79,383.84	<0.1%	\$21,830	\$23,781	\$33,773
Pembroke (T)	\$1,079,428,778	\$236,343.41	<0.1%	\$74,390	\$92,909	\$69,045
Stafford (T)	\$775,606,282	\$182,086.83	<0.1%	\$46,581	\$61,866	\$73,640
Tonawanda (R)	\$148,395,154	\$23,666.38	<0.1%	\$199	\$18,442	\$5,026
Genesee County (Total)	\$19,382,165,867	\$5,062,321	<0.1%	\$1,195,090	\$1,372,981	\$2,494,250

Source: Hazus v6.1, Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; RS Means 2024

9.2.3 Community Lifelines and Other Critical Facilities

The Hazus earthquake model was used to assign the range or average probability of each damage state category to the critical facilities in Genesee County for the 500-year MRP event. In addition, Hazus estimates the time to restore critical facilities to fully functional use. Results are presented as a probability of being functional at specified time increments (days after the event). For example, Hazus might estimate that a facility has a 5 percent chance of being fully functional at Day 3, and a 95 percent chance of being fully functional at Day 90. For percent probability of sustaining damage, the minimum and maximum damage estimated value for that facility type is presented.

As a result of a 500-year MRP event, Hazus estimates that community lifelines will be nearly 100 percent functional, with functionality reaching only as low as 96.6 percent in the Health and Medical lifeline. Slight damage will be received to facilities in each lifeline category, with the Health and Medical lifeline sustaining the most damage. View Table 9-14 for a full summary.

Table 9-19. Estimated Damage and Loss of Functionality for Community Lifelines in Genesee County for the 500-Year MRP Earthquake Event

Name	Average Percent Probability of Sustaining Damage					Average Percent Functionality			
	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7	Day 30	Day 90
Lifelines									
Communications	97.7%	1.8%	0.5%	<0.1%	0.0%	97.6%	99.4%	99.9%	99.9%
Energy	98.0%	1.5%	0.4%	<0.1%	0.0%	98.0%	99.5%	99.9%	99.9%
Food, Hydration, Shelter	97.6%	1.8%	0.5%	<0.1%	0.0%	97.6%	99.4%	99.9%	99.9%
Hazardous Materials	97.6%	1.8%	0.5%	<0.1%	0.0%	97.6%	99.4%	99.9%	99.9%
Health and Medical	96.7%	2.5%	0.7%	0.1%	0.0%	96.6%	99.1%	99.9%	99.9%



Name	Average Percent Probability of Sustaining Damage					Average Percent Functionality			
	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7	Day 30	Day 90
Safety and Security	97.9%	1.6%	0.4%	<0.1%	0.0%	97.9%	99.4%	99.9%	99.9%
Transportation	97.5%	1.9%	0.5%	0.1%	0.0%	97.4%	99.3%	99.9%	99.9%

Source: Hazus v6.1; Genesee County 2017, 2021, 2023, 2024; NYS GIS Clearinghouse 2021, 2023, 2024; Genesee Orleans Wyoming Opioid Task Force 2021; Genesee Orleans Health Department 2024; NY Open Data 2024; US DOT 2023, Clark Patterson Lee Inc 2024; US EPA 2021; HIFLD 2021; US NPS 2021; USGS 2023

After considering the general building stock exposed to and damaged by the 500-year MRP earthquake event, critical facilities were evaluated. All critical facilities (essential facilities, transportation systems, lifeline utility systems, high-potential loss facilities, and user-defined facilities) in Genesee County are considered exposed and vulnerable to the earthquake hazard. Table 9-15 summarizes the number of critical facilities by lifeline category located on NEHRP Soil Classes D and E.



Table 9-20. Number of Critical Facilities Located on NEHRP Soil Classes D and E by Lifeline Category

Jurisdiction	Number of Facilities Located on NEHRP Soil Classes D and E by Lifeline Category									Total Facilities in Hazard Area	
	Comm.	Energy	Food, Hyd., Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transp.	Water Systems	Other Critical Facilities	Number	% of Total
Alabama (T)	0	8	0	0	0	3	7	12	1	31	25.2%
Alexander (T)	0	4	0	0	0	1	14	11	0	30	19.6%
Alexander (V)	0	3	0	0	1	2	3	1	0	10	50.0%
Attica (V)	0	1	0	1	1	0	0	1	0	4	66.7%
Batavia (C)	6	28	2	8	6	17	18	6	31	122	51.5%
Batavia (T)	2	11	2	2	2	2	3	10	4	38	13.2%
Bergen (V)	1	1	0	0	0	0	2	9	2	15	21.4%
Bergen (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Bethany (T)	0	11	0	0	0	0	8	5	0	24	13.3%
Byron (T)	0	1	0	0	0	0	4	7	0	12	12.5%
Corfu (V)	0	3	0	0	1	4	1	7	3	19	61.3%
Darien (T)	0	24	0	0	0	0	3	31	0	58	11.9%
Elba (T)	1	0	0	0	0	0	1	4	0	6	7.4%
Elba (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Le Roy (T)	2	2	0	0	0	2	4	6	0	16	13.1%
Le Roy (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Oakfield (T)	0	0	0	0	0	0	3	4	0	7	9.9%
Oakfield (V)	0	0	0	0	0	0	0	0	0	0	0.0%
Pavilion (T)	3	17	1	0	1	4	9	26	10	71	25.4%
Pembroke (T)	1	71	0	1	3	1	15	35	6	133	40.3%
Stafford (T)	0	1	0	0	0	0	0	0	0	1	0.9%
Tonawanda (R)	0	0	0	0	0	0	1	15	0	16	94.1%
Genesee County (Total)	16	186	5	12	15	36	96	190	57	613	21.4%

Source: Genesee County 2017, 2021, 2023, 2024; NYS GIS Clearinghouse 2021, 2023, 2024; Genesee Orleans Wyoming Opioid Task Force 2021; Genesee Orleans Health Department 2024; NY Open Data 2024; US DOT 2023, Clark Patterson Lee Inc 2024; US EPA 2021; HIFLD 2021; US NPS 2021; USGS 2023; NYSDHES

Note: Comm = Communications; Hyd. = Hydration; Transp. = Transportation



9.2.4 Economy

Earthquakes also impact the economy, including loss of business function, damage to inventory (buildings, transportation, and utility systems), relocation costs, wage loss, and rental loss due to repair and replacement of buildings. Although the Hazus analysis did not compute damage estimates for individual roadway segments and railroad tracks, it can be assumed that these features would undergo damage due to ground failure, resulting in interruptions of regional transportation and of distribution of materials. Losses to the community that would result from damage to lifelines could exceed the costs of repair. Earthquake events can significantly affect road bridges, many of which provide the only access to certain neighborhoods. Because softer soils generally follow floodplain boundaries, bridges that cross watercourses should be considered vulnerable. Another key factor in degree of vulnerability is the age of facilities and infrastructure, which correlates with standards in place at time of construction.

Additionally, Hazus estimates the volume of debris that may be generated as a result of an earthquake event to enable the study region to prepare for and rapidly and efficiently manage debris removal and disposal. Debris estimates were divided into two categories: (1) reinforced concrete and steel that require special equipment to break up before transport can occur, and (2) brick, wood, and other debris that can be loaded directly onto trucks by use of bulldozers (FEMA 2020).

For the 500-year MRP event, Hazus estimates a total of 3,039.1 tons of debris will be generated countywide; the City of Batavia will generate the most brick/wood debris (1,435.6 tons), concrete/steel debris (253.4 tons), and total debris (1,689.0 tons).

Table 9-21. Estimated Debris Generated by the 500-Year MRP Earthquake Event

Jurisdiction	Brick/Wood (tons)	Concrete/Steel (tons)	Total Debris (tons)
Alabama (T)	16.5	4.2	20.6
Alexander (T)	11.3	2.8	14.1
Alexander (V)	1.7	0.4	2.1
Attica (V)	0.4	0.1	0.5
Batavia (C)	1,435.6	253.4	1,689.0
Batavia (T)	233.1	45.5	278.7
Bergen (V)	64.6	13.1	77.7
Bergen (T)	26.4	5.4	31.8
Bethany (T)	23.5	3.8	27.3
Byron (T)	81.6	16.5	98.2
Corfu (V)	9.6	2.2	11.8
Darien (T)	19.3	4.8	24.2
Elba (T)	44.4	8.2	52.6
Elba (V)	13.5	2.5	16.0
Le Roy (T)	114.2	20.6	134.8
Le Roy (V)	281.1	45.2	326.3
Oakfield (T)	36.2	6.7	42.9
Oakfield (V)	26.5	4.9	31.4



Jurisdiction	Brick/Wood (tons)	Concrete/Steel (tons)	Total Debris (tons)
Pavilion (T)	27.9	4.4	32.3
Pembroke (T)	49.3	11.6	61.0
Stafford (T)	53.9	10.6	64.5
Tonawanda (R)	0.5	0.8	1.3
Genesee County (Total)	2,571.2	467.9	3,039.1

Source: Hazus v6.1, County Planning 2023; NYS GIS Clearinghouse 2023

9.2.5 Natural, Historic, and Cultural Resources

Natural

According to USGS, earthquakes can cause damage to the surface of the Earth in various forms depending on the magnitude and distribution of the event. Surface faulting is one of the major seismic components to earthquakes that 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.).

Furthermore, 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 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.).

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.

Historic

Depending on the magnitude, earthquake events affecting the County could damage property in the area and around historical landmarks. Many historical buildings and homes may not be built to withstand earthquakes and are more vulnerable than other infrastructure.

Cultural

Depending on the magnitude, earthquake events affecting the County could bring damage to property to the area in and around cultural landmarks.

9.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.



9.3.1 Potential or Planned Development

As discussed in Section 3, areas targeted for future growth and development have been identified across the County. It is anticipated that the human exposure and vulnerability to earthquake impacts in newly developed areas will be similar to those that currently exist within the County. Current building codes require seismic provisions that should render new construction less vulnerable to seismic impacts than older, existing construction that may have been built using lower construction standards.

9.3.2 Projected Changes in Population

According to the 2020 Census, the population of the County has increased by approximately 2.85 percent since 2010. Population projections from Cornell University reveal the County's population is anticipated to continue decreasing. The population is projected to decline to 56,077 persons in 2030 and to 54,128 by 2040 (Cornell University 2018). Changes in the density of population can impact the number of persons exposed to earthquake. Furthermore, County visitors and tourists will continue to drive potential growth in the County's communities and their amenities, exposing more persons to earthquakes. Refer to Chapter 3 (County Profile), which includes a discussion on population trends for the County.

9.3.3 Climate Change

Providing projections of future climate change for a specific region is challenging. Shorter-term projections are more closely tied to existing trends, making longer-term projections even more challenging. The further out a prediction reaches, the more subject to changing dynamics it becomes. The potential impacts of global climate change 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 and stimulate volcanic activity according to research into prehistoric earthquakes and volcanic activity. NASA and USGS scientists found that retreating glaciers in southern Alaska might be opening the way for future earthquakes.

Secondary impacts of earthquakes could be magnified by future climate change. Soils saturated by repetitive storms could experience liquefaction during seismic activity because of increased saturation. Dams storing increased volumes of water from changes in the climate could fail during seismic events. There are currently no models available to estimate these impacts.

9.3.4 Change of Vulnerability Since 2019 HMP

Overall, the entire County continues to be vulnerable to earthquakes. For the 2025 HMP, the exposure analyses were conducted using 2020 Decennial Census. The building inventory was updated using RS Means 2024 values, which is more current and reflects replacement cost versus the building stock improvement values reported in the 2019 HMP. Additional building stock updates include updates to the critical facility inventory provided by Genesee County. Furthermore, since the 2019 HMP, an updated version of Hazus was released (v6.1). This updated model includes longer historical records to pull from to generate probabilistic events. Further, a NEHRP boundary was created for NEHRP Soil Classes D and E.



10. EPIDEMIC

10.1 HAZARD PROFILE

10.1.1 Hazard Description

An outbreak or an epidemic occurs when new cases of a certain disease in a given population substantially exceed what is expected. An epidemic may be restricted to one locale, or it may be global, at which point it is called a pandemic. A pandemic is defined as an outbreak of an infectious disease occurring over a wide geographical area that affects a large portion of the world's population. Pandemics often stem from epidemics (Britannica 2024).

Most epidemics occur due to respiratory viruses. A respiratory virus with pandemic potential is a highly contagious respiratory virus that spreads easily from person to person and for which there is little human immunity. Previous events that exemplify this hazard include the 1918 (Spanish flu) and 2009 (Swine flu) influenza pandemics, the 2003 SARS outbreak, which had pandemic potential, and the COVID-19 pandemic (NYC Emergency Management 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 (NYC Emergency Management 2019).

Of particular concern in Genesee County are respiratory illnesses such as influenza, also known as the “flu.” While flu symptoms are typically mild, vulnerable populations, such as older adults, younger children, pregnant persons, and people with pre-existing conditions, are more likely to experience flu-related complications. Seasonal flu epidemics occur yearly, typically beginning at the end of October and continuing through the colder months (NYS DOH 2023).

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 WNV cases will increase in portions of the state during the late summer and early fall seasons.

Tick-borne diseases are bacterial illnesses that spread to humans through infected ticks. These types of diseases rely on ticks for transmission. Ticks become infected by microorganisms when feeding on small, infected mammals (mice and voles). Different tick-borne diseases are caused by different microorganisms, and it is possible to be infected with more than one tick-borne disease at a time. Anyone who is bitten by an infected tick may get a tick-borne disease. People who spend a lot of time outdoors have a greater risk of becoming infected. 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), Lone Star tick (*Amblyomma americanum*), and the American dog tick (*Dermacentor variabilis*) (New York State Department of Health 2019).

The coronavirus, also known as COVID-19, is an infectious disease caused by the SARS-CoV-2 virus. The virus can spread from an infected person's mouth or nose in small liquid particles through coughing, sneezing, speaking, singing, or breathing (World Health Organization 2022).

For the purposes of this hazard mitigation plan update, the following infectious diseases will be discussed in further detail: Influenza, WNV, Lyme Disease, and Coronavirus (COVID-19).



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 (New York State Department of Health 2021).

Pandemic influenza differs from seasonal influenza because outbreaks of seasonal flu are caused by viruses already living among people. Seasonal flu happens annually and usually peaks between December and February. 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 (Center for Disease Control and Prevention 2020).

The risk of a global influenza pandemic has increased over the last several years. This disease 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.

West Nile Virus

WNV is the leading cause of mosquito-borne disease in the United States. WNV was first found in New York State in 1999. Since 2000, 490 human cases and 37 deaths of WNV have been reported statewide (the data range is 2000–2017).

WNV is most commonly spread to people who are bitten by an infected mosquito. WNV is usually diagnosed during mosquito season, starting in the summer months and continuing through the fall (CDC 2022).

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. Usually, symptoms occur from 3 to 14 days after being bitten by an infected mosquito (NYS DOH 2017).

Lyme Disease

Lyme disease is the most common vector-borne disease in the United States. It is an illness caused by infection with the bacterium *Borrelia burgdorferi*, which is carried by ticks.

Typical symptoms include fever, headache, fatigue, and skin rash. If left untreated, symptoms can be severe. Lyme disease is spread to people by the bite of an infected tick (CDC 2021).

In New York, the commonly infected tick is the deer tick. Immature ticks become infected by feeding on infected white-footed mice and other small mammals. Deer ticks can also spread other tick-borne diseases. Anyone who is bitten by a tick carrying the bacteria can become infected (NYS DOH 2019).

Coronavirus

Coronavirus disease (COVID-19) is an infectious disease first identified in 2019. The virus rapidly spread into a global pandemic by spring of 2020.

Older people, and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illnesses (World Health Organization 2022). With the virus



being relatively new, information regarding transmission and symptoms of the virus is still new. The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes.

Reported range from mild symptoms to severe illness and death. Reported 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. Symptoms may appear 2–14 days after exposure to the virus (based on the incubation period of MERS-CoV viruses) (CDC 2021).

As of December 2024, Genesee County has reported 20,529 positive cases of COVID-19 and 194 deaths (NYSDOH 2025, NYSDOH 2025).

10.1.2 Location

Genesee County's geographic and demographic characteristics make it particularly vulnerable to importation and spread of infectious diseases. In terms of pandemic influenza, all counties may experience pandemic influenza outbreak caused by factors such as population density and the nature of public meeting areas. Densely populated areas will spread diseases quicker than less densely populated areas. There are some densely populated municipalities in the County, leading to the spread of influenza and coronavirus more quickly than less densely populated communities. Lyme disease can be more prevalent in densely forested areas with the presence of animals that carry the various tick species.

10.1.3 Extent

The extent of disease outbreaks depends on the preferred habitat of the species, as well as the species' ease of movement and establishment. The magnitude of disease outbreaks ranges from nuisance to widespread. The exact size and extent of an infected population depend on how easily the illness is spread, the mode of transmission, and the amount of contact between infected and uninfected individuals. The transmission rates of pandemic illnesses are often higher in more densely populated areas. The transmission rate of infectious diseases will depend on the mode of transmission of a given illness, and whether a vaccine, cure, or treatment is available. The threat is typically intensified when the ecosystem or host species is already stressed, such as during periods of drought. The already weakened state of the ecosystem causes it to more easily be impacted by an infestation. The severity and length of the next pandemic cannot be predicted; however, experts anticipate that its effect on the United States could be severe.

The World Health Organization (WHO) has identified the six phases of a global pandemic (World Health Organization 2009). Phases 1 to 3 and 5 to 6 have been grouped to include common action points. The WHO pandemic phases are outlined in Table 10-1.

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 10-1. 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.

Influenza

The United States Environmental Protection Agency (U.S. EPA) has noted that fine droplets and particles 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. Seasonal flu epidemics occur yearly, typically beginning at the end of October and continuing through the colder months (NYS DOH 2023).

West Nile Virus

WNV is the leading cause of mosquito-borne diseases 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 2022). Genesee County's average annual incidence rate (per 100,000) is between 0.01 and 0.49 (CDC, West Nile Virus 2023).

Lyme Disease

Lyme disease is the most reported vector-borne illness in the U.S. Between 2000 and 2020, there was a total of 56 confirmed cases of Lyme disease in Genesee County, including 14 cases in 2019, the highest number of reported



cases of a given year (TickCheck 2022). The CDC only reports confirmed cases; however, the true number of cases is estimated at 560.

Coronavirus

Similar to influenza, coronaviruses are spread through droplets and virus particles released into the air when an infected person breathes, talks, laughs, sings, coughs, or sneezes, which is more likely to occur in indoor spaces.

10.1.4 Previous Occurrences

Federal Emergency Management Agency (FEMA) Major Disaster and Emergency Declarations

Between 1954 and 2024, Genesee County was included in three major disaster (DR) or emergency (EM) declarations for epidemic-related events (FEMA 2024). Table 10-2 lists these declarations.

Table 10-2. FEMA Declarations for Epidemic Events in Genesee County (1954 to 2024)

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

Sources: FEMA 2024

U.S. Department of Agriculture (USDA) Declarations

The 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. Between 2017 and 2024, Genesee County was not included in any USDA epidemic-related agricultural disaster declarations (USDA 2024).

Previous Events

Known hazard events that impacted Genesee County between January 2017 and December 2024 are discussed in Table 10-4. For events prior to 2017, refer to the 2019 Genesee County HMP.

Table 10-3. Epidemic Events in Genesee County (2016 to 2024)

Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
2017	N/A	N/A	Countywide	990 confirmed cases of influenza in Genesee County
2017	N/A	N/A	Countywide	581 confirmed cases of Lyme disease in Genesee County
2017	N/A	N/A	Countywide	One confirmed case of West Nile Virus in Genesee County



Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
2018	N/A	N/A	Countywide	1,648 confirmed cases of influenza in Genesee County
2018	N/A	N/A	Countywide	693 confirmed cases of Lyme disease in Genesee County
2018	N/A	N/A	Countywide	One confirmed case of West Nile Virus in Genesee County
2019	N/A	N/A	Countywide	749 confirmed cases of influenza in Genesee County
2019	N/A	N/A	Countywide	640 confirmed cases of Lyme disease in Genesee County
2020	N/A	N/A	Countywide	1,139 confirmed cases of influenza in Genesee County
2020	N/A	N/A	Countywide	198 confirmed cases of Lyme disease in Genesee County
2020–2021	DR-4480, EM-3434	Yes	Countywide	Genesee County received Public Assistance: Emergency protective measures (Category B). As of April 2023, Genesee County has reported 16,918 positive cases of COVID-19 and 209 deaths

Sources: FEMA 2024; USA Facts 2024

10.1.5 Probability of Future Occurrences

In Genesee County, the probability for a future epidemic event is dependent on several factors. One factor that influences the spread of disease is population density. 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 (NYC Emergency Management 2019).

As for mosquito-borne and tick-borne diseases, as long as mosquitoes and ticks are found in Genesee County, the risk of contracting WNV, Lyme disease, or other diseases carried by these insects 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 WNV and other mosquito-borne diseases due to changing climate conditions creating suitable habitats for mosquitoes (CDC 2013). Disease-carrying ticks will continue to inhabit Genesee County and the threat of Lyme disease and other tick-borne diseases will continue. Similar to mosquitoes, 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 Genesee County.

The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 20, the identified hazards of concern for Genesee County were ranked. Based on historical records and input from the Steering Committee, the probability of occurrence for epidemics in the County is considered “highly likely.”

Climate Change Projections

Some scientists anticipate an increase in WNV and other mosquito-borne diseases due to changing climate 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. The climate changes can also allow tropical and subtropical insects 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 led to an increase in influenza cases (Towers, et al. 2013).

10.1.6 Cascading Impacts on Other Hazards

There are no known cascading impacts that epidemics can cause to other hazards of concern for Genesee County.

10.2 VULNERABILITY AND IMPACT ASSESSMENT

To understand risk, a community must evaluate what assets are exposed or vulnerable to the identified hazard. The following discusses Genesee County's vulnerability, in a qualitative nature, to the epidemic hazard.

10.2.1 Life, Health, and Safety

Overall Population

The entire population of Genesee County is vulnerable to the epidemic hazard. Due to a lack of quantifiable loss information, a qualitative assessment was conducted to evaluate the assets exposed to this hazard and the potential impacts associated with this hazard. Healthcare 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 to the closer proximity of the population to potentially infected people.

Socially Vulnerable Population

Most recently with COVID-19, the Centers for Disease Control and Prevention have indicated that persons over 65 years and older, persons living in a nursing home or long-term care facility, and persons with underlying medical conditions such as diabetes, severe obesity, serious heart conditions, etc. are at a higher risk of getting severely ill (CDC 2021). According to the 2022 American Community Survey 5-year Estimates, there are 3,112 persons over 65 years old in Genesee County (5.2 percent of the County population). This age group would be considered at risk for getting severely ill from the COVID-19 virus.

10.2.2 General Building Stock

No structures are anticipated to be directly affected by epidemics.

10.2.3 Community Lifelines and Other Critical Facilities

An epidemic will not directly impact the actual structures of 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 the increased service demands, such as hospitalization and emergency room visit that would take place because of the epidemic. This would create a greater demand



on these critical facilities, their staff, and resources. The healthcare system will be severely taxed, if not overwhelmed, from the large number of illnesses and complications from influenza requiring hospitalization and critical care. Ventilators will be the most critical shortage if a respiratory outbreak were to occur (Homeland Security Council 2006).

An epidemic may quickly rise to the level of a catastrophic incident that results in mass fatalities, which will 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 anticipated increased numbers of deaths. The timely, safe, and respectful disposition of the deceased is an essential component of an effective response.

10.2.4 Economy

The impact epidemics have on the economy and estimated dollar losses are difficult to measure and quantify. Costs associated with the activities and programs implemented to conduct surveillance and address epidemics have not been quantified in the available documentation. Instead, activities and programs implemented by the County to address this hazard are described below, all of which could impact the local economy.

The COVID-19 pandemic had significant economic impacts across the State of New York, including Genesee County. Over the course of two months, nearly 2 million jobs as businesses were forced to close, disrupting the economy at the state, county, and local levels.

Smaller-scale epidemics 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 Genesee County's local economies associated with tourism and the use of parks and waterbodies.

10.2.5 Natural, Historic and Cultural Resources

Natural

Epidemics may have an impact on the environment if the outbreaks are caused by invasive species. Invasive species tend to be competitive with native species and their habitat and can be the major transmitters of disease like Zika, dengue, and yellow fever (Placer Mosquito and Vector Control District 2019). Secondary impacts from mitigating epidemics could also have an impact on the environment. Pesticides used to control disease-carrying insects like mosquitoes have been reviewed by the EPA and the New York Department of Environmental Conservation. If these sprays are applied in large concentrations, they could potentially leach into waterways and harm nearby terrestrial species. As a result, pesticides must be registered before they can be sold, distributed, or used in the state (New York Department of Environmental Conservation 2020).

Historic

Epidemics may limit access to historic resources. As seen during the COVID-19 pandemic, historic monuments, facilities, and sites had 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.



Cultural

No cultural structures are anticipated to be directly affected by epidemics. However, many cultural structures center around community and gatherings of large groups. Epidemics can halt or postpone gatherings and community events for prolonged periods of time, which can negatively impact the social and cultural resources within the County.

10.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

10.3.1 Potential or Planned Development

As discussed in Chapter 3 (County Profile), areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by the epidemic hazard because the entire planning area is exposed and vulnerable. Additional development of structures in areas with high population density are at an increased risk. Please refer to the specific areas of development indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II of this plan.

10.3.2 Projected Changes in Population

According to the 2020 Census, the population of the County has increased by approximately 2.85 percent since 2010. Population projections from Cornell University reveal the County's population is anticipated to continue decreasing. The population is projected to decline to 56,077 persons in 2030 and to 54,128 by 2040 (Cornell University 2018). Changes in the density of population could influence the number of persons exposed to epidemics. Higher density jurisdictions are not only at risk of greater exposure to epidemics, but density may also reduce available basic services provided by critical facilities such as hospitals and emergency facilities for persons that are not affected by a disease. Refer to Chapter 3 (County Profile), which includes a discussion on population trends for the County.

10.3.3 Climate Change

As discussed earlier in this section, the relationship between climate change and increase in infectious diseases is difficult to predict with certainty, however there may be linkages between the two. Changes in the environment may create a more livable habitat for vectors carrying disease as suggested by the Centers for Disease Control and Prevention (CDC 2021). Localized changes in climate and human interaction may also be a factor in the spread of disease.

10.3.4 Changes Since the 2019 HMP

Overall, the County will continue to be exposed and vulnerable to epidemics.



11. EXTREME TEMPERATURE

11.1 HAZARD PROFILE

11.1.1 Hazard Description

Extreme temperature includes both heat and cold events, which can have a significant impact on human health, commercial/agricultural businesses, and primary and secondary effects on infrastructure (such as burst pipes and power failure). What constitutes “extreme cold” or “extreme heat” can vary across different areas of the country, based on the population’s experience.

Extreme Cold

Extreme cold events occur when temperatures drop well below normal in an area. For example, near-freezing temperatures are considered “extreme cold” in regions relatively unaccustomed to winter weather. Conversely, “extreme cold” might be used to describe temperatures below 0°F in regions that are subjected to temperatures below freezing on more of a regular basis. For the purposes of this hazard mitigation plan (HMP), extreme cold temperatures are characterized when the ambient air temperature drops to approximately 0°F or below (National Weather Service n.d.).

Extensive exposure to extreme cold temperatures can cause frostbite or hypothermia and can become life-threatening. Extreme cold can also cause emergencies in susceptible populations, such as those without shelter, those who are stranded, or those who live in a home that is poorly insulated or without heat (such as mobile homes). Infants and the elderly are most susceptible to the effects of extreme changes in temperatures and are particularly at risk, but anyone can be affected (Centers for Disease Control and Prevention [CDC] 2012).

In New York State, extreme cold days are defined to reflect regional climate variations. Extreme cold days are individual days with minimum temperatures at or below 32°F or individual days with minimum temperatures at or below 0°F (NYSERDA 2014).

Several health hazards are related to extreme cold temperatures and include wind chill, frostbite, and hypothermia.

- *Wind chill* is not the actual temperature but rather how wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature.
- *Frostbite* is damage to body tissue caused by extreme cold. A wind chill of -20°F will cause frostbite in just 30 minutes. Frostbite can cause a loss of feeling and a white or pale appearance in the extremities.
- *Hypothermia* is a condition brought on when the body temperature drops to less than 95°F, and it can be deadly. Warning signs of hypothermia include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion.

Extreme Heat

Extreme heat is defined as temperatures that hover 10°F or more above the average high temperature for a region and last for several weeks (Centers for Disease Control and Prevention [CDC] 2012). Humid or muggy conditions occur when a “dome” of high atmospheric pressure traps hazy, damp air near the ground. A heat wave is a period of abnormally and uncomfortably hot and unusually humid weather. A heat wave will typically last two or more days (NOAA 2009).

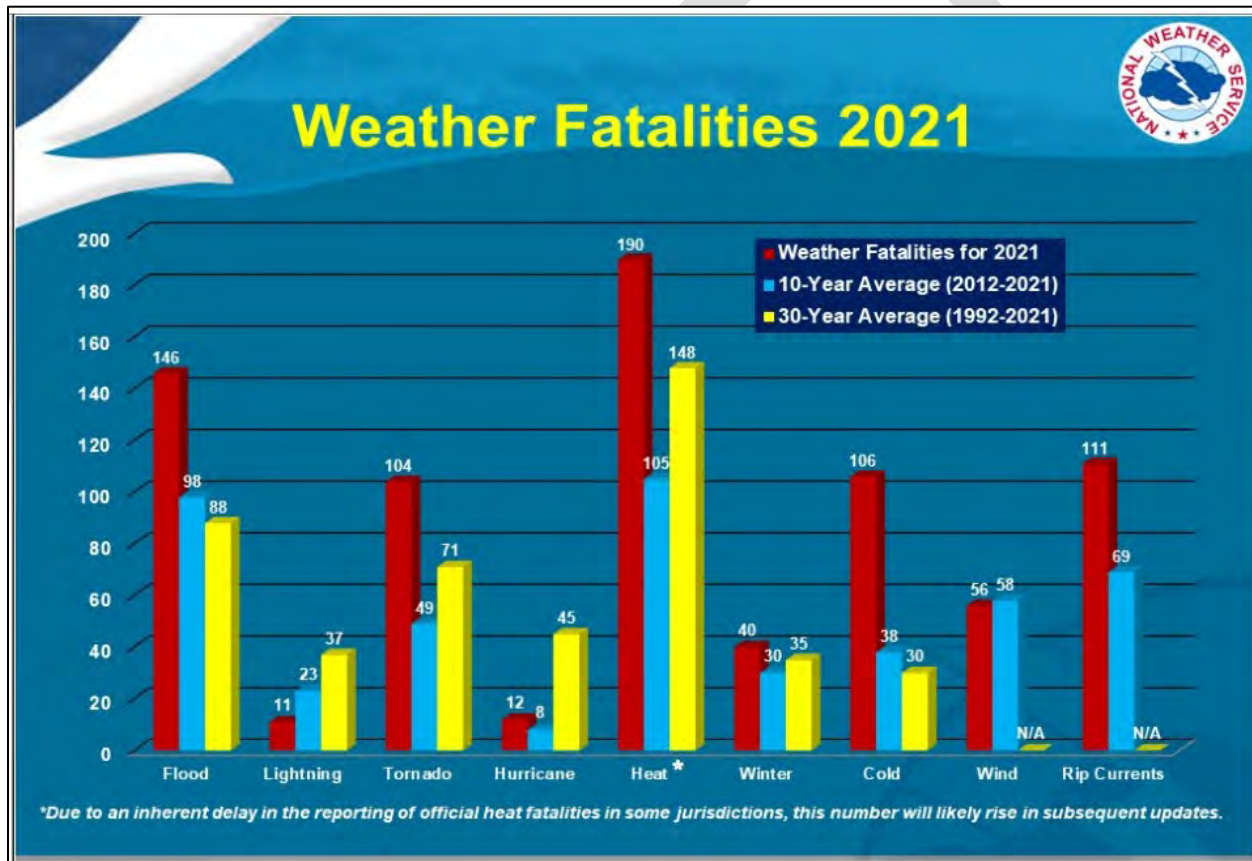


In New York State, high temperatures and heat waves are defined in several ways to reflect the diversity of conditions experienced across the state. Extreme hot days in New York State are defined as individual days with maximum temperatures at or above 90°F or 95°F. Heat waves are defined as three consecutive days with maximum temperatures above 90°F (NYSERDA 2014).

Depending on severity, duration, and location, extreme heat events can create or provoke secondary hazards, including but not limited to dust storms, droughts, wildfires, water shortages, and power outages. These secondary hazards could result in a broad and far-reaching set of impacts throughout a local area or an entire region. Impacts could include significant loss of life and 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 U.S. On average, nearly 150 people die each year in the United States from excessive heat (NWS 2021). Figure 11-1 shows the number of weather fatalities based on a 10-year average and a 30-year average. Heat caused the highest average of weather-related fatalities between 2012 and 2021.

Figure 11-1. Average Number of Weather-Related Fatalities in the U.S.

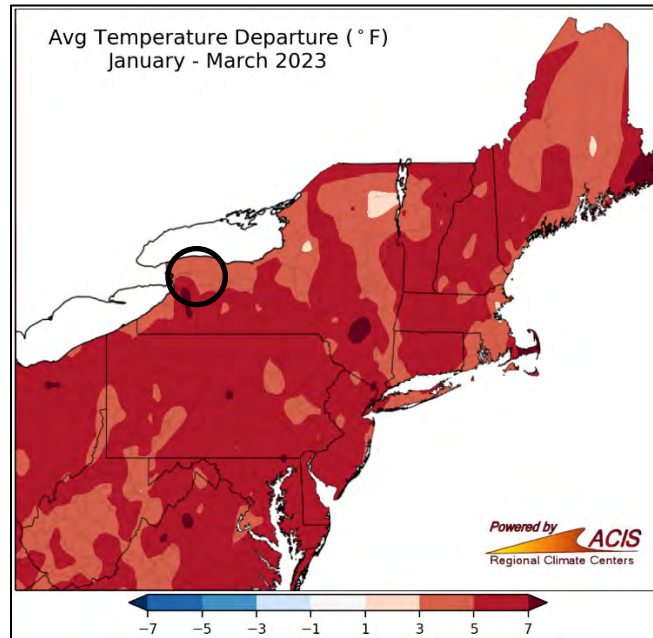


Source: NWS 2021

11.1.2 Location

Varying land elevations, character of the landscape, and proximity to large bodies of water play a significant role in New York State's temperatures. Genesee County is susceptible to both extreme cold and extreme heat temperature events. Figure 11-2 shows the Applied Climate Information System (ACIS) climate data interpolated to a 5 km by 5 km grid at the Northeast Regional Climate Center. Genesee County has an average of 3°F to 5°F temperature departure for 2023.

Figure 11-2. Average Temperatures in the Northeastern United States



Source: Northeast Regional Climate Center 2023

Note: The black circle is the general location for Genesee County.

Extensive periods of extreme cold temperatures are a result of movement of great high-pressure systems into and through the eastern United States. Under higher-than-normal atmospheric pressures when arctic air masses are present, extreme winter temperatures hover over New York. New York State's location in the Northeast makes it highly susceptible to extreme cold that can impact human life and property (NYS DHSES 2023). Extreme cold temperatures occur throughout most of the winter season and generally accompany most winter storm events throughout the state. The NYS Office of Cornell University indicates that cold temperatures prevail over the state whenever arctic air masses, under high barometric pressure, flow southward from central Canada or from Hudson Bay (Cornell University n.d.).

Excessive heat can occur anywhere, and occurrences of excessive heat are generally widespread and will cover an entire county. However, there can be spot locations that are somewhat cooler (e.g., a shady park near a stream) or hotter (e.g., urban areas because their built environment holds the heat) (NYS DHSES 2023). Extreme heat temperatures of varying degrees exist throughout the state for most of the summer season, except for areas with high altitudes (Cornell University n.d.).

New York State is divided into seven climate regions: Western New York/Great Lakes Plain, Catskill Mountains/West Hudson River Valley, Southern Tier, New York City/Long Island, East Hudson/Mohawk River Valley, Tug Hill Plateau, and Adirondack Mountains. According to NCDC, "Climatic divisions are regions within each



state that have been determined to be reasonably climatically homogeneous” (NOAA 2012). Genesee County is located within Region 1. Figure 11-3 depicts the climate regions in New York State.

Figure 11-3. New York State Climate Regions



Source: NYSDERDA 2023

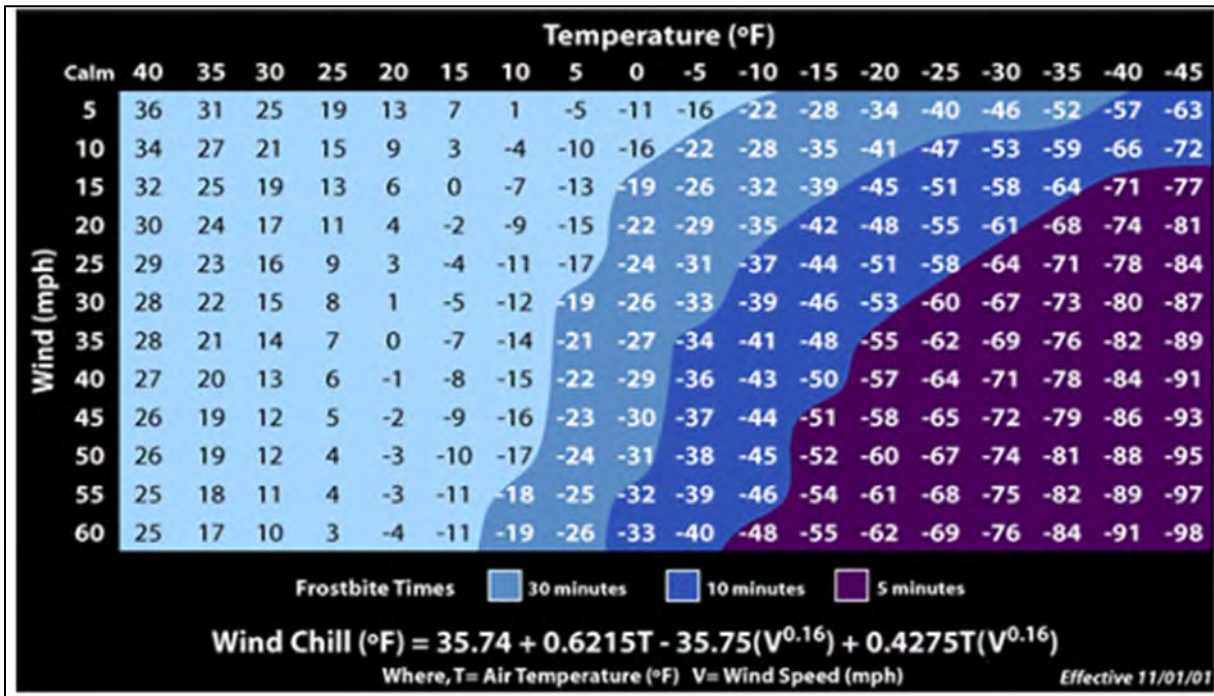
11.1.3 Extent

Extreme Cold

The extent (severity or magnitude) of extreme cold temperatures is generally measured through the Wind Chill Temperature (WCT) Index. The index uses advances in science, technology, and computer modeling to provide an accurate, understandable, and useful formula for calculating the dangers from wind chill. For details regarding the WCT, refer to: [Winter \(weather.gov\)](http://winter.weather.gov). The WCT is shown in Figure 11-4.



Figure 11-4. Wind Chill Index



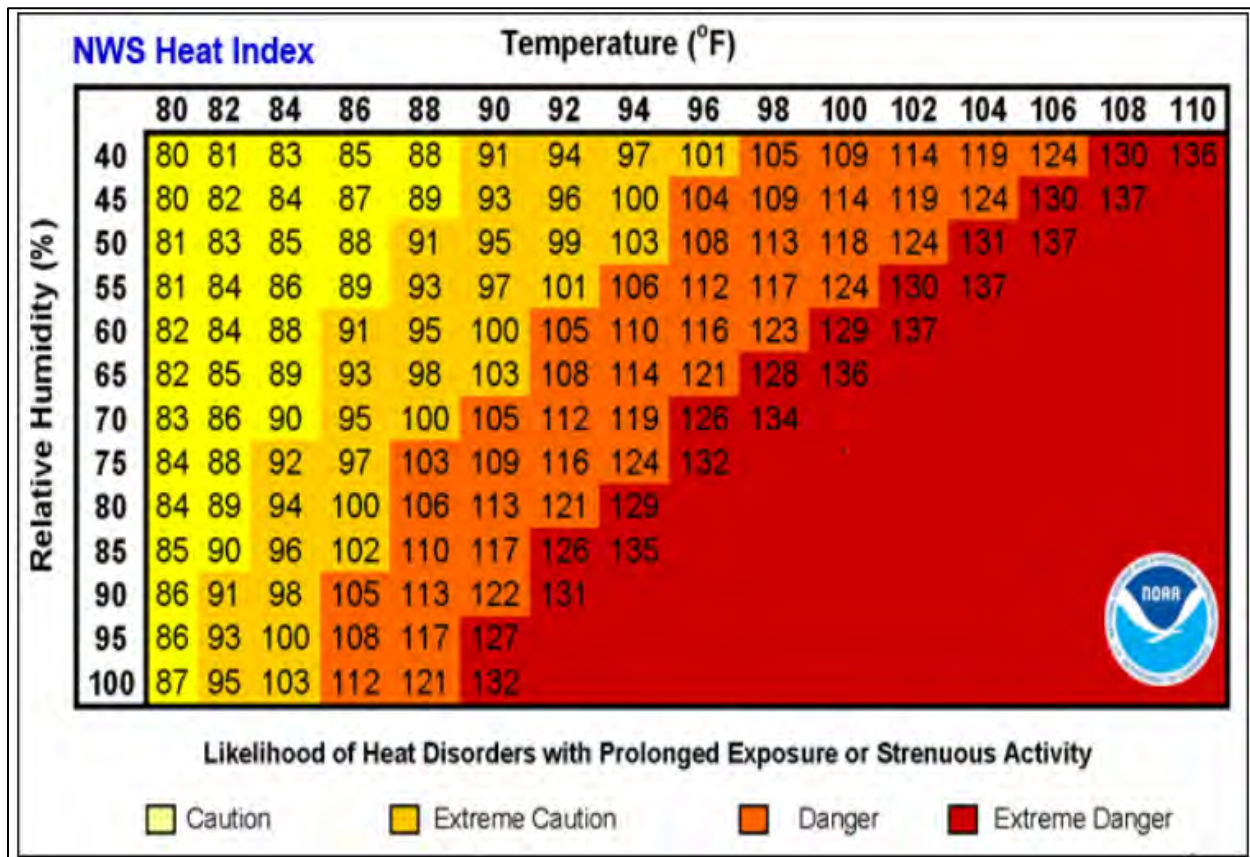
Source: NWS 2001

Extreme Heat

The extent of extreme heat temperatures is generally measured through the Heat Index, identified in Figure 11-5. Created by the NWS, the Heat Index is a chart that accurately measures the apparent temperature of the air as it increases with the relative humidity. The temperature and relative humidity are needed to determine the Heat Index. Once both values have been identified, the Heat Index is the corresponding number of both values (as seen in Figure 11-5). This index provides a measure of how temperatures actually feel; however, the values are devised for shady, light wind conditions. Figure 11-5 shows the Heat Index value for shaded areas. Exposure to full sun can increase the index by up to 15 degrees (NYSDHSES n.d.).



Figure 11-5. NWS Heat Index Chart – Shaded Areas



Source: NWS, n.d.

Table 11-1 describes the adverse effects of prolonged exposure to direct sunlight on an individual.

Table 11-4. Adverse Effects of Prolonged Exposure to Direct Sunlight

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

Source: NWS, n.d.

The National Weather Service (NWS) provides alerts when the Heat Index approaches hazardous levels. Table 11-2 explains these alerts. In the event of an extreme heat advisory, the NWS does the following:

- Includes Heat Index values and city forecasts



- Issues special weather statements, including who is most at risk, safety rules for reducing risk, and the extent of the hazard and Heat Index values
- Provides assistance to state and local health officials in preparing Civil Emergency Messages in severe heat waves (NYSDHSES n.d.)

Table 11-5. NWS Alerts

Alert	Criteria
Heat Advisory	Issued 12 hours of the onset of the following conditions: maximum daytime Heat Index values are to reach between 100°F to 104°F 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 the onset of the following conditions: 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°F

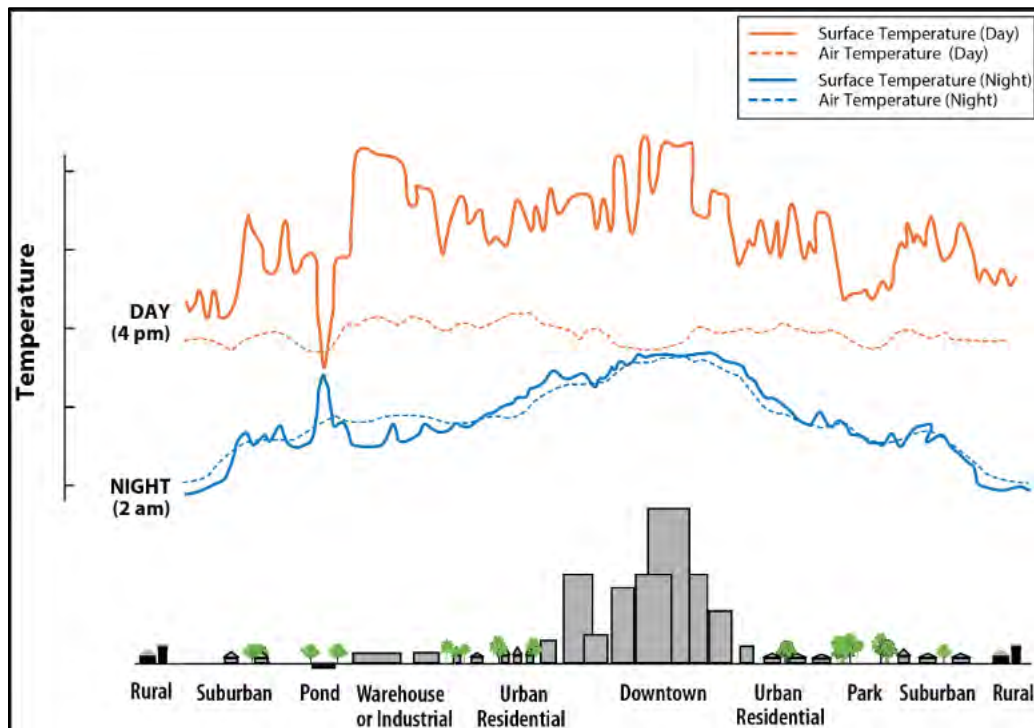
Source: NYSDHSES n.d.

Urbanized areas and urbanization create an exacerbated type of risk during an extreme heat event, compared to rural and suburban areas. As these urban areas develop and change, so does the landscape. Buildings, roads, and other infrastructure replace open land and vegetation. Surfaces that were once permeable and moist are now impermeable and dry. These changes cause urban areas to become warmer than the surrounding areas. This forms an “island” of higher temperatures (EPA 2022). The City of Batavia is the main urban area within Genesee County.

The term “heat island” describes built-up areas that are hotter than nearby rural areas. The annual mean air temperature of a city with more than 1 million people can be between 1.8°F and 5.4°F warmer than its surrounding areas. In the evening, the difference in air temperatures can be as high as 22°F. Heat islands occur on the surface and in the atmosphere. On a hot, sunny day, the sun can heat dry, exposed urban surfaces to temperatures 50°F to 90°F hotter than the air. Heat islands can affect communities by increasing peak energy demand during the summer; thereby escalating air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and death, and water quality degradation (EPA 2022).

Figure 11-6 below illustrates an urban heat island profile. The graphic demonstrates that heat islands are typically most intense over dense urban areas. Further, vegetation and parks within a downtown area may help reduce heat islands (EPA 2022).

Figure 11-6. Urban Heat Island Profile



Source: USGS 2019

11.1.4 Previous Occurrences

Federal Emergency Management Agency (FEMA) Major Disaster and Emergency Declarations

Between 1954 and 2024, Genesee County was not included in any major disaster (DR) or emergency (EM) declarations for extreme temperature-related events (FEMA 2024).

U.S. Department of Agriculture (USDA) Declarations

The 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. Between 2017 and 2024, Genesee County was not included in any USDA extreme temperature-related agricultural disaster declarations (USDA 2024).

Previous Events

Known hazard events that impacted Genesee County between January 2017 and December 2024 are discussed in Table 11-3. For events prior to 2017, refer to the 2019 Genesee County HMP.



Table 11-6. Extreme Temperature Events in Genesee County (2017 to 2024)

Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
January 30, 2019	-	-	Genesee County	Temperatures dropped rapidly dipping below 0°F county-wide, after a front which caused widespread snow drift. The wind gusts were recorded at up to 50 mph, which contributed to below-freezing temperatures. One individual experiencing homelessness died of exposure during the cold outbreak. Several schools and churches were closed. A temperature of -26°F was recorded at one point in Batavia.
May 9, 2020 – May 13, 2020	-	-	Northeastern U.S.	A cold front persisted from April through May throughout most of the northeastern U.S. Widespread snow and severe cold temperatures were seen countywide. This cold front impacted growing season in many areas.
May 17, 2023	-	-	Eastern and North Central New York State	A freeze occurred over most of the Western and North Central areas of New York. The freeze damaged apple orchards and grape vineyards across the region, especially Finger Lakes. Damage to grape crop was estimated to be at least 50 percent. Many farmers reported it as the worst frost damage they have ever seen.

Sources: NOAA NCEI 2024

11.1.5 Probability of Future Occurrences

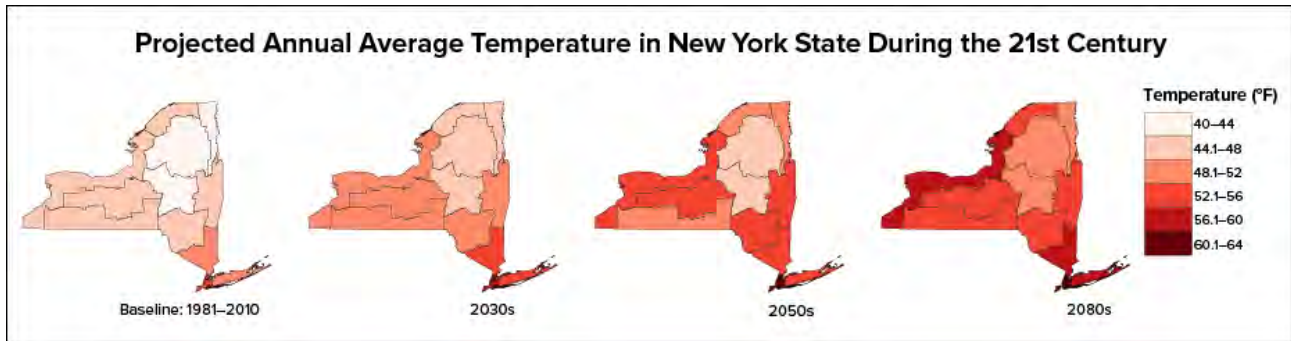
Based on the historic and more recent extreme temperature events in Genesee County, and the future climate projections for this region, the County has a moderate probability of future extreme temperature events. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 20, the identified hazards of concern for Genesee County were ranked. Based on historical records and input from the Steering Committee, the probability of occurrence for extreme temperature in the County is considered “occasional.”

Climate Change Projections

Figure 11-7 depicts the average temperature increase in New York State. Annual average precipitation is projected to decrease in the low estimate but increase in the middle range and high estimate across all regions of New York. Precipitation is projected to decrease by 2 percent or increase by up to 11 percent by the 2030s, decrease by 2 percent or increase by up to 14 percent by the 2050s, increase by one to 22 percent by the 2080s, and decrease by 4 percent or increase by 30 percent by 2100 (Stevens & Lamie 2024).



Figure 11-7. Projected Annual Average Temperature in New York State



Source: Stevens & Lamie 2024

New York State has warmed more rapidly than the national average, and winter is warming faster than other seasons. Evidence shows that extremely hot days are happening more often, and multiday heat waves are expected to occur more often and last longer in the upcoming decades. Areas such as metropolitan areas, with many buildings and limited green spaces, are more affected by heat because they retain and intensify heat as “heat islands”. Extremely cold days are becoming less common in New York State as the climate continues to warm. The number of days per year with temperatures below freezing and 0°F or below are projected to decrease across the state (Stevens & Lamie 2024). Table 11-4 further looks at the prediction of extreme heat and cold days in upcoming decades.

Table 11-7. Changes in Extreme Events in the Great Lakes Region – Heat Waves and Drought Conditions

Event Type	# Days Per Year	Baseline	10th Percentile	50th Percentile	90th Percentile
Heat Waves	2030s				
	Days over 90°F	3	7	10	27
	Days over 95°F	0.3	0.8	2	7
	Days below 32°F	126	76	102	110
	Days below 0°F	3	0	102	110
	Number of Heat Waves	0.2	0.6	0.9	3
	Average Length of Heat Waves	4	4	4	5
	Maximum Heat Index	95	101	103	108
	Days Heat Index is over 85°F	19	33	43	57
	Days Heat Index is over 95°F	2	8	10	16
	2050s				
	Days over 90°F	3	10	19	54
	Days over 95°F	0.3	1	5	24
	Days below 32°F	126	57	95	102
	Days below 0°F	3	0	0	0.4
	Number of Heat Waves	0.2	0.9	2	7
	Average Length of Heat Waves	4	4	4	6
	Maximum Heat Index	95	104	109	115
	Days Heat Index is over 85°F	19	42	60	81



Event Type	# Days Per Year	Baseline	10th Percentile	50th Percentile	90th Percentile
Days Heat Index is over 95°F	2	10	18	32	
2080s					
Days over 90°F	3	16	37	89	
Days over 95°F	0.3	3	19	54	
Days below 32°F	126	5	71	99	
Days below 0°F	3	0	0	0	
Number of Heat Waves	0.2	2	5	9	
Average Length of Heat Waves	4	4	5	8	
Maximum Heat Index	95	108	116	132	
Days Heat Index is over 85°F	19	54	77	118	
Days Heat Index is over 95°F	2	16	32	74	

Source: Stevens & Lamie 2024

11.1.6 Cascading Impacts on Other Hazards

Extreme heat temperature events can exacerbate the drought hazard, increase the potential risk of wildfires, and escalate severe storm and severe winter weather events for the County. For example, extreme heat events may accelerate evaporation rates, drying out the air and soils. Extreme heat can also dry out terrestrial species, making them more susceptible to catching fire. Extreme variation in temperatures could create ideal atmospheric conditions for severe storms or worsen the outcome of severe winter weather during freezing and thawing periods. Refer to Chapter 14 (Severe Storm), Chapter 15 (Severe Winter Storm), and Chapter 19 (Wildfire) for more information about these hazards of concern.

11.2 VULNERABILITY AND IMPACT ASSESSMENT

To understand risk, a community must evaluate what assets are exposed or vulnerable in the hazard area identified. The entire County has been identified as exposed to extreme temperature events. Therefore, all assets in the County (population, structures, critical facilities, and lifelines), as described in the County Profile (Section 3), are exposed and potentially vulnerable.

11.2.1 Life, Health, and Safety

Overall Population

The entire population of Genesee County is exposed to extreme temperature events. Extreme temperature events have potential health impacts, including injury and death. According to the Centers for Disease Control and Prevention, populations most at risk to extreme cold and heat events include the following: (1) the elderly, who are less able to withstand temperatures extremes because of their age, health conditions, and limited mobility to access shelters; (2) infants and children up to 4 years of age; (3) individuals who are physically ill (such as with heart disease or high blood pressure), (4) low-income persons who cannot afford proper heating and cooling; and (5) members of the general public who may overexert during work or exercise during extreme heat events or experience hypothermia during extreme cold events (WHO 2018).



Socially Vulnerable Population

According to the CDC, populations most at risk to extreme cold and heat events include the following groups: the elderly, who are less able to withstand temperatures extremes due to their age, health conditions, and limited mobility to access shelters; infants and children up to four years of age; individuals with chronic medical conditions (e.g., heart disease, high blood pressure), low-income persons that cannot afford proper heating and cooling; and the general public who may overexert during work or exercise during extreme heat events or experience hypothermia during extreme cold events (CDC 2022, CDC 2005).

11.2.2 General Building Stock

Extreme heat generally does not affect buildings; however, losses may be associated with overheating of heating, ventilation, and air conditioning (HVAC) systems. Extreme cold temperature events can damage buildings through freezing and bursting pipes and freeze/thaw cycles. Additionally, manufactured homes (mobile homes) and antiquated or poorly constructed facilities may have inadequate capabilities to withstand extreme temperatures.

All of the building stock in the County is exposed to the extreme temperature hazard; however, direct impacts are expected to be minimal. Refer to Chapter 3 (County Profile), which summarizes the building inventory in Genesee County.

11.2.3 Community Lifelines and Other Critical Facilities

Similar to the general building stock, all critical facilities in the County are exposed to the extreme temperature hazard; however, direct impacts are expected to be minimal. Impacts to critical facilities are the same as were described for general building stock. Additionally, it is essential that critical facilities remain operational during natural hazard events. Extreme heat events can sometimes cause short periods of utility failures, commonly referred to as “brown-outs,” created by increased usage from air conditioners, appliances, and similar equipment. Similarly, heavy snowfall and ice storms, associated with extreme cold temperature events, can interrupt power as well. This being said, backup power is recommended for critical facilities and infrastructure.

11.2.4 Economy

Extreme temperature events also have impacts on the economy, including loss of business function and damage and loss of inventory. Business owners may be faced with increased financial burdens due to unexpected repairs caused to the building (pipes bursting), higher than normal utility bills, or business interruption caused by power failure (loss of electricity and telecommunications).

The agricultural industry is most at risk in terms of economic impact and damage caused by extreme temperature events. Extreme heat events can result in drought and dry conditions and directly affect livestock and crop production.

Based on the 2022 Census of Agriculture, 435 farms were present in Genesee County, encompassing 176,887 acres of total farmland. The average farm size was 407 acres. Genesee County farms had a total market value of products sold of \$359 million (USDA 2022). Table 11-5 lists the acreage of agricultural land exposed to extreme temperature hazards.



Table 11-8. Agricultural Land in Genesee County in 2022

Number of Farms	Land in Farms (acres)	Total Cropland (acres)	Total Pastureland (acres)	Acres Irrigated
485	176,943	141,047	6,241	4,364

Source: USDA 2022

In 2022, the top three agricultural products sold in Genesee County were milk from cows at \$193,820; vegetables, melons, potatoes, sweet potatoes at \$61,562; and grains, oilseeds, dry beans, and dry peas at \$51,662. Genesee County was the highest ranked County in New York State for its sales of vegetables, melons, potatoes, sweet potatoes, and fourth highest ranked for its sales of poultry, eggs, and cattle and calves (USDA 2022).

If an extreme temperature event impacted the agricultural products sold from Genesee County farms, based on 2022 market values, this would be a loss of \$359,698,000. This figure does not include how the tourism industry and local jobs are impacted.

11.2.5 Natural, Historic, and Cultural Resources

Natural

Extreme temperature events can have a major impact on the environment. For example, freezing and warming weather patterns create changes in natural processes. An excess amount of snowfall and earlier warming periods may affect natural processes such as flow within water resources (USGS 2020). Extreme heat events can have particularly negative impacts on aquatic systems, contributing to fish kills, aquatic plant die-offs, and increased likelihood of harmful algal blooms. These extreme temperature events can also affect the surrounding ecosystems, which can destroy food webs and deplete resources in the environment.

Historic

Historic sites are at risk from the extreme cold or freeze hazard. Historic buildings may be susceptible to damage from extreme temperature conditions. 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).

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 also increase the probability of cracking or splitting in built structures. Under extreme heat, stones can face both macro (e.g., cracking of stones, soot accumulation, color change in stone containing iron) and micro degradation (e.g., mineralogical and textural changes), leading to potential structural instability. The long-term impacts include weakened stones and increased susceptibility to deterioration processes such as salt weathering and temperature cycling (Sesana, et al. 2021).

Cultural

Cultural heritage sites, particularly those exposed to the elements, are subject to weathering. Climate change is a potential threat to these sites as it exacerbates the expected rates of decay and contributes to the appearance of new decay. Climatic changes may aggravate the physical, chemical, and biological mechanisms causing degradation by affecting the structure or composition of building materials. Changes in temperature, precipitation, atmospheric moisture, and wind intensity, in addition to sea-level rise, desertification, and the interaction between



climatic changes and air pollution, have been identified as concerns by the United Nations Educational, Scientific and Cultural Organization (Sesana, et al. 2021).

11.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure the establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

11.3.1 Potential or Planned Development

The ability of new development to withstand extreme temperature impacts can be enhanced through land use practices and consistent enforcement of codes and regulations for new construction. New development will change the landscape where buildings, roads, and other infrastructure potentially replace open land and vegetation. Transformation of pervious surfaces (including vegetation) to impervious surfaces causes an island of higher temperatures. Specific areas of recent and new development are indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II (Jurisdictional Annexes) of this plan.

11.3.2 Projected Changes in Population

According to the 2020 Census, the population of the County has increased by approximately 2.85 percent since 2010. Population projections from Cornell University reveal the County's population is anticipated to continue decreasing. The population is projected to decline to 56,077 persons in 2030 and to 54,128 by 2040 (Cornell University 2018). Any changes in the density of population may require utility system upgrades to keep up with utility demands (e.g., water, electric) during extreme temperature events to prevent increased stresses on these systems. Additionally, by increasing development, green space preservation will need to continue to be a priority to mitigate increased heat islands. Refer to Chapter 3 (County Profile), which includes a discussion on population trends for the County.

11.3.3 Climate Change

As discussed above, most studies project that the State of New York will see an increase in average annual temperatures and precipitation. As the climate warms, extreme cold events might decrease in frequency, while extreme heat events might increase in frequency; the shift in temperatures could also result in hotter extreme heat events. With increased temperatures, vulnerable populations could face increased vulnerability to extreme heat and its associated illnesses, such as heatstroke and cardiovascular and kidney disease. Additionally, as temperatures rise, more buildings, facilities, and infrastructure systems may exceed their ability to cope with the heat.

11.3.4 Change of Vulnerability Since 2019 HMP

Overall, the County's vulnerability has not changed, and the entire County will continue to be exposed and vulnerable to extreme temperature events. As the climate warms, extreme cold events may decrease in frequency, but will become more severe, while extreme heat events may increase and become more severe. The shifts in temperatures could also result in hotter extreme heat events. With increased temperatures, vulnerable populations could face increased susceptibility to extreme heat and associated illnesses, such as heatstroke and cardiovascular and kidney disease. Additionally, as temperatures rise, more buildings, facilities, and infrastructure



systems may exceed their ability to cope with the heat. Thus, building efficiency and upgrading heating and cooling technology/HVAC will become an increasingly important issue for businesses and homeowners over the coming years.

DRAFT



12. FLOOD

12.1 HAZARD PROFILE

12.1.1 Hazard Description

Floods are one of the most common natural hazards in the U.S. They can develop slowly over a period of days or develop quickly, with disastrous effects that can be local (impacting a neighborhood or community) or regional (affecting entire river basins, coastlines, and multiple counties or states) (FEMA 2007). As defined in the State of New York Hazard Mitigation Plan (HMP), flooding is a general and temporary condition of partial or complete inundation on normally dry land as a result of the following (NYS DHSES 2023):

- Riverine overbank flooding
- Flash floods
- Alluvial fan floods
- Mudflows or debris floods
- Dam-break floods
- Local draining or high groundwater levels
- Fluctuating lake levels
- Ice jams
- Coastal flooding
- Urban flooding

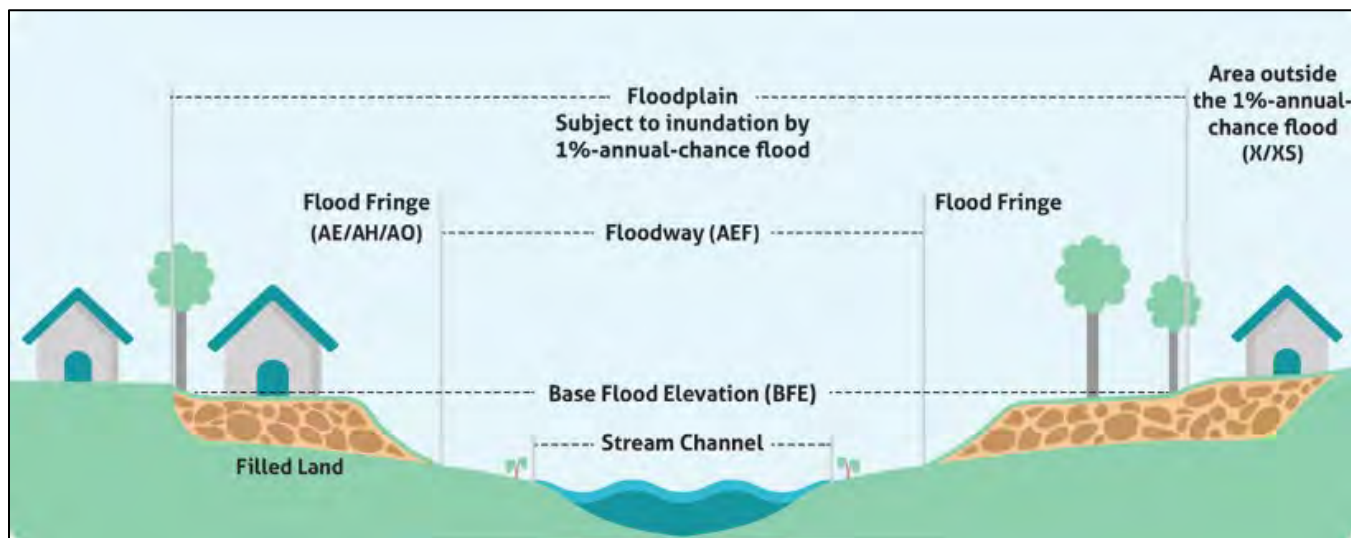
For the purpose of this HMP and as deemed appropriate by the Genesee County Steering Committee, the main flood types of concern discussed in this section include riverine, flash, stormwater/urban, and ice jam. In addition, coastal erosion is considered a cascading hazard in the coastal areas. These types of floods are further discussed below.

Riverine Flooding

Riverine floods are the most common flood type. They occur along a channel and include overbank and flash flooding. Channels are defined, ground features that carry water through and out of a watershed. They may be called rivers, creeks, streams, or ditches. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas (Illinois Association for Floodplain and Stormwater Management 2006)

A floodplain is defined as the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that becomes inundated with water during a flood. In Genesee County, floodplains line the rivers and streams of the County and the lakeshore areas. The boundaries of the floodplains are altered as a result of 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 modeling techniques. Figure 12-1 depicts the flood hazard area, the flood fringe, and the floodway areas of a floodplain.

Figure 12-8. Stream or Riverine Flood Zones



Source: City and County of Honolulu 2023

Flash Flooding

Flash floods are defined by the National Weather Service as “a flood caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through riverbeds, urban streets, or mountain canyons, sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance, after a levee or dam has failed, or after a sudden release of water by a debris or ice jam.” (National Weather Service 2009).

Stormwater/Urban Flooding

Stormwater/urban flooding described below is due to local drainage issues and high groundwater levels. Locally, heavy precipitation may produce flooding in areas other than delineated floodplains or along recognizable channels. If local conditions cannot accommodate intense precipitation through a combination of infiltration and surface runoff, water may accumulate and cause flooding problems. During winter and spring, frozen ground and snow accumulations may contribute to inadequate drainage and localized ponding. Flooding issues of this nature generally occur in areas with flat gradients and generally increase with urbanization, which speeds the accumulation of floodwaters because of impervious areas. Shallow street flooding can occur unless channels have been improved to account for increased flows (FEMA 1997).

High groundwater levels can be a concern and cause problems even where there is no surface flooding. Basements are susceptible to high groundwater levels. Seasonally high groundwater is common in many areas, while elsewhere high groundwater occurs only after a long period of above-average precipitation (FEMA 1997).

Heavy rainfall that overwhelms a developed area’s stormwater infrastructure causing flooding is commonly referred to as urban flooding. Urban flooding can be worsened by aging and 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). While riverine and lakeshore flooding is mapped and studied by FEMA, urban flooding is not.



NOAA defines urban flooding as the flooding of streets, underpasses, low-lying areas, or storm drains (National Weather Service 2009). Urban drainage flooding is caused by increased water runoff due to urban development and inadequate drainage systems. Drainage systems are designed to remove surface water from developed areas as quickly as possible to prevent localized flooding on streets and other urban areas. The systems make use of a closed conveyance system that channels water away from an urban area to surrounding streams. 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 any obstruction to the stream flow. Obstructions may include river bends, mouths of tributaries, points where the river slope decreases, as well as dams and bridges. The water held back by this obstruction can cause flooding upstream, and if the obstruction suddenly breaks, flash flooding can occur as well (NOAA 2024). The formation of ice jams depends on the weather and physical condition of the river and stream channels. They are most likely to occur where the channel slope naturally decreases, in culverts, and along shallows where channels may freeze solid. Ice jams and resulting floods can occur during at different times of the year: fall freeze-up from the formation of frazil ice; mid-winter periods when stream channels freeze solid, forming anchor ice; and spring breakup when rising water levels from snowmelt or rainfall break existing ice cover into pieces that accumulate at bridges or other types of obstructions (NYS DHSES 2023).

Ice Jams at a Glance

- Freeze-up jams occur when floating ice may slow or stop due to a change in water slope as it reaches an obstruction to movement.
- Breakup jams occur during periods of thaw, generally in late winter and early spring.

12.1.2 Location

While flooding can occur anywhere that it rains, flooding potential is influenced by such factors as climatology, meteorology, and topography (elevations, latitude, and water bodies and waterways). Flooding potential for each type of flooding that affects Genesee County is described in the subsections below.

Riverine Flooding

There are three main flood hazard areas in the County. The first area extends along the Tonawanda Creek watershed from the Wyoming County line north to the City of Batavia. This flood zone lies mostly within the Towns of Alexander and Batavia but extends into the northwest corner of the Town of Bethany and the south-central part of the City of Batavia. The flood zone is fairly restricted in the southern half of Alexander but expands to encompass most of the northeastern quadrant of the town. It continues north into the Town and City of Batavia. This area is primarily open agricultural land, but development pressure is in danger of encroaching onto the floodplain in areas along Route 98, which roughly forms the western border of the floodplain (GFLRPC 2002).

The second main flood hazard area is in the northeastern corner of the County, in the Towns of Byron and Bergen. Here, the Black Creek is the source of flooding in a band that stretches from the center of the Town of Byron eastward through the Town of Bergen to the County line. This area is primarily open agricultural land (GFLRPC 2002).



The third main flood hazard area is along the County's northern border. Low-lying muckland in the towns of Alabama, Oakfield, Elba, and Byron is within the 1 percent annual chance floodplain. A band of floodplain stretches along the Genesee-Orleans County line from the northwest corner of the Town of Alabama eastward to the northwest corner of the Town of Byron. This area is primarily open agricultural land (GFLRPC 2002).

In addition to these three main areas of flood hazard zones, numerous smaller flood hazard "pockets" are scattered about the County, especially in the towns of Darien, Pembroke, and Batavia. Other flood hazard pockets are located along the Black Creek in Bethany, the Oatka Creek in Pavilion, and the White Creek in Le Roy (GFLRPC 2002).

The Oatka and Tonawanda Creeks are the two most dangerous and historically the most destructive sources of flooding in Genesee County. The following sections provide narrative overviews of major past flooding events along these two creeks. These narratives were originally prepared for the Genesee and Wyoming Counties Joint Flood Mitigation Plan and were revised for inclusion in this Plan (GFLRPC 2002).

Floodplains

A floodplain is defined as the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that becomes inundated with water during a flood. In Genesee County, floodplains line the rivers, streams, and lakeshores of the County. The boundaries of the floodplains are altered as a result of 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 modeling techniques (NJAFM 2015).

Flood hazard areas are identified as Special Flood Hazard Area (SFHA). SFHA are defined as the area that will be inundated by the flood event having a 1 percent chance of being equaled to or exceeded in any given year. The 1 percent annual chance flood is also referred to as the base flood or 100-year flood. A 100-year floodplain is not a flood that will occur once every 100 years; the designation indicates a flood that has a 1 percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. Similarly, the moderate flood hazard area (500-year floodplain) will not occur every 500 years but is an event with a 0.2 percent chance of being equaled or exceeded each year (FEMA 2020). The 1 percent annual chance floodplain establishes the area that has flood insurance and floodplain management requirements. Figure 12-2 below provides a detailed explanation of flood map terminology.

Figure 12-9. Flood Map Terms

- Flood hazard areas identified on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area (SFHA).
- SFHA = area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year.
- 1-percent annual chance flood = the base flood or 100-year flood.
- SFHAs are 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 and are 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, are labeled

Source: FEMA 2018



Locations of flood zones in Genesee County as depicted on the FEMA preliminary Digital Flood Insurance Rate Map (DFIRM) are illustrated in Figure 12-3, and the total land area in the floodplain, inclusive of waterbodies, is summarized in Table 12-1. Refer to Section 9 for a map of each jurisdiction depicting the floodplains. Flood hazard zones occur throughout the County.

Table 12-1. Number of Acres Genesee County Is Exposed to 1 Percent and 0.2 Percent Annual Chance Flood

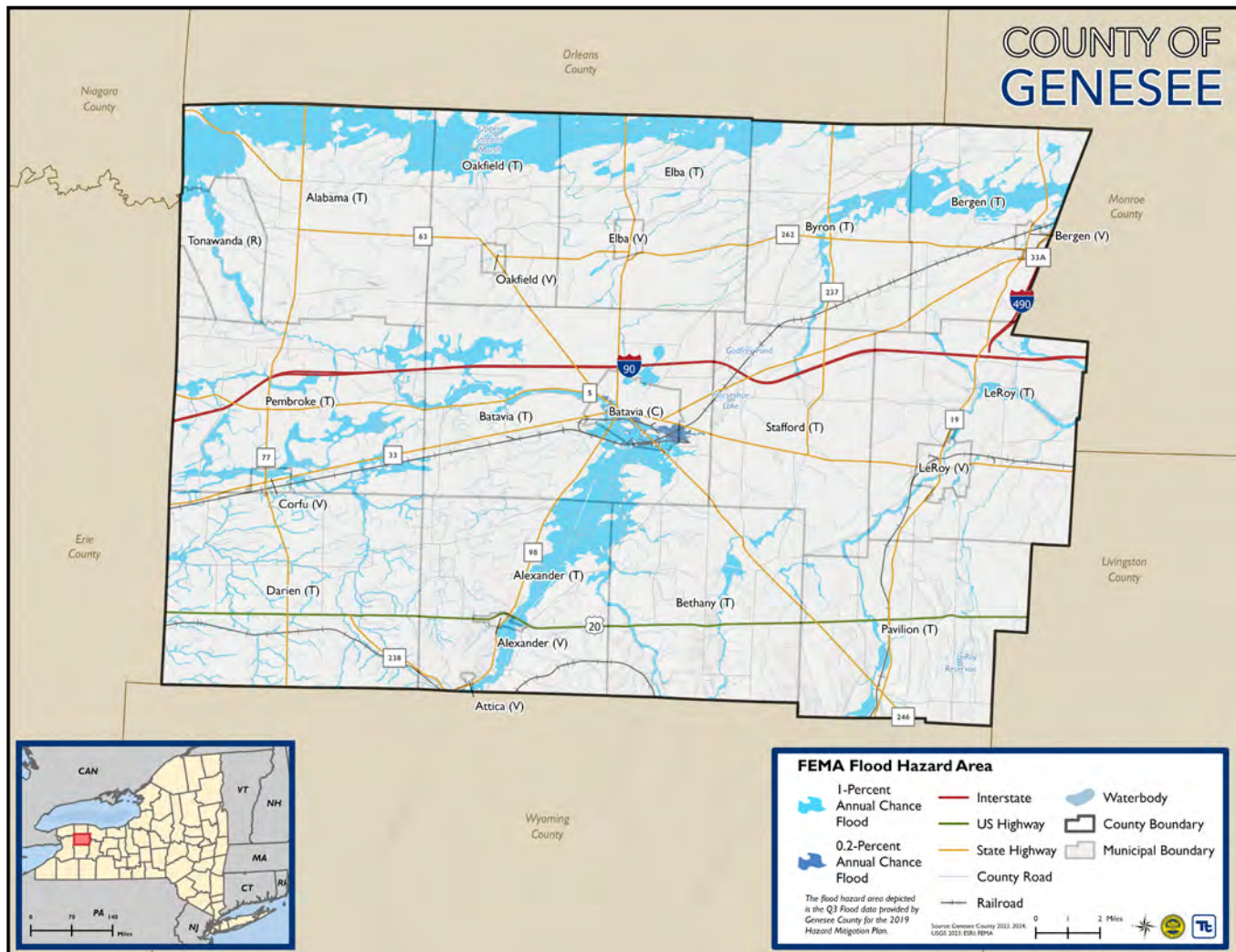
Jurisdiction	Total Acres of Land Area	Total Acres of Land Area (Excluding Waterbodies) Located in the Flood Hazard Areas			
		Total Acres Located in the 1 Percent Annual Chance Flood Event	Percent of Total	Total Acres Located in the 0.2 Percent Annual Chance Flood Event	Percent of Total
Alabama (T)	26,716	6,223	23.3%	6,223	23.3%
Alexander (T)	22,240	3,758	16.9%	3,767	16.9%
Alexander (V)	292	68	23.4%	70	24.0%
Attica (V)	116	18	15.8%	18	15.8%
Batavia (C)	3,297	738	22.4%	1,056	32.0%
Batavia (T)	30,929	4,217	13.6%	4,332	14.0%
Bergen (T)	17,139	2,749	16.0%	2,749	16.0%
Bergen (V)	464	22	4.7%	22	4.7%
Bethany (T)	23,047	1,446	6.3%	1,446	6.3%
Byron (T)	20,677	1,896	9.2%	1,896	9.2%
Corfu (V)	607	169	27.8%	169	27.8%
Darien (T)	30,269	2,573	8.5%	2,573	8.5%
Elba (T)	22,195	4,196	18.9%	4,196	18.9%
Elba (V)	633	25	4.0%	25	4.0%
Le Roy (T)	25,210	1,211	4.8%	1,211	4.8%
Le Roy (V)	1,702	135	7.9%	142	8.3%
Oakfield (T)	14,675	3,652	24.9%	3,652	24.9%
Oakfield (V)	419	19	4.6%	19	4.6%
Pavilion (T)	22,777	739	3.2%	739	3.2%
Pembroke (T)	26,068	3,998	15.3%	3,998	15.3%
Stafford (T)	19,922	200	1.0%	200	1.0%
Tonawanda (R)	5,946	808	13.6%	808	13.6%
Genesee County (Total)	315,342	38,861	12.3%	39,312	12.5%

Source: Genesee County Planning 2024; Genesee County 2017; USGS 2023

Note: % = Percent



Figure 12-10. FEMA Flood Hazard Areas in Genesee County



Flood Gages

The USGS National Water Information System (NWIS) collects surface water data from more than 850,000 stations across the country. The time-series data describes stream levels, streamflow (discharge), reservoir and lake levels, surface water quality, and rainfall. The data is collected by automatic recorders and manual field measurements at the gage locations. USGS uses stream gages to determine the severity of floods at different points along a body of water.

There is one stream gage in the County, as detailed in Table 12-2, in addition to others just outside of the County's boundary, that provide critical flood data for waterways affecting the County. The USGS website provides details about each of the gages (<https://waterwatch.usgs.gov/index.php>) and the gage heights of flooding events. The NWS provides the different flood stages for the gages (<https://water.weather.gov/ahps/>).



Table 12-2. Gages in Genesee County

Gage Site Number	Site Name	Latitude	Longitude	Flood Stage Height	Record Flood Height
04217000	Towanda Creek at Batavia	42.99658	-78.18816	9	13.85

Source: FEMA FIS 2022; NWS 2022; USGS 2022

Flash Flooding

Flash flooding can occur throughout any region of the State of New York; however, the distinctive flash flood event characterized by fast moving water and damaging impacts requires a steep topography. While Genesee County could undergo flash floods (and has, in the past), the County is at a lower risk than other parts of the State for this type of flood event (NYS DHSES 2023).

Stormwater/Urban Flooding

Stormwater/urban flooding is not mapped by the State or FEMA but is most likely to occur in highly developed areas with high percentages of impervious coverage that contribute to high rates of runoff. Locations that have undersized stormwater components or stormwater components that are prone to becoming clogged or failing often experience stormwater flooding.

Ice Jam Flooding

Ice jams are common in the northeast United States, and the State of New York is not an exception. In fact, according to U.S. Army Corps of Engineers (USACE), the State ranks second in the United States for total number of ice jam events, with over 1,600 incidents documented between 1867 and 2015. Areas of the State that include characteristics lending 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).

The Ice Jam Database, maintained by the Ice Engineering Group at the USACE Cold Regions Research and Engineering Laboratory (CRREL), currently consists of over 19,000 records from across the United States. According to the USACE-CRREL, Genesee County underwent or may have been impacted by 12 historic ice jam incidents between 1780 and 2024, though no events have occurred in the last 25 years (USACE 2022). Ice jams have formed along Tonawanda Creek.

12.1.3 Extent

The severity of a flood event is typically determined by a combination of several factors depending on the type of flooding event.

Riverine and Flash Flooding

The severity of riverine and flash flooding is determined by a combination of several factors including stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and degree of vegetative clearing and impervious surface. Generally, floods are long-term events that may last for several days. Severity depends not only on the amount of water that accumulates in a period of time, but also on the land's ability to manage this water. One element is the size of rivers and streams in an area; but an equally important factor is the land's absorbency. When it rains, soil acts as a sponge. When the land is saturated or frozen, infiltration into the ground slows and any more water that accumulates must flow as runoff (Harris 2008).



The frequency and severity of riverine flooding are measured using a discharge probability, which is the probability that a certain river discharge (flow) level will be equaled or exceeded in a given year. Flood studies use historical records to determine the probability of occurrence for the different discharge levels.

In the case of riverine or flash flooding, once a river reaches flood stage, the flood extent or severity categories used by the NWS include minor flooding, moderate flooding, and major flooding. Each category has a definition based on property damage and public threat (NWS 2011):

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

Flash Flooding

Flash flooding, like riverine flooding, occurs throughout the County, primarily along the bodies of water that flow through it.

Stormwater/Urban Flooding

Stormwater/urban flooding is not mapped by the State or FEMA but is most likely to occur in highly developed areas with high percentages of impervious coverage that contribute to high rates of runoff. Locations that have undersized stormwater components or stormwater components that are prone to becoming clogged or failing often experience stormwater flooding.

Ice Jam

Ice jam flooding events often occur suddenly and difficult to predict, allowing for 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).

12.1.4 Previous Occurrences

Federal Emergency Management Agency (FEMA) Major Disaster and Emergency Declarations

Between 1954 and 2024, Genesee County was included in seven major disaster (DR) or emergency (EM) declarations for flood-related events (FEMA 2024). Table 12-3 lists these declarations.

Table 12-3. FEMA Declarations for Flood Events in Genesee County (1954 to 2024)

Event Date	Declaration Date	Declaration Number	Description
March 21, 1973	March 21, 1973	DR-367	High Winds, Wave Action, Flooding
March 19, 1976	March 19, 1976	DR-494	Ice Storm, Severe Storms & Flooding
January 5–17, 1998	January 6, 1998	DR-1196	Severe Storms and Flooding
June 25–July 10, 1998	July 7, 1998	DR-1233	Severe Storms and Flooding



Event Date	Declaration Date	Declaration Number	Description
May 13–June 17, 2004	August 3, 2004	DR-1534	Severe Storms and Flooding
October 12–25, 2006	October 24, 2006	DR-1665	Severe Storms and Flooding
November 17–26, 2014	December 22, 2014	DR-4204	Severe Winter Storms, Snowstorm, and Flooding

Sources: FEMA 2024

U.S. Department of Agriculture (USDA) Declarations

The 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. Between 2017 and 2024, Genesee County was included in two USDA flood-related agricultural disaster declarations (USDA 2024). For declarations that occurred between 2017 and 2024, refer to Table 12-4.

Table 12-4. USDA Declarations for Flood Events in Genesee County (2017 to 2024)

Event Date	USDA Declaration Number	Description
1/29/2020	S4622	Excessive rain.
12/13/2017	S4265	Excessive rain.

Sources: USDA 2024

Previous Events

Known hazard events that impacted Genesee County between January 2017 and December 2024 are discussed in Table 12-5. For events prior to 2019, refer to the 2019 Genesee County HMP.

Table 12-5. Flood Events in Genesee County (2017 to 2024)

Event Date	FEMA Declaration or State Proclamation Number	Genesee County included in declaration?	Location Impacted	Description
April 20, 2017	-	-	Bushville	Several rounds of thunderstorms brought 1–3 inches of rain to the area in just a couple of hours.
July 13, 2017	-	-	Batavia	A convective complex moved across Western New York late in the morning. This produced a quick 2–4 inches of rain, which covered a significant portion of the region and resulted in flash flooding that impacted the Buffalo metro area, the Boston/Wyoming hills, and parts of the northern Finger Lakes Region.
July 23, 2017	-	-	West Bethany	Flash flooding and heavy rain.



Event Date	FEMA Declaration or State Proclamation Number	Genesee County included in declaration?	Location Impacted	Description
November 6, 2017	-	-	Batavia	After a warm front brought soaking rains to the region, a cold front brought additional rain. The heavy precipitation fell on already saturated ground resulting in both area and river flooding. Rainfall amounts of three to four inches were reported. Tonawanda Creek at Batavia crested at 11.23 feet at 9:00 p.m. on November 6 (Flood Stage is 9 feet).
July 29, 2023	-	-	Pembroke	A mid-level impulse and stalled out frontal boundary resulted in slow moving thunderstorms across the western Niagara Frontier that produced heavy rain and flash flooding. There were also waterspouts on Lake Erie in the afternoon as the impulse crossed the area. Flooding over roadway on State Route 77.
July 15, 2024	-	-	Le Roy, Batavia	A severe storm produced tornadoes, flash flooding, tennis ball sized hail (2.5) and numerous trees and wires downed. New York State Route 5 and railroad underpass flooded, accumulating around 5 feet of water. Route 63 (Ellicott St.) flooded in both directions.

Sources: NOAA-NCEI 2024

12.1.5 Probability of Future Occurrences

Genesee County is expected to continue experiencing direct and indirect impacts of flooding events in the future. These impacts may induce secondary hazards such as infrastructure deterioration or failure, utility failures, power outages, water quality and supply concerns, and transportation delays, accidents, and inconveniences.

The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 20, the identified hazards of concern for Genesee County were ranked. Based on historical records and input from the Steering Committee, the probability of occurrence for flood (due to ice jam, flash flood, or flood) in the County is considered “frequent”.

Climate Change Projections

The projected increase in precipitation is expected to fall as heavy downpours. Downpours are very likely to increase in frequency and intensity, a change which has the potential to affect drinking water; heighten the risk of riverine flooding; flood key rail lines, roadways, and transportation hubs; and increase delays and hazards related to extreme weather events. Table 12-6 identifies the mean annual changes in precipitation in the Great Lakes Region of New York, where Genesee County is located. Less frequent rainfall during the summer months may impact the potable



water availability. A secondary impact of flooding, which could occur due to climate change, includes impacts from increasing water temperatures in rivers and streams, which will affect aquatic health and reduce the capacity of streams to assimilate effluent wastewater treatment plants (Stevens & Lamie 2024).

Table 12-6. Mean Annual Changes in Precipitation in the Great Lakes Region

Decade	10 th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
2030s	-2%	1%	3%	7%	8%
2040s	-1%	2%	5%	8%	10%
2050s	-1%	2%	6%	10%	11%
2060s	-1%	4%	8%	11%	14%
2070s	-1%	6%	9%	12%	15%
2080s	2%	6%	10%	13%	17%
2100	-4%	4%	10%	17%	23%

Source: Stevens & Lamie 2024

Note: % = Percent

12.1.6 Cascading Impacts on Other Hazards

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

Cascading impacts may also include exposure to pathogens such as mold. 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. The degree of impact will vary and is not strictly measurable. Mold spores can grow in as short a period as 24–48 hours in wet and damaged areas of buildings that have not been properly cleaned. Very small mold spores can easily be inhaled, creating the potential for allergic reactions, asthma episodes, and other respiratory problems. Buildings should be properly cleaned and dried out to safely prevent mold growth (FEMA 2017).

Molds and mildews are not the only public health risk associated with flooding. Floodwaters can be contaminated by pollutants such as sewage, human and animal feces, pesticides, fertilizers, oil, asbestos, and rusting building materials. Common public health risks associated with flood events also include (FEMA 2017):

- Unsafe food
- Contaminated drinking and washing water and poor sanitation
- Mosquitos and animals
- Carbon monoxide poisoning
- Secondary hazards associated with re-entering/cleaning flooded structures



- Mental stress and fatigue

Current loss estimation models, such as Hazus, are not equipped to measure public health impacts. The best level of mitigation for these impacts is to be aware that they can occur, educate the public on prevention, and be prepared to deal with these vulnerabilities in responding to flood events.

Utility Disruption

Floods of any type have the potential to impact water and power utilities, which may impact public and private use, as well as cause disruption to critical infrastructure. Refer to the list below to view flooding's harmful effects on the water supply:

- **Water Supply Contamination:** Excess floodwater can contaminate private drinking water sources, such as wells and springs. Floodwater picks up debris, increasing the number of bacteria, sewage, and other industrial waste and chemicals into the water source or leaky pipes. Excess water also makes it more difficult for water treatment plants to treat the water efficiently and effectively. If there is a contamination at any step of the water flow process, this puts consumers at risk of exposure to dangerous toxins that could result in serious harm, such as wound infections, skin rashes, gastrointestinal illnesses, and tetanus; in extreme cases, death may occur.
- **Disruption to Clean Drinking and Cooking Water:** In the event of only having access to contaminated water, consumers are unable to cook or clean in their homes until the water is certified as safe. Depending on the severity of the flood and the storm, this could take days, weeks, months, and in some cases, even years. Without access to clean drinking and cooking water, consumers ultimately become reliant on bottled water. In impoverished communities, this reality is even more detrimental because those affected may not have the economic means to "stock up" on bottled water. Moreover, in a flood, retail locations are often inaccessible and/or low on water supply.

Floodwaters can also cause damage to power utilities. In particular, flooded buildings may have the utilities disrupted if the service panel, generator, meter, etc., are not elevated above the flood protection level. Oversaturated soils from periods of heavy rain and flooding may cause utility poles to tip over or fall completely, interrupting the power grid for a potentially large area, especially if the transformer is impacted.

Dam Failure

Severe weather, which is 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 the flooding result in a dam failure, the water behind the dam, including flood waters, may inundate jurisdictions downstream of the dam. More information on Dam Failure can be found in Chapter 7.

12.2 VULNERABILITY AND IMPACT ASSESSMENT

The 1 percent and 0.2 percent annual chance flood events were examined to evaluate the County's risk from the flood hazard. The Genesee County Q3 flood data and depth grids developed from the 2019 HMP were used to evaluate vulnerability and determine potential future losses for this plan update. The Genesee County Q3 flood data was used to evaluate vulnerability and determine potential future losses. The depth grid generated using the Q3 Flood data was integrated into the Hazus riverine flood model and used to estimate potential losses for the 1 percent annual chance flood event. The following discusses Genesee County's vulnerability to the flood hazard.



12.2.1 Life, Health, and Safety

Overall Population

The impact of flooding on life, health, and safety is dependent upon several factors, including the severity of the event and whether adequate warning time is provided to residents. Exposure represents the population living in or near floodplain areas that could be impacted should a flood event occur. Additionally, exposure should not be limited to only those who reside in a defined hazard zone, but everyone who may be affected by the effects of a hazard event (e.g., people are at risk while traveling in flooded areas, or their access to emergency services is compromised during an event). The degree of that impact will vary and is not strictly measurable.

To estimate population exposure to the 1 percent and 0.2 percent annual chance flood events, the DFIRM flood boundaries were used. Based on the spatial analysis, there are an estimated 3,800 residents living in the 1 percent annual chance floodplain or 6.2 percent of the County's total population. There are an estimated 5,057 residents living in the 0.2 percent annual chance floodplain, or 8.3 percent of the County's total population. The City of Batavia has the greatest number of residents living in the floodplain, with approximately 2,690 residents living in the SFHA and 3,920 people living in the 0.2 percent annual chance floodplain. Table 12-7 summarizes the population exposed to the flood hazard by jurisdiction.

Socially Vulnerable Population

Research has shown that some populations, while they may not have more hazard exposure, may experience exacerbated impacts and prolonged recovery if/when impacted. This is due to many factors, including their physical and financial ability to react or respond during a hazard. Of the population exposed, the most vulnerable include the economically disadvantaged and the population over age 65. Economically disadvantaged populations may be more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on net economic impacts on their families. The population over age 65 is also more vulnerable because they are more likely to seek or need medical attention that may not be available due to isolation during a flood event, and they may have more difficulty evacuating.

Within Genesee County, there are approximately 793 people over the age of 65 (6.8 percent of the County population) and 443 people below the poverty level (7.2 percent of the County population) located in the 1 percent annual chance flood hazard zone (American Community Survey 2020). In the 0.2 percent annual chance flood hazard area, there are approximately 1,057 people over the age of 65 (9.0 percent of the County population) and 603 people below the poverty level (9.8 percent of the County population). Table 12-8 and Table 12-9 provide a summary of the estimated number of vulnerable individuals situated within these hazard areas, categorized by jurisdiction.

The Centers for Disease Control and Prevention (CDC) 2016 Social Vulnerability Index (SVI) ranks U.S. Census tracts on socioeconomic status, household composition and disability, minority status and language, and housing and transportation. Genesee County's overall score is 0.17, indicating that its communities have a low level of social vulnerability (CDC 2018). This score indicates that there are few County residents may not have enough resources to respond to flood events.

Using 2020 U.S. Census data, Hazus estimates the potential sheltering needs as a result of a 1 percent annual chance flood event. For the 1 percent flood event, Hazus estimates 3,830 individuals will be displaced, and 629 people will seek short-term sheltering, as shown in Table 12-10.



The total number of injuries and casualties resulting from flooding is generally limited based on advance weather forecasting, blockades, and warnings. More likely, persons could become displaced from their homes or may seek shelter due to the impacts of a flood event. Therefore, injuries and deaths generally are not anticipated if proper warning and precautions are in place. Ongoing mitigation efforts should help to avoid the most likely cause of injury, which results from persons trying to cross flooded roadways or channels during a flood.

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Table 12-7. Estimated Population Exposed to the 1 Percent Annual Chance Flood Event Hazard Area

Jurisdiction	Total Population (2020 Decennial)	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
Alabama (T)	1,602	18	1.1%	18	1.1%
Alexander (T)	1,973	32	1.6%	32	1.6%
Alexander (V)	518	38	7.3%	38	7.3%
Attica (V)	2,450	0	0.0%	0	0.0%
Batavia (C)	15,600	2,690	17.2%	3,920	25.1%
Batavia (T)	6,293	362	5.8%	373	5.9%
Bergen (T)	1,912	20	1.0%	20	1.0%
Bergen (V)	1,208	6	0.5%	6	0.5%
Bethany (T)	1,780	40	2.2%	40	2.2%
Byron (T)	2,302	29	1.3%	29	1.3%
Corfu (V)	689	75	10.9%	75	10.9%
Darien (T)	3,010	91	3.0%	91	3.0%
Elba (T)	1,606	58	3.6%	58	3.6%
Elba (V)	558	2	0.4%	2	0.4%
Le Roy (T)	3,362	70	2.1%	70	2.1%
Le Roy (V)	4,300	41	1.0%	57	1.3%
Oakfield (T)	1,333	52	3.9%	52	3.9%
Oakfield (V)	1,812	3	0.2%	3	0.2%
Pavilion (T)	2,290	14	0.6%	14	0.6%
Pembroke (T)	3,575	152	4.3%	152	4.3%
Stafford (T)	2,424	7	0.3%	7	0.3%
Tonawanda (R)	241	0	0.0%	0	0.0%
Genesee County (Total)	60,838	3,800	6.2%	5,057	8.3%

Source: US Census Bureau 2020 Decennial; Genesee County Planning 2023; NYS GIS Clearinghouse; NYS DHHS 2023

Notes: % = Percent; Exposed population statistics are rounded down to the nearest whole number.



Table 12-8. Estimated Number of Vulnerable Persons Located in the 1 Percent Annual Chance Flood Hazard Area by Jurisdiction

Jurisdiction	Estimated Number of Vulnerable Persons Located in the 1% Annual Chance Flood Hazard Area									
	Persons Over 65	Percent of Total	Persons Under 5	Percent of Total	Non-English Speaking Persons	Percent of Total	Persons with a Disability	Percent of Total	Persons in Poverty	Percent of Total
Alabama (T)	2	0.8%	0	0.0%	0	0.0%	2	0.9%	2	1.1%
Alexander (T)	3	1.3%	4	1.3%	0	0.0%	3	1.3%	1	1.4%
Alexander (V)	3	5.9%	1	5.3%	0	0.0%	4	7.3%	4	6.6%
Attica (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Batavia (C)	564	17.2%	94	17.2%	22	16.5%	508	17.2%	343	17.2%
Batavia (T)	99	5.7%	15	5.5%	0	0.0%	61	5.7%	41	5.7%
Bergen (T)	3	1.0%	1	1.0%	0	0.0%	3	0.9%	0	0.0%
Bergen (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Bethany (T)	5	1.9%	1	1.4%	0	0.0%	4	2.1%	4	2.0%
Byron (T)	3	1.0%	2	1.0%	0	0.0%	3	1.2%	1	1.1%
Corfu (V)	21	10.7%	2	9.1%	0	0.0%	12	10.8%	4	10.0%
Darien (T)	19	2.9%	5	3.0%	0	0.0%	13	2.9%	1	2.5%
Elba (T)	8	3.5%	5	3.1%	3	3.6%	6	3.3%	4	3.2%
Elba (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Le Roy (T)	11	2.1%	2	1.9%	0	0.0%	1	0.4%	0	0.0%
Le Roy (V)	8	0.9%	3	0.9%	0	0.0%	8	0.9%	5	0.9%
Oakfield (T)	10	3.7%	0	0.0%	1	2.7%	10	3.9%	14	3.9%
Oakfield (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Pavilion (T)	2	0.5%	0	0.0%	0	0.0%	1	0.4%	1	0.4%
Pembroke (T)	31	4.2%	4	3.7%	1	2.7%	20	4.1%	18	4.1%
Stafford (T)	1	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Tonawanda (R)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Genesee County (Total)	793	6.8%	139	4.5%	27	6.3%	659	7.3%	443	7.2%

Source: US Census Bureau 2022 ACS Vulnerable Population Totals; Genesee County Planning 2023, NYS GIS Clearinghouse; NYS DHHS 2023; Genesee County 2017

Note: % = Percent; Exposed population statistics are rounded down to the nearest whole number.



Table 12-9. Estimated Number of Vulnerable Persons Located in the 0.2 Percent Annual Chance Flood Hazard Area by Jurisdiction

Jurisdiction	Estimated Number of Vulnerable Persons Located in the 0.2% Annual Chance Flood Hazard Area									
	Persons Over 65	Percent of Total	Persons Under 5	Percent of Total	Non-English Speaking Persons	Percent of Total	Persons with a Disability	Percent of Total	Persons in Poverty	Percent of Total
Alabama (T)	2	0.8%	0	0.0%	0	0.0%	2	21.4%	2	1.1%
Alexander (T)	3	1.3%	4	1.3%	0	0.0%	3	1.3%	1	1.4%
Alexander (V)	3	5.9%	1	5.3%	0	0.0%	4	7.3%	4	6.6%
Attica (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Batavia (C)	822	25.1%	137	25.0%	33	24.7%	741	25.1%	500	25.1%
Batavia (T)	102	5.9%	16	5.9%	0	0.0%	63	5.9%	42	5.8%
Bergen (T)	3	1.0%	1	1.0%	0	0.0%	3	0.9%	0	0.0%
Bergen (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Bethany (T)	5	1.9%	1	1.4%	0	0.0%	4	2.1%	4	2.0%
Byron (T)	3	1.0%	2	1.0%	0	0.0%	3	1.2%	1	1.1%
Corfu (V)	21	10.7%	2	9.1%	0	0.0%	12	10.8%	4	10.0%
Darien (T)	19	2.9%	5	3.0%	0	0.0%	13	2.9%	1	2.5%
Elba (T)	8	3.5%	5	3.1%	3	3.6%	6	3.3%	4	3.2%
Elba (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Le Roy (T)	11	2.1%	2	1.9%	0	0.0%	1	0.4%	0	0.0%
Le Roy (V)	11	1.2%	4	1.2%	0	0.0%	11	1.3%	7	1.2%
Oakfield (T)	10	3.7%	0	0.0%	1	2.7%	10	3.9%	14	3.9%
Oakfield (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Pavilion (T)	2	0.5%	0	0.0%	0	0.0%	1	0.4%	1	0.4%
Pembroke (T)	31	4.2%	4	3.7%	1	2.7%	20	4.1%	18	4.1%
Stafford (T)	1	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Tonawanda (R)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Genesee County (Total)	1,057	9.0%	184	5.9%	38	8.9%	897	10.1%	603	9.8%

Source: US Census Bureau 2022 ACS Vulnerable Population Totals; Genesee County Planning 2023, NYS GIS Clearinghouse; NYS DHHS 2023; Genesee County 2017

Note: % = Percent; Exposed population statistics are rounded down to the nearest whole number.



Table 12-10. Estimated Population Displaced or Seeking Short-Term Shelter from the 1 Percent Annual Chance Flood Event Hazard Area

Jurisdiction	Total Population (2020 Decennial)	1% Annual Chance Flood Impacts on People	
		Displaced Population	Persons Seeking Short-Term Sheltering
Alabama (T)	1,602	23	3
Alexander (T)	1,973	49	5
Alexander (V)	518	44	3
Attica (V)	2,450	0	0
Batavia (C)	15,600	2,580	389
Batavia (T)	6,293	312	31
Bergen (T)	1,912	37	11
Bergen (V)	1,208	14	6
Bethany (T)	1,780	65	12
Byron (T)	2,302	43	5
Corfu (V)	689	65	9
Darien (T)	3,010	117	27
Elba (T)	1,606	53	5
Elba (V)	558	10	6
Le Roy (T)	3,362	84	9
Le Roy (V)	4,300	93	43
Oakfield (T)	1,333	50	9
Oakfield (V)	1,812	26	23
Pavilion (T)	2,290	14	1
Pembroke (T)	3,575	136	29
Stafford (T)	2,424	7	0
Tonawanda (R)	241	8	3
Genesee County (Total)	60,838	3,830	629

Source: Hazus v6.1; US Census Bureau 2020; Genesee County 2017

12.2.2 General Building Stock

Exposure to the flood hazard includes those buildings located in the flood zone or those that are built downstream in other flood inundation areas such as dam failure inundation areas. The potential damage is the modeled loss that could occur to the exposed inventory measured by the structural and content replacement cost value. There are an estimated 1,774 and 2,285 buildings located in the 1 percent and 0.2 percent annual chance flood event hazard area, respectively. This represents approximately 5.4 percent and 6.9 percent of the County's total general building stock inventory Replacement Cost Value (RCV), respectively (approximately \$19 billion). The City of Batavia has the greatest number of its buildings located in the 1 percent annual chance floodplain (1,019 buildings or 18.4



percent of its total building stock) and in the 0.2 percent annual chance floodplain (1,498 buildings or 27.0 percent of its total building stock).

Table 12-11 and Table 12-12 summarize the exposed building stock and RCV by jurisdiction for the 1 percent and 0.2 percent flood hazard.

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Table 12-11. Estimated General Building Stock Exposure to the 1 Percent Annual Chance Flood Event

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
Alabama (T)	1,315	\$722,040,029	13	1.0%	\$3,909,880	0.5%
Alexander (T)	1,423	\$610,663,199	29	2.0%	\$21,857,335	3.6%
Alexander (V)	213	\$107,407,186	23	10.8%	\$24,612,161	22.9%
Attica (V)	52	\$65,949,240	11	21.2%	\$14,995,437	22.7%
Batavia (C)	5,548	\$4,822,536,729	1,019	18.4%	\$920,164,310	19.1%
Batavia (T)	3,680	\$2,447,128,797	206	5.6%	\$100,486,399	4.1%
Bergen (T)	1,248	\$591,610,057	16	1.3%	\$7,489,013	1.3%
Bergen (V)	511	\$156,058,577	5	1.0%	\$2,222,645	1.4%
Bethany (T)	1,330	\$628,307,466	25	1.9%	\$6,929,349	1.1%
Byron (T)	1,578	\$658,336,626	21	1.3%	\$9,053,114	1.4%
Corfu (V)	360	\$147,589,112	32	8.9%	\$16,386,901	11.1%
Darien (T)	2,434	\$1,285,847,435	91	3.7%	\$49,576,216	3.9%
Elba (T)	1,230	\$753,135,361	50	4.1%	\$25,311,017	3.4%
Elba (V)	373	\$125,049,373	4	1.1%	\$1,999,892	1.6%
Le Roy (T)	2,242	\$1,465,434,853	74	3.3%	\$42,199,744	2.9%
Le Roy (V)	1,742	\$1,128,112,213	15	0.9%	\$8,898,437	0.8%
Oakfield (T)	1,002	\$490,544,840	32	3.2%	\$8,943,434	1.8%
Oakfield (V)	735	\$374,066,224	5	0.7%	\$4,154,445	1.1%
Pavilion (T)	1,577	\$798,918,335	7	0.4%	\$1,543,683	0.2%
Pembroke (T)	2,373	\$1,079,428,778	88	3.7%	\$30,161,627	2.8%
Stafford (T)	1,668	\$775,606,282	3	0.2%	\$997,803	0.1%
Tonawanda (R)	284	\$148,395,154	5	1.8%	\$1,707,412	1.2%
Genesee County (Total)	32,918	\$19,382,165,867	1,774	5.4%	\$1,303,600,253	6.7%

Source: Genesee County Planning 2023,2024; NYS GIS Clearinghouse 2023; RS Means 2024; Genesee County 2017

Notes: % = Percent



Table 12-12. Estimated General Building Stock Exposure to the 0.2 Percent Annual Chance Flood Event

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
Alabama (T)	1,315	\$722,040,029	13	1.0%	\$3,909,880	0.5%
Alexander (T)	1,423	\$610,663,199	29	2.0%	\$21,857,335	3.6%
Alexander (V)	213	\$107,407,186	24	11.3%	\$30,216,918	28.1%
Attica (V)	52	\$65,949,240	11	21.2%	\$14,995,437	22.7%
Batavia (C)	5,548	\$4,822,536,729	1,498	27.0%	\$1,335,101,956	27.7%
Batavia (T)	3,680	\$2,447,128,797	232	6.3%	\$148,367,714	6.1%
Bergen (T)	1,248	\$591,610,057	16	1.3%	\$7,489,013	1.3%
Bergen (V)	511	\$156,058,577	5	1.0%	\$2,222,645	1.4%
Bethany (T)	1,330	\$628,307,466	25	1.9%	\$6,929,349	1.1%
Byron (T)	1,578	\$658,336,626	21	1.3%	\$9,053,114	1.4%
Corfu (V)	360	\$147,589,112	32	8.9%	\$16,386,901	11.1%
Darien (T)	2,434	\$1,285,847,435	91	3.7%	\$49,576,216	3.9%
Elba (T)	1,230	\$753,135,361	50	4.1%	\$25,311,017	3.4%
Elba (V)	373	\$125,049,373	4	1.1%	\$1,999,892	1.6%
Le Roy (T)	2,242	\$1,465,434,853	74	3.3%	\$42,199,744	2.9%
Le Roy (V)	1,742	\$1,128,112,213	20	1.1%	\$10,159,819	0.9%
Oakfield (T)	1,002	\$490,544,840	32	3.2%	\$8,943,434	1.8%
Oakfield (V)	735	\$374,066,224	5	0.7%	\$4,154,445	1.1%
Pavilion (T)	1,577	\$798,918,335	7	0.4%	\$1,543,683	0.2%
Pembroke (T)	2,373	\$1,079,428,778	88	3.7%	\$30,161,627	2.8%
Stafford (T)	1,668	\$775,606,282	3	0.2%	\$997,803	0.1%
Tonawanda (R)	284	\$148,395,154	5	1.8%	\$1,707,412	1.2%
Genesee County (Total)	32,918	\$19,382,165,867	2,285	6.9%	\$1,773,285,352	9.1%

Source: Genesee County Planning 2023,2024; NYS GIS Clearinghouse 2023; RS Means 2024; Genesee County 2017

Notes: % = Percent



Table 12-13 highlights the significant financial impact of potential flooding on Genesee County. The total RCV for the County is over \$19 billion. The estimated loss for all occupancies is substantial, amounting to over \$20 million. This includes \$2,541,695 for residential properties, \$11,205,580 for commercial properties, and \$6,646,066 for all other occupancies.

Table 12-13. Estimated Building Stock Potential Loss by Occupancy to the 1 Percent Annual Chance Flood Event

Jurisdiction	Total Replacement Cost Value (RCV)	1% Annual Chance Flood Impacts on Buildings				
		Estimated Loss for All Occupancies	Percent of Total	Estimated Loss for Residential Properties	Estimated Loss for Commercial Properties	Estimated Loss for All Other Occupancies
Alabama (T)	\$722,040,029	\$592	<0.1%	\$0	\$592	\$0
Alexander (T)	\$610,663,199	\$146,501	<0.1%	\$50,996	\$88,964	\$6,541
Alexander (V)	\$107,407,186	\$118,960	0.1%	\$8,432	\$110,528	\$0
Attica (V)	\$65,949,240	\$10,885	<0.1%	\$0	\$10,885	\$0
Batavia (C)	\$4,822,536,729	\$6,098,729	0.1%	\$910,143	\$4,595,470	\$593,116
Batavia (T)	\$2,447,128,797	\$3,470,233	0.1%	\$311,703	\$620,231	\$2,538,299
Bergen (T)	\$591,610,057	\$186,839	<0.1%	\$1,846	\$184,993	\$0
Bergen (V)	\$156,058,577	\$40,311	<0.1%	\$0	\$40,311	\$0
Bethany (T)	\$628,307,466	\$217,908	<0.1%	\$103,593	\$114,315	\$0
Byron (T)	\$658,336,626	\$206,993	<0.1%	\$88,007	\$110,826	\$8,159
Corfu (V)	\$147,589,112	\$13,088	<0.1%	\$9,975	\$3,113	\$0
Darien (T)	\$1,285,847,435	\$324,523	<0.1%	\$102,833	\$221,690	\$0
Elba (T)	\$753,135,361	\$135,296	<0.1%	\$56,539	\$58,786	\$19,971
Elba (V)	\$125,049,373	\$646	<0.1%	\$0	\$646	\$0
Le Roy (T)	\$1,465,434,853	\$8,674,155	0.6%	\$471,260	\$4,723,390	\$3,479,506
Le Roy (V)	\$1,128,112,213	\$182,020	<0.1%	\$8,392	\$173,628	\$0
Oakfield (T)	\$490,544,840	\$15,333	<0.1%	\$13,481	\$1,852	\$0
Oakfield (V)	\$374,066,224	\$2,879	<0.1%	\$374	\$2,456	\$49
Pavilion (T)	\$798,918,335	\$842	<0.1%	\$842	\$0	\$0
Pembroke (T)	\$1,079,428,778	\$530,406	<0.1%	\$391,676	\$138,304	\$426
Stafford (T)	\$775,606,282	\$11,602	<0.1%	\$11,602	\$0	\$0
Tonawanda (R)	\$148,395,154	\$4,600	<0.1%	\$0	\$4,600	\$0
Genesee County (Total)	\$19,382,165,867	\$20,393,341	0.1%	\$2,541,695	\$11,205,580	\$6,646,066

Source: Genesee County Planning 2023,2024; NYS GIS Clearinghouse 2023; RS Means 2024; Genesee County 2017

Notes: % = Percent

National Flood Insurance Program (NFIP) Statistics

In addition to total building stock modeling, individual data available on flood policies, claims, repetitive loss (RL) properties, and severe RL (SRL) properties were analyzed. FEMA Region 2 provided a list of residential properties with NFIP policies, past claims, and multiple claims (RLs). According to the metadata provided, "The NFIP Repetitive Loss File contains losses reported from individuals who have flood insurance through the federal government. A property is considered a repetitive loss property when there are two or more losses reported



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. Only losses from (sic since) January 1, 1978, that are closed are considered."

SRLs were then examined for Genesee County. According to Section 1361A of the National Flood Insurance Act, as amended (NFIA), 42 *United States Code* (U.S.C.) 4102a, an SRL property is defined as a residential property covered under an NFIP flood insurance policy, and satisfying either of conditions 1 and 2, as well as condition 3:

1. At least four NFIP claim payments for the property (including building and contents) over \$5,000 each have occurred, and the cumulative amount of such claims payments exceeded \$20,000.
2. At least two separate claims payments for the property (building payments only) have occurred, and the cumulative amount of the building portion of such claims exceeded the market value of the building.
3. For either of the above, at least two of the referenced claims must have occurred within any 10-year period and must have occurred more than 10 days apart.

Table 12-14 through Table 12-16 summarize NFIP policies, claims, and repetitive loss statistics for Genesee County as of February 28, 2018; updated data was not provided by FEMA to be included in this plan update. According to FEMA, Table 12-14 summarizes occupancy classes of RL properties in Genesee County. of properties within the RL occupancy class are single family residences (86.7 percent). One SRL property is Assumed Condo and the other SRL property is non-residential (business).

Table 12-14. Occupancy Class of Repetitive Loss Structures in Genesee County

Occupancy Class	Total Number of Repetitive Loss Properties	Total Number of Severe Repetitive Loss Properties	Total
Single Family	7	0	7
Condo	1	1	2
2-4 Family	0	0	0
Other Residential	0	0	0
Business-Non-Residential	3	1	4
Other Non-Residential	11	2	13
Genesee County	7	0	7

Source: FEMA 2018

Notes: Repetitive loss and severe repetitive loss statistics provided by FEMA Region 2 and are current as of February 28, 2018. The total number of repetitive loss properties does not include severe repetitive loss properties.



Table 12-15. Occupancy Class of Repetitive Loss Structures in Genesee County by Municipality

Jurisdiction	Repetitive Loss Properties					Severe Repetitive Loss Properties				
	2-4 Family	Assumed Condo	Non-Residential	Other Residential	Single Family	2-4 Family	Assumed Condo	Non-Residential	Other Residential	Single Family
Alabama (T)	0	0	0	0	0	0	0	0	0	0
Alexander (T)	0	0	0	0	3	0	0	0	0	0
Alexander (V)	0	0	0	0	1	0	0	0	0	0
Attica (V)	0	1	3	0	0	0	1	1	0	0
Batavia (C)	0	0	0	0	2	0	0	0	0	0
Batavia (T)	0	0	0	0	1	0	0	0	0	0
Bergen (T)	0	0	0	0	0	0	0	0	0	0
Bergen (V)	0	0	0	0	0	0	0	0	0	0
Bethany (T)	0	0	0	0	0	0	0	0	0	0
Byron (T)	0	0	0	0	0	0	0	0	0	0
Corfu (V)	0	0	0	0	0	0	0	0	0	0
Darien (T)	0	0	0	0	0	0	0	0	0	0
Elba (T)	0	0	0	0	0	0	0	0	0	0
Elba (V)	0	0	0	0	0	0	0	0	0	0
Le Roy (T)	0	0	0	0	0	0	0	0	0	0
Le Roy (V)	0	0	0	0	0	0	0	0	0	0
Oakfield (T)	0	0	0	0	0	0	0	0	0	0
Oakfield (V)	0	0	0	0	0	0	0	0	0	0
Pavilion (T)	0	0	0	0	0	0	0	0	0	0
Pembroke (T)	0	0	0	0	0	0	0	0	0	0
Stafford (T)	0	0	0	0	0	0	0	0	0	0
Tonawanda (R)	-	-	-	-	-	-	-	-	-	-
Genesee County	0	1	3	0	7	0	1	1	0	0

Source: FEMA 2018

Notes: Repetitive loss and severe repetitive loss statistics provided by FEMA Region 2 and are current as of February 28, 2018. The total number of repetitive loss properties does not include severe repetitive loss properties.

(-) Indicates records were unavailable



Table 12-16. NFIP Statistics in Genesee County

Jurisdiction	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (1)	# Rep. Loss Prop. (2)	# Severe Rep. Loss Prop. (1)	# Policies in the 1% Flood Boundary (1)
Alabama (T)	0	1	\$0	0	0	0
Alexander (T)	10	14	\$117,880	3	0	5
Alexander (V)	3	11	\$136,019	1	0	2
Attica (V)	5	70	\$1,053,909	6	2	2
Batavia (C)	293	49	\$93,986	2	0	268
Batavia (T)	35	15	\$59,069	1	0	26
Bergen (T)	3	2	\$2,245	0	0	2
Bergen (V)	0	0	\$0	0	0	0
Bethany (T)	4	0	\$0	0	0	2
Byron (T)	5	0	\$0	0	0	4
Corfu (V)	3	0	\$0	0	0	3
Darien (T)	1	0	\$0	0	0	1
Elba (T)	2	0	\$0	0	0	2
Elba (V)	1	0	\$0	0	0	0
Le Roy (T)	10	4	\$14,843	0	0	5
Le Roy (V)	8	2	\$4,879	0	0	5
Oakfield (T)	2	1	\$0	0	0	2
Oakfield (V)	0	0	\$0	0	0	0
Pavilion (T)	1	1	\$16	0	0	0
Pembroke (T)	9	0	\$0	0	0	6
Stafford (T)	0	1	\$0	0	0	0
Tonawanda (R)	-	-	-	-	-	-
Genesee County	395	171	\$1,482,846	11	2	335

Source: FEMA 2018

Notes: Repetitive loss and severe repetitive loss statistics provided by FEMA Region 2 and are current as of February 28, 2018. The total number of repetitive loss properties does not include severe repetitive loss properties.

(-) Indicates records were unavailable



12.2.3 Community Lifelines and Other Critical Facilities

It is important to determine the critical facilities and infrastructure within the County that may be at risk to flooding and who may be impacted should damage occur. Critical services during and after a flood event may not be available if critical facilities are directly damaged or transportation routes to access these critical facilities are impacted. Roads that are blocked or damaged can isolate residents and can prevent access throughout the planning area to many service providers needing to get to vulnerable populations or to make repairs. Utilities such as overhead power, cable, and phone lines could also be vulnerable due to utility poles damaged by standing water or the surge of water from a dam failure event. Loss of these utilities could create additional isolation issues for the inundation zones.

Major roadways that may be impacted by the 1 percent annual chance flood event include State Routes 98, 19, 246, 33, 17, and various County and local roads. There are several issues associated with transportation routes flooding, including isolation caused by bridges being washed out or blocked by floods or debris, health problems caused by water and sewer systems that are flooded or backed up, drinking water contamination caused by floodwaters carrying pollutants in water supplies, and localized urban flooding caused by culverts blocked with debris.

Critical facility exposure to the 1 percent and 0.2 percent annual chance flood hazard event boundary was examined. In addition, Hazus was used to estimate the flood loss potential to critical facilities located in the FEMA mapped floodplains. Table 12-17 summarizes the number of critical facilities exposed to the 1 percent and 0.2 percent flood inundation areas by jurisdiction. There is a total of 259 critical facilities located in the 1 percent annual chance flood event boundary, with Transportation having the most (90). In the 0.2 percent annual chance flood event boundary, there are a total of 290 critical facilities with Transportation having the highest number of facilities (93) in the County. Refer to Section 3 (County Profile) for more information about the critical facilities and lifelines in Genesee County.

In cases where short-term functionality is impacted by a hazard, other facilities of neighboring municipalities may need to increase support response functions during a disaster event. Mitigation planning should consider means to reduce impact on critical facilities and ensure enough emergency and school services remain when a significant event occurs.

Table 12-17. Number of Facilities in Flood Hazard Areas, by Lifeline Category

FEMA Lifeline Category	Number of Lifelines	Number of Lifelines 1 Percent Flood Hazard Area	Number of Lifelines 0.2 Percent Flood Hazard Area
Communications	56	8	10
Energy	1,086	80	89
Food, Hydration, Shelter	12	0	0
Hazardous Materials	38	2	5
Health and Medical	71	4	6
Safety and Security	193	20	23
Transportation	229	90	93
Water Systems	928	38	39
Other Critical Facilities	250	17	25
Total	2,862	259	290



Source: County 2017, 2021, 2023, 2024; NYS GIS Clearinghouse 2021, 2023, 2024; Genesee-Orleans Wyoming Opioid Task Force 2021; Genesee-Orleans Health Department 2024; NY Open Data 2024; US DOT 2023, Clark Patterson Lee Inc 2024; US EPA 2021; HIFLD 2021; US NPS 2021; USGS 2023

12.2.4 Economy

Flood events can significantly impact the local and regional economy. This includes but is not limited to general building stock damages 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. The Impact on General Building Stock subsection above discusses direct impacts on buildings in Genesee County.

Debris management may also be a large expense after a flood event. Hazus estimates the amount of structural debris generated during a flood event. The model breaks down debris into three categories: (1) finishes (dry wall, insulation, etc.); (2) structural (wood, brick, etc.); and (3) foundations (concrete slab and block, rebar, etc.). These distinctions are necessary because of the different types of equipment needed to handle debris. Table 12-18 summarizes the Hazus v6.1 countywide debris estimates for the 1 percent annual chance flood event. This table only estimates structural debris generated by flooding and does not include non-structural debris or additional potential damage and debris possibly generated by wind that may be associated with a flood event or storm that causes flooding. Overall, Hazus estimates that there will be 213.8 tons of debris generated during the 1 percent annual chance flood event in Genesee County.

Table 12-18. Estimated Debris Generated from the 1 Percent Annual Chance Flood Event

Jurisdiction	Debris Created During the 1-Percent Annual Chance Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Alabama (T)	0.2	0.1	<0.1%	0.1
Alexander (T)	10.1	6.4	1.0	2.6
Alexander (V)	4.7	4.7	0.0	0.0
Attica (V)	0.0	0.0	0.0	0.0
Batavia (C)	87.9	87.9	0.0	0.0
Batavia (T)	20.4	17.7	0.8	1.9
Bergen (T)	1.9	1.9	0.0	0.0
Bergen (V)	0.6	0.6	<0.1%	<0.1%
Bethany (T)	13.7	13.6	<0.1%	0.1
Byron (T)	4.3	4.3	0.0	0.0
Corfu (V)	0.6	0.6	0.0	0.0
Darien (T)	4.2	3.7	0.1	0.3
Elba (T)	3.5	2.9	0.2	0.4
Elba (V)	<0.1%	<0.1%	0.0	0.0
Le Roy (T)	20.9	12.1	4.8	3.9
Le Roy (V)	16.2	16.1	<0.1%	0.1
Oakfield (T)	0.3	0.3	0.0	0.0
Oakfield (V)	0.1	0.1	0.0	0.0



Jurisdiction	Debris Created During the 1-Percent Annual Chance Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Pavilion (T)	0.2	0.2	0.0	0.0
Pembroke (T)	23.4	22.1	0.4	0.9
Stafford (T)	0.7	0.7	0.0	0.0
Tonawanda (R)	0.1	0.1	0.0	0.0
Genesee County (Total)	213.8	196.0	7.3	10.3

Source: Hazus v6.1; Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; Genesee County 2017

Notes: % = Percent

12.2.5 Natural, Historic, and Cultural Resources

Natural

As Genesee County and its jurisdictions evolve with changes in population and density, flood events may increase in frequency and/or severity as land use changes, more structures are built, and impervious surfaces expand. Furthermore, flood extents for the 1 percent annual chance flood event will continue to evolve alongside natural occurrences such as climate change and/or severe weather events. These flood events will inevitably impact Genesee County's natural and local environment.

Furthermore, the environmental impacts of a flood can include significant water quality and debris-disposal issues. Flood waters can back up sanitary sewer systems and inundate wastewater treatment plants, causing raw sewage to contaminate residential and commercial buildings and the flooded waterway. The contents of unsecured containers of oil, fertilizers, pesticides, and other chemicals get added to flood waters. Hazardous materials may be released and distributed widely across the floodplain. Water supply and wastewater treatment facilities could be offline for weeks. After the flood waters subside, contaminated and flood-damaged building materials and contents must be properly disposed of. Contaminated sediment must be removed from buildings, yards, and properties. In addition, severe erosion is likely; such erosion can negatively impact local ecosystems.

Historic

Historic resources, such as historic places, community facilities, and religious institutions, are all vulnerable to impacts from flooding. Venues such as museums and historic buildings face structural damage during flood events. Historic structures are often not built to modern building code requirements, including design flood elevation and construction standards. Historic resources and structures were often built close to waterways, increasing their flood risk. Depending on severity, flood events affecting the County could bring devastating loss of life and property to the area in and around historical landmarks.

Cultural

Cultural resources, such as cultural institutions, parks and open spaces, community facilities, 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. Furthermore, parks and recreational areas are often located near waterways. Although these facilities often experience flooding, they are positioned with flooding



in mind, as many parks are considered open space to disallow development. Depending on severity, flood events affecting the County could bring devastating loss of life and property to the area in and around historical landmarks.

12.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

12.3.1 Potential or Planned Development

Chapter 3 (County Profile) identifies areas targeted for future growth and development across the County. Any areas of growth located in the SFHA could be potentially 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. Specific areas of recent and new development are indicated in tabular form and/or on the hazard maps included in Volume II of this plan.

12.3.2 Projected Changes in Population

According to the 2020 Census, the population of the County has increased by approximately 2.85 percent since 2010. Population projections from Cornell University reveal the County's population is anticipated to continue decreasing. The population is projected to decline to 56,077 persons in 2030 and to 54,128 by 2040 (Cornell University 2018). Changes in the density of population can impact the number of persons exposed to erosion. As forests continue to be cleared for new development and runoff persists, the population in the County will remain exposed to this hazard. Refer to Chapter 3 (County Profile), which includes a discussion on population trends for the County.

12.3.3 Climate Change

Climate is defined not simply as average temperature and precipitation but also by the type, frequency, and intensity of weather events. Both globally and at the local scale, climate change has the potential to alter the prevalence and severity of events that exacerbate coastal erosion. While predicting changes of coastal erosion under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society, and the environment (US EPA 2009). Warmer temperatures may lead to an increase in frequency of storms, thus leading to more weather events with potentially increased severity that cause erosion.

12.3.4 Change of Vulnerability Since 2019 HMP

The entire County continues to be vulnerable to the flood hazard. Since the 2019 analysis, the general building stock was updated using RS Means 2024 building valuations that estimated RCV for each building in the inventory. This provides an up-to-date look at the entire building stock for Genesee County and gives more accurate results for the exposure and loss estimation analysis. Additionally, the 2019 critical facility dataset was updated by the County and includes FEMA community lifelines.



13. HAZARDOUS MATERIALS

13.1 HAZARD PROFILE

13.1.1 Hazard Description

Hazardous materials are substances considered severely harmful to human health and the environment, as defined by the United States Environmental Protection Agency (U.S. EPA) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Superfund Law). This law created a tax on the chemical and petroleum industries and provided federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment (U.S. EPA 2022). There are about 800 CERCLA hazardous materials. Additionally, there are approximately 1,500 known radionuclides, approximately 760 of which are listed individually (U.S. EPA 2022).

Hazardous materials, as defined by section 101(14) of CERCLA, include the following (U.S. EPA 2022):

- Any substance designated pursuant to section 311(b)(2)(A) of the Federal Water Pollution Control Act (33 U.S.C 1215 et seq.);
- Any element, compound, mixture, solution, or substance designated as hazardous under section 102 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA);
- Any hazardous waste having the characteristics identified under or listed pursuant to section 3001 of the Solid Waste Disposal Act (42 U.S.C. 6801 et seq.) (excluding any waste for which regulations have been suspended by an Act of Congress);
- Any toxic pollutant listed under section 307(a) of the Federal Water Pollution Control Act;
- Any hazardous air pollutant listed under section 112 of the Clean Air Act ([42 U.S.C. 7401 et seq.](#)); and
- Any imminently hazardous chemical substance or mixture with respect to which the Administrator of EPA (Administrator) has taken action pursuant to Section 7 of the Toxic Substances Control Act ([15 U.S.C. 2601 et seq.](#)). The term does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under paragraphs (1) through (6) of this definition, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).

Numerous facilities throughout Genesee County use and store hazardous materials as defined by the U.S. EPA. Many products containing hazardous materials are used and stored in homes, and these products are shipped daily on highways, railroads, waterways, and pipelines. If released or misused, hazardous materials can cause death, serious injury, long-lasting health effects, and damage to structures and other properties as well as to the environment.

Another consideration is the transportation of hazardous materials on local highways and interstates. Tanker trucks or trailers are responsible for the greatest number of hazardous materials release incidents. Public roads in Genesee County are owned and maintained by the New York State Department of Transportation (NYSDOT), Genesee County, and local municipalities. Town highway departments maintain most of the County's 2,521 miles of public roads. In Genesee County, there are 250 centerline miles of national highway system (NHS) roads, including I-84 and Routes 9, 9D, 44, 55, 22, and the Taconic State Parkway, plus segments of Routes 52, 9G, and 199 (DCTC n.d.). These roads cross rivers and streams at many points; hazardous substance spills on roads could



pollute watersheds that serve as domestic water supplies for areas within Genesee County and other parts of the state. Hazardous substance releases could also occur along rail lines, as freight trains carry hazardous materials cargo through the planning area on a regular basis. An example of such lines is the CSX rail lines, which span the entire County.

Pipelines transport hazardous liquids and flammable substances such as natural gas and petroleum. If these pipes are corroded, hazardous substances releases could occur when the pipes are damaged during excavation, incorrect operation, or by other forces. When hazardous materials are transported by aircraft or by watercraft, crashes, spills of materials, or fires on these vessels can pose hazards.

Nuclear power generating stations, research reactors, or other stationary sources of radioactivity present the threat of release of radiological material. This type of event could threaten a large, multi-jurisdictional area and result in property damage, contamination of farm and water supplies, and economic damage.

13.1.2 Location

The following information pertains to the locations of hazardous materials incidents.

Hazardous Materials Fixed Site

A fixed-site hazardous materials incident is the uncontrolled release of materials from a fixed site, capable of posing a risk to health, safety, and property as determined by the Resource Conservation Recovery Act (RCRA). It is possible to identify and prepare for a fixed-site incident because federal and state laws require those facilities to notify state and local authorities about the materials being used or produced at the site. Hazardous materials at fixed sites are regulated by the EPA.

The EPA chooses to specifically list substances as hazardous and extremely hazardous, rather than providing objective definitions. Hazardous substances (as listed) are generally materials that, if released into the environment, tend to persist for long periods and pose long-term health hazards for living organisms. Extremely hazardous substances, while also generally toxic materials, represent acute health hazards that, when released, are immediately dangerous to the lives of humans and animals and cause serious damage to the environment. When facilities contain these materials in quantities at or above the threshold planning quantity (TPQ), they must submit "Tier II" information to appropriate state and/or local agencies to facilitate emergency planning.

Superfund is a program administered by the U.S. EPA to locate, investigate, and clean up the worst hazardous waste sites throughout the United States. Data from the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database indicates that no Superfund sites are present in Genesee County (U.S. EPA 2022).

Hazardous Materials In-Transit

As defined in regulations by the U.S. Department of Transportation (DOT) Materials Transport, a hazardous materials transportation incident is any event resulting in an uncontrolled release of materials during transport that can pose a risk to health, safety, and property. Transportation incidents are difficult to prepare for because there is little, if any, notice about the types of materials involved should an accident happen.

Hazardous materials transportation incidents can occur anywhere within the United States. Transportation of hazardous materials on highways involves tanker trucks or trailers, and these are responsible for the greatest number of hazardous substance release incidents. Potential also exists for hazardous substance releases to occur

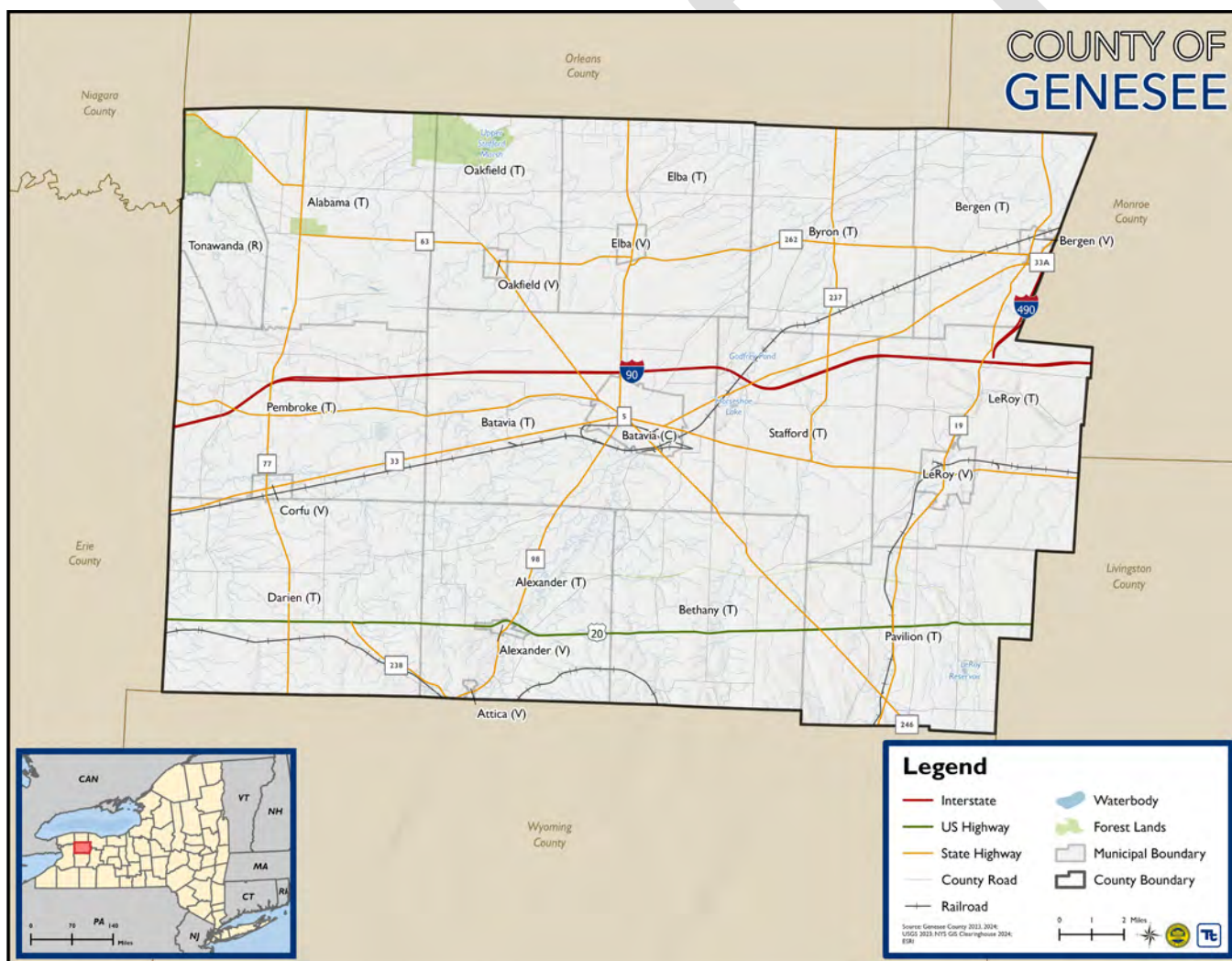


along rail lines, as collisions and derailments of train cars can result in large spills. Hazardous materials in transit are regulated by DOT.

Incidents involving hazardous materials in transit can occur anywhere in Genesee County. Transportation corridors within Genesee County that carry hazardous materials include highways, railroads, air/flight paths, pipelines, and navigable waterways. Major highways are more likely to be settings for this type of hazard because of interstate and local commercial transport of hazardous materials. Transport vehicles do not typically travel through residential areas unless enroute to destinations such as a gasoline service station or storage facility.

Major transportation routes through Genesee County include a framework of north/south, east/west, and diagonal roads. Primary east/west roads include State Routes (S.R.) 5, 20, 33, and 262, and Interstate (I) 90. Primary north/south roads include S.R. 19, 77, 98, and 237. SR 63 crosses Genesee County diagonally from the northwest to the southeast. The potential for a spill also exists on routes used for industrial and business purposes. Section 4 of this hazard mitigation plan (HMP) discusses roadways in the County. Figure 13-1 shows the major transportation routes and railways in Genesee County. Section 4 discusses roadways in the County.

Figure 13-1. Major Transportation Routes and Railways in Genesee County

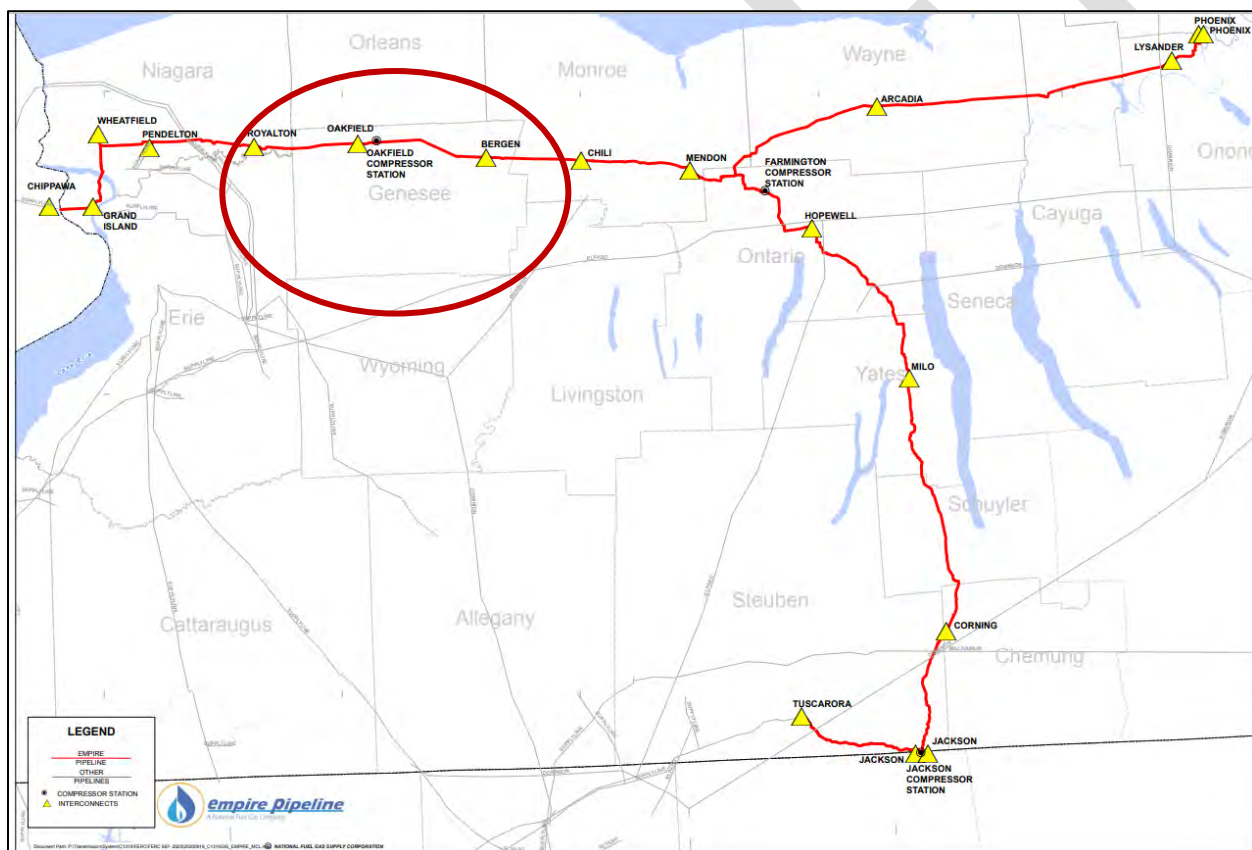




Hazardous materials incidents may occur along railways in Genesee County. Rail lines that may carry hazardous materials include the passenger and commercial railways located within Genesee County as well as rail lines that are contiguous to Genesee County. The New York Department of Transportation (NYDOT) has a vital interest in preserving and improving the rail freight part of its transportation network. Rail shipments allow cost-effective movement of goods and thus decrease stress on the State's highway system. Major commodities shipped by rail include petrochemicals (including plastic pellets), construction materials, food products, raw materials, and finished goods for manufacturers. Rail cars carrying hazardous materials are of concern because an accident or release could pose a public safety hazard to the community. Rail lines that may carry hazardous materials include the CSX Corporation, Norfolk Southern, and two short lines: Depew, Lancaster & Western Railroad and Rochester & Southern Railroad. Railways pose an immediate risk for the following municipalities: the City of Batavia and the Towns of Alexander, Batavia, Bergen, Bethany, Byron, Corfu, Darien, Le Roy, Pavilion, Pembroke, and Stafford.

Hazardous materials can also be transported via underground petroleum and gas (natural and propane) pipelines across the State. New York has an extensive network of natural gas and petroleum pipelines, at least one of which passes through Genesee County. Figure 13-2 shows the extent and location of pipelines throughout western New York State and Pennsylvania, with Genesee County's general area indicated by the red oval.

Figure 13-2. National Fuel Empire Pipeline Map



Source: National Fuel Gas Company 2020

Note: The red oval represents the approximate location of Monroeville

Radiological

The threat of a radiological event at a fixed facility is always a possibility because of the proximity of the Ginna Nuclear Power Station in Wayne County. For commercial reactors, areas of risk from exposure to radiation releases



are designated as (1) within the Plume Exposure Emergency Planning Zone (EPZ) of such sites (within a 10-mile radius of a site) for direct exposure, or (2) within the Ingestion Pathway Emergency Planning Zone (within a 50-mile radius of a nuclear site) for exposure via the food chain. Genesee County is not included in either of these zones; however, it could experience issues regarding exposure to goods and other objects. A credible worst-case event of a radioactive release from a fixed site could affect a large region around the nuclear power site.

13.1.3 Extent

The extent of a hazardous substance release depends on (1) whether the substance is released from a fixed or mobile source, (2) the size of the impacted area, (3) the toxicity and properties of the substance, (4) the duration of the release, and (5) environmental conditions (for example, wind and precipitation, terrain, etc.).

Hazardous substance releases can contaminate air, water, and soils, possibly resulting in death and/or injuries. Dispersion can occur rapidly when the hazardous substance is transported by water and wind. While often accidental, releases can occur because of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary events. Hazardous materials can include toxic chemicals, radioactive substances, infectious substances, and hazardous waste. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas.

Severity or impact of a hazardous substance release, whether accidental or intentional, depends on several potentially mitigating or exacerbating circumstances. Mitigation involves precautionary measures taken in advance to reduce the impact of a release on the surrounding environment. For example, primary and secondary containment or shielding by implementation of sheltering-in-place protects people and property from the harmful effects of a hazardous substance release. Exacerbating conditions, characteristics that can enhance or magnify the effects of a hazardous substance release, include the following:

- Weather conditions, which affect how the hazard occurs and develops
- Micro-meteorological effects of buildings and terrain, which alter dispersion of hazardous materials in compliance with applicable codes (such as building or fire codes)
- Maintenance failures (such as fire protection and containment features), which can substantially increase damage to a facility and to surrounding buildings

The severity of an incident depends not only on the circumstances described above, but also on the type of substance released and the distance from the incident and related response time of emergency response teams. Areas closest to a release are generally at greatest risk; however, depending on the substance, a release can travel great distances or remain present in the environment for a long period of time (for example, centuries to millennia).

According to the Federal Motor Carrier Safety Administration, there are nine classes of hazardous materials incidents (FMCSA 2013):

- Class 1: Explosives
- Class 2: Gases
- Class 3: Flammable Liquid and Combustible Liquid
- Class 4: Flammable Solid, Spontaneously Combustible, and Dangerous When Wet
- Class 5: Oxidizer and Organic Peroxide
- Class 6: Poison (Toxic) and Poison Inhalation Hazard
- Class 7: Radioactive



- Class 8: Corrosive
- Class 9: Miscellaneous

The occurrence of a hazardous materials incident can be sudden and occur without any warning, such as an explosion, or may develop slowly, such as a leaking container. Facilities that store extremely hazardous substances are required to notify local officials when an incident occurs. Local emergency responders and emergency management officials would determine whether they need to evacuate the public or advise the public to shelter in place. Similar to on-site hazardous substances incidents, the amount of warning time for incidents associated with hazardous substances in transit varies based on the nature and scope of the incident. If an explosion did not occur immediately following an accident, officials may have time to warn adjacent neighborhoods and facilitate appropriate protective actions.

Depending on the type and quantity of chemicals released and weather conditions, an incident can affect larger areas that cross jurisdictional boundaries. When hazardous materials are released into the air or water or on land, they may contaminate the environment and pose greater danger to human health. The general population may be exposed to a hazardous materials release through inhalation, ingestion, or dermal exposure. Exposure may be either acute or chronic, depending upon the nature of the substance and the extent of release and contamination. Hazardous materials incidents can lead to injury, illness, and/or death of involved persons and those living within the impacted areas. Genesee County may use the following to alert the public of a hazardous materials incident:

- **NY Alert:** The primary emergency notification system for Genesee County allows for landline notification with a pre-recorded message as well as emergency notification emails and text messages to residents who have opted in to the system.
- **Social Media Alerting:** Genesee County will utilize social media platforms, such as Facebook and X (formerly Twitter) to notify the public and media.
- **Emergency Alert System (EAS):** Activation of the EAS will provide warning messages over cable television systems and radio stations. This system can be activated by predesignated government officials or the National Weather Service.
- **Wireless Emergency Alert (WEA):** Wireless Emergency Alerts can be issued to cellular devices within a designated area, utilizing the Integrated Public Alert and Warning System.
- **Route Alerting:** Emergency personnel utilizing emergency vehicles equipped with a siren, a public address system, and appropriate personal protective equipment (PPE) may drive through the affected area and announce the emergency situation.
- **Residential Door-to-Door Alerting:** Emergency personnel equipped with appropriate PPE may walk through the affected area and announce the emergency situation on a door-to-door basis.
- **Press Release:** A press release may be relayed from the County to media representatives. A press release may be made directly to on-scene media representatives. Sample news release messages are provided in the appendices of this document.
- **2-1-1:** The United Way 2-1-1 Hotline can be utilized as a service to provide information and resources to residents.



13.1.4 Previous Occurrences

Federal Emergency Management Agency (FEMA) Major Disaster and Emergency Declarations

Between 1954 and 2024, Genesee County was not included in any major disaster (DR) or emergency (EM) declarations for hazardous materials-related events (FEMA 2024).

U.S. Department of Agriculture (USDA) Declarations

The 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. Between 2017 and 2024, Genesee County was not included in any USDA hazardous materials-related agricultural disaster declarations (USDA 2024).

Previous Events

One of the most prominent and long-lasting hazardous materials incidents occurred in 1970, when two tank cars ruptured and spilled approximately 30,000 gallons of trichloroethylene (TCE) onto the ground. A third car containing a crystalline form of cyanide was also reported to have partially spilled. The cyanide was recovered shortly after the derailment. However, the TCE was flushed with water, and it seeped into the ground, resulting in a 4-mile-long plume of TCE contamination. The site was placed on the EPA's Superfund site list in 1999, and since then, cleanup efforts have continued. In October of 2023, the EPA finalized its cleanup plan.

Known hazard events with released quantities greater than 100 gallons that impacted Genesee County between 2019 and 2024 are discussed in Table 13-1. For events prior to 2019, refer to the 2019 Genesee County HMP.

Table 13-1. Hazardous Materials Events in Genesee County (2019 to 2024)

Event Date	FEMA Declaration or State Proclamation Number	Genesee County included in declaration?	Location Impacted	Description
March 14, 2019	N/A	N/A	Pembroke	Traffic accident involving a commercial vehicle caused a release of 10 gallons of motor oil, 100 gallons of diesel, and 10 gallons of antifreeze into a roadside ditch.
April 24, 2019	N/A	N/A	Batavia	Traffic accident involving a commercial vehicle caused a 130-gallon diesel leak.
May 4, 2019	N/A	N/A	Batavia	Traffic accident involving a commercial vehicle caused a leak of 200 gallons of diesel.
June 13, 2019	N/A	N/A	Batavia	Commercial/industrial human error caused 6 gallons of ebonite 200 black oil to spill.



Event Date	FEMA Declaration or State Proclamation Number	Genesee County included in declaration?	Location Impacted	Description
July 19, 2019	N/A	N/A	Pembroke	Motor vehicle accident involving a tractor trailer with a ruptured saddle tank caused 100 gallons of petroleum to leak.
September 12, 2019	N/A	N/A	Corfu	Traffic accident caused 150 gallons of diesel to leak.
March 24, 2020	N/A	N/A	Le Roy	Equipment failure caused 130,000 gallons of ammonium phosphate to leak.
March 25, 2020	N/A	N/A	Batavia	200 pounds of petroleum grease leaked, cause unknown.
October 2, 2020	N/A	N/A	Corfu	Airport/aircraft incident caused 200 gallons of jet fuel to leak.
November 4, 2020	N/A	N/A	Batavia	Commercial/industrial equipment failure caused 100 pounds of petroleum oil to leak.
January 22 ,2021	N/A	N/A	Oakfield	Commercial/Industrial equipment failure caused 225 gallons of sodium hypochlorite to leak.
April 16, 2021	N/A	N/A	Pembroke	Human error at a gas station caused 100 gallons of diesel spill.
June 4,2021	N/A	N/A	Batavia	Equipment failure from a non major facility caused 1,200 gallons of diesel to leak into Horseshoe Lake.
November 29, 2021	N/A	N/A	Le Roy	Private dwelling with equipment failure caused 200 gallons of fuel oil to spill.
January 31, 2022	N/A	N/A	Batavia	4,000 pounds of petroleum grease leaked due to equipment failure.
March 15, 2022	N/A	N/A	Batavia	100 gallons of petroleum grease leaked due to equipment failure.



Event Date	FEMA Declaration or State Proclamation Number	Genesee County included in declaration?	Location Impacted	Description
June 23, 2022	N/A	N/A	Batavia	Traffic accident caused 100 gallons of diesel leak.
July 15, 2022	N/A	N/A	Alabama	Equipment failure caused 100 gallons of hydraulic oil to leak.
September 16, 2022	N/A	N/A	Batavia	600 pounds of petroleum grease released due to equipment failure.
October 27, 2022	N/A	N/A	Corfu	Traffic accident caused 100 gallons of diesel to leak.
October 27, 2022	N/A	N/A	Pembroke	Traffic accident caused 200 gallons of diesel to leak.
November 2, 2022	N/A	N/A	Batavia	Equipment failure at an institutional, educational, government location, where 170 gallons of diesel leaked.
November 8, 2022	N/A	N/A	Batavia	150 gallons of petroleum grease leaked due to equipment failure.
May 24, 2023	N/A	N/A	Batavia	Human error caused 100 pounds of petroleum oil to leak.
August 21, 2023	N/A	N/A	Pavilion	Traffic accident caused 150 gallons of diesel to leak.
February 8, 2024	N/A	N/A	Byron	Human error caused 150 gallons of fair chloride to be released.
April 3, 2024	N/A	N/A	Batavia	Human error caused 330 gallons of petroleum oil to be released.
May 12, 2024	N/A	N/A	Batavia	Human error at a gas station caused a leak of 109.67 gallons of gasoline.
August 6, 2024	N/A	N/A	Oakfield	Traffic accident caused 100 gallons of diesel to spill.
October 5, 2024	N/A	N/A	Le Roy	Traffic accident caused 100 gallons of diesel to spill in an unknown creek.



Event Date	FEMA Declaration or State Proclamation Number	Genesee County included in declaration?	Location Impacted	Description
November 9, 2024	N/A	N/A	Batavia	Commercial/Industrial: 250 gallons of unknown petroleum spill.

Sources: State of New York 2024

Note: Incidents reflected in the table are a result of 100 gallons or more. Incidents that resulted in quantities less than 100 were not listed.

13.1.5 Probability of Future Occurrences

Predicting future hazardous substance incidents in Genesee County is difficult. These can occur at any time anywhere in the County. Incidents can occur suddenly without any warning or develop slowly. Small spills, both fixed site and in transit, occur throughout the year, and probability of occurrences of these events is high. Risk of a major incident within a given year is small, yet relatively unpredictable.

The County is expected to continue to undergo direct and indirect impacts of hazardous substance incidents annually that may induce secondary hazards, such as infrastructure deterioration or failure; potential decreases in water quality and supply; and transportation delays, accidents, and inconveniences.

The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 20, the identified hazards of concern for Genesee County were ranked. Based on historical records and input from the Steering Committee, the probability of occurrence for hazardous materials in the County is considered “occasional.”

Climate Change Projections

It can be assumed that the projected increase in temperature may impact the storage and ultimately transportation of hazardous materials. If stored improperly or if storage methods are not adapted to withstand extreme temperatures, hazardous materials may have an adverse reaction, leading to a potential hazardous materials incident (OSHA 2016).

Similarly, the increase in frequency and magnitude of flood and severe weather events may impact hazardous materials at fixed sites and during transit. The County experiences significant flooding events already, and based on future climate projections, these events may become more frequent and intense. If not properly stored, hazardous materials could mix with flood waters and cause adverse impacts (EPA 2021). Hazardous materials in-transit would be at risk, varying by mode of transport. Transport by rail and highway would need to be aware of flooding conditions and visibility during severe storms; transport by water would need to be aware of wave action and water elevation levels; transport by pipeline would need to be aware of potential excess soil saturation, which could influence the integrity of pipelines during extreme conditions.

13.1.1 Cascading Impacts on Other Hazards

Hazardous materials releases have the potential to cause major disruptions to local businesses that house hazardous materials and to other major businesses in the vicinity. Depending on the severity of the release event, this could result in additional economic impacts to the region, such as prolonged business closures or supply chain disruptions.



Hazardous materials releases can result in fires, leading to structural impacts on nearby buildings. Flammable gases, combustible materials, and electrical hazards are just a few examples of hazardous materials that can result in a fire. Mixed-use areas within the County may be more at risk of a fire caused by a hazardous materials release.

Instability to a building or structure following a hazardous materials incident may cause a collapse of the impacted site. Hazardous materials can be stored in a variety of locations, including at industrial facilities, hospitals, gas stations, and even residential properties. The improper storage of these materials can result in an incident, which can cause substantial structural damage. Structural damage to any building has the potential to lead to a collapse of the site, which can cause additional harm to surrounding structures, infrastructure, and nearby persons.

13.2 VULNERABILITY AND IMPACT ASSESSMENT

To understand risk, a community must evaluate what assets are vulnerable within the identified hazard area. Hazardous materials were quantitatively analyzed using three risk assessment exposure analyses on varying types of infrastructure: (1) major roadways, (2) rail lines, and (3) Superfund Amendments and Reauthorization Act (SARA) sites. These infrastructure datasets were provided by Genesee County, and a 0.5-mile buffer was applied to the major roadways and rail lines, while the SARA sites had varying buffer delineations applied, dependent on the particular chemical. To determine what assets are exposed to hazardous materials, the buffered infrastructure datasets were overlaid with the asset inventories (population, general building stock, critical facilities, and new development). Assets with their centroid located in the hazard area were totaled to estimate the totals and values at risk from the impacts of a hazardous materials release event.

13.2.1 Life, Health, and Safety

Overall Population

Hazardous materials incidents have the potential to compromise the health and safety of those living and working in the area of the incident. Specific impacts vary according to the type of material released, the area affected, and the population within the affected area.

A chemical incident may also include an explosion, with additional injuries and deaths being caused by the pressure wave from the explosion. The effects of biological incidents on the population depend on the nature of the agent involved, transmissibility, at-risk populations, incubation period, time before detection, and other factors. Biological agents may cause disease from which some individuals will recover while others will not. Radioactive materials can cause significant health effects in individuals, especially if the materials are taken into the body. Radiological incidents that result in the release of radioactive materials from a nuclear power plant can contaminate sources of potable water, livestock, and crops, leading to a dramatically reduced local food supply. Large chemical incidents and radiological incidents that result in the release of radioactive materials can contaminate sources of potable water, crops, and livestock, leading to a reduced local food supply.

Locations of these different hazardous materials and waste sites in Genesee County render the entire County vulnerable to these hazards. Populations particularly vulnerable to the effects of hazardous materials incidents are located near hazardous materials sites and along major transportation routes because significant quantities of chemicals are transported along these major thoroughfares.

The vulnerability analysis evaluated populations within 0.5 miles of major transportation infrastructure where a hazardous materials event could occur. Table 13-2 summarizes population vulnerability to hazardous materials incidents by jurisdiction. According to this analysis, there are 44,985 persons, 19,115 persons, and 48,678 persons



living within 0.5 miles of all roadways, railways, and SARA sites, respectively. The City of Batavia has the highest number of residents living within 0.5 miles of all roadways, with 13,768 people, or 88.3 percent of the jurisdiction's total population. Additionally, it has the greatest number of people living within 0.5 miles of all railways, totaling 8,578 individuals, or 55.0 percent of the jurisdiction's population. Furthermore, the City of Batavia has the largest population living within 0.5 miles of a SARA site, encompassing 15,600 people, which is 100 percent of the jurisdiction's total population.

Socially Vulnerable Population

Socially vulnerable populations may be impacted by hazardous materials events differently than others. For example, in the event of an evacuation, younger and older populations and those with disabilities may have mobility issues or rely on others (i.e., parents, aides) to get around. Low-income households have less disposable capital to pay for temporary shelter (i.e., hotels) should their place of occupancy become unlivable. Individuals who do not speak English very well, or speak another language, may receive warning or evacuation notices but not understand them.

As shown in Table 13-3, within 0.5 miles of all roadways, the City of Batavia has the highest population over 65, totaling 2,889 individuals. It also has the largest population under the age of 5, with 483 children, and the greatest population living in poverty, with 1,757 individuals. Additionally, the City of Batavia has the highest number of non-English speaking persons, totaling 117, and the highest disabled population, with 2,603 individuals.

As shown in Table 13-4, within 0.5 miles of all railways, the City of Batavia has the highest population over 65, with 1,800 individuals. It also has the largest population under the age of 5, with 301 children. Additionally, Batavia has the greatest population of non-English speaking persons, totaling 73, the highest disabled population, with 1,622 individuals, and the largest population living in poverty, with 1,094 individuals.

As shown in Table 13-5, within 0.5 miles of all SARA sites, the City of Batavia has the highest population over 65, with 3,274 individuals. It also has the largest population under the age of 5, with 548 children, the greatest number of non-English speaking persons, totaling 133, the highest disabled population, with 2,950 individuals, and the largest population living in poverty, with 1,990 individuals.



Table 13-2. Population in the Hazardous Materials Buffer Hazard Areas

Jurisdiction	Total Population	Population Vulnerable to Hazardous Material Incidents					
		Within 0.5 Miles of Hazardous Materials Roadways		Within 0.5 Miles of Hazardous Materials Railways		Within a Varying Radii of SARA Sites	
		Number of People	Percent of Total	Number of People	Percent of Total	Number of People	Percent of Total
Alabama (T)	1,602	885	55.2%	0	0.0%	684	42.7%
Alexander (T)	1,973	923	46.8%	319	16.2%	606	30.7%
Alexander (V)	518	517	99.8%	0	0.0%	0	0.0%
Attica (V)	2,450	2,449	100.0%	0	0.0%	0	0.0%
Batavia (C)	15,600	13,768	88.3%	8,578	55.0%	15,600	100.0%
Batavia (T)	6,293	5,211	82.8%	1,597	25.4%	5,871	93.3%
Bergen (T)	1,912	1,172	61.3%	327	17.1%	1,912	100.0%
Bergen (V)	1,208	1,207	99.9%	1,159	95.9%	1,207	99.9%
Bethany (T)	1,780	695	39.0%	163	9.2%	1,766	99.2%
Byron (T)	2,302	1,346	58.5%	469	20.4%	2,301	100.0%
Corfu (V)	689	688	99.9%	672	97.5%	458	66.5%
Darien (T)	3,010	1,450	48.2%	919	30.5%	0	0.0%
Elba (T)	1,606	554	34.5%	0	0.0%	1,505	93.7%
Elba (V)	558	555	99.5%	0	0.0%	558	100.0%
Le Roy (T)	3,362	1,890	56.2%	897	26.7%	3,362	100.0%
Le Roy (V)	4,300	4,300	100.0%	2,504	58.2%	4,300	100.0%
Oakfield (T)	1,333	510	38.3%	0	0.0%	1,332	99.9%
Oakfield (V)	1,812	1,812	100.0%	0	0.0%	1,812	100.0%
Pavilion (T)	2,290	1,258	54.9%	832	36.3%	2,245	98.0%
Pembroke (T)	3,575	2,298	64.3%	295	8.3%	736	20.6%
Stafford (T)	2,424	1,497	61.8%	384	15.8%	2,423	100.0%
Tonawanda (R)	241	0	0.0%	0	0.0%	0	0.0%
Genesee County (Total)	60,838	44,985	73.9%	19,115	31.4%	48,678	80.0%

Source: US Census Bureau 2020 Decennial; Genesee County Planning 2023; NYS GIS Clearinghouse; NYS DHHS 2023; Genesee County 2017

Note: % = Percent; exposed population statistics are rounded down to the nearest whole number.



Table 13-3. Estimated Vulnerable Population in the 0.5-Mile Hazardous Materials Roadway Buffer Hazard Area

Jurisdiction	Estimated Number of Vulnerable Persons Located in the Roadway Buffer Hazard Area									
	Over 65	Percent of Total	Under 5	Percent of Total	Non-English Speaking	Percent of Total	Disability	Percent of Total	Poverty Level	Percent of Total
Alabama (T)	140	54.9%	47	54.7%	4	42.7%	127	55.0%	97	55.1%
Alexander (T)	108	46.8%	142	46.6%	0	0.0%	105	46.7%	34	45.9%
Alexander (V)	50	98.0%	18	94.7%	0	0.0%	55	100.0%	60	98.4%
Attica (V)	406	99.8%	112	100.0%	27	96.2%	211	100.0%	148	100.0%
Batavia (C)	2,889	88.2%	483	88.1%	117	87.7%	2,603	88.2%	1,757	88.2%
Batavia (T)	1,436	82.8%	226	82.8%	0	0.0%	882	82.8%	596	82.8%
Bergen (T)	179	61.3%	63	60.6%	0	0.0%	195	61.1%	52	60.5%
Bergen (V)	159	100.0%	40	97.6%	0	0.0%	106	100.0%	153	100.0%
Bethany (T)	103	39.0%	28	37.8%	7	37.4%	75	38.9%	79	38.9%
Byron (T)	172	58.5%	112	58.3%	0	0.0%	141	58.3%	50	57.5%
Corfu (V)	196	99.5%	22	100.0%	0	0.0%	111	100.0%	40	100.0%
Darien (T)	311	48.1%	81	47.9%	0	0.0%	216	48.0%	19	47.5%
Elba (T)	79	34.2%	54	34.0%	29	34.4%	62	34.4%	43	34.1%
Elba (V)	71	98.6%	27	96.4%	0	0.0%	60	98.4%	27	96.4%
Le Roy (T)	299	56.2%	57	55.3%	0	0.0%	34	11.9%	15	31.3%
Le Roy (V)	889	99.9%	332	100.0%	41	97.3%	879	99.9%	582	100.0%
Oakfield (T)	102	37.9%	4	36.4%	14	37.4%	97	37.9%	138	38.0%
Oakfield (V)	225	100.0%	109	100.0%	0	0.0%	190	100.0%	253	99.6%
Pavilion (T)	215	54.8%	82	54.7%	0	0.0%	139	54.9%	142	54.8%
Pembroke (T)	475	64.2%	69	63.9%	23	61.4%	312	64.2%	280	64.2%
Stafford (T)	259	61.7%	95	61.7%	0	0.0%	131	61.5%	105	61.4%
Tonawanda (R)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Genesee County (Total)	8,763	74.7%	2,203	70.8%	262	61.5%	6,731	74.3%	4,670	76.3%

Source: US Census Bureau 2020 Decennial; Genesee County Planning 2023; NYS GIS Clearinghouse; NYS DHHS 2023; Genesee County 2017

Note: % = Percent; exposed population statistics are rounded down to the nearest whole number.



Table 13-4. Estimated Vulnerable Population in the 0.5-Mile Hazardous Materials Railway Buffer Hazard Area

Jurisdiction	Estimated Number of Vulnerable Persons Located in the Railway Buffer Hazard Area									
	Over 65	Percent of Total	Under 5	Percent of Total	Non-English Speaking	Percent of Total	Disability	Percent of Total	Poverty Level	Percent of Total
Alabama (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Alexander (T)	37	16.0%	49	16.1%	0	0.0%	36	16.0%	11	14.9%
Alexander (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Attica (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Batavia (C)	1,800	55.0%	301	54.9%	73	54.7%	1,622	55.0%	1,094	54.9%
Batavia (T)	440	25.4%	69	25.3%	0	0.0%	270	25.4%	182	25.3%
Bergen (T)	49	16.8%	17	16.3%	0	0.0%	54	16.9%	14	16.3%
Bergen (V)	152	95.6%	39	95.1%	0	0.0%	101	95.3%	146	95.4%
Bethany (T)	24	9.1%	6	8.1%	1	5.3%	17	8.8%	18	8.9%
Byron (T)	59	20.1%	39	20.3%	0	0.0%	49	20.2%	17	19.5%
Corfu (V)	192	97.5%	21	95.5%	0	0.0%	108	97.3%	39	97.5%
Darien (T)	197	30.5%	51	30.2%	0	0.0%	137	30.4%	12	30.0%
Elba (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Elba (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Le Roy (T)	142	26.7%	27	26.2%	0	0.0%	16	5.6%	7	14.6%
Le Roy (V)	518	58.2%	193	58.1%	24	57.0%	512	58.2%	338	58.1%
Oakfield (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Oakfield (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Pavilion (T)	142	36.2%	54	36.0%	0	0.0%	91	36.0%	94	36.3%
Pembroke (T)	61	8.2%	8	7.4%	3	8.0%	40	8.2%	36	8.3%
Stafford (T)	66	15.7%	24	15.6%	0	0.0%	33	15.5%	27	15.8%
Tonawanda (R)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Genesee County (Total)	3,879	33.0%	898	28.9%	101	23.7%	3,086	34.0%	2,035	33.2%

Source: US Census Bureau 2020 Decennial; Genesee County Planning 2023; NYS GIS Clearinghouse; NYS DHHS 2023; Genesee County 2017

Note: % = Percent; exposed population statistics are rounded down to the nearest whole number.



Table 13-5. Estimated Vulnerable Population in the 0.5-Mile Hazardous Materials SARA Sites Buffer Hazard Area

Jurisdiction	Estimated Number of Vulnerable Persons Located in the SARA Sites Buffer Hazard Area									
	Over 65	Percent of Total	Under 5	Percent of Total	Non-English Speaking	Percent of Total	Disability	Percent of Total	Poverty Level	Percent of Total
Alabama (T)	109	42.7%	36	41.9%	3	32.1%	98	42.4%	75	42.6%
Alexander (T)	71	30.7%	93	30.5%	0	0.0%	69	30.7%	22	29.7%
Alexander (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Attica (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Batavia (C)	3,274	100.0%	548	100.0%	133	99.7%	2,950	100.0%	1,990	99.9%
Batavia (T)	1,618	93.3%	254	93.0%	0	0.0%	993	93.2%	671	93.2%
Bergen (T)	292	100.0%	103	99.0%	0	0.0%	318	99.7%	86	100.0%
Bergen (V)	159	100.0%	40	97.6%	0	0.0%	106	100.0%	153	100.0%
Bethany (T)	262	99.2%	73	98.6%	18	96.2%	191	99.0%	201	99.0%
Byron (T)	293	99.7%	191	99.5%	0	0.0%	241	99.6%	86	98.9%
Corfu (V)	131	66.5%	14	63.6%	0	0.0%	73	65.8%	26	65.0%
Darien (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Elba (T)	216	93.5%	149	93.7%	78	92.6%	168	93.3%	118	93.7%
Elba (V)	72	100.0%	28	100.0%	0	0.0%	60	98.4%	28	100.0%
Le Roy (T)	532	100.0%	102	99.0%	0	0.0%	61	21.4%	27	56.3%
Le Roy (V)	889	99.9%	332	100.0%	41	97.3%	879	99.9%	582	100.0%
Oakfield (T)	268	99.6%	10	90.9%	36	96.2%	256	100.0%	363	100.0%
Oakfield (V)	225	100.0%	109	100.0%	0	0.0%	190	100.0%	253	99.6%
Pavilion (T)	384	98.0%	147	98.0%	0	0.0%	248	98.0%	253	97.7%
Pembroke (T)	152	20.5%	22	20.4%	7	18.7%	100	20.6%	89	20.4%
Stafford (T)	419	99.8%	153	99.4%	0	0.0%	213	100.0%	171	100.0%
Tonawanda (R)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Genesee County (Total)	9,366	79.8%	2,404	77.2%	316	74.2%	7,214	79.6%	5,194	84.8%

Source: US Census Bureau 2020 Decennial; Genesee County Planning 2023; NYS GIS Clearinghouse; NYS DHHS 2023; Genesee County 2017

Note: % = Percent; exposed population statistics are rounded down to the nearest whole number.



13.2.2 General Building Stock

Potential losses to property caused by a hazardous materials release, whether in transit or at fixed sites, are difficult to quantify. The degree of damage depends on the scale of the incident. Potential impacts may include inaccessibility, loss of service, contamination, and/or potential damage to the structure or contents. Hazardous materials can pose a serious long-term threat to property, particularly to the fixed-site facilities where hazardous materials are stored.

The impact of a fixed-facility incident will often be localized to the property where it occurs. It is difficult to determine potential losses to surrounding development because of the variable nature of a hazardous materials spill. For example, a very small chemical spill in a less populated area would be much less costly and possibly limited to remediation of soil. Local building stock characteristics and the type of substance released during a spill will greatly affect the extent of property damage.

The vulnerability analysis indicates 21,917 buildings with an estimated value of \$13 billion within 0.5 miles of all roadways, 9,001 buildings with an estimated value of \$6 billion within 0.5 miles of all railways, and 25,720 buildings with an estimated value of \$16 billion within 0.5 miles of all SARA sites. The City of Batavia has the greatest number of buildings within 0.5 miles of all roadways (4,930), railways (3,153), and SARA sites (5,548). Refer to Table 13-6 through Table 13-8 for building vulnerability to hazardous materials incidents by jurisdiction.

Table 13-9 through Table 13-11 list the buildings within the hazardous materials hazard areas by general occupancy. The vulnerability analysis estimates that across all hazardous materials hazard areas, residential buildings face the most vulnerability to the hazardous materials hazard within 0.5 miles of roadways (14,501), 0.5 miles of railways (6,244), and 0.5 miles of SARA sites (16,721).



Table 13-6. Estimated Number and Total Replacement Cost Value of Structures in the 0.5-Mile Hazardous Materials Roadway Buffer Hazard Area

Jurisdiction	Jurisdiction Total Buildings		Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Total	Value	% of Total
Alabama (T)	1,315	\$722,040,029	685	52.1%	\$328,960,316	45.6%
Alexander (T)	1,423	\$610,663,199	625	43.9%	\$275,102,822	45.0%
Alexander (V)	213	\$107,407,186	213	100.0%	\$107,407,186	100.0%
Attica (V)	52	\$65,949,240	52	100.0%	\$65,949,240	100.0%
Batavia (C)	5,548	\$4,822,536,729	4,930	88.9%	\$4,340,332,421	90.0%
Batavia (T)	3,680	\$2,447,128,797	2,951	80.2%	\$2,004,327,912	81.9%
Bergen (T)	1,248	\$591,610,057	751	60.2%	\$397,594,520	67.2%
Bergen (V)	511	\$156,058,577	511	100.0%	\$156,058,577	100.0%
Bethany (T)	1,330	\$628,307,466	439	33.0%	\$217,351,045	34.6%
Byron (T)	1,578	\$658,336,626	917	58.1%	\$322,321,954	49.0%
Corfu (V)	360	\$147,589,112	360	100.0%	\$147,589,112	100.0%
Darien (T)	2,434	\$1,285,847,435	1,168	48.0%	\$638,237,274	49.6%
Elba (T)	1,230	\$753,135,361	423	34.4%	\$225,571,002	30.0%
Elba (V)	373	\$125,049,373	371	99.5%	\$124,340,653	99.4%
Le Roy (T)	2,242	\$1,465,434,853	1,231	54.9%	\$814,862,221	55.6%
Le Roy (V)	1,742	\$1,128,112,213	1,741	99.9%	\$885,519,704	78.5%
Oakfield (T)	1,002	\$490,544,840	393	39.2%	\$239,219,388	48.8%
Oakfield (V)	735	\$374,066,224	735	100.0%	\$374,066,224	100.0%
Pavilion (T)	1,577	\$798,918,335	845	53.6%	\$473,315,349	59.2%
Pembroke (T)	2,373	\$1,079,428,778	1,529	64.4%	\$717,153,416	66.4%
Stafford (T)	1,668	\$775,606,282	1,047	62.8%	\$507,227,838	65.4%
Tonawanda (R)	284	\$148,395,154	0	0.0%	\$0	0.0%
Genesee County (Total)	32,918	\$19,382,165,867	21,917	66.6%	\$13,362,508,175	68.9%

Source: Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; RS Means 2024; Genesee County 2017

Note: % = Percent



Table 13-7. Estimated Number and Total Replacement Cost Value of Structures in the 0.5-Mile Hazardous Materials Railway Buffer Hazard Area

Jurisdiction	Jurisdiction Total Buildings		Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Total	Value	% of Total
Alabama (T)	1,315	\$722,040,029	0	0.0%	\$0	0.0%
Alexander (T)	1,423	\$610,663,199	211	14.8%	\$69,096,123	11.3%
Alexander (V)	213	\$107,407,186	0	0.0%	\$0	0.0%
Attica (V)	52	\$65,949,240	1	1.9%	\$1,153,852	1.7%
Batavia (C)	5,548	\$4,822,536,729	3,153	56.8%	\$3,150,873,717	65.3%
Batavia (T)	3,680	\$2,447,128,797	950	25.8%	\$505,521,178	20.7%
Bergen (T)	1,248	\$591,610,057	209	16.7%	\$87,908,002	14.9%
Bergen (V)	511	\$156,058,577	485	94.9%	\$146,531,560	93.9%
Bethany (T)	1,330	\$628,307,466	105	7.9%	\$36,272,641	5.8%
Byron (T)	1,578	\$658,336,626	283	17.9%	\$105,097,722	16.0%
Corfu (V)	360	\$147,589,112	352	97.8%	\$145,510,948	98.6%
Darien (T)	2,434	\$1,285,847,435	624	25.6%	\$269,867,587	21.0%
Elba (T)	1,230	\$753,135,361	0	0.0%	\$0	0.0%
Elba (V)	373	\$125,049,373	0	0.0%	\$0	0.0%
Le Roy (T)	2,242	\$1,465,434,853	545	24.3%	\$423,477,135	28.9%
Le Roy (V)	1,742	\$1,128,112,213	1,062	61.0%	\$922,137,587	81.7%
Oakfield (T)	1,002	\$490,544,840	0	0.0%	\$0	0.0%
Oakfield (V)	735	\$374,066,224	0	0.0%	\$0	0.0%
Pavilion (T)	1,577	\$798,918,335	514	32.6%	\$299,662,037	37.5%
Pembroke (T)	2,373	\$1,079,428,778	233	9.8%	\$126,281,858	11.7%
Stafford (T)	1,668	\$775,606,282	274	16.4%	\$100,271,094	12.9%
Tonawanda (R)	284	\$148,395,154	0	0.0%	\$0	0.0%
Genesee County (Total)	32,918	\$19,382,165,867	9,001	27.3%	\$6,389,663,041	33.0%

Source: Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; RS Means 2024; Genesee County 2017

Note: % = Percent



Table 13-8. Estimated Number and Total Replacement Cost Value of Structures in the Hazardous Materials SARA Sites Buffer Varying Radii Hazard Area

Jurisdiction	Jurisdiction Total Buildings		Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Total	Value	% of Total
Alabama (T)	1,315	\$722,040,029	582	44.3%	\$285,731,447	39.6%
Alexander (T)	1,423	\$610,663,199	382	26.8%	\$178,645,751	29.3%
Alexander (V)	213	\$107,407,186	0	0.0%	\$0	0.0%
Attica (V)	52	\$65,949,240	0	0.0%	\$0	0.0%
Batavia (C)	5,548	\$4,822,536,729	5,548	100.0%	\$4,822,536,729	100.0%
Batavia (T)	3,680	\$2,447,128,797	3,379	91.8%	\$2,326,124,065	95.1%
Bergen (T)	1,248	\$591,610,057	1,248	100.0%	\$591,610,057	100.0%
Bergen (V)	511	\$156,058,577	511	100.0%	\$156,058,577	100.0%
Bethany (T)	1,330	\$628,307,466	1,322	99.4%	\$624,918,730	99.5%
Byron (T)	1,578	\$658,336,626	1,578	100.0%	\$658,336,626	100.0%
Corfu (V)	360	\$147,589,112	219	60.8%	\$73,529,017	49.8%
Darien (T)	2,434	\$1,285,847,435	3	0.1%	\$1,864,204	0.1%
Elba (T)	1,230	\$753,135,361	1,164	94.6%	\$730,769,471	97.0%
Elba (V)	373	\$125,049,373	373	100.0%	\$125,049,373	100.0%
Le Roy (T)	2,242	\$1,465,434,853	2,242	100.0%	\$1,465,434,853	100.0%
Le Roy (V)	1,742	\$1,128,112,213	1,742	100.0%	\$1,128,112,213	100.0%
Oakfield (T)	1,002	\$490,544,840	1,002	100.0%	\$490,544,840	100.0%
Oakfield (V)	735	\$374,066,224	735	100.0%	\$374,066,224	100.0%
Pavilion (T)	1,577	\$798,918,335	1,540	97.7%	\$778,413,115	97.4%
Pembroke (T)	2,373	\$1,079,428,778	482	20.3%	\$224,272,540	20.8%
Stafford (T)	1,668	\$775,606,282	1,668	100.0%	\$775,606,282	100.0%
Tonawanda (R)	284	\$148,395,154	0	0.0%	\$0	0.0%
Genesee County (Total)	32,918	\$19,382,165,867	25,720	78.1%	\$15,811,624,113	81.6%

Source: Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; RS Means 2024; Genesee County 2017

Note: % = Percent



Table 13-9. Buildings in the 0.5-Mile Hazardous Materials Roadway Buffer Hazard Area by General Occupancy Class

Jurisdiction	Buildings in the 0.5-Mile Hazardous Materials Roadway Buffer Hazard Area			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Alabama (T)	389	281	0	15
Alexander (T)	344	270	0	11
Alexander (V)	149	60	0	4
Attica (V)	23	26	0	3
Batavia (C)	3,961	835	66	68
Batavia (T)	1,928	952	13	58
Bergen (T)	466	269	6	10
Bergen (V)	399	109	2	1
Bethany (T)	260	168	1	10
Byron (T)	502	400	0	15
Corfu (V)	248	112	0	0
Darien (T)	557	595	3	13
Elba (T)	226	185	2	10
Elba (V)	252	116	0	3
Le Roy (T)	695	488	10	38
Le Roy (V)	1,346	367	8	20
Oakfield (T)	204	184	0	5
Oakfield (V)	539	175	12	9
Pavilion (T)	511	292	8	34
Pembroke (T)	902	588	6	33
Stafford (T)	600	412	12	23
Tonawanda (R)	0	0	0	0
Genesee County (Total)	14,501	6,884	149	383

Source: Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; Genesee County 2017



Table 13-10. Buildings in the 0.5-Mile Hazardous Materials Railway Buffer Hazard Area by General Occupancy Class

Jurisdiction	Buildings in the 0.5-Mile Hazardous Materials Railway Buffer Hazard Area			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Alabama (T)	0	0	0	0
Alexander (T)	119	90	0	2
Alexander (V)	0	0	0	0
Attica (V)	0	1	0	0
Batavia (C)	2,468	584	62	39
Batavia (T)	591	351	4	4
Bergen (T)	130	73	2	4
Bergen (V)	383	99	2	1
Bethany (T)	61	43	0	1
Byron (T)	175	100	0	8
Corfu (V)	242	110	0	0
Darien (T)	353	257	3	11
Elba (T)	0	0	0	0
Elba (V)	0	0	0	0
Le Roy (T)	330	188	12	15
Le Roy (V)	784	254	6	18
Oakfield (T)	0	0	0	0
Oakfield (V)	0	0	0	0
Pavilion (T)	338	148	6	22
Pembroke (T)	116	104	3	10
Stafford (T)	154	115	1	4
Tonawanda (R)	0	0	0	0
Genesee County (Total)	6,244	2,517	101	139

Source: Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; Genesee County 2017



Table 13-11. Buildings in the Hazardous Materials Varying Radii SARA Sites Buffer Hazard Area by General Occupancy Class

Jurisdiction	Buildings in the Hazardous Materials Varying Radii SARA Sites Buffer Hazard Area			
	Residential	Commercial	Industrial	Government, Religion, Agricultural, and Education
Alabama (T)	301	260	2	19
Alexander (T)	226	147	0	9
Alexander (V)	0	0	0	0
Attica (V)	0	0	0	0
Batavia (C)	4,488	919	66	75
Batavia (T)	2,172	1,123	9	75
Bergen (T)	760	469	6	13
Bergen (V)	399	109	2	1
Bethany (T)	660	638	2	22
Byron (T)	858	683	3	34
Corfu (V)	165	54	0	0
Darien (T)	0	2	0	1
Elba (T)	613	516	3	32
Elba (V)	253	117	0	3
Le Roy (T)	1,236	920	17	69
Le Roy (V)	1,346	367	9	20
Oakfield (T)	533	459	0	10
Oakfield (V)	539	175	12	9
Pavilion (T)	912	568	9	51
Pembroke (T)	289	180	0	13
Stafford (T)	971	656	15	26
Tonawanda (R)	0	0	0	0
Genesee County (Total)	16,721	8,362	155	482

Source: Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; Genesee County 2017

13.2.3 Community Lifelines and Other Critical Facilities

Potential losses of critical facilities caused by a hazardous materials incident are difficult to quantify. Potential losses may include inaccessibility, loss of service, contamination, and/or potential structural and content losses if an explosion occurs. If the operators at a critical piece of infrastructure, such as a power plant, were unavailable, there could be physical damage to the infrastructure itself. Refer to Section 3 (County Profile), which summarizes the number and type of critical facilities in Genesee County. Hazardous materials incidents have the potential to lead to major transportation route closures in the County. The closure of railroads, airports, and highways as a result of hazardous materials release incidents has the potential to impact the ability to deliver goods and services.

Table 13-12 summarizes critical facilities and lifelines located within the hazardous materials hazard areas. A total of 2,862 critical facilities are located in Genesee County. Across all hazard areas, the Energy lifeline has the greatest number of facilities exposed, while the Food, Hydration, Shelter lifeline has the fewest facilities exposed.



Table 13-12. Number of Facilities in Hazardous Materials Hazard Areas, by Lifeline Category

FEMA Lifeline Category	Number of Lifelines	Number of Lifelines 0.5 Miles of Hazardous Materials Roadways	Number of Lifelines 0.5 Miles of Hazardous Materials Railways	Number of Lifelines in Varying Radii of SARA Sites
Communications	56	42	18	47
Energy	1,086	523	242	531
Food, Hydration, Shelter	12	9	9	12
Hazardous Materials	37	30	23	32
Health and Medical	71	67	27	60
Safety and Security	193	150	55	157
Transportation	229	162	79	167
Water Systems	928	379	123	599
Other Critical Facilities	250	228	113	224
Total	2,862	1,590	689	1,829

Source: Genesee County 2017,2021,2023,2024; NYS GIS Clearinghouse 2021,2023,2024; Genesee Orleans Wyoming Opioid Task Force 2021; Genesee Orleans Health Department 2024; NY Open Data 2024; US DOT 2023; Clark Patterson Lee Inc 2024; U.S. EPA 2021; HIFLD 2021; US NPS 2021; USGS 2023

Note: % = Percent

13.2.4 Economy

If a significant hazardous materials release occurred, not only would life, safety, and building stock be at risk, but the economy of the County may be impacted as well. A significant incident in a developed area may force businesses to close for an extended period of time because of contamination or direct damage. The potential losses to existing development vary because of the variable nature of hazardous materials spills, but costs from product loss, property damage and decontamination, and other costs can add up to millions of dollars.

Hazardous materials incidents can cause major economic disruptions. Not only do these events impact the companies transporting the materials, but the incidents may also impact facilities surrounding the location of the incident. A hazardous materials incident can become costly quickly due to the cost of responders, response equipment, and clean-up.

Hazardous materials incidents can lead to extended business closures that greatly affect the local economy. As businesses close and tourists are prohibited from entering the affected area, tourism may decline, and public perception of the area may be permanently affected. It may also prevent workers from commuting or consumers from traveling to businesses.

The closure of railroads, airports, and highways as a result of a hazardous materials incident has the potential to impact the ability to deliver goods and services efficiently. Potential impacts may be local, regional, or statewide, depending on the magnitude of the event and level of service disruptions.

Radiological contamination of agriculture, livestock, and production can lead to loss of commerce with other regions of the state, country, and even the world. Certain chemicals and hazardous materials can be toxic to plants and animals, damaging their habitats and food sources. Radioactive materials released into the environment could enter the food chain and ultimately contaminate the human food supply. Nuclear impacts on the environment are similar to that of radioactive materials; however, the extent of impacts can be larger due to the number of miles it can impact (NYC 2019).



13.2.5 Natural, Historic, and Cultural Resources

Natural

Hazardous materials incidents can have obvious, direct environmental impact as well as long-term, hidden environmental damage. If spilled, hazardous substances can contaminate wells, kill wildlife, and harm ecosystems. Water pollution is an immediate concern for direct human consumption, recreation, crop irrigation, and fish and wildlife consumption. Depending on the material, pollutants can bio-accumulate to differing degrees, affecting animals high on the food chain long after a spill. Hazardous waste can also leach into soils and travel with wind, which not only impacts the localized habitat but also can create issues for surrounding communities. Strict disposal regulations have been defined by the EPA to ensure that the environment and community are protected from these types of events (EPA 2023). Hazardous materials incidents would not likely affect geology but could significantly impact soils and farmlands, requiring expensive remediation.

Historic

Unless a spill is directly adjacent to a site or if the site stores hazardous materials, a hazardous materials incident is unlikely to affect historic resources. However, hazardous materials can pose a serious long-term threat to historic resources, particularly if the incident is on or near a historic site. Historic sites are typically not built to modern building codes, making them susceptible to damage. These sites often cannot be easily moved or upgraded without getting special permits.

Cultural

Unless a spill is directly adjacent to a site or if the site stores hazardous materials, a hazardous materials incident is unlikely to affect cultural resources. However, hazardous materials can pose a serious long-term threat to cultural resources, particularly if the incident is on or near a cultural site. Cultural events and/or festivals often take place in outdoor areas. A hazardous materials incident could impact the participants or visitors at these events and festivals or result in the event or festival becoming postponed or cancelled.

13.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

13.3.1 Potential or Planned Development

As discussed in Chapter 3 (County Profile), areas targeted for future growth and development have been identified across the County. Any areas of growth near a fixed facility site or transportation corridor would become exposed to hazardous materials incidents. The number and types of hazardous chemicals stored in and transported through the County may increase as available land is developed.

Development near the transit routes for hazardous materials and facilities will increase the County's overall risk. Therefore, the County should take precautions with the location of new development and the development's proximity to hazardous materials facilities and transit routes. The County may want to consider implementing designs into new development that enable improved evacuation or protection from residual impacts of hazardous materials.



13.3.2 Projected Changes in Population

According to the 2020 Census, the population of the County has increased by approximately 2.85 percent since 2010. Population projections from Cornell University reveal the County's population is anticipated to continue decreasing. The population is projected to decline to 56,077 persons in 2030 and to 54,128 by 2040 (Cornell University 2018). Any changes in the density of population can impact the number of persons living near hazardous materials facilities, transit routes, and pipelines. Refer to Section 3 (County Profile), which includes a discussion on population trends for the County.

13.3.3 Climate Change

Hazardous materials moved by transportation systems could be impacted by climate change, depending on the method for storing materials. If storage systems do not adapt to changing temperatures, hazardous materials could react to any increase in extreme temperatures caused by climate change. Furthermore, if climate change leads to a significant increase in temperature, roads and potential rail lines may buckle and warp. Climate change may increase the frequency and magnitude of flood and severe weather events, which may lead to an increased release of hazardous substances at both fixed sites and in transit.

13.3.4 Change of Vulnerability Since 2019 HMP

Overall, the County's vulnerability to the hazardous materials hazard has not changed, and the entire County will continue to be vulnerable to this hazard. Any change in vulnerability since the previous HMP would be attributed to changes in population density and new development. This updated HMP used updated building stock and critical asset inventories to assess the County's risk to these assets. The building inventory was updated using RS Means 2024 values, which are more current and reflect replacement cost rather than the building stock improvement values reported in the 2019 HMP. Further, the 2022 5-year population estimates from the American Community Survey were used to evaluate the population exposed to the hazard areas.



14. SEVERE STORM

14.1 HAZARD PROFILE

14.1.1 Hazard Description

Severe storm events are a common occurrence in Genesee County. A variety of severe storm types, such as thunderstorms, lightning, hail, tornadoes, high winds, and tropical cyclones, have damaged property and infrastructure, disrupted power, downed trees and power lines, and caused injuries and fatalities. The following section describes the different severe storm types that impact Genesee County.

Thunderstorms

Thunderstorms can lead to flooding, landslides, strong winds, and lightning. Roads could become impassable from flooding, downed trees, or power lines or a landslide. Downed utility poles can lead to utility losses, such as electricity, phone, and water (from loss of pumping and filtering capabilities).

A thunderstorm is a local storm produced by a cumulonimbus cloud and accompanied by lightning and thunder (NOAA-NSSL n.d.). A thunderstorm forms from a combination of moisture, rapidly rising warm air, and a force capable of lifting air such as a warm and cold front, a sea breeze, or a mountain. 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.

Typical thunderstorms are 15 miles in diameter and last an average of 30 minutes. The National Weather Service (NWS) classifies a thunderstorm as severe if it generates damaging wind gusts of 58 mph or higher, produces large hail measuring 1 inch (quarter size) or larger, or spawns tornadoes (NWS n.d.). An estimated 100,000 thunderstorms occur each year in the U.S., with approximately 10 percent of them classified as severe (U.S. Department of Commerce; NOAA; NWS 1994). During the warm season, thunderstorms are responsible for most of the rainfall.

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. All thunderstorms produce lightning. Lightning ranks as one of the top weather killers in the United States, killing approximately 80 people and injuring hundreds each year. Lightning can occur anywhere there is a thunderstorm. Lightning can be cloud to air, cloud to cloud, and cloud to ground.

Lightning can damage homes and injure people. In the United States, an average of 300 people are injured and 80 people are killed by lightning each year. Typical thunderstorms are 15 miles in diameter and last an average of 30 minutes. An estimated 100,000 thunderstorms occur each year in the United States, with approximately 10 percent of them classified as severe. During the warm season, thunderstorms are responsible for most of the rainfall. (NOAA n.d.)

Hailstorms

Hail forms inside a thunderstorm where there are strong updrafts of warm air and downdrafts of cold water. If a water droplet is picked up by the updrafts, it can be carried well above the freezing level. Water droplets freeze when temperatures reach 32 degrees Fahrenheit (°F) or colder. As the frozen droplet begins to fall, it may thaw as it moves into warmer air toward the bottom of the thunderstorm. However, the droplet may be picked up again by



another updraft and carried back into the cold air and re-freeze. With each trip above and below the freezing level, the frozen droplet adds another layer of ice. The frozen droplet with many layers of ice falls to the ground as hail. Most hail is small, typically less than 2 inches in diameter (NOAA-NSSL n.d.).

High Winds

High winds are experienced in all parts of the United States. According to the most recent National Oceanic Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI) data, the highest wind speeds are typically seen along the West Coast, spanning California up to Alaska, and inland toward the northern portion of Texas (NOAA-NCEI 2023). Wind begins with differences in air pressure. It 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 (National Geographic Society 2023). There are five major wind zones due to high winds (National Geographic Society 2023):

- **Polar Easterlies** are characterized by dry, cold prevailing winds that blow from the east. Polar easterlies will flow to low-pressure areas in the sub-polar regions.
- **Westerlies** are characterized by prevailing winds that blow from the west at midlatitudes. These winds are fed by polar easterlies and from the high-pressure horse latitudes, which flank the westerlies on either side. Westerlies are the strongest during the winter seasons and weakest in the summer when the polar high creates strong polar easterlies.
- **Horse Latitudes** are characterized by a narrow zone of warm, dry climates found between the westerlies and trade winds. Horse latitudes are located 30 and 35 degrees north and south. The prevailing winds found at the horse latitudes will vary but are generally light and last for a short duration.
- **Trade Winds** are characterized by powerful prevailing winds that blow from the east across the tropics. These winds are generally predictable and have been critical for communication and trade. Ships and sails rely on trade winds for reliable routes across the Atlantic and Pacific Oceans. Most severe storms, such as hurricanes and cyclones, will develop as trade winds.
- **Doldrums** are areas where the trade winds of two hemispheres meet at the intertropical convergence zone. The prevailing winds found here are extremely weak, and the weather is characterized as calm throughout.

High winds have the potential to down trees, tree limbs, and power lines, which could lead to widespread power outages and structural damage throughout Genesee County. High winds are often associated with other severe weather events such as thunderstorms, tornadoes, hurricanes, and tropical storms. Table 14-1 provides the descriptions of winds used by the NWS.

Table 14-1. National Weather Service Wind Descriptions

Descriptive Term	Sustained Wind Speed (mph)
Strong, dangerous, or damaging	≥40
Very windy	30 to 40
Windy	20 to 30
Breezy, brisk, or blustery	15 to 25
None	5 to 15 or 10 to 20
Light or light and variable wind	0 to 5

Source: NWS 2010
mph miles per hour



Tornadoes

Tornadoes are violent storms that can cause fatalities and devastate neighborhoods in seconds. Approximately 1,200 tornadoes touchdown in the United States per year (NOAA-NSSL n.d.). A tornado appears as a rotating, funnel-shaped cloud that extends from a thunderstorm to the ground with whirling winds that can reach 300 miles per hour (mph). Damage paths can be greater than 1 mile in width and 50 miles in length. Tornadoes typically develop from either a severe thunderstorm or hurricane as cool air rapidly overrides a layer of warm air. The average speed of a tornado is 30 mph but may vary from nearly stationary to 70 mph. The lifespan of a tornado is rarely longer than 30 minutes (NOAA-NSSL n.d.).

Hurricanes/Tropical Cyclones

A hurricane is a tropical storm that attains hurricane status when its wind speed reaches 74 mph or more. Tropical systems may develop in the Atlantic between the Lesser Antilles and the African coast or may develop in the warm tropical waters of the Caribbean and Gulf of Mexico. These storms may move up the Atlantic Coast and impact the Eastern Seaboard or move into the United States through the states along the Gulf Coast, bringing wind and rain as far north as New England before moving offshore and heading east (NOAA 2024).

A tropical storm system is characterized by a low-pressure center and numerous thunderstorms that produce strong winds and heavy rain. Compared to a hurricane, these storms tend to have slower wind speeds. Tropical storms strengthen when water evaporated from the ocean is released as the saturated air rises, resulting in condensation of water vapor contained in the moist air. They are fueled by a different heat mechanism than other cyclonic windstorms, such as Nor'easters and polar lows. The characteristic that separates tropical cyclones from other cyclonic systems is that at any height in the atmosphere, the center of a tropical cyclone will be warmer than its surroundings, a phenomenon called "warm core" storm systems (NOAA 2023).

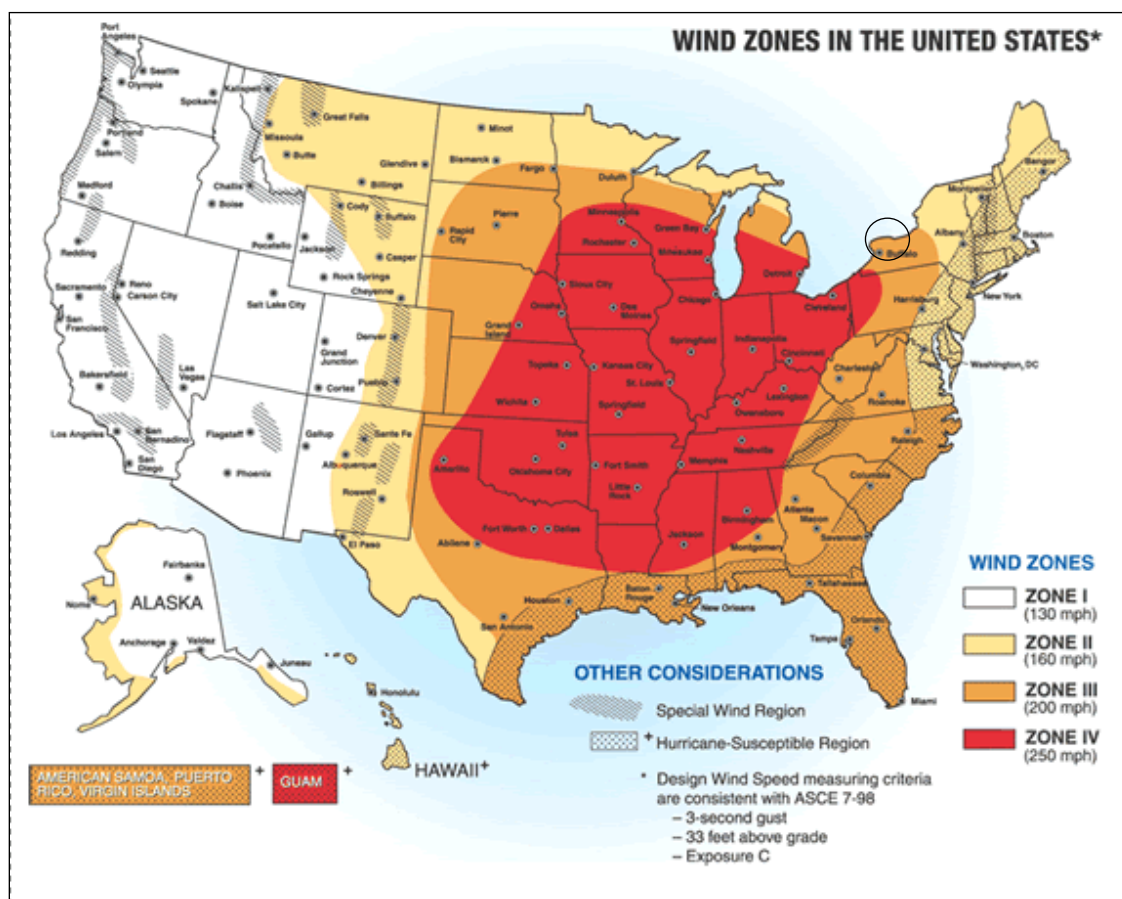


14.1.2 Location

All of Genesee County is exposed to thunderstorms, lightning, hailstorms, high winds, tornadoes, and tropical cyclones. Despite Genesee County's inland location, coastal storms, such as hurricanes and tropical storms, can impact the County. Hurricanes and tropical storms can affect Genesee County from June to November, which is the official hurricane season for the eastern U.S. However, the highest likelihood of impact occurs between late July and early October when waters are warmest (NYS 2023). Although one of the most severe impacts associated with hurricanes is storm surge, due to Genesee County's location, storm surge is not a concern for the County and has not been detailed in this profile.

According to the Federal Emergency Management Agency (FEMA) Winds Zones of the United States map, Genesee County is located within Wind Zone III, where wind speeds can reach up to 200 mph. Table 14-1 illustrates wind zones across the United States, which indicate the impacts of the strength and frequency of wind activity per region. The information on the figure is based on 40 years of tornado data and 100 years of hurricane data collected by FEMA.

Figure 14-1. Wind Zones in the United States



Source: FEMA 2012

Note: The black oval indicates the approximate location of Genesee County.

Thunderstorms

Thunderstorms affect relatively small, localized areas rather than large regions like winter storms and hurricane events. Thunderstorms can strike anywhere, but they are most common in the central and southern United States. The atmospheric conditions in these regions of the country are ideal for generating these powerful storms. It is estimated that there are as many as 40,000 thunderstorms each day worldwide (NOAA 2023). The most thunderstorms are seen in the southeast United States, with Florida having the highest incidences (80 to over 100 thunderstorm days each year).

Lightning

Lightning is associated with moderate to severe thunderstorms. Lightning severity is determined by the frequency of lightning strikes during a storm. The New York City Office of Emergency Management notes that lightning strikes occur with moderate frequency in the State of New York, with 3.8 strikes occurring per square mile each year. Multiple devices are available to track and monitor the frequency of lightning (NYC Emergency Management n.d.).

Hailstorms

Hailstorms are most frequent in the Southern and Central Plains states, where warm moist air off the Gulf of America and cold dry air from Canada collide, thereby spawning violent thunderstorms. This area of the United States is



known as “hail alley” and lies within the states of Texas, Oklahoma, Colorado, Kansas, Nebraska, and Wyoming (NOAA-NSSL n.d.). In the State of New York, hailstorms can occur anywhere within the state independently or during a tornado, thunderstorm, or lightning event.

Figure 14-2 shows the Hail Risk Index for Genesee County on the county tract scale. This index helps to understand the susceptibility of the County to hail. According to the National Risk Index, on the county scale, the County has a very low risk of hail (FEMA 2019).

Figure 14-2. National Risk Index for Hail in Genesee County

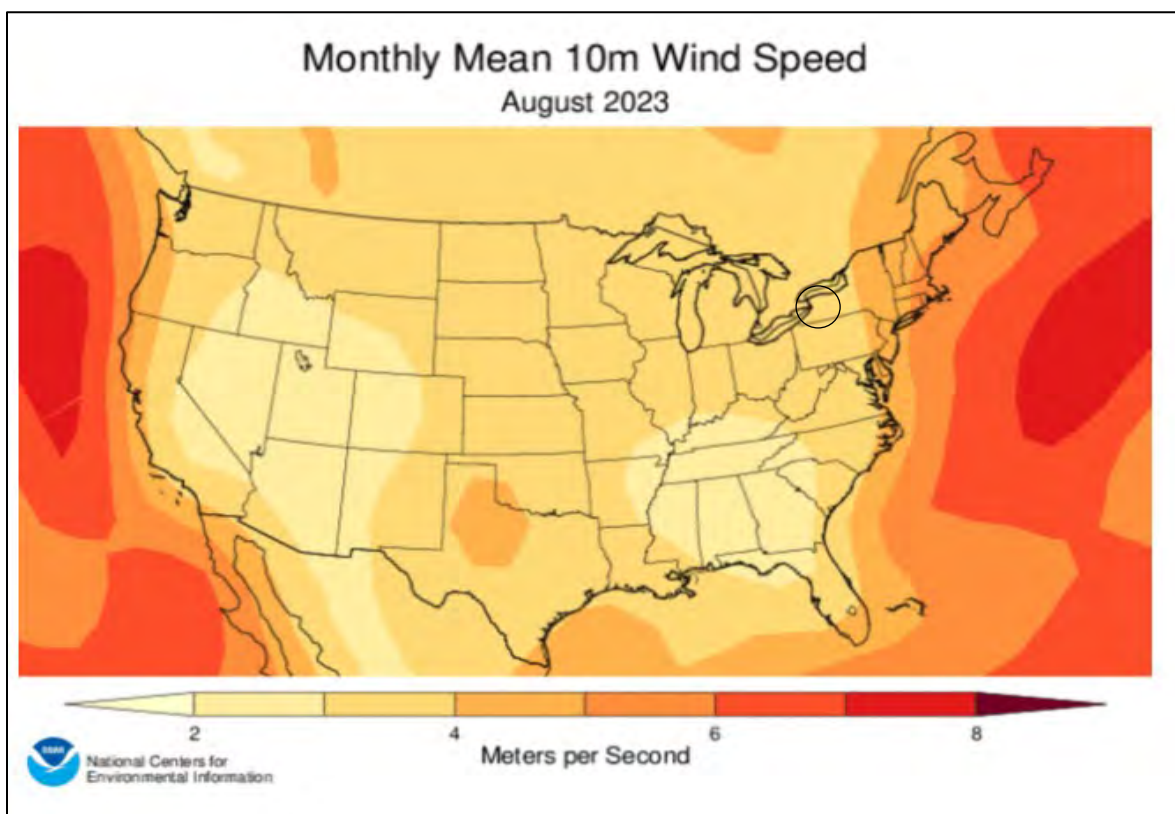


Source: FEMA 2019

High Winds

All of Genesee County is subject to high winds from thunderstorms, hurricanes/tropical storms, tornadoes, and other severe weather events. According to the Federal Emergency Management Agency’s (FEMA) Winds Zones of the United States map, Genesee County is located in Wind Zone III, where wind speeds can reach up to 200 mph. The County is also located in the Hurricane Susceptible Region, which extends along the entire East Coast from Maine to Florida, the Gulf Coast, and Hawaii. Figure 14-3 illustrates the frequency and intensity of windstorms in the United States, highlighting the areas with the most wind activity. The data shows that New York State recorded wind speeds ranging from 4 to 6 meters per second in August 2023. In contrast, Genesee County experienced lower average wind speeds, approximately 4 meters per second.

Figure 14-3. Mean 10m Wind Speed for August 2023



Source: NOAA 2023

Note: Black circle indicates the relative area for Genesee County.

Figure 14-4 shows the Strong Wind Risk Index for Genesee County on the county scale. This index helps to understand the susceptibility of the County to strong winds. According to the National Risk Index, on the county scale, the County has a relatively low risk to strong winds (FEMA 2019).



Figure 14-4. National Risk Index for Strong Wind in Genesee County



Source: FEMA 2019

Tornadoes

Approximately 1,200 tornadoes occur in the United States each year, with the central portion of the country experiencing the most (NOAA-NSSL n.d.). Tornadoes can occur at any time of the year, but their peak seasons vary by state. In the Southern Plains (including Texas, Oklahoma, and Kansas), the peak season is from May to early June. The Gulf Coast experiences tornado activity primarily in the spring. In the Northern Plains and Upper Midwest (comprising North and South Dakota, Nebraska, Iowa, and surrounding areas), tornado seasons typically occur from June to July. (NOAA-NSSL n.d.).

The entire State of New York is susceptible to tornado activity and vulnerable to tornado impacts. Based on statistics from 1996 to 2018, it was found that on average eight tornadoes ranging from F0 to F4 occurred each year in the state (NYS 2023). This resulted in an average of \$6.4 million in annualized loss from tornadoes for the State of New York. Approximately 143 injuries and six fatalities were recorded from 1996 to 2018 as a result of tornado impacts (NYS 2023). The entirety of Genesee County is vulnerable to tornado impacts and can experience a tornado at any time when suitable conditions are present.

Figure 14-5 shows the Tornado Risk Index for Genesee County on the county tract scales. This index helps to understand the susceptibility of the County to tornadoes. According to the National Risk Index, on the county scale, the County has a very low risk of tornadoes (FEMA 2019).



Figure 14-5. National Risk Index for Tornadoes in Genesee County



Source: FEMA 2019

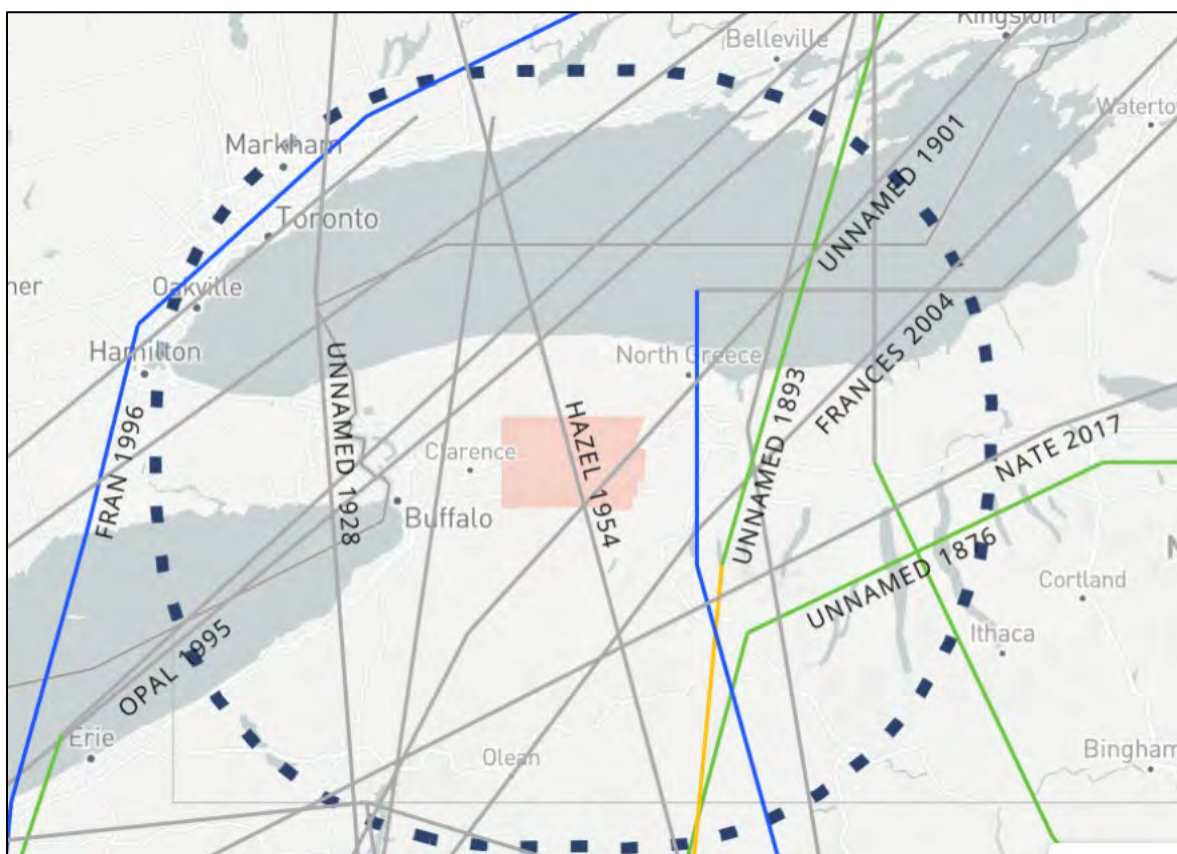
Hurricanes/Tropical Cyclones

The official hurricane season for the eastern United States, including the State of New York, is from June to November. Hurricanes and tropical storms are most likely to affect the state between late July to early September due to the warmth of the Atlantic Ocean (NYS 2023).

Genesee County is vulnerable to the impacts of hurricanes and tropical storms. However, it depends on the storm's track. The majority of damage from these events often results from residual wind damage and inland flooding, most recently experienced during Hurricane Nate in October 2017.

NOAA's Historical Hurricane Tracks tool is a public interactive mapping application that displays Atlantic Basin and East-Central Pacific Basin tropical cyclone data. This interactive tool catalogs tropical cyclones that have occurred from 1958 to 2021 (latest date available from data source). Between 1861 and 2021, 18 tropical cyclones tracked within 60 nautical miles of Genesee County (NOAA 2021). Figure 14-6 displays the tropical cyclone track for Genesee County that tracked with 60 nautical miles between 1861 and 2023.

Figure 14-6. Historical Hurricane Tracks



Source: NOAA 2021

14.1.3 Extent

The extent (severity or magnitude) of a severe storm is largely dependent upon the most damaging aspects of each type of severe weather. This section describes the extent of thunderstorms, lighting, hail, windstorms, tornadoes, and tropical cyclones in Genesee County.

Thunderstorms

Severe thunderstorm watches and warnings are issued by the local NWS office and the Storm Prediction Center (SPC). The NWS and SPC will update the watches and warnings and will notify the public when they are no longer in effect. Watches and warnings for tornadoes in the State of New York are as follows (NWS n.d.):

- **Severe Thunderstorm Warnings** are issued when there is evidence based on radar or a reliable spotter report that a thunderstorm is producing, or forecast to produce, wind gusts of 58 mph or greater, structural wind damage, and/or hail one inch in diameter or greater. A warning will include where the storm was located, what municipalities will be impacted, and the primary threat associated with the severe thunderstorm warning. After it has been issued, the NWS office will follow up periodically with Severe Weather Statements that contain updated information on the severe thunderstorm and will let the public know when the warning is no longer in effect.
- **Severe Thunderstorm Watches** are issued by the SPC when conditions are favorable for the development of severe thunderstorms over a larger-scale region for a duration of at least three hours. Tornadoes are not

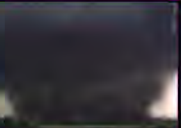


expected in such situations, but isolated tornado development may also occur. Watches are normally issued well in advance of the actual occurrence of severe weather. During the watch, the NWS will keep the public informed of what is happening in the watch area and let the public know when the watch has expired or been canceled.

- **Special Weather State for Near Severe Thunderstorms** are issued for strong thunderstorms that are below severe levels but still may have some adverse impacts. Usually, they are issued for the threat of wind gusts of 40 to 58 mph or small hail less than one inch in diameter.

Figure 14-7 presents the severe thunderstorm risk categories, as provided by the SPC.

Figure 14-7. Severe Thunderstorm Risk Categories

Understanding 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
* NWS defines a severe thunderstorm as measured wind gusts to at least 58 mph, and/or hail to at least one inch in diameter, and/or a tornado. All thunderstorm categories imply lightning and the potential for flooding. Categories are also tied to the probability of a severe weather event within 25 miles of your location.					

Source: NOAA SPC 2017

Lightning

Lightning is associated with moderate to severe thunderstorms. Lightning severity is determined by the frequency of lightning strikes during a storm. The New York City Office of Emergency Management notes that lightning strikes occur with moderate frequency in the State of New York, with 3.8 strikes occurring per square mile each year. Multiple devices are available to track and monitor the frequency of lightning (NYC Emergency Management n.d.).

Hailstorms

The severity of hail is measured by duration, hail size, and geographic extent. All of these factors depend on the condition of the storm generating the hail. Hail can be produced from many different types of storms, but typically it occurs with thunderstorms. There is wide potential variation in these severity components. The most significant impact of hail is damage to crops. Hail also has the potential to damage structures and vehicles during hailstorms.



The size of hail is estimated by comparing it to a known object. Most hailstorms are made up of a variety of sizes, and only the very largest hailstones pose serious risk to people when exposed (NOAA-NSSL n.d.). Table 14-2 shows the different sizes of hail and the comparison to real-world objects.

Table 14-2. Estimating Hail Size

Size	Inches in Diameter
Pea	0.25 inch
Marble/Mothball	0.50 inch
Dime/Penny	0.75 inch
Nickel	0.875 inch
Quarter	1.0 inch
Ping-Pong Ball	1.5 inches
Golf Ball	1.75 inches
Tennis Ball	2.5 inches
Baseball	2.75 inches
Teacup	3.0 inches
Softball	4.0 inches
Grapefruit	4.5 inches

Source: NOAA-NSSL, n.d.

High Winds

The NWS issues advisories and warnings for winds. Issuance is normally site-specific. High wind advisories, watches, and warnings are products issued by the NWS when wind speeds may pose a hazard or are life-threatening. The criterion for each of these varies from state to state. Wind warnings and advisories for the State of New York are as follows:

- **High Wind Warnings** are issued when sustained wind speeds reach 40 mph or higher for at least one hour, or when winds of 58 mph or more are expected for any duration, indicating the potential for widespread damage.
- **Wind Advisories** are issued when sustained winds are forecast to be between 30 and 39 mph for one hour or longer, or when wind gusts are expected to range from 46 to 57 mph for any duration (NWS 2011).

The following table provides the descriptions of winds used by the NWS during wind-producing events.

Table 14-3. 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 2010



Notes: mph Miles per hour

Tornadoes

The magnitude or severity of a tornado is categorized using the Enhanced Fujita Tornado Intensity Scale (EF Scale). This is the scale now used exclusively for determining tornado ratings by comparing wind speed and actual damage. Figure 14-8 illustrates the relationship between EF ratings, wind speed, and expected tornado damage.

Tornado watches and warnings are issued by the local NWS office. A tornado watch is released when tornadoes are possible in an area. A tornado warning means a tornado has been sighted or indicated by weather radar. The current average lead time for tornado warnings is 13 minutes. Occasionally, tornadoes develop so rapidly that little, if any, advance warning is possible (FEMA n.d.).

Figure 14-8. Explanation of EF Scale Ratings

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

Source: NOAA 2020

Hurricanes/Tropical Cyclones

Hurricane severity is approximated using the Saffir-Simpson Hurricane Scale. The Saffir-Simpson Hurricane Wind Scale is based on a hurricane's sustained wind speed and estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of



life and damage. Category 1 and 2 storms are still dangerous and require preventive measures (NOAA-NHC n.d.). Table 14-4 presents this scale, which is used to estimate the potential property damage and flooding expected when a hurricane makes landfall.

Table 14-4. The Saffir-Simpson Scale

Category	Wind Speed (mph)	Expected Damage
1	74 to 95 mph	Very dangerous winds will produce some damage: Homes with well-constructed frames could have damage to roof, shingles, vinyl siding, and gutters. Large branches of trees will snap, and shallowly 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 mph	Extremely dangerous winds will cause extensive damage: Homes with well-constructed frames could sustain major roof and siding damage. Many shallowly 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 mph	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 mph	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 mph	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 2013

Notes: mph Miles per hour

> Greater than

The NWS issues hurricane and tropical storm watches and warnings. These watches and warnings are issued or will remain in effect after a tropical cyclone becomes post-tropical, when such a storm poses a significant threat to life and property. The NWS allows the National Hurricane Center (NHC) to issue advisories during the post-tropical stage. The following are the definitions of the watches and warnings (NWS n.d.):

- **Hurricane/Typhoon Warning** is issued when sustained winds of 74 mph or higher are expected somewhere within the specified area in association with a tropical, subtropical, or post-tropical cyclone. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the warning is issued 36 hours in advance of the anticipated onset of tropical storm force winds. The warning can remain in effect when dangerously high water or combination of dangerously high water and waves continue, even though winds may be less than hurricane force.
- **Hurricane Watch** is issued when sustained winds of 74 mph or higher are possible within the specified area in association with a tropical, subtropical, or post-tropical cyclone. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours prior to the anticipated onset of tropical storm force winds.
- **Tropical Storm Warning** is issued when sustained winds of 39 to 73 mph are expected somewhere within the specified area within 36 hours (24 hours for the western north Pacific) in association with a tropical, subtropical, or post-tropical storm.
- **Tropical Storm Watch** is issued when sustained winds of 39 to 73 mph are possible within the specified area within 48 hours in association with a tropical, subtropical, or post-tropical storm.

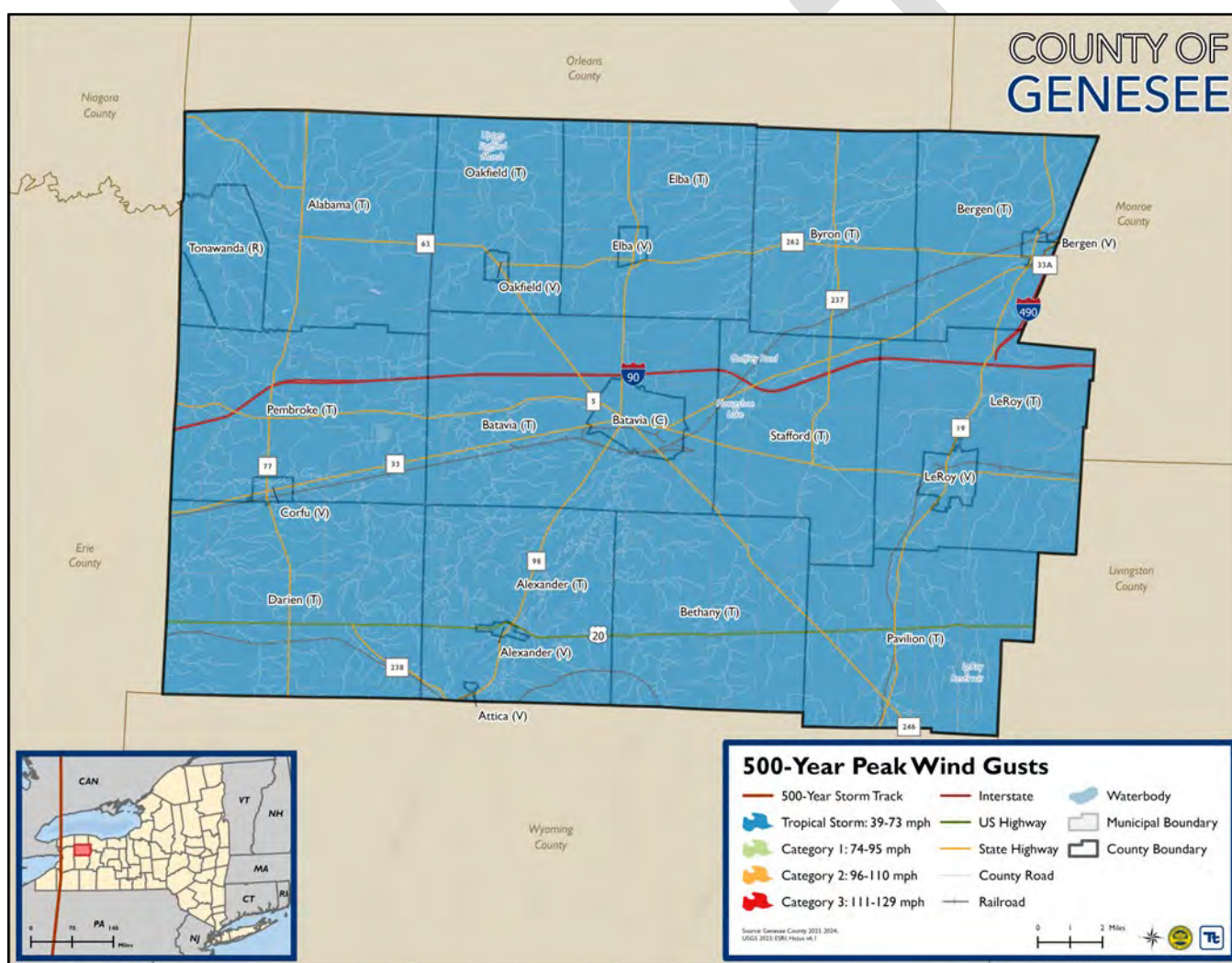


Mean Return Period (MRP)

In evaluating the potential for hazard events of a given magnitude, an MRP is often used. The MRP provides an estimate of the magnitude of an event that may occur within any given year based on past recorded events. MRP is the average period of time, in years, between occurrences of a particular hazard event, equal to the inverse of the annual frequency of exceedance.

Figure 14-9 shows the estimated maximum three-second gust wind speeds that can be anticipated in the study area associated with the 500-year MRP event. The peak wind speed projections were generated using Hazards U.S. Multi-Hazard (HAZUS-MH) model runs for the 500-year event. The maximum 3-second gust wind speeds for Genesee County range from 39 to 73 mph for the 500-year MRP event. The associated impacts and losses from the 500-year MRP hurricane event model run is reported in the Vulnerability Assessment.

Figure 14-9. Wind Speeds for the 500-Year MRP Event





14.1.4 Previous Occurrences

Federal Emergency Management Agency (FEMA) Major Disaster and Emergency Declarations

Between 1954 and 2024, Genesee County was included in six major disaster (DR) or emergency (EM) declarations for severe storm-related events (FEMA 2024). Table 14-5 lists these declarations. Though not included in the declaration, the County felt impacts from a severe storm which earned a declaration (DR-4472-NY).

Table 14-5. FEMA Declarations for Severe Storm Events in Genesee County (1954 to 2024)

Event Date	Declaration Date	Declaration Number	Description
March 21, 1973	March 21, 1973	DR-367	High Winds, Wave Action, and Flooding
June 25–July 10, 1998	July 7, 1998	DR-1233	New York Severe Storms and Flooding
May 13–June 17, 2004	August 3, 2004	DR-1534	New York Severe Storms and Flooding
September 30, 2005	August 29–October 1, 2005	EM-3262	Hurricane Katrina Evacuation
October 12–25, 2006	October 24, 2006	DR-1665	Severe Storms and Flooding
October 27–November 8, 2012	October 28, 2012	EM-3351	New York Hurricane Sandy

Sources: FEMA 2024

U.S. Department of Agriculture (USDA) Declarations

The 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. Between 2017 and 2024, Genesee County was included in three USDA severe storm-related agricultural disaster declarations (USDA 2024). For declarations that occurred between 2017 and 2024, refer to Table 14-6.

Table 14-6. USDA Declarations for Severe Storm Events in Genesee County (2017 to 2024)

Event Date	USDA Declaration Number	Description
2017	S4265	Excessive Rain
2019	S4595	Hail
2019	S4622	Excessive Rain

Sources: USDA 2024

Previous Events

Known hazard events that impacted Genesee County between January 2017 and December 2024 are discussed in Table 14-7. For events prior to 2017, refer to the 2019 Genesee County Hazard Mitigation Plan (HMP). Events with less than \$5,000 in property or crop damages were not included in Table 14-7.



Table 14-7. Severe Storm Events in Genesee County (2017 to 2024)

Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
January 4, 2017	N/A	N/A	Genesee County	Wind gusts between 50-60 mph were reported, knocking down trees and power lines. Several structures were damaged by the falling trees, resulting in \$50,000 in property damage.
January 11, 2017	N/A	N/A	Genesee County	Wind gusts of 60 mph were reported, which resulted in thousands of customers without power. Downed trees blocked roads and led to structural damage, which resulted in \$75,000 in property damage.
March 1-2, 2017	N/A	N/A	Genesee County	Wind gusts as high as 64 mph were measured and were reported to have knocked down power lines and damaged several buildings and automobiles. Property damage of \$25,000 was reported.
March 8, 2017	N/A	N/A	Genesee County	Sustained winds of 49 mph were recorded at Batavia, which resulted in damage to several buildings. Minor injuries were reported in Alexander, and a total of \$500,000 in property damage was reported.
April 4, 2017	N/A	N/A	Genesee County	Wind gusts as high as 59 mph were measured, and \$30,000 in property damage was reported.
May 1, 2017	N/A	N/A	Genesee County	A line of thunderstorms produced damaging winds that were measured up to 60 mph and knocked numerous trees over. The storms also produced heavy rainfall in a short period of time, which led to road closures due to flooding. A total of \$45,000 in property damage was reported.
July 8, 2017	N/A	N/A	Genesee County	A thunderstorm produced damaging wind and large hail, which led to downed trees and power lines. Numerous roads were blocked by debris. A total of \$32,000 in property damage was reported.
July 24, 2017	N/A	N/A	Genesee County	Thunderstorms developed and produced a lightning strike that caused a house fire. There were no injuries, but extensive damage to the structure, resulting in \$75,000 in property damage.
September 4, 2017	N/A	N/A	Genesee County	Thunderstorms produced wind gusts of 61 mph, which knocked numerous trees down which damaged several homes and cars and led to road closures. Property damage of \$8,000 was reported.
October 15, 2017	N/A	N/A	Genesee County	A thunderstorm produced wind gusts measured at 63 mph, which knocked down trees and power lines that damaged several homes and cars and led to road closures. Property damage of \$10,000 was reported.



Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
April 4, 2018	N/A	N/A	Genesee County	Damaging wind gusts knocked trees and powerlines down and overturned multiple semitrucks. Property damage of \$20,000 was reported.
July 16, 2018	N/A	N/A	Genesee County	Thunderstorms produced strong wind that led to several trees being downed with damage to camping equipment. Property damage of \$10,000 was reported.
January 1, 2019	N/A	N/A	Genesee County	Damaging wind gusts of 61 mph were reported to have knocked over trees and wires, resulting in \$10,000 in damages.
February 24-25, 2019	N/A	N/A	Genesee County	Peak winds of 69 mph were measured in Batavia, which led to downed trees and wires that produced substantial structural damage to homes and businesses. Thousands of people were reported to have no power. Property damage of \$20,000 was documented.
March 10, 2019	N/A	N/A	Genesee County	Maximum wind speed of 57 mph was reported in Batavia, with numerous damages as a result of trees and powerlines being knocked over. Property damage of \$5,000 was documented.
October 31- November 1, 2019	DR-4472-NY	No	Genesee County	Strong storms produced 1-3 inches of rain and wind gusts of 61 mph, which produced substantial property damage, road closures, and power outages. A total of \$575,000 in property damage was reported.
January 12, 2020	N/A	N/A	Genesee County	Wind gusts of 65 mph were recorded, and property damage totaling \$15,000 was documented.
July 29, 2020	N/A	N/A	Genesee County	Thunderstorms developed that produced wind damage and a tornado in a neighboring County. Numerous trees and wires were reported downed, and a total of \$5,500 in property damage was documented.
August 27, 2020	N/A	N/A	Genesee County	A line of storms produced hail the size of 2 inches and strong wind, which knocked down trees and wires, damaging homes and leading to road closures. A total of \$35,000 in property damage was reported.
November 15-16, 2020	N/A	N/A	Genesee County	Widespread wind damage was reported after 58 mph wind speed was documented. A total of \$50,000 in property damage was documented.
March 26, 2021	N/A	N/A	Genesee County	Strong winds that reached 60 mph were documented, which led to property damage of around \$10,000.
December 11, 2021	N/A	N/A	Genesee County	Wind gusts of up to 70 mph were reported at Batavia, which led to dozens of trees and power lines being knocked over. This resulted in \$50,000 in property damage.



Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
March 6, 2022	N/A	N/A	Genesee County	Peak wind gusts reached 66 mph, which led to numerous trees and wires that were knocked over, resulting in \$50,000 in property damage. One tree fell over and killed a 61-year-old man.
April 25, 2022	N/A	N/A	Genesee County	A strong storm system produced winds strong enough to spur an EF0 tornado in the Town of Alexander, which produced wind damage relating to shattered windows, missing shingles, and numerous trees that were snapped. A total of \$25,000 in property damage was reported.
January 9, 2024	N/A	N/A	Genesee County	A strong storm system crossed the central Great Lakes, producing a period of damaging winds across the region. Damaging wind gusts caused trees and power lines down in Batavia, Byron, and Elba. A total of \$10,000 in property damage was reported.
January 13-14, 2024	N/A	N/A	Genesee County	A powerful storm impacted the County with damaging winds. Strong winds continued as rain changed to snow, eventually becoming lake enhanced and then lake effect. Lake effect snow became heavier later Saturday evening, causing brief periods of near blizzard conditions. Winds weakened through the middle of the weekend as heavy lake effect snow lingered into Monday morning. Reports of trees and wires down in Batavia and Darien Center. A total of \$10,000 in property damage was reported.
July 10, 2024	N/A	N/A	Genesee County	On July 10, 2024, the County was impacted by the remnants of tropical cyclone Beryl. The event brought every type of warm season severe hazard, including numerous reports of wind damage, hail, significant flash flooding, and an EF-0 tornado confirmed by NWS Storm Survey in the Town of Darien and Town of Alexander. Maximum winds were 75 mph. Path length was 1 mile. Maximum width was 50 yards.
July 15, 2024	N/A	N/A	Genesee County	Thunderstorms in Genesee County resulted in tennis ball-sized hail (2.5), numerous trees and wires downed, and an EF-0 tornado confirmed with a peak wind of 85 mph. A narrow, discontinuous path of tree damage along a 0.75-mile path length with a path width of 75 yards through the center of Pavilion, NY.
August 5, 2024	N/A	N/A	Genesee County	Thunderstorms with heavy rainfall resulted in instances of flooding and flash flooding across Genesee County. Several trees and wires were downed. A total of \$5,000 in property damage was reported.



Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
September 9, 2024	N/A	N/A	Genesee County	Thunderstorms with heavy rainfall resulted in instances of flooding and flash flooding across Genesee County. Several trees and wires were downed, closing roadways. NWS confirmed a weak EF-0 tornado in the Hamlet of Indian Falls from near NY Route 77 to Little Falls Road. About a half dozen trees were damaged or blown down, but all trees showed significant rot. Max winds were 75 mph, path length was 0.2 miles, width 50 yards, and duration was 2 minutes. A total of \$20,000 in property damage was reported.

Sources: NOAA-NCEI 2024; FEMA 2024



14.1.5 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 summarized in Table 14-8. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 20, the identified hazards of concern for Genesee County were ranked. Based on historical records and input from the Steering Committee, the probability of occurrence for severe storms in the County is considered “frequent.”

Table 14-8. Probability of Future Severe Storm Events in Genesee County

Hazard Type	Number of Occurrences Between 1996 and 2024	Percent Chance of Occurring in Any Given Year
Hail	17	60.71%
High Wind	65	100%
Lightning	4	14.29%
Thunderstorm Wind	70	100%
Tornado	5	17.86%
Total	161	100%

Sources: NOAA-NCEI 2024; FEMA 2024

Notes: Due to limitations in data, not all severe storm 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 2024.

In addition to the events listed above, 18 tropical cyclones have passed within 60 nautical miles of Genesee County since 1861 (two tropical storms, one Category 16 hurricane), resulting in 11.4 percent chance of occurrence in any given year over the 160-year record keeping (NOAA n.d.).

Climate Change Projections

Projected changes in storm intensity and frequency depend on the type of storm. Heavy rainstorms are projected to happen more often and can become more intense as the climate continues to warm, a change which has the potential to affect drinking water; heighten the risk of riverine flooding; flood key rail lines, roadways, and transportation hubs; and increase delays and hazards related to extreme weather events. Hurricanes and tropical storms have become more intense since the mid-1990s, and their winds and associated flooding are expected to increase. The number of hurricanes and tropical storms in the Atlantic basin may not increase, but storms that do form are projected to be stronger and shift farther north (Stevens & Lamie 2024). The length of hurricane season is also likely to expand due to rising water temperatures. Research also suggests that there is a greater risk of more off-season tornadoes in a warmer future climate, which suggests that more tornadic activity may occur when people are least expecting it (NOAA 2023).

14.1.6 Cascading Impacts on Other Hazards

Severe storm incidents can lead to utility failure and downed trees and wires due to strong winds. Electrical utility failure also has the potential to start fires that can damage infrastructure and woodlands. The damage from electrical utility failure can include fatalities and injuries, depending on the location and severity of the failure. Damage incurred from utility failure can also be costly and time-consuming to fix.



14.2 VULNERABILITY AND IMPACT ASSESSMENT

A probabilistic assessment was conducted for the 500-year MRP hurricane wind event through a Level 2 analysis in Hazus to analyze the severe storm hazard and provide a range of loss estimates due to wind impacts. Chapter 4, Methodology includes additional details on the methodology used to assess the severe storm risk.

14.2.1 Life, Health, and Safety

Overall Population

The entire population of Genesee County is exposed to this hazard. Impacts on life, health, and safety are dependent upon factors including the severity of the event and whether adequate warning time is provided to residents.

As a result of a significant hurricane event, residents may be displaced or require temporary to long-term sheltering. The number of people requiring shelter is generally less than the number displaced, as some displaced persons use hotels or stay with family or friends following a disaster event. Hazus estimates that there will not be any displaced households or persons seeking short-term shelter from the 500-year MRP event in Genesee County.

Socially Vulnerable Population

Socially vulnerable populations are most susceptible due to their physical and financial ability to react and respond during extreme severe weather. This population includes the elderly, young, and individuals with disabilities or access or functional needs who may be unable to evacuate in the event of an emergency. The elderly are considered most vulnerable because they require extra time or outside assistance during evacuations and are more likely to need medical attention that might not be readily available due to isolation during a storm event. The vulnerable population also includes those who would not have adequate warning from an emergency warning system (e.g., television or radio); this would include residents and visitors. The population adversely affected by severe weather may also include those beyond the disaster area that rely on affected roads for transportation.

Economically disadvantaged people are at high risk from severe weather because of the potential inability to afford up-to-code homes and buildings that are deemed safe from storms. They may also face health issues that water seepage may cause, such as exposure to mold. These populations may also lack access to vehicles for any necessary evacuations.

The municipalities with the highest and lowest numbers and percentages in each social vulnerability category are listed in Table 14-9.

Table 14-9. Municipalities With Highest and Lowest Socially Vulnerable Populations

Category	Municipality Highest in Category		Municipality Lowest in Category	
	Number	Percent	Number	Percent
Population Over 65	Batavia (C)	Tonawanda (R)	Alexander (V)	Alexander (V)
	3,274	49.2%	51	10.1%
Population Under 5	Batavia (C)	Alexander (T)	Oakfield (T)	Oakfield (T)
	548	14.1	11	0.8%
	Batavia (C)	Tonawanda (R)	-	-



Category	Municipality Highest in Category		Municipality Lowest in Category	
	Number	Percent	Number	Percent
Non-English-Speaking Population	133	10.7%	-	-
Population With Disability	Batavia (C)	Tonawanda (R)	Alexander (V)	Le Roy (T)
	2,950	31%	55	8.7%
Population Below Poverty Level	Batavia (C)	Oakfield (T)	Elba (V)	Darien (T)
	1,991	24.9%	28	1.3%

Source: U.S. Census Bureau 2022 ACS Vulnerable Population Totals

14.2.2 General Building Stock

Damage to buildings is dependent upon several factors, including wind speed, storm duration, and path of the storm track. Building construction also plays a major role in the extent of damage resulting from a storm. Due to differences in construction, residential structures are generally more susceptible to wind damage than commercial and industrial structures. Wood and masonry buildings, in general, regardless of their occupancy class, tend to experience more damage than concrete or steel buildings. Furthermore, high-rise buildings are also very vulnerable structures.

An extreme hailstorm event can carry hailstones traveling at speeds greater than 100 miles per hour (NWS 2019). This could cause structural damage for the general building stock in the County. Severe weather that causes lightning could be a threat to the County's general building stock if the lightning starts a fire. Over 22,000 fires caused by lightning occurred annually throughout the U.S. between 2007 and 2011, resulting in \$450 million of damage per year (NFPA 2013).

The Hazus wind model was run to estimate potential losses to buildings. Expected building damage was evaluated across the following wind damage categories: no damage/very minor damage, minor damage, moderate damage, severe damage, and total destruction. Table 14-10 summarizes the definition of the damage categories.

Table 14-10. Description of Damage Categories

Qualitative Damage Description	Roof Cover Failure	Window Door Failures	Roof Deck	Missile Impacts on Walls	Roof Structure Failure	Wall Structure Failure
No Damage or Very Minor Damage Little or no visible damage from the outside. No broken windows or failed roof deck. Minimal loss of roof cover, with no or very limited water penetration.	≤2%	No	No	No	No	No
Minor Damage Maximum of one broken window, door, or garage door. Moderate roof cover loss that can be covered to prevent additional water entering the building. Marks or dents on walls requiring painting or patching for repair.	>2% and ≤15%	One window, door, or garage door failure	No	<5 impacts	No	No
Moderate Damage Major roof cover damage, moderate window breakage. Minor roof sheathing failure. Some resulting damage to interior of building from water.	>15% and ≤50%	> one and ≤ the larger of 20% & 3	1 to 3 panels	Typically 5 to 10 impacts	No	No



Qualitative Damage Description	Roof Cover Failure	Window Door Failures	Roof Deck	Missile Impacts on Walls	Roof Structure Failure	Wall Structure Failure
Severe Damage Major window damage or roof sheathing loss. Major roof cover loss. Extensive damage to interior from water.	>50%	> the larger of 20% & 3 and ≤50%	>3 and ≤25%	Typically 10 to 20 impacts	No	No
Destruction Complete roof failure and/or failure of wall frame. Loss of more than 50 percent of roof sheathing.	Typically >50%	>50%	>25%	Typically >20 impacts	Yes	Yes

Source: FEMA 2022

Building damage levels as a result of the 500-year MRP hurricanes were estimated for each municipality. Table 14-11 summarizes the results by building occupancy class. Up to 46 buildings will be minimally damaged by the 500-year MRP event. The majority of the losses are estimated to the residential occupancy class.

Table 14-11. Estimated Building Damage Levels from the 500-year MRP Hurricane

Occupancy Class	Total Number of Buildings in Occupancy	Severity of Expected Damage	500-Year Mean Return Period Hurricane	
			Building Count	Percent Buildings in Occupancy Class
Residential Exposure (Single and Multi-Family Dwellings)	20,385	None	20,383	100.0%
		Minor	2	<0.1%
		Moderate	0	0.0%
		Severe	0	0.0%
		Destruction	0	0.0%
Commercial Buildings	11,765	None	11,722	99.6%
		Minor	43	0.4%
		Moderate	0	0.0%
		Severe	0	0.0%
		Destruction	0	0.0%
Industrial Buildings	171	None	170	99.4%
		Minor	1	0.6%
		Moderate	0	0.0%
		Severe	0	0.0%
		Destruction	0	0.0%
Government, Religion, Agricultural, and Education Buildings	597	None	597	100.0%
		Minor	0	0.0%
		Moderate	0	0.0%
		Severe	0	0.0%
		Destruction	0	0.0%

Source: Hazus v6.1; Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023

Table 14-12 summarizes the Hazus results of damage by dollar amount for the 500-year MRP event. Hazus estimates \$133,627 in damage to structures, with the estimated residential damage making up the entire \$133,627.



Table 14-12. Estimated Building Losses Caused by the 500-Year MRP Hurricane

Jurisdiction	Estimated Building Losses (Residential)	Estimated Building Losses (Commercial)	Estimated Building Losses (Industrial)	Estimated Damages (All Other Occupancies)	Estimated Building Losses (All Occupancies)
Alabama (T)	\$14,081	\$0	\$0	\$0	\$14,081
Alexander (T)	\$14,304	\$0	\$0	\$0	\$14,304
Alexander (V)	\$2,141	\$0	\$0	\$0	\$2,141
Attica (V)	\$523	\$0	\$0	\$0	\$523
Batavia (C)	\$16,340	\$0	\$0	\$0	\$16,340
Batavia (T)	\$26,531	\$0	\$0	\$0	\$26,531
Bergen (T)	\$0	\$0	\$0	\$0	\$0
Bergen (V)	\$0	\$0	\$0	\$0	\$0
Bethany (T)	\$10	\$0	\$0	\$0	\$10
Byron (T)	\$0	\$0	\$0	\$0	\$0
Corfu (V)	\$4,499	\$0	\$0	\$0	\$4,499
Darien (T)	\$24,467	\$0	\$0	\$0	\$24,467
Elba (T)	\$1,043	\$0	\$0	\$0	\$1,043
Elba (V)	\$316	\$0	\$0	\$0	\$316
Le Roy (T)	\$0	\$0	\$0	\$0	\$0
Le Roy (V)	\$0	\$0	\$0	\$0	\$0
Oakfield (T)	\$850	\$0	\$0	\$0	\$850
Oakfield (V)	\$623	\$0	\$0	\$0	\$623
Pavilion (T)	\$0	\$0	\$0	\$0	\$0
Pembroke (T)	\$27,879	\$0	\$0	\$0	\$27,879
Stafford (T)	\$0	\$0	\$0	\$0	\$0
Tonawanda (R)	\$21	\$0	\$0	\$0	\$21
Genesee County (Total)	\$133,627	\$0	\$0	\$0	\$133,627

Source: Hazus v6.1; Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; RS Means 2024

14.2.3 Community Lifelines and Other Critical Facilities

All critical facilities in the County are exposed to the severe weather hazard. Critical facilities are at risk of being impacted by high winds associated with structural damage, or falling tree limbs/flying debris, which can result in the loss of power. Power loss can greatly impact households, business operations, public utilities, and emergency personnel. Emergency personnel, such as police, fire, and emergency medical services, will not be able to effectively respond in a power loss event to maintain public safety unless backup power and fuel sources are available. Loss of power can impact other public utilities, including potable water, wastewater treatment, and communications. In addition to public water services, property owners with private wells might not have access to potable water until power is restored.



It is essential that critical facilities remain operational during natural hazard events. Backup power is recommended for critical facilities and infrastructure. Where backup power is needed for critical facilities that provide essential services, municipalities identified mitigation actions in Volume II.

The Hazus hurricane model was used to assign the range or average probability of each damage state category to the critical facilities and lifelines in Genesee County for the 500-year MRP hurricane events. For percent probability of sustaining damage, the minimum and maximum damage estimated value for that facility type is presented. Table 14-13 summarizes the damage state probabilities for critical facilities during the 500-year MRP event. Hazus estimates that communications will have the greatest chance of sustaining minor damage (0.4 percent). All lifelines are expected to sustain only minor damage, with no predictions of damage exceeding that level.

Table 14-13. Estimated Critical Facilities Damage for the 500-Year MRP Hurricane

Name	Loss of Days	Average Percent Probability of Sustaining Damage 500-Year Mean Return Period Hurricane			
		Minor	Moderate	Severe	Complete
Lifelines					
Communications	0	0.4%	0.0%	0.0%	0.0%
Energy	0	0.3%	0.0%	0.0%	0.0%
Food, Hydration, Shelter	0	0.3%	0.0%	0.0%	0.0%
Hazardous Materials	0	0.3%	0.0%	0.0%	0.0%
Health and Medical	0	0.1%	0.0%	0.0%	0.0%
Safety and Security	0	0.3%	0.0%	0.0%	0.0%
Transportation	0	0.3%	0.0%	0.0%	0.0%
Water	0	0.3%	0.0%	0.0%	0.0%

Source: Hazus v6.1; Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023

14.2.4 Economy

Severe weather events can have short- and long-lasting impacts on the economy. 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. 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. Impacts on transportation lifelines affect both short-term (e.g., evacuation activities) and long-term (e.g., day-to-day commuting and goods transport) transportation needs. Utility infrastructure (power lines, gas lines, electrical systems) could suffer damage that can result in the loss of power, which can impact business operations and heating or cooling provision to the population.

Hazus estimates the volume of debris that may be generated as a result of a hurricane event. Debris estimates are divided into two categories: reinforced concrete and steel that require special equipment to break up before it can be transported, and brick, wood, and other debris that can be loaded directly onto trucks with bulldozers (FEMA 2022c). Table 14-14 summarizes the estimated debris generated because of these events by municipality. For the 500-year MRP event, Hazus estimates a total of 112.7 tons of debris will be generated countywide.



Table 14-14. Estimated Debris Created During the 500-Year MRP Hurricane

Jurisdiction	Estimated Debris Created During the 500-Year Mean Return Period Hurricane Wind Event			
	Brick and Wood (tons)	Concrete and Steel (tons)	Tree (tons)	Eligible Tree Volume (tons)
Alabama (T)	0.6	0.0	0.0	0.0
Alexander (T)	0.3	0.0	0.0	0.0
Alexander (V)	0.1	0.0	0.0	0.0
Attica (V)	<0.1	0.0	0.0	0.0
Batavia (C)	0.0	0.0	9.5	96.6
Batavia (T)	0.0	0.0	0.5	4.7
Bergen (T)	0.0	0.0	0.0	0.0
Bergen (V)	0.0	0.0	0.0	0.0
Bethany (T)	<0.1	0.0	0.0	0.0
Byron (T)	0.0	0.0	0.0	0.0
Corfu (V)	<0.1	0.0	0.0	0.0
Darien (T)	<0.1	0.0	0.0	0.0
Elba (T)	0.0	0.0	0.0	0.0
Elba (V)	0.0	0.0	0.0	0.0
Le Roy (T)	0.0	0.0	0.0	0.0
Le Roy (V)	0.0	0.0	0.0	0.0
Oakfield (T)	0.0	0.0	0.0	0.0
Oakfield (V)	0.0	0.0	0.0	0.0
Pavilion (T)	0.0	0.0	0.0	0.0
Pembroke (T)	0.4	0.0	0.0	0.0
Stafford (T)	0.0	0.0	0.0	0.0
Tonawanda (R)	<0.1	0.0	0.0	0.0
Genesee County (Total)	1.4	0.0	10.0	101.3

Source: Hazus v6.1; Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023

14.2.5 Natural, Historic, and Cultural Resources

Natural

The impact of severe weather events on the environment varies, but researchers are finding that the long-term impacts of more severe weather can be destructive to the natural and local environment. National organizations such as United States Geological Survey (USGS) and National Oceanic and Atmospheric Administration (NOAA) have been studying and monitoring the impacts of extreme weather phenomena as it impacts long-term climate change, streamflow, river levels, reservoir elevations, rainfall, floods, landslides, erosion, etc. (USGS 2020). For example, severe weather that creates longer 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. Researchers also believe that a greater number of diseases will spread across ecosystems because of the impacts that severe weather and climate change will have on water supplies (NOAA 2019). Overall, as the



physical environment becomes more altered, species will begin to contract or migrate in response, which may cause additional stressors to the entire ecosystem within Genesee County.

Historic

Historic structures are particularly vulnerable to the effects of severe weather, especially high winds, tornadoes, and flooding due to the fragility of their structure due to their construction before modern building codes existed. Structure failures are particularly seen in the foundations and roof sheeting as a result of the stresses of wind and water (Gibbs 2001). Many of the losses that are caused by the loss of a historic building or site are of cultural significance, including museum collections, archival documents, and family or cultural heirlooms (US DOI n.d.).

Cultural

Winds associated with severe weather can cause damage or destruction to the County's cultural resources. These resources may be housed within historical buildings and homes that are not designed to withstand high winds, making them more vulnerable. Additionally, some cultural resources may be located outdoors, further increasing their risk of damage. Outdoor events are likely to be postponed or canceled as a result of severe weather conditions.

14.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure the establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

14.3.1 Potential or Planned Development

The ability of new development to withstand severe weather hazard impacts lies in sound land use practices, building design considerations (e.g., Leadership in Energy and Environmental Design [LEED]), and consistent enforcement of codes and regulations for new construction. New development will change the landscape where buildings, roads, and other infrastructure potentially replace open land and vegetation. Surfaces that were once permeable and moist will become impermeable and dry, potentially making them more susceptible to fires caused by lightning. Specific areas of recent and new development are indicated in tables and maps included in the jurisdictional annexes in Volume II of this plan.

14.3.2 Projected Changes in Population

Genesee County has experienced an increase in its population since 2010. According to the U.S. Census Bureau, the County's population increased by 1.26 percent between 2010 and 2020 (U.S. Census Bureau 2023). Cornell University's Program on Applied Demographics projects Genesee County will have a population of 57,176 by 2030 and 54,153 by 2040 (Cornell University 2018). Any changes in the distribution of the population can impact the source of water resources required to sustain the user demand of each household, agricultural operation, and business operation.

14.3.3 Climate Change

As the climate warms and other changes in climate continue to unfold, the intensity of severe weather may change, producing more ideal conditions for severe storms to form. It is anticipated that the County will continue to



experience direct and indirect impacts of severe weather events annually that may induce secondary hazards such as infrastructure deterioration or failure, utility failures, power outages, water quality and supply concerns, and transportation delays, accidents, and inconveniences.

14.3.4 Change in Vulnerability Since 2019 HMP

Genesee County remains vulnerable to severe storm events. This vulnerability assessment uses a more accurate and updated building inventory, which provides more accurate estimated exposure and potential losses for Genesee County.

DRAFT



15. SEVERE WINTER STORM

15.1 HAZARD PROFILE

15.1.1 Hazard Description

A winter storm is a weather event in which the main types of precipitation are snow, sleet, or freezing rain. Winter storms can be a combination of heavy snow, blowing snow, and dangerous wind chills. According to the National Severe Storms Laboratory (n.d.), the three basic components of winter storms include the following:

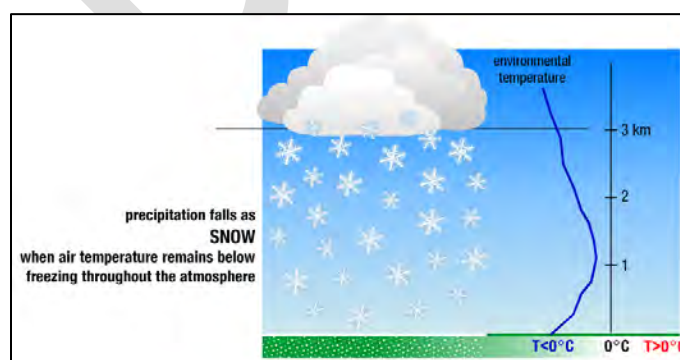
- Below freezing temperatures (cold air) in the clouds and near the ground to make snow and ice
- Lift, something to raise the moist air to form clouds and cause precipitation, such as warm air colliding with cold air and being forced to rise over the cold dome or air flowing up a mountainside (orographic lifting)
- Moisture to form clouds and precipitation, such as air blowing across a large lake or the ocean (NOAA 2021)

Some winter storms can immobilize an entire region, while others might only affect a single community. Winter storms typically are accompanied by low temperatures, high winds, freezing rain or sleet, and heavy snowfall. The aftermath of a winter storm can have an impact on a community or region for days, weeks, or even months, potentially causing cold temperatures, flooding, storm surge, closed and blocked roadways, downed utility lines, and power outages. Genesee County's winter storms include blizzards, snowstorms, and ice storms. Extreme cold temperatures and wind chills are associated with winter storms. For more information on extreme cold temperatures, refer to Chapter 11 (Extreme Temperature).

Heavy Snow

According to the National Snow and Ice Data Center (NSIDC), snow is precipitation in the form of ice crystals. It originates in clouds when temperatures are below the freezing point (32°F) 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 snow crystals or a snow pellet, which then falls to the earth. Snow falls in different forms: snowflakes, snow pellets, or sleet. Snowflakes are clusters of ice crystals that form from a cloud. Figure 15-1 depicts snow creation.

Figure 15-1. Snow Creation



Source: NOAA-NSSL 2015

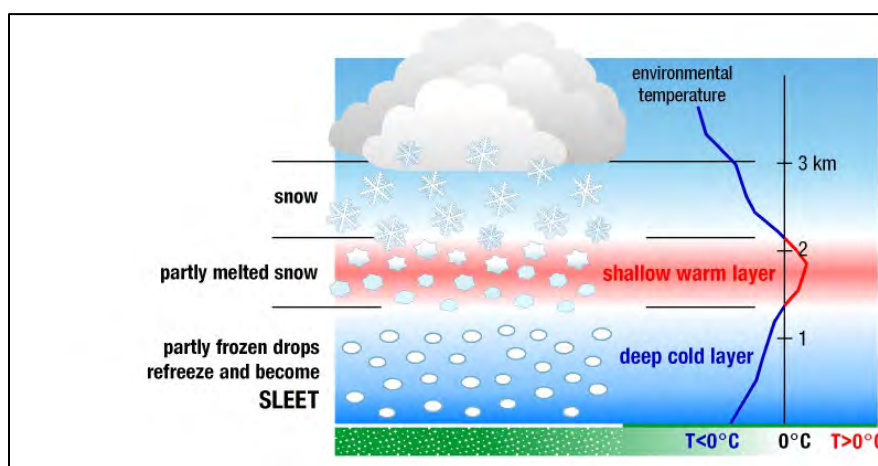


Snow pellets are opaque ice particles in the atmosphere. They form as ice crystals fall through super-cooled cloud droplets, which are below freezing but remain a liquid. The cloud droplets then freeze to the crystals.

Sleet

Sleet is made up of drops of rain that freeze into ice as they fall through colder air layers. They are usually smaller than 0.30 inches in diameter (NSSL 2021). Figure 15-2 depicts sleet creation.

Figure 15-2. Sleet Creation



Source: NOAA-NSSL 2020

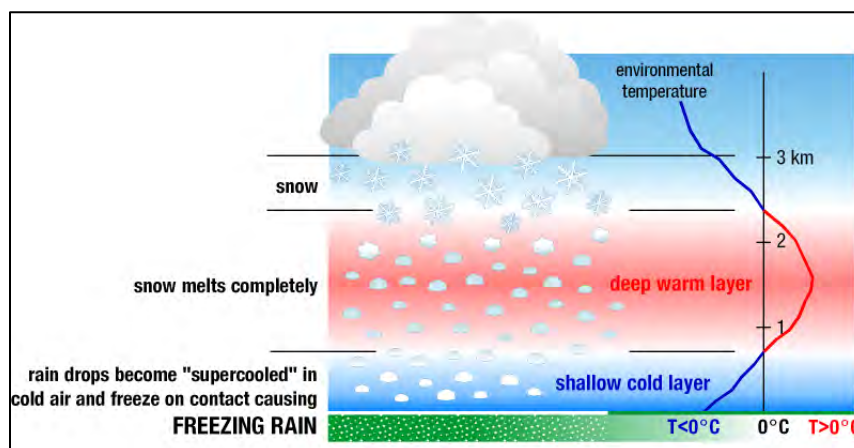
Blizzards

A blizzard is a winter snowstorm with sustained or frequent wind gusts of 35 miles per hour (mph) or more, accompanied by falling or blowing snow reducing visibility to or below 0.25 miles, as the predominant conditions over a 3-hour period. Extremely cold temperatures are often associated with blizzard conditions but are not a formal part of the definition. The hazard, created by the combination of snow, wind, and low visibility, significantly increases when temperatures are below 20°F. A severe blizzard is categorized as having temperatures near or below 10°F, 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, moister 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 and the higher pressure to the west creates a tight pressure gradient, resulting in strong winds and extreme conditions caused by the blowing snow (Lam 2019).

Ice Storms

An ice storm describes those events when damaging accumulations of ice are expected during freezing rain situations. Significant ice accumulations typically are accumulations of 0.25 inches or greater (NWS 2013). Heavy accumulations of ice can bring down trees, power lines, utility poles, and communication towers. Ice can disrupt communications and power for days. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians (Dolce 2012). Figure 15-3 depicts freezing rain creation.

Figure 15-3. Freezing Rain Creation



Source: NOAA-NSSL 2020

Severe winter storm events that bring icy conditions to the County can quickly produce significant impacts. As trees and power lines being accumulating ice, the added weight becomes too much, and it breaks down. As tree limbs fall from trees, they can strike utility poles and communications towers which can then lead to a prolonged period of communication outages. Similarly, ice storms frequently result in downed power lines, and any prolonged period of no electricity can produce deadly conditions for anyone without power. Types of ice are described below.

- **Black Ice:** This type of ice can create deadly driving conditions as roads and bridges begin accumulating freezing rain. These darker roadway surfaces make black ice difficult to see. It is frequently most prevalent during the morning hours, especially after snow melt on the roadways has a chance to refreeze overnight as temperatures drop below freezing.
- **Frost:** Frost describes the formation of thin ice crystals on the ground or other surfaces in the form of scales, needles, feathers, or fans. Frost develops under similar conditions as dew, except during winter months sub-freezing temperatures at the surface result in that dew freezing.

15.1.2 Location

The climate of New York State is marked by abundant snowfall. Winter weather can reach New York State as early as October and is usually in full force by late November, with average winter temperatures between 20°F and 40°F. The inland regions of New York State receive more snow than most other communities in the nation. Although the entire state is subject to winter storms, the easternmost and west-central portions of the state are more likely to experience severe winter storm occurrences than any other location (NYS DHSES 2023). With the exception of coastal areas, New York State receives an average snowfall of 40 inches or more. Over 60 percent of the state experiences an average snowfall of more than 70 inches, while Genesee County averages between 60 to over 100 inches of snowfall each year, as shown in Figure 15-4. The City of Rochester is typically in the top 10 cities in the nation in annual snowfall (NYS DHSES 2023). Table 15-1 presents some of the first snowfall facts in Genesee County, NY.

Table 15-1. First Snowfall Facts in Genesee County, NY

Snowfall Occurrence	Type of Snowfall	Buffalo, NY	Rochester, NY
Average	First Flake	October 24	October 23
	First Measurable (>0.1")	November 8	November 8

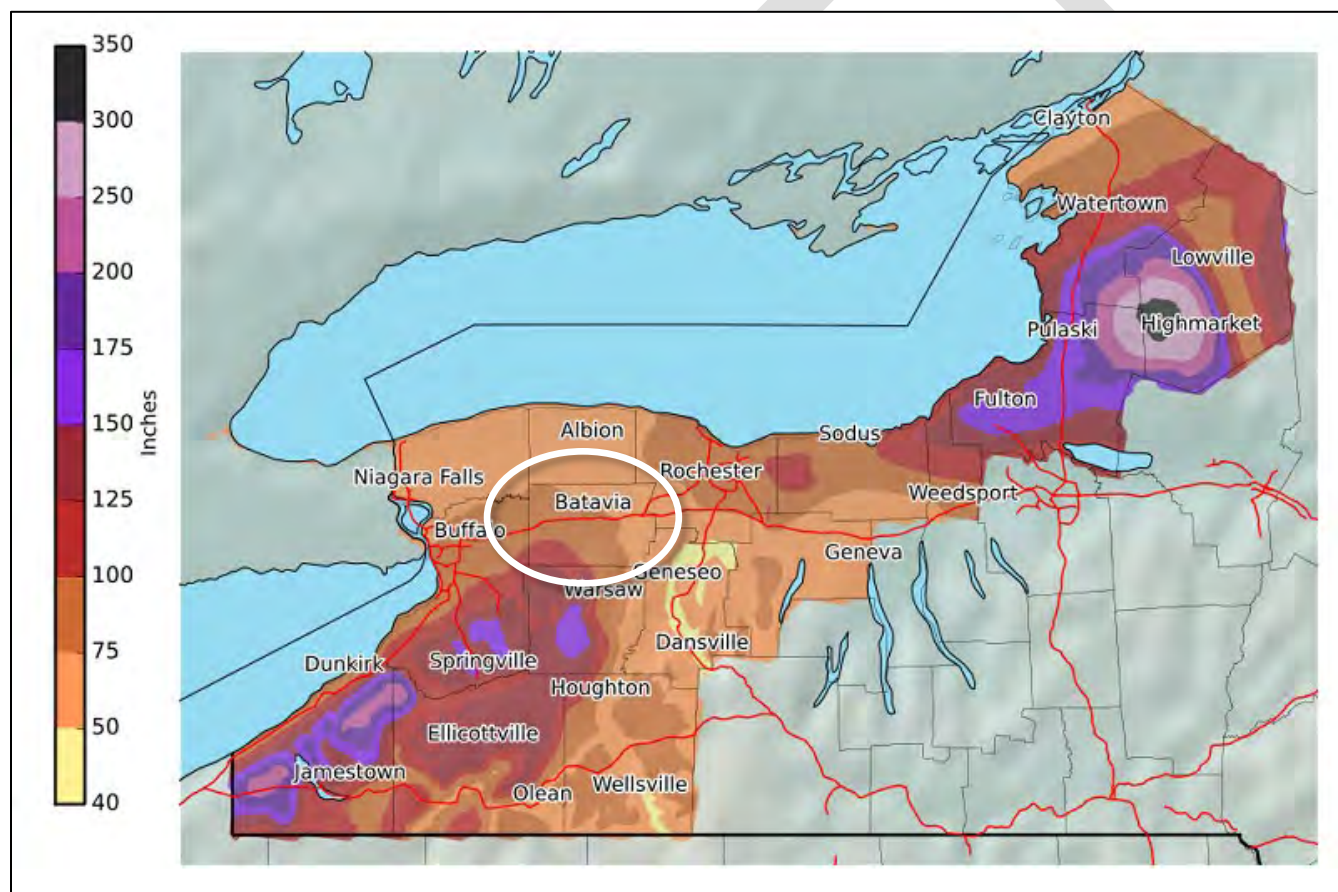


Snowfall Occurrence	Type of Snowfall	Buffalo, NY	Rochester, NY
	First Inch	November 18	November 20
Earliest	First Flake	September 20, 1956	September 20, 1956
	First Measurable (>0.1")	October 6, 1991	October 9, 1925
	First Inch	October 10, 1906	October 11, 1906
Latest Ever	First Flake	November 22, 1946 & 1985	November 20, 1918
	First Measurable (>0.1")	December 18, 2015	December 10, 1948
	First Inch	January 2, 1932	December 28, 2015

Source: NWS Buffalo 2019

Notes: Period of Record is 1884-present. The two nearest stations where NWS Buffalo collects climatological data is the Buffalo, NY site and the Rochester, NY site.

Figure 15-4. Average Annual Snowfall, 1999–2024



Source: NWS Buffalo, NY 2024

Notes: white circle denotes where Genesee County is located



15.1.3 Extent

The magnitude or severity of a severe winter storm depends on several factors, including snowfall rates, regional climatological susceptibility to snowstorms, snowfall amounts, wind speeds, temperatures, visibility, storm duration, topography, time of occurrence during the day and week (e.g., weekday versus weekend), and time of season.

The extent of a severe winter storm can be classified both by meteorological measurements and by evaluating societal impacts. The National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC) is currently producing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two-thirds of the United States. The RSI ranks snowstorm impacts on a scale from 1 to 5 and is based on the spatial extent of the storm, the amount of snowfall, and the interaction of the extent and snowfall totals with population. The NCDC has analyzed and assigned RSI values to over 500 storms since 1900 (NOAA n.d.). Table 15-2 presents the five RSI ranking categories.

Table 15-2. 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 2020

Note: RSI = Regional Snowfall Index

The National Center for Environmental Information (NCEI) provides records on the 1-day, 2-day, and 3-day snowfall extremes. In Genesee County, 1-day snowfall records were made on November 19, 2022, when 28.3 inches fell near Alden. This severe winter storm event went on to take the 2-day snowfall extreme at the same location. 46.6 inches fell in a 48-hour period. The highest 3-day snowfall totals were measured on November 20, 2014, when areas south of Batavia accumulated 51.0 inches of snow (NCEI 2024).

The NWS operates a widespread network of observing systems, such as geostationary satellites, Doppler radars, and automated surface observing systems that feed into the current state-of-the-art numerical computer models to provide a look into what will happen next, ranging from hours to days. The models are then analyzed by NWS meteorologists, who then write and disseminate forecasts. According to NWS, the magnitude of a severe winter storm can be qualified into five main categories by event type (NWS 2021), as described in Table 15-3.

Table 15-3. Winter Storm Category Thresholds

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 and 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 the 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

Additionally, the NWS uses winter weather watches, warnings, and advisories to help people anticipate what to expect in the days and hours prior to an approaching storm (NWS 2021). Refer to Figure 15-8 for the warning thresholds.

Figure 15-5. Winter Storm Warning Thresholds



Source: NWS 2021

15.1.4 Previous Occurrences

Federal Emergency Management (FEMA) Major Disaster and Emergency Declarations

Between 1954 and 2024, Genesee County was included in six major disaster (DR) and six emergency (EM) declarations for severe winter storm-related events (FEMA 2024). Table 15-4 lists these declarations.

Table 15-4. FEMA Declarations for Severe Winter Storm Events in Genesee County (1954 to 2024)

Event Date	Declaration Date	Declaration Number	Description
March 19, 1973	March 19, 1973	DR-494-NY	Ice Storm, Severe Storms & Flooding
February 5, 1977	February 5, 1977	DR-527-NY	Snowstorms
March 3–4, 1990	March 21, 1991	DR-898-NY	Severe Winter Storm
April 3–5, 2003	May 12, 2003	DR-1467-NY	Ice Storm
November 17–26, 2014	December 22, 2014	DR-4202-NY	Severe Winter Storm, Snowstorm, & Flooding
December 23–28, 2022	March 15, 2023	DR-4694-NY	Severe Winter Storm and Snowstorm



Sources: FEMA 2024

U.S. Department of Agriculture (USDA) Declarations

The 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. Between 2017 and 2024, Genesee County was not included in any USDA severe winter storm-related agricultural disaster declarations (USDA 2024).

Previous Events

Known hazard events that impacted Genesee County between January 2017 and December 2024 are discussed in Table 15-6. For events prior to 2017, refer to the 2019 Genesee County HMP.

Table 15-5. Severe Winter Storm Events in Genesee County (2017 to 2024)

Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
March 13–15, 2017	N/A	N/A	Countywide	A winter storm resulted in \$30,000 in property damage. 14 inches of snow was recorded.
December 10–11, 2017	N/A	N/A	Countywide	Lake-effect snow resulted in \$15,000 in property damage.
January 12–13, 2018	N/A	N/A	Countywide	A winter storm resulted in \$30,000 in property damage.
March 1–2, 2018	N/A	N/A	Countywide	A winter storm resulted in \$30,000 in property damage.
April 14–15, 2018	N/A	N/A	Countywide	An ice storm resulted in \$15,000 in property damage. Freezing rain and wind led to multiple trees knocked over which resulted in falling powerlines.
January 19–20, 2019	N/A	N/A	Countywide	A winter storm was documented in the County; however, no property or crop damage were reported.
January 25–26, 2019	N/A	N/A	Countywide	Lake-effect snow was documented in the County; however, no property or crop damage were reported.
January 29–31, 2019	N/A	N/A	Countywide	A blizzard was documented in the County; however, no property or crop damage were reported.
February 27, 2019	N/A	N/A	Countywide	A winter storm was documented in the County; however, no property or crop damage were reported.



Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
November 11–12, 2019	N/A	N/A	Countywide	A winter storm was documented in the County; however, no property or crop damage were reported.
December 26, 2020	N/A	N/A	Countywide	Lake-effect snow was documented in the County; however, no property or crop damage were reported.
February 6, 2021	N/A	N/A	Countywide	Lake-effect snow was documented in the County; however, no property or crop damage were reported.
February 15–16, 2021	N/A	N/A	Countywide	A winter storm was documented in the County; however, no property or crop damage were reported.
January 6, 2022	N/A	N/A	Countywide	Lake-effect snow was documented in the County; however, no property or crop damage were reported.
January 16–17, 2022	N/A	N/A	Countywide	A winter storm was documented in the County; however, no property or crop damage were reported.
February 2–4, 2022	N/A	N/A	Countywide	A winter storm was documented in the County; however, no property or crop damage were reported.
November 17–20, 2022	N/A	N/A	Countywide	Lake-effect snow resulted in \$500,000 in property damage due to a barn collapsing in the Town of Darien due to the weight of the snow.
December 23–26, 2022	N/A	N/A	Countywide	A winter storm was documented in the County; however, no property or crop damage were reported.
February 22–23, 2023	N/A	N/A	Countywide	An ice storm was documented in the County; however, no property or crop damage were reported.
January 13–15, 2024	N/A	N/A	Countywide	A winter storm was documented in the County; however, no property or crop damage were reported.
January 16–18, 2024	N/A	N/A	Countywide	A winter storm was documented in the County causing lake-effect snow; however, no property or crop damage were reported.



Sources: NOAA-NCEI 2024

15.1.5 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, as summarized in Table 15-7. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 20, the identified hazards of concern for Genesee County were ranked. Based on historical records and input from the Steering Committee, the probability of occurrence for severe winter storm in the County is considered “frequent.”

Table 15-6. Probability of Future Severe Winter Storm Events in Genesee County

Hazard Type	Number of Occurrences Between 1996 and 2024	Percent Chance of Occurring in Any Given Year
Blizzard	4	14.28%
Heavy Snow	34	100%
Ice Storm	5	17.86%
Lake-Effect Snow	23	82.14%
Sleet	0	0%
Winter Storm	31	100%
Total	97	100%

Sources: NOAA-NCEI 2024

Notes: Due to limitations in data, not all severe winter storm 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 2024

Climate Change Projections

New York has experienced a decrease in the number of cold winter days (below 32°F) and is projected to experience an additional decrease in the number of cold winter days by more than 50 percent by the 2080s. While projected temperature increases may reduce the likelihood of snow, future changes in frozen precipitation are also dependent upon changes in winter storm intensity and track. On balance, most of New York State is likely to see a shorter snow season, reduced snow cover and snow depth, and fewer snow events. However, for extratropical cyclones, the largest snow events of all types could grow in magnitude since a warmer atmosphere can hold more moisture (Stevens & Lamie 2024).

As the century progresses, snowfall is likely to become less frequent, with the snow season decreasing in length. Many parts of this region experience lake-effect snow coming off the Great Lakes. As winters continue to warm, ice is projected to become rarer in the upcoming decades, 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).

15.1.6 Cascading Impacts on Other Hazards

Severe winter weather events may exacerbate flooding. As discussed, the freezing and thawing of snow and ice associated with winter weather events can create major flooding issues in the County. Maintaining winter weather hazards through snow and ice removal could minimize the potential risk of flooding during a warming period. Refer to Chapter 12 for more information about the flood hazard of concern.



15.2 VULNERABILITY AND IMPACT ASSESSMENT

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the severe winter storm hazard, all of Genesee County has been identified as the hazard area. Therefore, all assets in the County (population, structures, critical facilities, and lifelines), as described in the County Profile (Chapter 3), are vulnerable to a winter storm event.

15.2.1 Life, Health, and Safety

Overall Population

The entire population of Genesee County is exposed to severe winter storm events. Winter weather kills hundreds of people in the United States every year, primarily from automobile accidents, overexertion, and exposure. Winter storms are often accompanied by strong winds, with blinding wind-driven snow, drifting snow, and dangerous wind chills (NSSL 2021).

Socially Vulnerable Population

People who experience homelessness, those over the age of 65, and those under the age of 5 are considered to be the most susceptible to this hazard. Older adults are susceptible to this hazard due to their increased risk of injuries and death from falls and overexertion from attempts to clear snow and ice and/or hypothermia. Young children are at risk from hypothermia or other cold-related illnesses due to their inability to care for themselves. Individuals who experience homelessness are at risk from hypothermia due to lack of a warming shelter from cold temperatures. People living below the poverty level are dependent on limited income and may not be able to afford staying at an alternative shelter, such as a hotel. They also may not be able to afford to miss work, regardless of the weather conditions. People who are non-English speaking may not be able to interpret public emergency warnings and signage, which puts them at an increased risk.

The municipalities with the highest and lowest numbers and percentages in each social vulnerability category are listed in Table 15-8.

Table 15-7. Municipalities With Highest and Lowest Socially Vulnerable Populations

Category	Municipality Highest in Category		Municipality Lowest in Category	
	Number	Percent	Number	Percent
Population Over 65	Batavia (C)	Tonawanda (R)	Alexander (V)	Alexander (V)
	3,274	49.2%	51	10.1%
Population Under 5	Batavia (C)	Alexander (T)	Oakfield (T)	Oakfield (T)
	548	14.1	11	0.8%
Non-English-Speaking Population	Batavia (C)	Tonawanda (R)	-	-
	133	10.7%	-	-
Population With Disability	Batavia (C)	Tonawanda (R)	Alexander (V)	Le Roy (T)
	2,950	31%	55	8.7%
Population Below Poverty Level	Batavia (C)	Oakfield (T)	Elba (V)	Darien (T)
	1,991	24.9%	28	1.3%



Source: U.S. Census Bureau 2022 ACS Vulnerable Population Totals

15.2.2 General Building Stock

The entire general building stock inventory is vulnerable to the severe winter storm hazard. An extreme blizzard or snowstorm event can deposit significant amounts of snow that are heavy enough to knock down power and telephone lines as well as damage roofs and aging buildings, some of which are critical facilities and community lifelines. Potential structural impacts include partial damage to roofs and building frames, rather than an entire building.

Table 15-9 shows potential losses based on a percentage of total building stock replacement cost value. Planners and emergency managers can assess a range of potential economic impacts based on assumptions about the percentage of damage to the general building stock. The information in Table 15-9 should be used only for planning purposes with the knowledge that the associated losses for severe winter storm events vary greatly. Given professional knowledge and the currently available information, the potential loss for this hazard is often overestimated.

Table 15-8. Estimated Damages for Total Replacement Cost Value of Structures in Genesee County

Jurisdiction	Number of Buildings	Replacement Cost Value		
		Structure	Contents	Total
Alabama (T)	1,315	\$387,711,848	\$334,328,181	\$722,040,029
Alexander (T)	1,423	\$339,392,054	\$271,271,145	\$610,663,199
Alexander (V)	213	\$59,587,045	\$47,820,142	\$107,407,186
Attica (V)	52	\$34,968,218	\$30,981,022	\$65,949,240
Batavia (C)	5,548	\$2,458,272,949	\$2,364,263,780	\$4,822,536,729
Batavia (T)	3,680	\$1,317,549,185	\$1,129,579,612	\$2,447,128,797
Bergen (T)	1,248	\$321,453,487	\$270,156,570	\$591,610,057
Bergen (V)	511	\$93,825,954	\$62,232,624	\$156,058,577
Bethany (T)	1,330	\$343,166,485	\$285,140,980	\$628,307,466
Byron (T)	1,578	\$356,294,939	\$302,041,687	\$658,336,626
Corfu (V)	360	\$84,142,413	\$63,446,699	\$147,589,112
Darien (T)	2,434	\$699,900,249	\$585,947,187	\$1,285,847,435
Elba (T)	1,230	\$405,306,132	\$347,829,229	\$753,135,361
Elba (V)	373	\$71,897,894	\$53,151,479	\$125,049,373
Le Roy (T)	2,242	\$775,536,738	\$689,898,115	\$1,465,434,853
Le Roy (V)	1,742	\$583,531,243	\$544,580,970	\$1,128,112,213
Oakfield (T)	1,002	\$266,175,219	\$224,369,622	\$490,544,840
Oakfield (V)	735	\$192,857,296	\$181,208,928	\$374,066,224
Pavilion (T)	1,577	\$434,975,399	\$363,942,936	\$798,918,335
Pembroke (T)	2,373	\$609,605,101	\$469,823,677	\$1,079,428,778
Stafford (T)	1,668	\$421,725,034	\$353,881,248	\$775,606,282
Tonawanda (R)	284	\$74,480,572	\$73,914,582	\$148,395,154



Jurisdiction	Number of Buildings	Replacement Cost Value		
		Structure	Contents	Total
Genesee County (Total)	32,918	\$10,332,355,453	\$9,049,810,414	\$19,382,165,867

Source: Genesee County Planning 2023, 2024; NYS GIS Clearinghouse 2023; RS Means 2024

15.2.3 Community Lifelines and Other Critical Facilities

Full functionality of critical facilities, such as police, fire, and medical facilities, is essential for response during and after a severe winter storm event. These critical facility structures are often constructed of concrete and masonry; therefore, they should only sustain minimal structural damage from severe winter storm events. Because power interruption can occur, backup power is recommended. Damage to pipes may limit or prevent the circulation of water and heat in a facility, which poses a risk to people depending on that infrastructure.

Infrastructure at risk for this hazard includes roadways that could be damaged from the application of salt and intermittent freezing and warming conditions that can damage roads over time. Severe snowfall requires clearing of roadways so that emergency responders can access areas that may have people who need medical attention. Following the winter season, resources for road maintenance and repair are required. Severe winter weather also requires alerting citizens to dangerous conditions (NWS 2019).

Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days while utility companies work to repair damage. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces (NWS 2019).

15.2.4 Economy

Depending on the severity and duration of the severe winter weather event, damage to the general building stock, critical facilities, and community lifelines can include roof damage from heavy snow loads, structural damage from downed trees, and power outages.

The cost of snow and ice removal and repair of roads from the freeze/thaw process can drain local financial resources. In addition to snow removal costs, severe winter weather affects the ability of persons to commute into and out of the area for work or school. The loss of power and closure of roads prevents the commuter population from traveling to work within and outside of the County and may cause a loss in economic productivity.

15.2.5 Natural, Historic, and Cultural Resources

Natural

Severe winter weather can have a major impact on the environment. For example, an excess amount of snowfall and earlier warming periods may affect natural processes such as stream flow. The residual impacts of a community's methods to maintain its infrastructure through winter weather maintenance may also have an impact on the environment. (NSIDC n.d.).

Rain-on-snow events can exacerbate runoff rates with warming winter weather. Resulting excess volumes of water can erode banks, tear apart habitat along stream banks, and disrupt terrestrial plants and animals. 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).

Historic

Historic buildings may be susceptible to damage from severe winter weather conditions, especially if they were not built to modern building standards for snow loading (CCAHA 2019).

Cultural

Cultural heritage sites, particularly those exposed to the elements, are subject to weathering. Severe winter weather exacerbates expected rates of decay and contributes to the appearance of new decay. It may affect physical, chemical, and biological mechanisms, causing degradation by affecting the structure or composition of building materials. Changes in temperature, precipitation, atmospheric moisture, and wind intensity have been identified as concerns (Sesana, et al. 2021).

15.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

15.3.1 Potential or Planned Development

As discussed in Chapter 3, areas targeted for future growth and development have been identified across the County. Any new development could be impacted by severe winter storm events. Current State land use and building codes incorporate standards that address and mitigate snow accumulation.

15.3.2 Projected Changes in Population

Genesee County has experienced an increase in its population since 2010. According to the U.S. Census Bureau, the County's population increased by 1.26 percent between 2010 and 2020 (U.S. Census Bureau 2023). Cornell University's Program on Applied Demographics projects Genesee County will have a population of 57,176 by 2030 and 54,153 by 2040 (Cornell University 2018). Any changes in the distribution of the population can impact the source of water resources required to sustain the user demand of each household, agricultural operation, and business operation.

15.3.3 Climate Change

Both globally and at the local scale, climate change has the potential to alter the prevalence and severity of extremes such as winter storms. While predicting changes of winter storm events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society, and the environment (NASA 2023)



15.3.4 Change in Vulnerability Since 2019 HMP

Genesee County remains vulnerable to severe winter storm events. This vulnerability assessment uses a more accurate and updated building inventory, which provides more accurate estimated exposure and potential losses for Genesee County.

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16. TERRORISM

16.1 HAZARD PROFILE

16.1.1 Hazard Description

According to the Federal Bureau of Investigation (FBI), terrorism is “the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives” (Pomerantz 1987). Acts of terrorism include threats of terrorism, assassinations, kidnappings, hijackings, bomb scares and bombings, cyber-attacks (computer-based attacks), and use of chemical, biological, nuclear, and radiological weapons (FEMA n.d.). Various types of terrorism are discussed in the sections below.

Armed Attacks and Assassinations

Armed attacks include raids and ambushes. An assassination is the killing of a selected victim, usually by bombings or small arms. A drive-by shooting is a common technique employed by unsophisticated or loosely organized terrorist groups. Historically, terrorists have assassinated specific individuals for psychological effect.

Arson and Firebombing

Incendiary devices are inexpensive and easy to hide. Arson and fire-bombings are easily conducted by terrorist groups that may not be as well organized, equipped, or trained as a major terrorist organization. An act of arson or firebombing against a utility, hotel, government building, or industrial center portrays an image to the public that the ruling government is incapable of maintaining order.

Bioterrorism

Bioterrorism refers to the intentional release of toxic biological agents to harm and terrorize civilians in the name of a political or other cause. The U.S. Centers for Disease Control and Prevention (CDC) has classified the viruses, bacteria, and toxins that could be used in an attack. Category A Biological Diseases are most likely to cause the greatest harm. They include (CDC, Bioterrorism Agents/Diseases 2018):

- Anthrax (*Bacillus anthracis*)
- Botulism (*Clostridium botulinum* toxin)
- Plague (*Yersinia pestis*)
- Smallpox (*Variola major*)
- Tularemia (*Francisella tularensis*)
- Hemorrhagic fever caused by Ebola virus or Marburg virus.

Bombings

Bombings are the most common type of terrorist act. Typically, improvised explosive devices are inexpensive and easy to make. Modern devices are smaller and harder to detect and have destructive capabilities. Terrorists responsible for this bombing can use materials readily available to the average consumer to construct a bomb.



Cyber Terrorism

Cyber terrorists use information technology to attack civilians and draw attention to the terrorists' cause. They may use information technology, such as computer systems or telecommunications, as a tool to orchestrate a traditional attack. More often, cyber terrorism, also known as cyber crime, refers to an attack on information technology itself in a way that would radically disrupt networked services. For example, cyber terrorists could disable networked emergency systems or hack into networks that house critical financial information. There is wide disagreement about the extent of the existing threat by cyber terrorists.

Ecoterrorism

Ecoterrorism is defined by the FBI as "the use or threatened use of violence of a criminal nature against innocent victims or property by an environmentally oriented... group for environmental-political reasons... often of a symbolic nature" (Farboe 2002). In general, environmental extremists sabotage property to inflict economic damage on industries, businesses, or persons perceived as harming animals or the natural environment. Targets of ecoterrorist attacks have included fur companies, logging companies, and animal research laboratories.

Hijackings and Skyjackings

Hijacking, also known as cargo theft, is seizure by force of a surface vehicle, its passengers, or its cargo (FBI 2019). Skyjacking is taking of an aircraft, which creates a mobile hostage barricade situation; provides terrorists with hostages from many nations; and draws heavy media attention. Skyjacking also provides mobility for the terrorists to relocate the aircraft to a country that supports their cause, and provides them with a human shield, making retaliation difficult.

Kidnappings and Hostage-Takings

Terrorists use kidnapping and hostage-taking to establish a bargaining position and to elicit publicity. Kidnapping is one of the most difficult acts for a terrorist group to accomplish, but a successful kidnapping can gain terrorists money, release of jailed comrades, and publicity for an extended period. Hostage-taking involves seizure of a facility or location and taking hostages present in that facility. Unlike a kidnapping, hostage-taking provokes a confrontation with authorities. It forces authorities to make dramatic decisions or to comply with the terrorists' demands. It is overt and designed to attract and hold media attention. The intended target is the audience affected by the hostage's confinement, not the hostage.

Nuclear Terrorism

Nuclear terrorism refers to a number of different ways nuclear materials might be exploited as a terrorist tactic. These methods include attacking nuclear facilities, purchasing nuclear weapons, or building nuclear weapons or otherwise finding ways to disperse radioactive materials.

16.1.2 Location

Terrorism could occur anywhere in Genesee County, depending on the agenda of the terrorist group. Any facility is vulnerable, as terrorists have historically sent chemical or biological agents through the mail. High-risk targets include local, county, state, or federal government facilities; major venues and gathering places; and sites with historic, cultural, or other significance; and key infrastructure. Damage to or disruption of operations at government facilities could profoundly impact Genesee County's population, even if the terrorism event is relatively small-scale.



16.1.3 Extent

Any acts of terrorism could occur anywhere at any time of day. The National Terrorism Advisory System (NTAS) communicates information about terrorist threats by providing detailed information to the public, government agencies, first responders, airports and other transportation hubs, and the private sector (USDHS 2022). When a threat is posed, an NTAS Alert will be announced by the Secretary of Homeland Security and will be shared with the public. It may include specific information about the nature of the threat, including the geographic region, mode of transportation, or critical infrastructure potentially affected, as well as steps that individuals and communities can take to protect themselves and help prevent, mitigate, or respond to the threat. The alert indicates whether the threat is elevated or imminent. An elevated threat is issued when no specific information is available about timing or location. An imminent threat is issued when the threat is believed to be impending or to very soon result in an incident. Alerts will be posted online and released to the news media for distribution. The United States Department of Homeland Security (USDHS) will also distribute alerts through its social media channels (USDHS 2022).

Domestic terrorism and violent extremism often spread through social media and other platforms. The Governor of New York State issued Executive Order 18, which requires each County and City of New York State to develop plans to respond domestic terrorism, especially against those racially driven attacks against minority groups (NYS - Governor Kathy Hochul 2022). Executive Order 18 also establishes a new unit within the New York State Intelligence Center (NYSIC) with the purpose of tracking domestic terrorism and increasing social media monitoring to target violent extremism.

The effect of a terrorism event can vary depending on the type of attack and magnitude of the event or events. A terrorism event can create fear among members of the public about using mass transportation or leaving their homes in the event of a biological or nuclear attack. Communication systems, both public and private, can fail because of an overwhelming amount of use or damage to the communications infrastructure. Healthcare facilities can become quickly inundated and must be prepared to triage injured patients, handle mass casualties, and conduct decontamination operations.

Most terrorist attacks occur with very little, if any, advanced warning. However, thwarting terrorist attacks is possible through aggressive intelligence monitoring and monitoring of individuals who exhibit radical tendencies. Warning signs of some terrorist attacks may appear, such as a suspicious package left unattended. Local, state, and federal officials, as well as the public, are responsible for recognizing warning signs of terrorism incidents and for taking appropriate actions to mitigate against possible attacks.

16.1.4 Previous Occurrences

Federal Emergency Management Agency (FEMA) Major Disaster and Emergency Declarations

Between 1952 and 2024, FEMA issued two major disaster declarations as a result of terrorism in New York State. According to the 2014–2016 New York State Homeland Security Strategy, New York has been identified as the most likely target of terrorism within the United States. However, the County has not experienced any acts of terrorism (FEMA 2024).

U.S. Department of Agriculture (USDA) Declarations

The 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. The USDA does not designate terrorism as a natural disaster for emergency loans and does not track this hazard by disaster area (USDA 2024).



Previous Events

No known major terrorist activities have taken place in Genesee County from 2017 to 2024. This may be due to limited reporting and records for tracking terrorist activity. For events prior to 2017, please refer to the 2019 Genesee County Hazard Mitigation Plan.

16.1.5 Probability of Future Occurrences

The potential for future terrorism incidents in Genesee County is difficult to predict. Efforts of local, state, and federal officials must be coordinated to prevent occurrences of future terrorist incidents. However, despite the best efforts of these entities, the reality is that a terrorist attack may occur in Genesee County or the surrounding areas.

The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 20, the identified hazards of concern for Genesee County were ranked. Based on historical records and input from the Steering Committee, the probability of occurrence for terrorism in the County is considered “rare.”

Climate Change Projections

Climate change is not expected to impact terrorist activity as a whole. However, it may exacerbate the impacts felt by agroterrorism which can impact entire regions and economies which rely on agriculture for food, goods, and services.

16.1.6 Cascading Impacts on Other Hazards

Terrorism and potential terrorist activity have the potential to impact and/or exacerbate other hazard events identified in this plan. For example, chemical terrorism is the release of toxins and radiological agents to cause harm. This form of terrorism is meant to cause physical harm and/or spread illness and disease. Other hazards that can impact the health of the community is hazardous material releases and pandemics. If chemical terrorism were to occur during a large hazardous material release or a pandemic, the community impacts would be severely worse than if the incidents happened on separate occasions. Terrorist activity can leave the community more vulnerable to other hazards, by separating people and causing terror during a time of stress.

16.2 VULNERABILITY AND IMPACT ASSESSMENT

To understand risk, a community must evaluate what assets are exposed or vulnerable in the hazard area identified. All of Genesee County has been identified as the hazard area for terrorism events. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County profile, are vulnerable.

16.2.1 Life, Health, and Safety

Overall Population

For this hazard mitigation plan (HMP), the entire population in Genesee County is considered vulnerable to terrorism events. However, it can be inferred that individuals living in highly populated areas will have a greater exposure to terrorist incidents than those living in rural areas because terrorists typically prefer to affect the greatest number of individuals at a given location. Refer to Chapter 3 for a summary of population statistics for the County. A large-



scale incident could kill or injure many residents in the immediate vicinity of the attack and could also affect people at a distance from the initial event.

Socially Vulnerable Population

A new National Institute of Justice-supported study revealed the most prominent terrorism risk profiles identified through its analysis included areas with the following characteristics (NIJ 2023):

- High population density
- Low white population
- Less-than-high-school education
- Moderate unemployment
- Low percentage of families below the poverty line
- Moderate percentage of families living in the same residence as one year prior (stability measure)
- Low percentage of vacant houses
- High percentage of foreign born

16.2.2 General Building Stock

The entire general building stock inventory in the County of Genesee is exposed and vulnerable to the threat of terrorism. This includes a wide range of structures, from residential buildings to commercial properties, all of which can suffer significant damage in the event of a terrorist attack. Structural impacts typically include damage to roofs, building frames, windows, and the contents within these buildings. Unfortunately, current modeling tools are not sophisticated enough to estimate specific losses from such hazards accurately.

Particularly vulnerable to terrorism are critical facilities and culturally significant locations. These include schools, community centers, libraries, and other public spaces that are essential to the fabric of the community. These areas are not only important for their functional roles but also as places where people gather, socialize, and spend time. As previously discussed, the core aim of terrorism is to instill fear and terror among large groups of people by targeting community events and public spaces.

Schools, for instance, are vital as they educate and nurture the city's youth. An attack on a school could have devastating psychological and emotional impacts on students, staff, and families, disrupting education and creating a climate of fear. Community centers and libraries serve as hubs for social interaction, learning, and cultural activities. An attack on these facilities could disrupt community cohesion and access to essential services.

Given these vulnerabilities, it is imperative that the County of Genesee continues to implement and enhance mitigation and protection measures to safeguard these public locations. This includes physical security measures such as surveillance systems, security personnel, and controlled access points. Additionally, emergency preparedness plans should be regularly updated and tested to ensure a swift and effective response in the event of an attack.

Public awareness and community engagement are also crucial. Educating residents about the importance of vigilance and encouraging them to report suspicious activities can help prevent potential threats. Collaboration with federal and state agencies can provide additional resources and expertise to bolster local efforts.



By taking a comprehensive approach to security and preparedness, the County of Genesee can better protect its critical facilities and culturally significant locations, ensuring that these spaces remain safe and welcoming for all members of the community. This proactive stance not only helps to mitigate the immediate risks of terrorism but also strengthens the overall resilience and unity of the County.

16.2.3 Community Lifelines and Other Critical Facilities

Critical facilities and lifelines are exposed to terrorist attacks, effects of which could be catastrophic. Dams, power stations, and government facilities are all examples of critical infrastructure and facilities that are vulnerable. Additionally, communications systems, first-responder stations, and emergency operations centers are all vulnerable to terrorist attacks. Disrupting one of these facilities or destroying critical infrastructure could result in devastating, cascading impacts on Genesee County. All critical facilities in the County are at risk to impacts from the terrorism hazard.

16.2.4 Economy

Measuring the economic impact of a terrorist attack on Genesee County is difficult. The initial impact can be measured in immediate costs, such as costs related to response to the event and those associated with immediate loss of productivity that results from closed businesses. The full economic impact includes long-term costs such as terrorism mitigation activities.

Terrorism can immobilize a region and paralyze a County, shutting down transportation routes and disrupting medical and emergency services as they respond and control the impacted location. It can take several weeks, months, and even years for the economy in the affected areas to fully bounce back from a terrorist attack.

The economy is vital to the health and wellbeing of a community and is often a target for terrorist attacks. By disrupting the economy, terrorist groups can instill fear and create additional vulnerabilities within the community. This can have long-lasting effects on residents and neighboring areas. In response, new measures are often implemented after a terrorist attempt to prevent future incidents and to build a more resilient economy and community.

16.2.5 Natural, Historic and Cultural Resources

Natural

The environment is exposed to terrorist attacks through secondary impacts, such as hazardous material releases by nuclear terrorism, toxic biological agents through bioterrorism, or physical damages by explosives. It is difficult to measure the impact to natural resources from terrorist attacks in Genesee County. However, generally any terrorist attack has some degree of negative impact to the natural resources available to the community.

Historic

It is difficult to measure the impact to historical resources from terrorist attacks in Genesee County. However, historical sites and artifacts are still vulnerable to terrorism as they are key cultural assets to the community and promote unity which is a major target for terrorist activity.



Cultural

Cultural resources and assets are especially vulnerable to terrorism, as they provide a space for community engagement and coordination which are a major target for terrorist activity. It is difficult to measure the impact to cultural resources and assets from terrorist attacks in Genesee County. However, generally any terrorist attack has some degree of negative impact to cultural resources and assets to the community.

16.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

16.3.1 Potential or Planned Development

As discussed, and illustrated in Chapter 3 (County Profile), areas targeted for future growth and development have been identified across the County. Areas of growth may become a target for terrorism depending on the type of development and the economic impacts it will have on Genesee County. Refer to Chapter 3 and Volume II for more information about the potential new development in Genesee County.

16.3.2 Projected Changes in Population

According to the 2020 Census, the population of the County has increased by approximately 2.85 percent since 2010. Population projections from Cornell University reveal the County's population is anticipated to continue decreasing. The population is projected to decline to 56,077 persons in 2030 and to 54,128 by 2040 (Cornell University 2018). Terrorism has the potential to impact a growing population by increasing their vulnerability through large public events such as sporting events, public spaces, concerts, schooling, and more. Further mitigation and planning mechanisms for safety and emergency personnel on how to prevent and respond to terrorist attacks should be implemented within the County to combat these impacts on residents.

16.3.3 Climate Change

Climate change is not expected to impact terrorist activity. However, it may exacerbate the impacts felt by agroterrorism which can impact entire regions and economies which rely on agriculture for food, goods, and services.

16.3.4 Changes Since the 2019 HMP

Overall, the County's vulnerability has not changed since the 2019 HMP, and the entire County will continue to be exposed and vulnerable to terrorism events.



17. TRANSPORTATION ACCIDENT

17.1 HAZARD PROFILE

17.1.1 Hazard Description

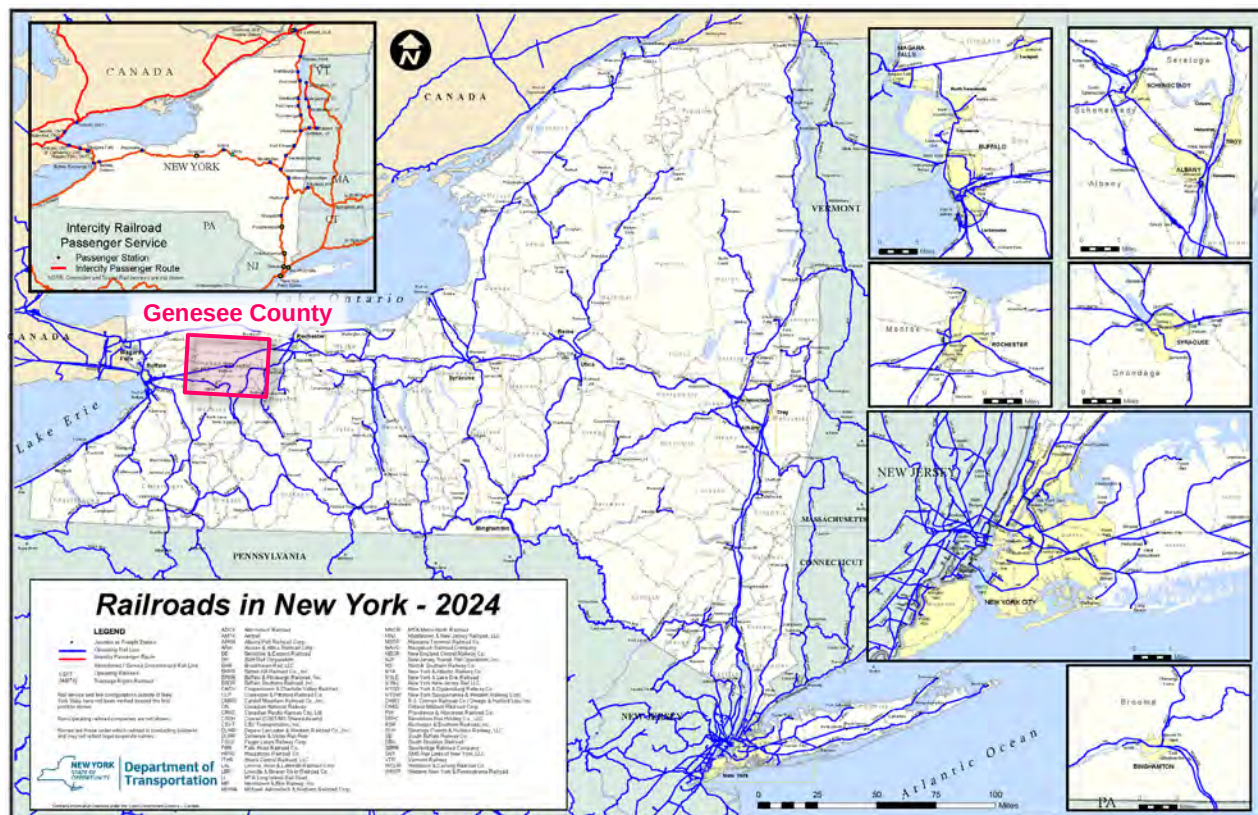
Transportation accidents include the following: vehicular, aviation, marine, hazardous materials in transit, at-grade railroad crossings, and roadways. The National Transportation Safety Board (NTSB) reports the Bureau of Transportation Statistics' (BTS) transportation-related fatalities each year. In 2021–2022 (the most recent data available), the BTS reported 44,959 total fatalities. Of those 44,959 fatalities, 42,939 were highway incidents, 922 were rail incidents (2022), 371 were aviation incidents, 5 were pipeline incidents (2022), and 686 were marine incidents (2022) (BTS 2023). For the purpose of this plan update, transportation accidents are defined as incidents involving highway, air, and rail travel, including hazardous materials in transport, resulting in death, serious injury, extensive property loss or damage; or situations that cause delay or closure.

A transportation hazard may be defined as a condition created by movement of anything by common carrier. Transportation hazards can be divided into two categories: hazards created by the material being transported and hazards created by the transportation medium. Transportation systems available in Genesee County include roadways, railways, and airports. Based on historical records, major road accidents in the County are probable; however, aviation or rail accidents are less likely. All County systems and supporting transportation resources, with the exception of the private airports, provide services locally, regionally, and nationally. Transportation accidents involving road, air, and rail travel are defined below:

- **Vehicular Accidents:** A vehicular accident is a road traffic incident that usually involves one vehicle colliding with another vehicle or other road user, such as an animal or a stationary roadside object. A vehicular accident may result in injury, property damage, or possible fatalities. Many factors contribute to vehicular accidents, including equipment failure, poor road conditions, weather, traffic volume, and driver behavior.
- **Aviation Accidents:** According to the NTSB, an aviation accident is an occurrence during operation of an aircraft between the time a person boards the aircraft with intent to fly to a destination and the time the person has disembarked the aircraft. Three different situations qualify as an aviation accident: a person is fatally or seriously injured; the aircraft sustains damage or structural failure; or the aircraft is missing or inaccessible. An aviation incident is an occurrence, other than an accident, associated with operation of an aircraft that affects or could affect the safety of operation (NTSB n.d.). Although Genesee County is home to only private airports/airstrips, thereby limiting the probability of aviation accidents, airport accidents and incidents have the potential to occur while a plane is flying over County airspace.
- **Hazardous Materials in Transit:** Hazardous materials are defined as substances or materials determined capable of posing an unreasonable risk to health, safety, or property when transported. "Unreasonable risk" covers a broad range of health, fire, and environmental considerations. Hazardous materials substances come in various forms, which, under certain conditions, can cause death; serious injury; long-lasting health effects; and damage to buildings, homes, and other property. Hazardous materials substances include explosives, flammable solids, substances that become dangerous when wet, oxidizing substances, and toxic liquids. An accident involving a vehicle carrying hazardous materials becomes a hazardous materials incident if the hazardous materials leak, if the vehicle is involved in a fire; or if potential for release, fire, or other hazard exists. Hazards can occur during production, storage, transportation, use, or disposal of hazardous materials (FEMA 2019).

- **Railway Accidents:** Railway accidents involve one or more trains. They can involve a train derailment or one train impacting another train, vehicle, or pedestrian. In Genesee County, there are 65 miles of rail freight lines and 30 miles of passenger rail lines (U.S. DOT 2023).

Figure 17-1. Railroad Network Across the State of New York



Source: NYSDOT 2014

Transportation of hazardous materials is a threat to Genesee County. The volatility of products transported, along with the potential impact on a local community, may increase the risk of intentional acts against a transport vehicle. Release of certain products, considered as hazardous materials, can cause immediate and adverse impacts on the general population, ranging from the inconvenience of evacuations to personal injury and even death. Additional effects of the release of hazardous materials from transportation accidents are addressed in the Hazardous Materials profile (Chapter 13).

17.1.2 Location

Vehicular Accidents

Roadway accidents in Genesee County range from minor crashes to more serious incidents that involve injuries or fatalities or result in release of hazardous materials (described further in Chapter 13).

The worst-case transportation accident within the County would be the overturn of a tractor-trailer carrying an extremely hazardous substance (described in Chapter 13), resulting in a massive release of its cargo on a major roadway. This incident would block traffic on Genesee County's major transportation routes and could threaten the health and safety of individuals on the roadways and in surrounding neighborhoods. In addition, a release could



necessitate closure of critical facilities. The most likely transportation accident in the County would involve a single vehicle hitting an object and sustaining minimal damage.

Aviation Accidents

Aircraft accidents can vary from a single-engine aircraft having a “hard landing” causing damage to the aircraft, to a crash of a small turboprop or jet aircraft, to a crash of a large jet aircraft (such as a Boeing 727). Other aircraft accidents could include helicopter or experimental aircraft crashes. Aviation accidents can also involve radio-controlled or drone aircraft devices, many of which are experimental and not subject to defined regulatory oversight, potentially complicating issues with and for the public that could arise if one of these devices crashes.

Hazardous Materials in Transit

The extent of a hazardous substance release depends on (1) whether the substance is released from a fixed or mobile source, (2) the size of the impacted area, (3) the toxicity and properties of the substance, (4) the duration of the release, and (5) environmental conditions (for example, wind and precipitation, terrain, etc.). The extent of a hazardous materials release in transit is further described in Chapter 13.

Railway Accidents

Rail accidents can vary widely in terms of injuries, fatalities, property damage, release of hazardous materials, and interruption of service, depending on the nature and severity of the accident.

17.1.3 Extent

Vehicular Accidents

Genesee County is bisected by the New York State Thruway (I-90), which is the primary east/west transportation route in New York State. The Thruway runs through the towns of Pembroke, Batavia, Stafford, and LeRoy. Three I-90 exits serve Genesee County: Exit 47 (LeRoy), Exit 48 (Batavia), and Exit 48A (Pembroke). Route 490 is another primary transportation route and connects the County to the Greater Rochester area.

A total of 1,129 miles of roads and 163 bridges are present in Genesee County. Table 17-1 provides a breakdown of the transportation infrastructure across the planning area, with each mapped in Figure 17-2. Major roadways in Genesee County include I-90 and Route 490. Transportation accidents can occur at any point along these roadways, with many occurring at the intersection of two or more roadways.

Table 17-1. Transportation Overview in Genesee County

Description	Count
Interstate highway miles	64 mi.
County roads	261.08 mi.
Local roads	605 mi.
Total miles of roads	1,129 mi.
Rail freight	65 mi.
Rail passenger	30 mi.
Civil use and seaplane airports	1
Other airports	6



Description	Count
Total airports	7
Bridges in fair condition	86
Bridges in good condition	50
Bridges in poor condition	27
Total bridges	163

Source: U.S. DOT 2023; NYS DOT 2019

There is no warning time for vehicular accidents. Factors contributing to these accidents are typically associated with the driver, vehicle, and the environment. Factors associated with the driver include error, speeding, lack of experience, texting or talking on a cellular phone, and blood-alcohol level. Factors associated with the vehicle include type, condition, and center of gravity. Environmental factors include the quality of the infrastructure, weather, and obstacles. The majority of vehicular accidents are attributed to the driver. Vehicular accidents can severely affect those directly involved as well as others not directly involved. Other effects may include severe traffic delays, lost sales to businesses, delayed commodity shipments, and increased insurance costs.

Aviation Accidents

The Genesee County Airport is the main air facility; however, a few private air strips are also located throughout the County. Two major regional airports, the Greater Rochester International Airport and the Buffalo Niagara International Airport, are located near the County. These airports may have associated air traffic patterns in the skies above Genesee County that could lead to problems in flight, resulting in a crash within the County boundaries.

Approximately 45 percent of all aviation accidents occur during the approach and landing phases of a flight. Reportedly, 80 percent of these accidents are caused by human error (FAA n.d.). Mid-flight accidents are rare but not unheard of. A survey of plane crashes between 2000 to 2010 (most recent data available) shows that 57 percent of accidents were the result of the pilot (human) error, 21 percent were caused by mechanical failure, 10 percent were caused by weather, 4 percent were caused by sabotage and terrorism, and 4 percent resulted from other causes (PlaneCrashInfo 2019).

Aviation accidents are often devastating incidents that may result in serious injuries or fatalities. The Federal Aviation Administration (FAA) and NTSB are the agencies responsible for monitoring air travel and investigating accidents. Some of the most common causes of aviation accidents occur as a result of violations of FAA and NTSB regulations. Some other causes of accidents include, but are not limited to:

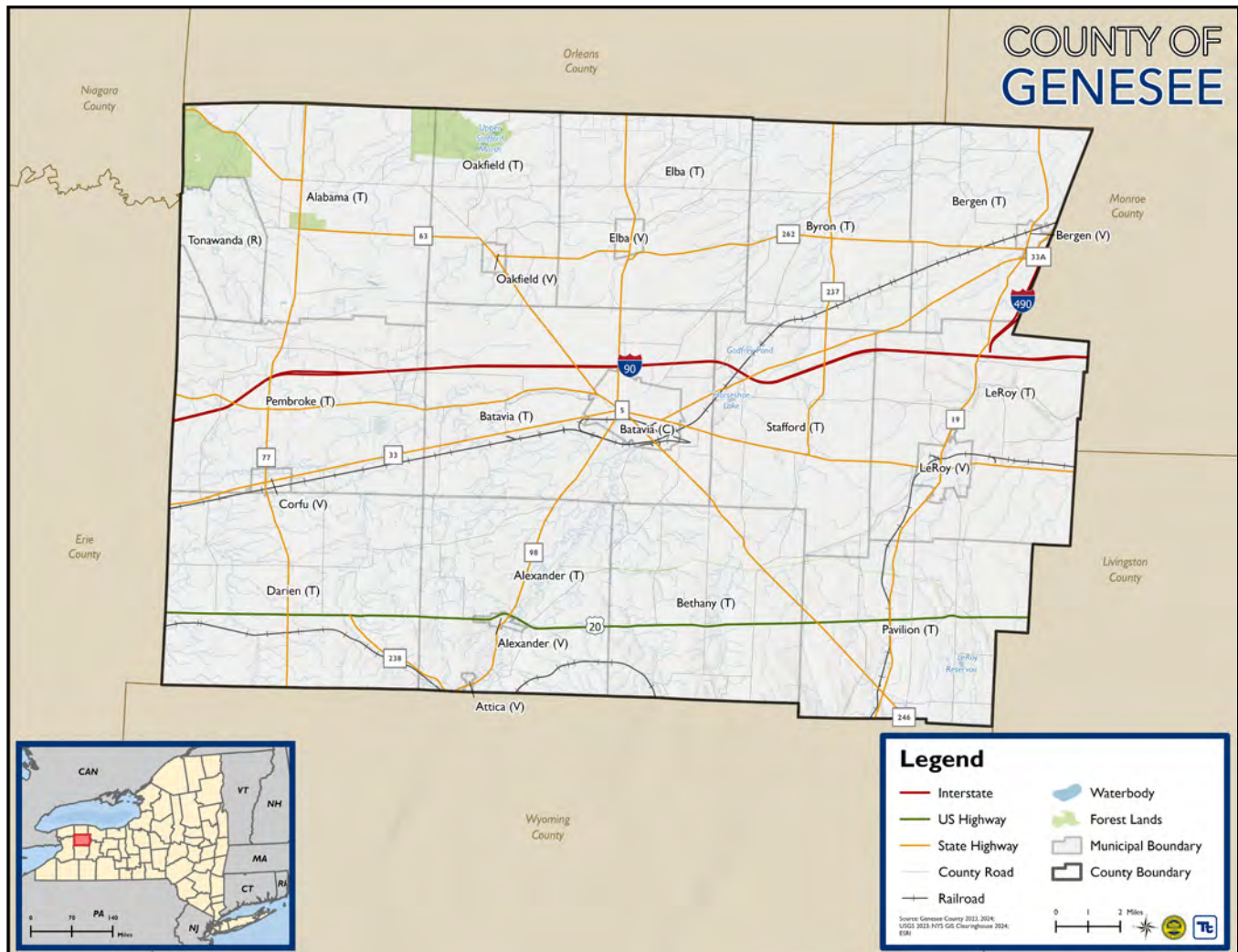
- **Pilot or flight crew errors** – Pilot error is the primary cause of aviation accidents and accounts for the highest number of fatalities. Pilots have the responsibility to transport passengers safely from one place to another and follow the FAA and NTSB regulations to better ensure passenger safety. If a pilot or flight crew makes an error, an accident may occur.
- **Faulty equipment** – Faulty aircraft equipment or mechanical features is another common cause of aviation accidents.
- **Aircraft design flaws** – The manufacturer of an aircraft is responsible for an aviation accident if the structural design is flawed and results in an accident.
- **Failure to properly fuel or maintain the aircraft** – If any regulations and safety standards set by the FAA or NTSB are violated, an accident may occur.
- **Negligence of Federal Air Traffic Controllers** – Failure of air traffic controllers to properly monitor the airways is another cause of aviation accidents (Wilson Kehoe Winingham 2020).



Railway Accidents

Norfolk Southern and two short lines (Depew, Lancaster & Western Railroad, and Rochester & Southern Railroad) provide railroad service throughout the County, and as shown in Table 17-2, these rail networks carry both passenger traffic as well as freight.

Figure 17-2. Major Transportation Routes in Genesee County



17.1.4 Previous Occurrences

Federal Emergency Management Agency (FEMA) Major Disaster and Emergency Declarations

Between 1954 and 2024, Genesee County was not included in any major disaster (DR) or emergency (EM) declarations for transportation accident-related events (FEMA 2024).



U.S. Department of Agriculture (USDA) Declarations

The 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. Between 2017 and 2024, Genesee County was not included in any USDA transportation accident-related agricultural disaster declarations (USDA 2024).

Previous Events

Major roadway accidents (such as multi-vehicle accidents that close roads or bridges or those involving school buses) are reported to the state, and Table 17-2 summarizes these accidents between 2017 and 2024. While this table lists accidents reported to the County and state agencies, significantly more minor accidents are not assumed and not accounted for in these statistics.

Table 17-2. Summary of Major Transportation Accidents in Genesee County, 2017 to 2024

Year	Vehicle Accidents				Railroad Accidents	Aircraft Accidents
	Annual Total	Fatalities	Injuries	Property Damage		
2017	1,944	13	379	\$1,552	2	2
2018	2,348	5	373	\$1,970	1	1
2019	2,352	13	371	\$1,968	1	1
2020	1,856	9	254	\$1,593	0	2
2021	1,983	5	292	\$1,686	0	1
2022	2,174	10	334	\$1,830	0	1
2023	2,135	8	346	\$1,781	1	0
2024*	1,004	1	173	\$847	-	-
TOTAL	15,796	64	2,522	\$13,227	5	8

Source: ITSMR 2024; NTSB 2019; USDOT 2020; FRA 2020a; FRA 2020b

*Preliminary data for 2024 is valid through September 1, 2024.

With no centralized resource for previous transportation accident events, extensive desktop research yielded a summary, which is compiled in Table 17-3. Notable aviation and railroad accidents are listed with a general description of each accident. While most transportation accidents occurred after 1996, a few prior incidents have also been included due to their significance in Genesee County.



Table 17-3. Notable Transportation Accidents in Genesee County, NY

Date	Type	Location	Cause of Accident
December 6, 1970	Railroad	Le Roy	Two tank cars ruptured and spilled approximately 30,000 gallons of trichloroethylene (TCE) onto the ground. A third car containing a crystalline form of cyanide was also reported to have partially spilled. The cyanide was recovered shortly after the derailment. However, the TCE was flushed with water, and it seeped into the ground, resulting in a 4-mile-long plume of TCE contamination. The site was placed on the EPA's Superfund site list in 1999, and since then, cleanup efforts have continued. In October of 2023, the EPA finalized its cleanup plan.
August 3, 1994	Railroad	Batavia	On August 3 rd , a westbound Amtrak train 49 derailed on Conrail (Consolidated Rail Corporation) as it tracked past milepost 406.7 near Batavia. Ten crewmembers and 108 passengers sustained injuries.
July 26, 2000	Aviation	Genesee County Airport	The pilot's failure to attain adequate airspeed before liftoff, which resulted in a stall/mush. A factor was the pilot's lack of experience in the type of airplane.
August 11, 2001	Aviation	Byron	The pilot's failure to maintain aircraft control. A factor in the accident was the physiological impairment of the pilot due to the consumption of alcohol. 2 fatalities were reported.
December 27, 2003	Aviation	Byron	The pilot's improper use of the collective, and failure to maintain main rotor rpm, which resulted in low main rotor rpm and a hard landing. One person was reported as being seriously injured.
February 15, 2004	Aviation	Genesee County Airport	The pilot's failure to maintain directional control while landing. Factors were a tailwind and icy runway.
January 6, 2007	Railroad	Genesee (T)	Several freight cars derailed, spilling their load of corn. Ten freight cars with a Wisconsin & Southern Railroad Co. train derailed but had no injuries reported.
June 15, 2007	Aviation	Genesee County Airport	The student pilot's failure to flare the airplane during landing resulting in a hard landing.
February 7, 2009	Aviation	Le Roy Airport	The pilot's inadequate compensation for a crosswind during an aborted landing. Contributing to the accident was the pilot's decision to land in gusting crosswinds in excess of the manufacturer's recommended crosswind limit.
July 15, 2011	Aviation	Genesee County Airport	The pilot's failure to maintain control of the airplane during takeoff. One person was reported as being seriously injured.
August 2, 2012	Aviation	Alexander	The pilot's inadequate visual lookout and failure to maintain altitude during aerial application, which resulted in controlled flight into terrain.
September 20, 2014	Aviation	Bethany Airpark	The pilot's failure to maintain a directional control of the airplane during gusting wind conditions.
July 11, 2015	Aviation	Genesee County Airport	The pilot's improper flare, which resulted in a hard landing and subsequent loss of directional control.
May 19, 2016	Aviation	Genesee County Airport	The student pilot's failure to maintain directional control during takeoff, which resulted in a collision with runway signs.
November 6, 2016	Railroad	Byron	A South Byron man was killed Sunday morning in a Genesee County train accident. Officials think that the 60-year-old man was taking photos of deer on the tracks when he was unfortunately struck.



17. Transportation Accident

Date	Type	Location	Cause of Accident
March 8, 2017	Railroad	Batavia (T)	A CSX train derailed on Donahue Rd in Batavia due to high winds. Unknown injuries reported. The cargo train had 12 rail cars involved that were blown off the tracks during winds which reached 81 mph., one of which was carrying gun powder.
November 19, 2017	Railroad	Bergen	The driver of a 2000 model Ford F-250 fell asleep at the wheel, driving his vehicle off the shoulder and down an embankment where it came to rest on the northbound tracks. An eastbound CSX train struck the vehicle, causing damage to the rear of the truck as vehicle occupants watched nearby.
February 15, 2018	Railroad	Alexander	Two engines and eleven train cars with the Norfolk Southern Railroad derailed in remote northern Wyoming County, spurring a response from Alexander volunteer firefighters along with the hazardous materials team from the Genesee County Emergency Services.
August 25, 2019	Railroad	Corfu (V)	While driving in heavy traffic, a man decided to drive across the railroad tracks in his pickup and drove into an oncoming train behind the lumber yard.
October 27, 2019	Aviation	Le Roy	The pilot's improper pitch control during takeoff in high, gusting wind conditions, which resulted in a runway overrun and the nose landing gear collapsing. 4 minor injuries were reported.
June 1, 2020	Aviation	Genesee County Airport	The pilot's failure to extend the landing gear during a precautionary landing after an electrical failure.
October 2, 2020	Aviation	Corfu	The pilot's failure to maintain control of the airplane for undetermined reasons during the descent to the destination airport. 2 fatalities were reported.
October 6, 2021	Aviation	Genesee County Airport	The pilot's failure to disengage the autopilot prior to climbing out of a fog bank.
April 26, 2022	Aviation	Elba / Genesee County Airport	The pilots' inappropriate flight control inputs while in vortex ring state, which resulted in main rotor blade contact with the tail boom and a subsequent in-flight breakup. Also causal was the flight instructor's inadequate monitoring of the flight. 2 fatalities were reported. No injuries were reported and no hazardous materials were a threat.
June 19, 2023	Railroad	Genesee County	Darien Fire and Ambulance responded to a train derailment along the Erie Railroad line in southwestern Genesee County. Four train cars carrying tractor-trailer units were involved in what was possibly caused by a mechanical failure.

Source: NTSB 2024; EPA 2023; The Batavian 2018; Rochester First 2023; NTSB 1996; WIVB News 4 2017; WGRZ 2 2016; WIVB 4 2019; 13WHAM News 2017; GM Today 2007

Note: With transportation failure documentation for Genesee County being so extensive, not all sources have been identified or researched; therefore, not all events may be included in the table.



17.1.5 Probability of Future Occurrences

Transportation hazards are impossible to predict accurately; however, areas prone to these hazards can be located, quantified through analysis of historical records, and plotted on countywide and municipality base maps. Certain characteristics that together cause these hazards or increase vulnerability to these hazards can be identified, as well as areas that may be prone to these hazards.

The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 20, the identified hazards of concern for Genesee County were ranked. Based on historical records and input from the Steering Committee, the probability of occurrence for any type of transportation accidents in the County is considered “frequent.”

Climate Change Projections

According to the New York State Energy Research and Development Authority, precipitation totals will increase between 4 and 10 percent by the 2050s and 6 to 13 percent by the 2080s (baseline of 34.0 inches, middle-range projection). The projected increase in precipitation is expected to fall in heavy downpours and less in light rains. The increase in heavy downpours has the potential to flood key rail lines, roadways, and transportation hubs and increase delays and hazards related to extreme weather events (NYSERDA 2023).

Road, rail, and air traffic is also vulnerable to freezing rain (icing) and snow. Increasing temperatures lead to shorter duration freezes of Lake Ontario and the Finger Lakes, allowing more moisture to be drawn up. During the winter months, that moisture may fall as snow or freezing rain across central New York State. Additional snow and icing would result in more transportation accidents (NYSERDA 2023).

17.1.6 Cascading Impacts on Other Hazards

Transportation accidents, such as vehicle accidents or railway accidents, often cause hazardous material spills. Hazardous material spills have the potential to cause further impacts to natural and cultural resources. Other natural hazards also have a cascading impact on transportation accidents. Severe winter weather, severe storms, hurricanes, flooding, landslides, earthquakes, and more have potential to cause vehicle, aviation, and railway. Inclement weather is a large cause of many vehicle accidents, which can cause closure of major transportation routes located in the County.

17.2 VULNERABILITY AND IMPACT ASSESSMENT

To understand risk, a community must evaluate the assets that are exposed or vulnerable within the identified hazard area. For the transportation accident hazard, all of Genesee County has been identified as the hazard area. Therefore, all assets in the County (population, structures, critical facilities, and lifelines), as described in the County Profile, are vulnerable to a transportation accident.



17.2.1 Life, Health, and Safety

Overall Population

Transportation hazards could lead to potential losses in human health and life, property, and natural resources. Vehicular accidents, flooded roadways, and other roadway impairments may result in injury or death to drivers and passengers on the road, the public in the immediate vicinity, and emergency services personnel. The number of people exposed depends on population density, whether the accident occurs during the day or night, and whether the accident location is near a population located indoors or outdoors.

Genesee County and its municipalities are prepared to manage and respond to transportation hazards.

Socially Vulnerable Population

Socially vulnerable populations are especially at risk to transportation accidents due to reliance on public transportation networks. When a major roadway is shut down due to transportation accidents, public transit such as buses will be late for routes, making it difficult for economically disadvantaged residents to reach their daily commute.

Elderly (65 and older) and young (16 to 19 years old) drivers are the most at-risk populations behind the wheel of a vehicle. In 2020, about 7,500 older adults were killed in traffic crashes, and almost 200,000 were treated in emergency departments for crash injuries. Age-related changes in vision, physical functioning, and the ability to reason and remember, as well as some diseases and medications, might affect some older adults' driving abilities (CDC 2022). Young drivers who are at especially high risk for motor vehicle crashes include the following (CDC 2022):

- **Males**—The motor vehicle crash death rate for male drivers ages 16 to 19 years was three times as high as the death rate for female drivers in the same age group in 2020.
- **Teens Driving with Teen or Young Adult Passengers**—The presence of teen or young adult passengers increases the crash risk of unsupervised teen drivers. This risk increases with each additional teen or young adult passenger.
- **Newly Licensed Teens**—Crash risk is particularly high during the first months of licensure. The crash rate per mile driven is about 1.5 times as high for 16-year-old drivers as it is for 18- to 19-year-old drivers.

Factors that put young drivers more at risk include inexperience, driving at night or on the weekend, not using seat belts, distracted driving, speeding, drinking alcohol, and using drugs and other substances (CDC 2022).

17.2.2 General Building Stock

Property may be impacted by transportation accidents if a vehicle collides with a structure. A railway incident may break or destroy the rail line; vehicles in urban settings have the potential to impact nearby buildings if the driver loses control of the vehicle; an airplane accident has the potential to impact a variety of forms of property, such as buildings, other vehicles, and open spaces.

17.2.3 Community Lifelines and Other Critical Facilities

County transportation systems rely on the use of roadways. Hazards associated with transportation can be natural hazards that affect the roadway, the material being transported, or hazards pertaining to the transportation medium



itself. Multiple major roadways (interstates and other major highways) within the County are used by residents and commuters, and these are means for transporting all types of materials, including hazardous materials. A major accident on any of these major roadways is possible, which could minimally, moderately, or severely affect the County in various ways.

17.2.4 Economy

Because of insufficient data, a full loss estimate was not completed for the transportation hazard. Loss of roadway use and public transportation services would affect thousands of commuters, employment, day-to-day operations within the County, and delivery of critical municipal and emergency services. Disruption of one or more of these modes of transportation can lead to congestion of another and affect both the County and the region.

17.2.5 Natural, Historic, and Cultural Resources

Natural

It is difficult to measure the impacts of transportation accidents on natural resources. However, transportation accidents still have the potential to impact natural resources and the surrounding environment. Vehicle accidents and railway accidents often cause hazardous material spills, which can pollute waterways and soils. Aviation accidents have the potential to destroy trees on impact, which are habitats for birds and other animals.

Historic

Transportation accidents have the potential to impact and damage historical landmarks and assets for the community. However, it is difficult to measure quantitatively the impacts transportation accidents have on historical resources.

Cultural

Cultural assets such as community centers and public spaces are vulnerable to transportation accidents. It is difficult to measure the impacts transportation accidents have on cultural resources and assets. However, major transportation accidents, especially vehicular accidents, which drastically impact the community generally occur where a large population of people gather and move.

17.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

17.3.1 Potential or Planned Development

As discussed in the County Profile and Volume II, areas targeted for future growth and development have been identified across Genesee County. Future growth could affect the amount of road traffic.



17.3.2 Projected Changes in Population

According to the 2020 Census, the population of the County has increased by approximately 2.85 percent since 2010. Population projections from Cornell University reveal the County's population is anticipated to continue decreasing. The population is projected to decline to 56,077 persons in 2030 and to 54,128 by 2040 (Cornell University 2018). As population grows, the number of people susceptible to the impacts of transportation incidents (located near existing or future transportation corridors) is expected to increase.

17.3.3 Climate Change

Climate change is projected to increase the frequency and intensity of severe weather events, which could damage transportation infrastructure. Heat waves will likely be more extreme, and precipitation will be more intense. These changes could increase the risk of delays, disruptions, damage, and failure across all modes of transportation (EPA 2019). The increase in heavy precipitation and flooding can create an environment conducive to potential crashes.

17.3.4 Other Identified Conditions

Overall, the County's vulnerability has not changed since the previous hazard mitigation plan (HMP). Vulnerability of the entire County to transportation accidents will continue.

DRAFT



18. UTILITY INTERRUPTION

18.1 HAZARD PROFILE

18.1.1 Hazard Description

Utility interruption is defined as any interruption or loss of electrical service caused by disruption of power transmission from accident, sabotage, natural hazards, or equipment failure (also referred to as a loss of power or power outage). A significant utility interruption is defined as any incident of a long duration that would require the involvement of the local and/or state emergency management organizations to coordinate provision of food, water, heating, cooling, and shelter.

Widespread power outages can occur without warning or as a result of a natural disaster. Generally, warning times will be short in the case of technological failure, such as a fire at a sub-station, traffic accident, human error, or terrorist attack. In cases where a utility interruption is caused by natural hazards, greater warning time is possible. For example, high wind events (such as tornadoes and hurricanes) often cause widespread utility interruption, and are often forecasted before they affect a community. Additionally, severe winter weather conditions (such as ice storms, blizzards, and snowstorms) often cause utility interruptions. These types of incidents are often preceded with warnings allowing power response crews to stage resources to prepare for utility interruption.

18.1.2 Location

Utility interruptions in Genesee County are usually localized and are frequently the result of a natural hazard event involving high winds or ice storms. Utility interruption is particularly problematic for homes that are heated with electricity. Widespread power outages during the winter months can directly impact vulnerable populations, such as the elderly and medically frail. According to the 2022 American Community Survey, 3,083 homes across Genesee County are heated with electricity (American Community Survey 2022). This represents 12.6 percent of the total homes in the County. The primary electricity utility in Genesee County is National Grid. Gas and oil are transmitted through the County primarily by National Fuel Gas Distribution Company, Rochester Gas and Electric, and New York State Gas and Electric Corporation (NYSEG). Some areas depend on residential propane tanks for gas service.

Wastewater treatment for most municipalities is provided by municipal or private treatment facilities. Municipal wastewater treatment services are provided by wastewater treatment plants, wastewater treatment facilities, and sewage treatment plants. Private wastewater treatment within Genesee County includes septic systems and sand filters. Where municipal sewage treatment is not available, on-site septic systems are used. Soil quality in the County is variable, resulting in many parts of the County being unsuitable for on-site wastewater treatment. Undersized or unmaintained on-site septic systems can be an issue, particularly in the drinking watersheds, where exposure and runoff can impair water quality. These wastewater facilities and pump stations are displayed in Chapter 3, County Profile.

Genesee County is served by a variety of communications systems, including traditional land line and cellular service provided by multiple companies, Verizon Wireless and AT&T, plus T-Mobile and others (Genesee County 2017). Wireless Broadband internet services are provided by Starlink, ViaSat, and HughesNet, and two predominant wire line broadband companies include Verizon and Charter Spectrum (NYS 2023).



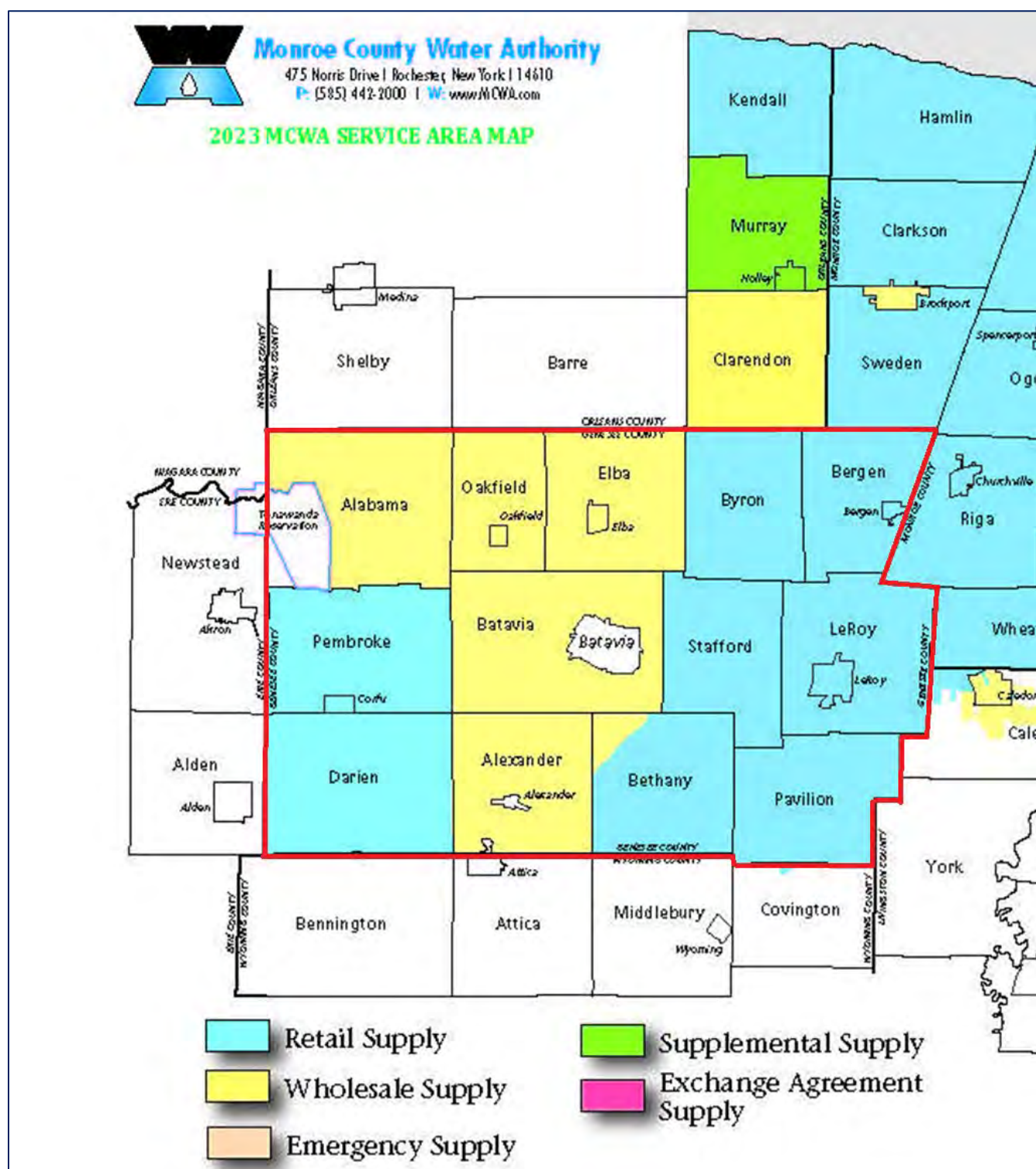
Potable water in Genesee County is provided by private wells; systems maintained by the Village of Attica, City of Batavia, and Village of Elba, the Tonawanda Creek and associated aquifer; and the Monroe County Water Authority (MCWA), which draws water from Lake Ontario and Hemlock Lake. MCWA serves the following towns (T) and villages (V) in Genesee County:

• Alabama (T)	• Bergen (V)	• Elba (T)	• Oakfield (T)
• Alexander (T)	• Byron (T)	• Elba (V)	• Oakfield (V)
• Batavia (T)	• Corfu (V)	• LeRoy (T)	• Pavilion (T)
• Bergen (T)	• Darien (T)	• LeRoy (V)	• Pembroke (T)
			• Stafford (T)

The Town of Alexander, Town of Batavia, and Town and Village of Oakfield are served from the City of Batavia's water plant. Parts of the Town of Alabama, Town of Darien, and Town of Pembroke are served through the MCWA with ECWA source water. The Corfu Water Plant, operated by the MCWA, supplies the Village of Corfu and parts of the Town of Darien and Town of Pembroke. Figure 18-1 shows the sources of water for Genesee County's municipalities that purchase water from the MCWA. The Village of Elba switched from City of Batavia's water plan to the MCWA as its water supplier in 2019. Small parts of the Town of Alabama and Town of Darien are served by the Village of Akron Water System. The Village of Alexander and parts of the Town of Alexander are also serviced by the Village of Attica's water supply.



Figure 18-1. Genesee County MCWA Service Area by Supply



Source: MCWA 2023

Note: Genesee County is indicated with the red outline. Villages within serviced towns also draw their water from the same place.



18.1.3 Extent

The extent and severity of a power outage depends on the cause, location, duration, and time of year. It can range from a small, localized event to a countywide power outage. Impacts from an outage can be significant to the County and its residents.

Utility interruptions often result from damage to or electrical hazards within an electric power system. System components include power generation plants, substations, circuits, switches, transformers, power lines, and power poles. Because the varied nature of power outages can range from vehicle accidents to severe weather, utility interruptions can happen at any time.

Utility interruptions lead to the inability to use electric-powered equipment, such as: lighting; heating, ventilation, and air conditioning (HVAC) and necessary equipment; communications equipment (telephones, computers, etc.); fire and security systems; small appliances, such as refrigerators, sterilizers, etc.; and medical equipment. These types of failures can lead to food spoilage, loss of heating and cooling, basement flooding from sump pump failure, and loss of water from well pump failure.

18.1.4 Previous Occurrences

Federal Emergency Management Agency (FEMA) Major Disaster and Emergency Declarations

Between 1954 and 2024, Genesee County was included in one major disaster (DR) or emergency (EM) declaration for utility interruption-related events (FEMA 2024). Table 18-1 lists statewide declarations.

Table 18-1. FEMA Declarations for Utility Interruption Events in Genesee County (1954 to 2024)

Event Date	Declaration Date	Declaration Number	Description
August 14, 2003	August 23, 2003	EM-3186	Widespread power outages

Sources: FEMA 2024

U.S. Department of Agriculture (USDA) Declarations

The 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. Between 2017 and 2024, Genesee County was not included in any USDA utility interruption-related agricultural disaster declarations (USDA 2024).

Previous Events

Known hazard events that impacted Genesee County between January 2019 and December 2024 are discussed in Table 18-2. For events prior to 2017, refer to the 2019 Genesee County Hazard Mitigation Plan (HMP).

Table 18-2. Utility Interruption Events in Genesee County (2017 to 2024)

Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
January 4, 2017	-	-	Regional, Countywide	Strong, gusty winds between 50 and 60 mph impacted parts of Erie,



Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
				Genesee and Chautauqua counties. The strong winds downed trees and power lines. Power outages were reported by New York State Electric and Gas and National Grid in all three counties.
January 11, 2017	-	-	Regional, Countywide	Gusty winds up to 64 mph downed trees and power lines. Several thousand customers were without power. Numerous roads were closed because they were blocked by fallen trees. There was also damage reported to several home and cars caused by falling trees.
April 5, 2018	-	-	Darien, Byron, Bergen, Alexander, Oakfield, Stafford, Le Roy, and Pavilion	113 mph high gust winds caused 824 customers in Genesee County to experience power outages. Much of Upstate New York were without power.
April 14, 2018			Regional, Countywide	Sleet transitioned to freezing rain before temperatures eventually increased above freezing. Several areas saw nearly an inch of sleet combined with around .5 inch of freezing rain. This resulted in thousands of power outages and substantial tree damage.
February 24, 2019	-	-	Genesee County	A power outage impacted more than 1,018 customers in Genesee County.
May 31, 2019	-	-	Batavia	A power outage on Highland through Pringle Avenue affected 24 customers.
October 31 – November 1, 2019	-	-	Regional, Countywide	Severe storms brought gusting winds. Thousands of power outages occurred across the area, and pervasive wind-related damage closed hundreds of roads and did countless tree damage.



Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
January 5, 2020	-	-	Le Roy, Stafford, Bethany, South Byron	A power outage affected more than 5,000 customers. The outage impacted majority of the east side of Genesee County.
November 15, 2020	-	-	Western NY	A severe storm left 35,00 customers without power across Western NY. Approximately 13 customers in Genesee County experienced an outage.
November 30, 2020	-	-	Byron, South Byron, and Bergen	More than 1,000 customers were affected by a power outage in Byron, South Byron, and Bergen area. There was no report of cause.
June 30, 2021	-	-	East Batavia, Stafford, Bethany, and Byron	A power outage affected more than 4,600 customers in the northeast section of Batavia through to Byron, Stafford, and East Bethany.
January 19, 2022	-	-	Central Batavia	A power outage affected 1,548 customers in the central part of Batavia.
June 4, 2022	-	-	South Batavia	A power outage affected 1,220 customers. The affected area included Walnut Ave, south to the City line.
August 17, 2022	-	-	Batavia	Power outage affected 2,455 customers on the north side of Batavia.
November 24, 2022	-	-	Batavia	A vehicle accident caused a significant power surge in the area.
December 23, 2022	-	-	Regional	Due to inclement weather, over 1,800 customers experienced power outages in Genesee County.
February 22, 2023	-	-	Regional, Countywide	Widespread sleet and freezing rain fell across much of western New York. Significant icing occurred resulting in scattered downed tree branches and nearly



Event Date	FEMA Declaration or State Proclamation Number	Genesee County Included in Declaration?	Location Impacted	Description
				20,000 without power at the height of the storm.
July 16, 2023	-	-	Oakfield	A power outage affecting 829 customers on Lockport Road and Lewiston Road.
January 6, 2024	-	-	Regional	As part of an upgrade to the system, National Grid scheduled a routine power outage for Genesee County region on January 6.

Sources: *The Batavian* 2018, 2019, 2020, 2023, 2024; NOAA NCEI 2024

18.1.5 Probability of Future Occurrences

While the probability of future utility interruption incidents in Genesee County is difficult to predict, historical records indicate that significant utility interruptions have occurred as a result of high winds, lightning, winter weather, and technological failures. Data were not readily available on the frequency of smaller power outages across the County; however, it is reasonable to assume that utility interruption events of shorter duration will continue to occur in the future. In addition, future changes in climate may also impact the frequency and probability of future utility interruption occurrences.

The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 20, the identified hazards of concern for Genesee County were ranked. Based on historical records and input from the Steering Committee, the probability of occurrence for utility interruption in the County is considered “frequent.”

Climate Change Projections

Climate change projections are indicating an increase in temperature for the State of New York and Yates County, along with an increase in the number and intensity of severe weather events. Warmer temperatures may lead to an increase in extreme hot and cold temperature events; this can lead to greater strains on utilities, increasing the likelihood of utility failures. More frequent and strong storms with higher wind speeds will increase the chance of utility failures as well. Additionally, climatologists predict an increase in precipitation, which may lead to more severe winter weather, causing additional utility failures. Excess and extreme heat can lead to increased outages and other utility failure, especially as infrastructure continues to age.

18.1.6 Cascading Impacts on Other Hazards

Utility interruptions can lead to secondary hazards as well, leading to negative impacts on the health and safety of residents.

- Residents who rely on electric medical devices such as home oxygen machines, medication nebulizers, home dialysis, infusion pumps, and electric wheelchairs may face life-threatening situations if power failure extends beyond the battery backup timeframe of their device (Huff 2021).



- If climate control systems, such as air conditioning or heating, stop working during periods of extreme heat or extreme cold, vulnerable populations such as the elderly and those with chronic health conditions may face an elevated risk of hypothermia or heat stroke.
- Utility failure can lead to food spoilage, which has negative impacts on public health.
- Downed powerlines can spark fires that can spread and impact the rest of the County.
- Utility failure can affect communication lines that may limit connectivity to emergency responders, which would negatively affect any segment of the population that would need their services.
- Utility outages can also lead to instances of civil disturbance, including looting.
- Utility interruptions at chemical handling plants pose the risk of a chemical spill during restart, with significant health and environmental impacts (EPA 2001).
- Interruption of wastewater and potable water utilities may have cascading economic and environmental impacts.
- Lack of power can prevent fuel pumps from operating and lead to fuel shortages.
- Traffic accidents may increase because of the lack of traffic control devices such as stoplights and railroad crossing advisory signals. Utility outages lasting a long duration will require law enforcement officials to man traffic control points to prevent accidents.

18.2 VULNERABILITY AND IMPACT ASSESSMENT

To understand risk, a community must evaluate the assets that are exposed or vulnerable within the identified hazard area. For the Utility Interruption hazard, all of Genesee County has been identified as the hazard area. Therefore, all assets in the County (population, structures, critical facilities, and lifelines), as described in the County Profile, Chapter 3, are vulnerable to a utility interruption. This section discusses the potential impact of the utility interruption hazard on the County.

18.2.1 Life, Health, and Safety

Overall Population

For the purposes of this HMP, the entire population in Genesee County is considered vulnerable to utility interruption events. Utility interruptions pose potential health impacts including injury and death. Other issues pertaining to power outages include food safety from lack of refrigeration and carbon monoxide poisoning from misuse of generators.

During utility failures, water purification systems may not function. Further, populations relying on private wells will not have access to potable water. A lack of clean, potable water has health implications for all people, and a lack of water supply may also impact sewer systems and availability of sewer service.

During communications outages, individuals within the County may not be able to contact emergency response resources through the 911 system. This could lead to a delay or lack of emergency medical care, possibly resulting in death.



Socially Vulnerable Population

Utility Interruption is particularly problematic for homes that are heated with electricity. Widespread power outages during the winter months can directly impact vulnerable populations, such as the elderly and medically frail. Individuals with medical needs are vulnerable to utility interruptions because medical equipment, such as oxygen concentrators, requires electricity to operate. The elderly population (persons over 65 years old) is also vulnerable to the effects of utility interruption, as utility interruption could expose older residents to extreme heat or extreme cold. Over 20 percent of persons are over 65 years old in Genesee County (American Community Survey 2022).

Furthermore, during utility interruption events, water purification systems may not function. Populations relying on private wells will not have access to potable water. Additionally, many power outage events are caused by storm events that can lead to flooding. Without electricity, residents would be unable to pump water from their basements, potentially causing structural and content damage to their homes.

Individuals powering their homes with generators are subjected to carbon monoxide poisoning if proper ventilation procedures are not followed. Improperly connected portable generators are capable of “back feeding” power lines, which may cause injury or death to utility works attempting to restore power and may damage house wiring and/or generators (Community Health Care Association of New York State 2020).

18.2.2 General Building Stock

All building stock in the County is exposed to the utility interruption hazard. Chapter 3, County Profile, summarizes the building inventory in Genesee County. Impacts sustained from utility interruption are likely to be secondary impacts. Should potable water distribution be reduced or not available, then structures could be at increased risk for structural fire because current fire suppression is dependent on accessing water from hydrants.

Many power outage events are caused by storm events that can lead to flooding. Without electricity, residents would be unable to pump water from their basements, potentially causing damage to their homes' structure or contents.

18.2.3 Community Lifelines and Other Critical Facilities

All critical facilities in the County are exposed to the utility interruption hazard. It is essential that critical facilities remain operational during natural hazard events. Backup power is recommended for critical facilities and infrastructure. Loss of power can have serious impacts on the health and welfare of residents, continuity of business, and the ability of public safety agencies to respond to emergencies. Interruption of utility gas or water distribution could also reduce the effectiveness of critical facilities to operate at full capacity.

18.2.4 Economy

A prolonged utility interruption in Genesee County may impact the County's economy. All roadway systems and supporting resources provide services locally, regionally, nationally, and internationally. Disruption in any of these services would mean that many workers, residents, and travelers would not be able to go where needed.

Power interruptions can cause economic impacts stemming from lost income, spoiled food and other goods, costs to the owners/operators of the utility facilities, and costs to government and community service groups. Interruption of utility gas or potable water distribution could also cause significant economic impacts such as additional costs for bringing in water tenders to maintain fire suppression capabilities; opening additional warming centers should



electric and utility gas utility be interrupted to residential areas; and distribution of potable water for public consumption. Significant costs could be associated with reimbursing fire departments from other counties within New York to travel, staff, and maintain water tenders within Genesee County during the duration of a water outage event.

Potential modeling of economic impacts from utility interruption would be developed by calculating interruption of service costs derived from a standard value per person per day multiplied out by the number of customers served. This would help to provide an estimate of the impact of the interrupted utility service but may not be representative of the complete economic impact of a prolonged utility interruption. For example, FEMA's benefit-cost analysis (BCA) methodology measures the loss of electrical service on a per-person-per-day-of-lost-service basis for the service area affected. The FEMA BCA Toolkit version 6.0 uses the following standard values to estimate cost of utility usage per person per day (FEMA 2023):

- Electric: \$174.00
- Potable Water: \$114.00
- Wastewater: \$58.00

18.2.5 Natural, Historic and Cultural Resources

Natural

At this time, there are no known impacts to the environment caused by utility interruptions. Some indirect impacts to the environment are potential wildfires sparked from downed electric wires, which could affect animals that rely on the forest as a habitat.

Historic

Utility interruptions, such as power outages, have the potential to impact historical structures and places as they rely on electricity to operate. Historical structures benefit the County's economy by drawing tourism and businesses. Power outage, wastewater failure, or potable water failure has the potential to impact these important assets to the community and economy.

Cultural

Cultural facilities, such as community centers, are major hubs for community engagement and coordination. Power outage, wastewater failure, or potable water failure has the potential to impact cultural facilities, which can drastically affect the community.

18.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.



18.3.1 Potential or Planned Development

Any areas of growth could be potentially impacted by utility interruptions because the entire county is exposed and vulnerable. However, because of increased standards and codes, new development may be less vulnerable to utility interruptions compared to the aging building stock in the County. Chapter 3, County Profile, provides more information about the new development plans for Genesee County.

18.3.2 Projected Changes in Population

According to the U.S. Census, the population for Genesee County has decreased approximately 1.5 percent between 2020 and 2023 (American Community Survey 2022). Estimated population projections provided by the 2017 Cornell Program on Applied Demographics indicates that the County's total population will increase to approximately 54,128 residents by 2040 (Cornell University 2017). With the projected estimates, more people will reside in the County, resulting in a higher reliance on electric power or more will be living/working out of properties that do not meet existing codes and are at risk of experiencing utility interruption events. Chapter 3, County Profile, provides additional discussion on population trends.

18.3.3 Climate Change

Several implications for climate change are related to the utility interruption hazard. Providing projections of future climate change for a specific region is challenging. Shorter-term projections are more closely tied to existing trends making longer-term projections even more challenging. The further out a prediction reaches, the more subject to changing dynamics it becomes.

Climatologists predict an increase in the number and intensity of severe weather events. More storms with higher winds will increase the chance that the power infrastructure will be impacted. Extreme temperatures are predicted to increase as well. During the hot summer months, the potential for power overload will increase as demand for power increases. Additionally, climatologists predict an increase in precipitation, which may lead to more winter weather, causing additional utility interruptions and utility interruptions.

18.3.4 Other Identified Conditions

Overall, the County's vulnerability has not changed since the previous HMP. Vulnerability of the entire County to the utility failure hazard will continue.



19. WILDFIRE

19.1 HAZARD PROFILE

19.1.1 Hazard Description

A wildfire is defined as an uncontrolled fire spreading through natural or unnatural vegetation that can threaten lives and property if not contained. Wildfires are commonly termed forest fires, brush fires, grass fires, wildland-urban interface (WUI) fires, range fires, or ground fires. Wildfires do not include fires naturally or purposely ignited to manage vegetation for one or more benefits (NYS DHSES 2023). Although destructive fires do not occur annually, the State of New York's fire history shows a cycle of outbreaks that have caused human death, property loss, forest destruction, and air pollution (NYS DHSES 2023).

Several factors create conditions prime for wildfire hazards to occur. The interaction of fuel sources (vegetation and/or structure of the built environment), weather, and topography determines how a wildfire grows. A variety of weather conditions can promote wildfire events, such as high temperatures during heat waves, low humidity, lack of precipitation, droughts, as well as high winds. Likewise, environmental factors like hilly terrain can promote the spread of wildfires. Fires tend to move more rapidly uphill because rising air currents from the flames and the advancing heat dry out the vegetation in front of the fire (NYS DHSES 2023).

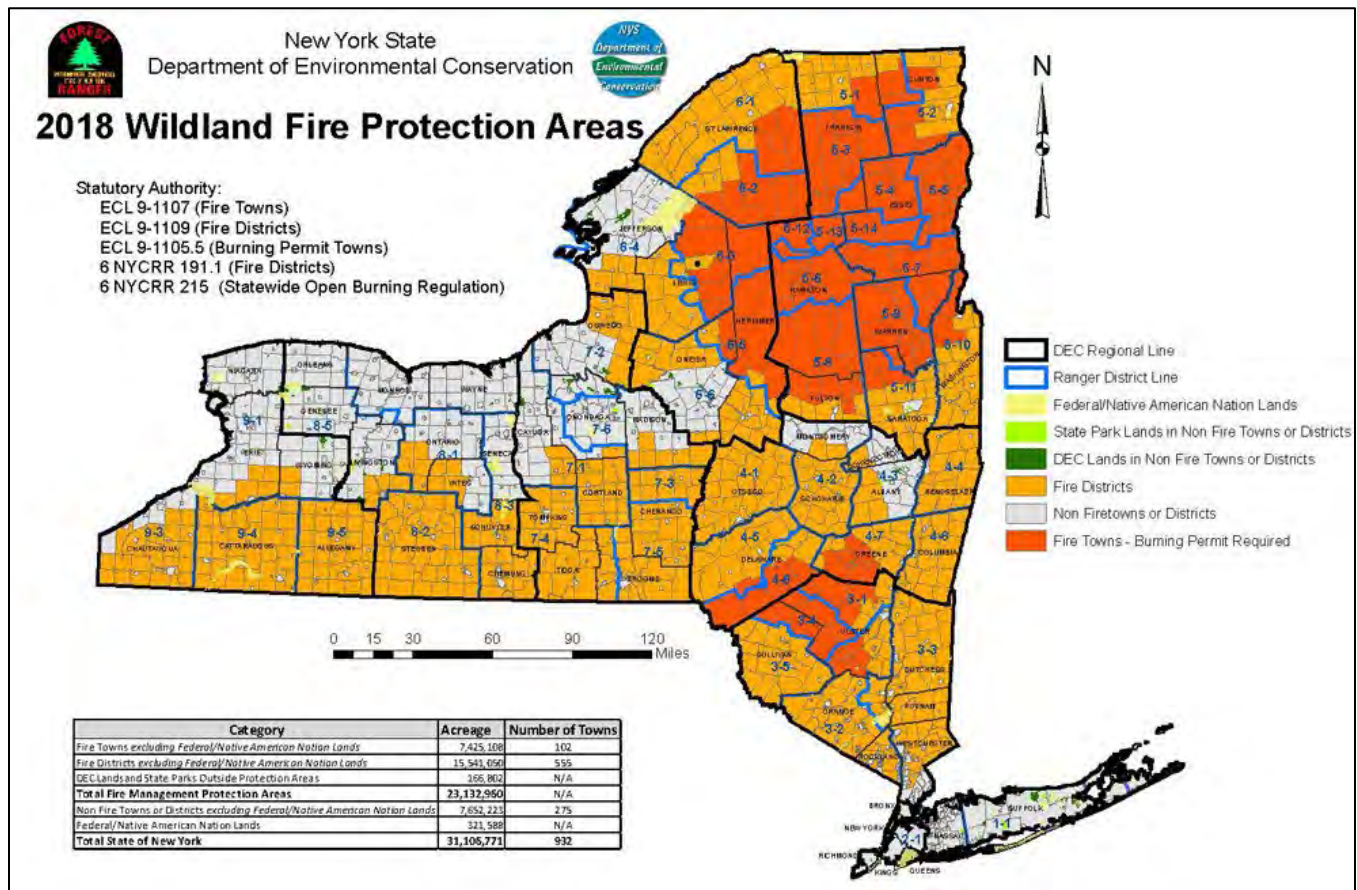
Humans or lightning strikes are the most common sources of wildfires, and the burn scars they produce can exacerbate flooding issues (especially in hilly terrain). Problems with transportation, gas, power, and communication systems are also areas where wildfire hazards can have detrimental impacts. (FEMA 2018). Wildland fires can also encroach on human development and structures of the built environment, and the resulting fire damage can be catastrophic (FEMA 2008). The zone of transition between unoccupied land and human development is called the WUI, and the United States Fire Administration (USFA) defines this area or zone as being one where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels (USFA 2022).

19.1.2 Location

Wildfires occur throughout the State of New York, including in Genesee County. Areas most prone to this natural hazard are regions that are heavily forested or contain large tracts of brush and shrubs (Genesee County 2019).

The New York State Department of Environmental Conservation (NYSDEC) Division of Forest Protection (Forest Ranger Division) is designated as the state's lead agency for wildfire mitigation. The Forest Ranger Division has a statutory requirement to provide a forest fire protection system for 657 of the 932 jurisdictions throughout New York State. This jurisdiction includes cities and villages and covers 23.1 million acres of land, including all state-owned land outside of the jurisdictions. The Lake Ontario Plains and New York City-Long Island areas are the general areas not under the statutory requirement. Records on wildfires in this area are collected from fire department reports to evaluate any need to expand statutory responsibilities. Figure 19-1 displays the fire protection areas in New York State (NYS DEC 2024). Figure 19-1 indicates that, as of 2018, Genesee County is not part of the wildfire protection area.

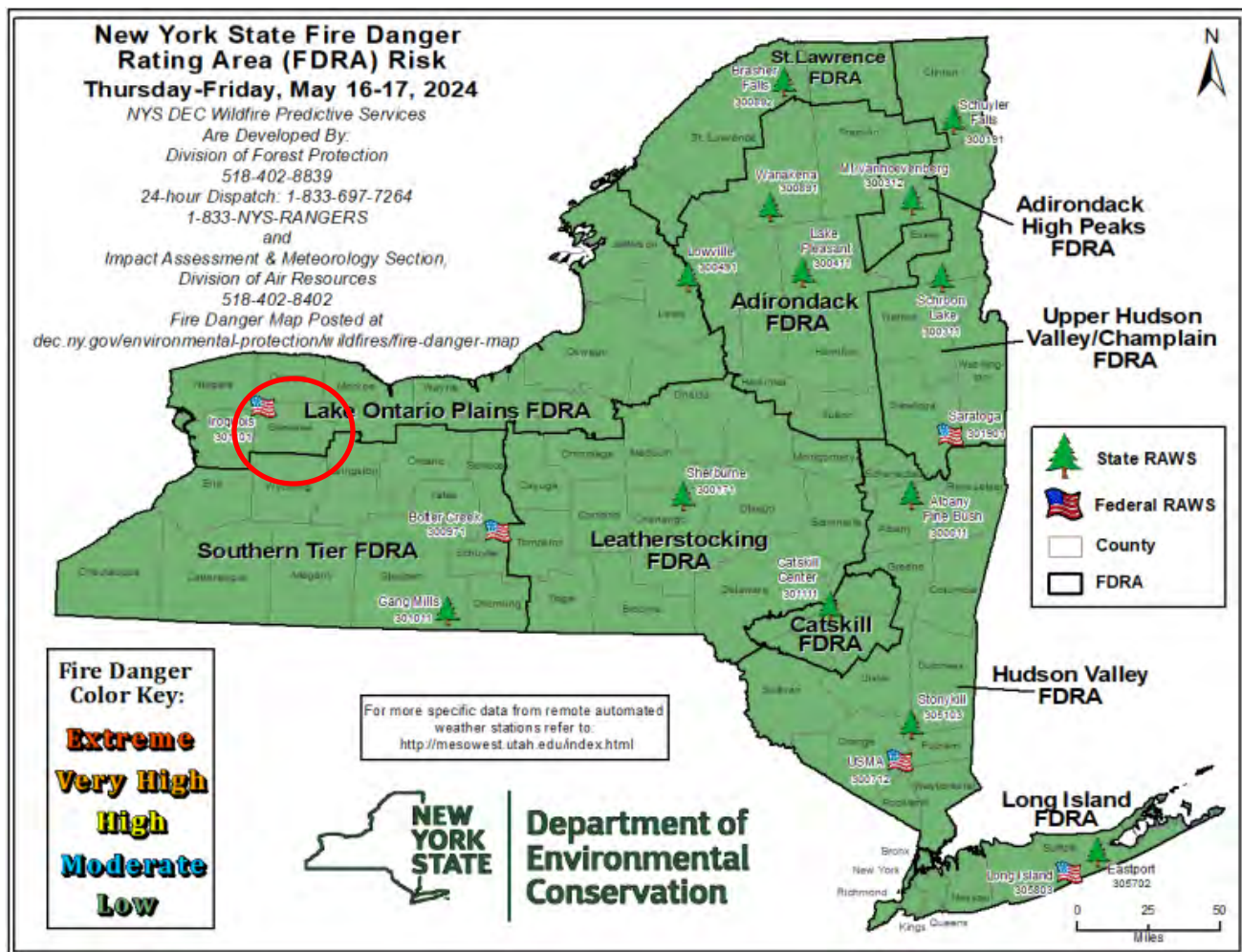
Figure 19-1. Wildland Fire Protection Areas of New York State



Source: NYS DEC 2024

The State of New York is divided into 10 Fire Danger Rating Areas (FDRAs) based on which areas have similar vegetation, climate, and topography features. Additionally, FDRAs are formed in conjunction with agency regional boundaries, National Weather Service (NWS) fire weather zones, political boundaries, fire occurrence history, and other influences (Genesee County 2019). Genesee County is part of the Lake Ontario Plains FDRA. The Forest Ranger Division issues daily fire danger warnings when the Fire Danger Rating within one or more FDRAs is at "high" or above. Current Fire Danger Rating maps are updated daily and available online through the [NYSDEC website](https://www.nysdec.gov/). Figure 19-2 shows an example of this map.

Figure 19-2. New York State FDRAs



Source: NYSDEC 2014

Note: The approximate location of Genesee County is indicated by the red circle.

WUI in New York State/Genesee County

The WUI is any location where human structures and woodlands intermingle, allowing a wildland fire to reach beyond trees, brush, and other natural fuels to ignite homes and their immediate surroundings (NYSDEC n.d.). The WUI can also be subdivided into three categories: intermix, interface, and occluded/interior (Sustainable Defensible Space n.d.). The NYS Hazard Mitigation Plan (HMP) indicates that New York State has all three types of WUI interfaces.

The Adirondack and Catskill Mountains contain large tracts of forests with the mixed, and to a lesser extent, the classic interface occurring throughout. The remainder of the state contains classic and mixed interfaces, with some major cities containing an occluded interface.

Population migration from urban to suburban and rural living will continue, increasing the possibility of loss or damage to structures in the WUI, for a number of reasons. Many property owners are unaware that a threat from a wildfire exists or that their homes are not defensible from it. Water supplies at the scene in the WUI are often inadequate. Access by firefighting equipment is often blocked or hindered by driveways that are narrow, winding, dead-ended, have tight turning radii, or have weight restrictions. Most wildland fire suppression personnel are

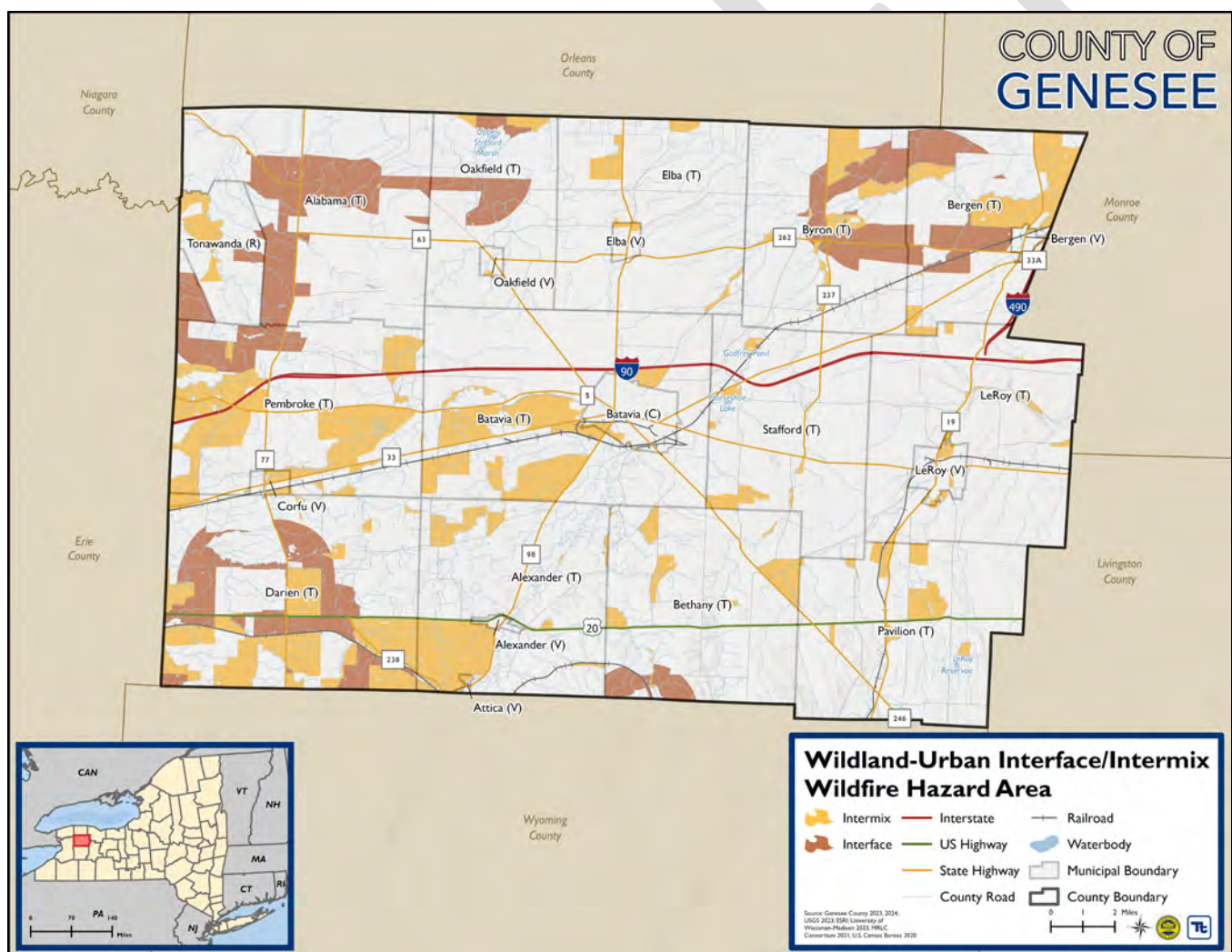


inadequately prepared for fighting structural fires, and local fire departments are not usually fully trained or equipped for wildfire suppression. Furthermore, the mix of structures, ornamental vegetation, and wildland fuels may cause erratic fire behavior. These factors and others substantially increase risk to life, property, and economic welfare in the WUI.

While many interface communities are present throughout the State of New York and Genesee County, an official list that details the location, type of interface, and surrounding fuel makeup does not exist (NYS DHSES 2011).

A detailed WUI (interface and intermix) that also defines the wildfire hazard area was obtained through the SILVIS Laboratory, Department of Forest Ecology and Management, University of Wisconsin – Madison. The California Fire Alliance determined that areas within 1.5 miles of wildland vegetation are the approximate distance that firebrands can be carried from a wildland fire to the roof of a house. Therefore, even structures not located within the forest are at risk from wildfire. This buffer distance, along with housing density and vegetation type, were used to define the WUI illustrated on Figure 19-3 (Radeloff 2018). Specifically, significant portions of land area in the Towns of Alabama, Alexander, Batavia, Bergen, Byron, Darien, and Oakfield are within the WUI interface/intermix, as shown in Figure 19-3.

Figure 19-3. WUI in Genesee County





19.1.3 Extent

Wildfire events can range in size and intensity. A wildfire's intensity depends significantly on both meteorological conditions and human activity.

Wildfire Behavior and Fire Ecology

Fire behavior is defined as the way fuel ignites, flame develops, and fire spreads, which depend on interactions among fuel, weather, and topography. Fire behavior is one of the most important aspects of wildfires because almost all actions in response to a fire depend on how it behaves. The extent to which fire managers can understand and predict fire behavior relies on success in pre-suppression planning and actual suppression of wildfires.

Potential for wildfire and its subsequent development (growth) and severity are controlled by the three principal factors of topography, fuel, and weather, described as follows:

Topography – Topography can powerfully influence wildfire behavior. 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 behavior 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.

Fuel – Fuels are classified by weight or volume (fuel loading) and by type. Fuel loading is used to describe 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 burn qualities, and some burn more easily than others. Grass fires release relatively little energy but can sustain very high rates of spread (FEMA 1997). According to the U.S. Forest Service (USFS), a forest stand may consist of several layers of live and dead vegetation in the understory (surface fuels), midstory (ladder fuels), and overstory (crown fuels):

- 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 likelihood that future wildfires will grow into crown fires.
- 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 is the most important factor influencing fire behavior, but it is always changing. Air mass, defined by the NWS as a body of air covering a relatively wide area and exhibiting horizontally uniform properties, can affect wildfire through climatic factors that include temperature and relative humidity, local wind speed and direction, cloud cover, precipitation amount and duration, and stability of the atmosphere at the time of the fire (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 1997).

Several tools are available to estimate fire potential, extent, danger, and growth, including, but not limited to, the following:

- The Wildland Fire Assessment System (WFAS) is an internet-based information system that provides a national view of weather and fire potential, including national fires danger, weather maps, and satellite-derived “greenness” maps (USFS n.d.).
- The Fire Potential Index (FPI) is derived by combining information on daily weather and vegetation condition and can identify areas most susceptible to fire ignition (Burgan, Klaver and Klaver 2000).
- Fuel Moisture (FM) content is quantity of water in a fuel particle expressed as a percent of oven-dry weight of the fuel particle and is an expression of cumulative effects of past and present weather events, to help evaluate the effects of current or future weather on fire potential (Burgan, Klaver and Klaver 2000).
- The Keetch-Byram Drought Index (KBDI) is designed for fire potential assessment and is a number representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers (USFS n.d.).
- The Haines Index, also known as the Lower Atmosphere Stability Index, is a fire weather index based on stability and moisture content of the lower atmosphere that measures potential for existing fires to become large fires (USFS n.d.).
- The Buildup Index (BUI) is a number that reflects combined cumulative effects of daily drying and precipitation in fuels with a 10-day time lag constant (North Carolina Forest Service 2009).

The Fire Danger Rating in New York is established using information from the National Fire Danger Rating System (NFDRS) and takes into account current and antecedent weather, fuel types, and both live and dead FM. This information is provided by local station managers (USFS n.d.) in each of the 10 regions of the State of New York. Figure 19-2 shows an example of an FDRA in NYS and the fire danger risk within each area on a specific date. Genesee County is part of the Lake Ontario Plains FDRA. On this particular day, the Lake Ontario Plains Fire Danger Rating was low, however some parts of the state were experiencing moderate fire danger. Table 19-1 lists Fire Danger Ratings and color codes, also used by NYSDEC to update its Fire Danger Rating maps, identified earlier in Figure 19-2.

Table 19-3. Description of Fire Danger Ratings in the State of New York

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.



Adjective Rating Class and Color Code	Class Description
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: NYS DHSES 2022

19.1.4 Previous Occurrences

Federal Emergency Management Agency (FEMA) Major Disaster and Emergency Declarations

Between 1954 and 2024, Genesee County was not included in any major disaster (DR) or emergency (EM) declarations for wildfire-related events (FEMA 2024).

U.S. Department of Agriculture (USDA) Declarations

The 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. Between 2017 and 2024, Genesee County was not included in any USDA wildfire-related agricultural disaster declarations (USDA 2024).

Previous Events

Many sources provided historical information regarding previous occurrences and losses associated with wildfires throughout the State of New York and Genesee County; therefore, the loss and impact information for many events varies depending on the source. The accuracy of monetary figures discussed is based on the available information in cited sources.

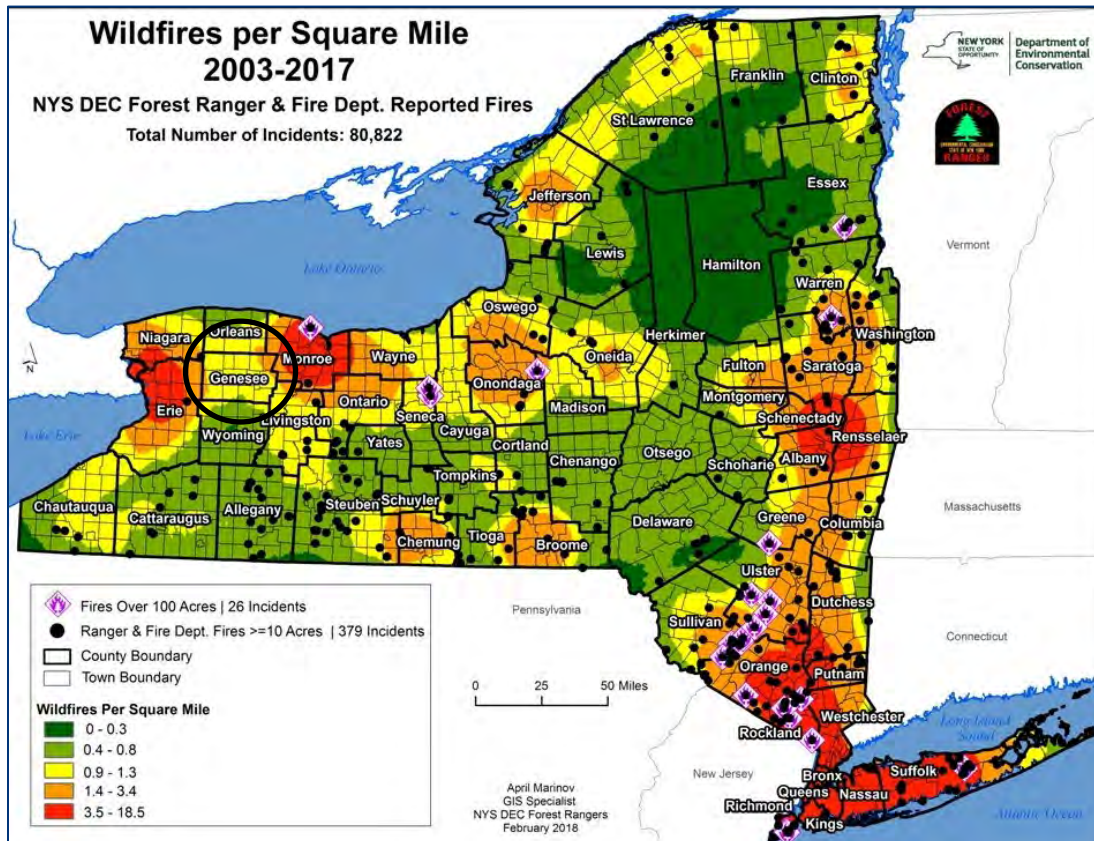
Short-term effects of wildfires can include destruction of timber, forest, wildlife habitats, scenic vistas, and watersheds. Business and transportation can also be disrupted in the short term. Long-term effects can include reduced access to recreational areas and destruction of community infrastructure and cultural and economic resources (USDA n.d.).

According to Ranger Division wildfire occurrence data from 1993 through 2017, 95 percent of wildfires in New York were human-caused; the remaining 5 percent are the result of lightning. With regard to human-caused fires, debris



burning accounted for 33 percent; arson accounted for 16 percent; campfires accounted for 16 percent; children accounted for 4 percent; and smoking, equipment, and railroads accounted for 25 percent (NYSDEC 2022). Figure 19-4 illustrates occurrences of natural vegetation wildfires in the State of New York between 2003 and 2017. This figure reveals occurrences of between 0 and 3.4 wildfires per square mile within Genesee County municipalities, with the highest number focused on the upper eastern portion of the County.

Figure 19-4. Wildfire Occurrences in New York State, 2003-2017



Source: NYSDEC 2022

Note: The black oval indicates the location of Genesee County.

19.1.5 Probability of Future Occurrences

According to the New York State Forest Ranger Division, wildfire occurrence data from 1993 to 2017 have shown that the State of New York, including Genesee County, is susceptible to wildfires. Beginning in 2010, the State of New York enacted revised open burning regulations that ban brush burning statewide during this time period. Forest ranger data indicate that this new statewide ban resulted in 74 percent fewer wildfires caused by debris burning in upstate New York from 2010 to 2012. Forest ranger and fire department historical fire occurrence data recorded after the new burn ban regulations were enacted in 2010 will serve as a benchmark for analysis of wildfire occurrence (NYS DHSES 2014).

Fire probability depends on local weather conditions, outdoor activities (such as camping, debris burning, and construction) and the degree of public cooperation with fire prevention measures. Dry weather, such as drought, can increase the likelihood of wildfire events. Lightning can also trigger wildfire and urban fire events. Other natural disasters can increase the probability of wildfires by producing fuel in both urban and rural areas. Forest damage



from hurricanes and tornadoes may block interior access roads and fire breaks, pull down overhead power lines, or damage pavement and underground utilities (NVRC 2006).

Wildfire experts point to four reasons why wildfire risks are increasing (NYS DHSES 2011):

- Fuel, in the form of fallen leaves, branches, and plant growth, has accumulated over time on the forest floor. Now, this fuel has the potential to “feed” a wildfire.
- Increasingly hot, dry weather has occurred and will occur within the United States.
- Weather patterns across the country are changing.
- More homes are built within areas of WUI, meaning that homes are built closer to wildland areas where wildfires can occur.

Annual small wildfires likely will occur throughout the State of New. However, advanced methods of wildfire management and control and a better understanding of the fire ecosystems should reduce the number of devastating fires in the future (NYS DHSES 2011).

The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 20, the identified hazards of concern for Genesee County were ranked. Based on historical records and input from the Steering Committee, the probability of occurrence for wildfire in the County is considered “occasional.”

Climate Change Projections

The State of New York experiences fires every year, especially in the spring, and nearly all wildfires that occur are started by humans. From 1919 to 2018, the number and size of fires in the state has declined due to improving efforts to prevent, detect, and extinguish fires. However, fire weather conditions, including high temperature, low humidity, and high wind, have increased from 1919 to 2018 (Stevens & Lamie 2024).

Climate change will lead to more frequent and intense wildfires in many states. 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).

A gradual change in temperatures will alter the growing environment of many tree species throughout the United States and the State of New York, reducing the growth of some trees and increasing the growth of others. Tree growth and regeneration may be affected more by extreme weather events and climatic conditions than by gradual changes in temperature or precipitation. Warmer temperatures may lead to longer dry seasons and multi-year droughts, creating triggers for wildfires, insects, and invasive species. Increased temperature and change in precipitation will also affect FM during wildfire season and the length of time wildfires can burn in a given year (USDA 2011).

Climate change may also increase the frequency of lightning strikes. A warmer atmosphere holds more moisture, which is one of the key items for triggering a lightning strike. Lightning strikes cause approximately half of the wildfires in the United States. If the frequency of lightning strikes increases, the potential for wildfires from these strikes also increases (Lee 2014). Wildfire incidents are predicted to increase throughout the United States because of climate change, causing at least a doubling of areas burned within the next century (USDA 2011).

Climate change directly and indirectly affects growth and productivity of forests: directly as a result of changes in atmospheric carbon dioxide and climate, and indirectly through complex interactions within forest ecosystems. Climate also affects the frequency and severity of many forest disturbances, such as infestations, invasive species,



wildfires, and storm events. As temperatures increase, the suitability of a habitat for specific types of trees changes. There is also evidence that prolonged heat waves are likely to lead to a greater number of wildfires. Stronger winds from larger storms may lead to more fallen branches for wildfires to consume. An increase in rain and snow events primes forests for fire by supporting growth of more fuel. Drought and warmer temperatures lead to drier forest fuels (Stevens & Lamie 2024).

19.1.6 Cascading Impacts on Other Hazards

Following wildfires, cascading hazards such as debris flow, landslides, and flooding may occur due to loss of stabilizing vegetation, resulting in potentially catastrophic sequences. When wildfire hits in drought-stricken areas, watersheds and reservoirs can be further impacted by ash and debris flows, water treatment facilities may shut down with damage or loss of power, crops can be destroyed, and smoke can affect animal and human health (NIDIS 2023).

Wildfires result in the uncontrolled destruction of forests, brush, field crops, grasslands, real estate, and personal property and have secondary impacts on other hazards such as flooding, by removing vegetation and destroying watersheds. Additionally, wildfires can increase because of rising temperatures and increased droughts. More information about extreme temperature and drought hazards of concern is provided in Chapter 11 and Chapter 8, respectively.

Severe wildfires can result in a loss of vegetation that causes slope instability. This can contribute to an increase in landslide events. Vegetation loss can also increase the amount of runoff during rainfall events, increasing the likelihood of flash flooding. For more information on the flood hazard, refer to Chapter 12.

Flooding after a wildfire is often more severe, as debris and ash left from the fire can form mudflows. During and after a rain event, as water moves across charred and denuded ground, it can also pick up soil and sediment and carry it in a stream of floodwaters. These mudflows have the potential to cause significant damage to impacted areas. Areas directly affected by fires and those located below or downstream of burn areas are most at risk for flooding (FEMA 2020). For more information on the flood hazard, refer to Chapter 12.

As previously mentioned, 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).

19.2 VULNERABILITY AND IMPACT ASSESSMENT

To understand risk, a community must evaluate what assets are exposed or vulnerable within the hazard area identified. To determine what assets are exposed to wildfire, the WUI hazard boundaries were overlaid with the asset inventories. Assets with their centroid located in the hazard area were totaled to estimate the totals and values at risk from the impacts of a wildfire event. Refer to Chapter 4 (Methodology and Tools) for additional details on the methodology used to assess wildfire risk. The following discusses Genesee County's vulnerability to the wildfire hazard.



19.2.1 Life, Health, and Safety

Overall Population

Wildfires have the potential to impact human health and life of residents and responders, structures, infrastructure, and natural resources. Given the immediate response times to reported wildfires, the likelihood of injuries and casualties is minimal. Smoke and air pollution from wildfires can be a health hazard, especially for sensitive populations, including children, the elderly, and those with respiratory and cardiovascular diseases. Wildfire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. The most vulnerable populations include emergency responders and those within a short distance of the interface between the built environment and the wildland environment. Table 19-2 summarizes the estimated population exposed to the wildfire hazard by jurisdiction.

Based on the analysis, an estimated 4,371 residents (7.2 percent of the County population) are located in the WUI interface hazard area, and 7,875 residents (12.9 percent of the County's population) are located in the WUI intermix hazard areas. Overall, the Town of Darien has the greatest number of individuals located in the WUI hazard area (1,117). The Towns of Batavia and Pembroke had the highest number of individuals located in the wildland-urban intermix hazard area (1,235 each).

Table 19-4. Estimated Population within the WUI in Genesee County

Jurisdiction	Total Population (2020 Decennial Census)	Estimated Population Located Within the Wildland-Urban Interface/Intermix (WUI) Wildfire Hazard Areas			
		Number of People in the WUI Interface Wildfire Hazard Area	Percent of Total	Number of People in the WUI Intermix Wildfire Hazard Area	Percent of Total
Alabama (T)	1,602	839	52.4%	9	0.6%
Alexander (T)	1,973	0	0.0%	526	26.7%
Alexander (V)	518	0	0.0%	3	0.6%
Attica (V)	2,450	0	0.0%	1,065	43.5%
Batavia (C)	15,600	0	0.0%	198	1.3%
Batavia (T)	6,293	0	0.0%	1,235	19.6%
Bergen (T)	1,912	493	25.8%	362	18.9%
Bergen (V)	1,208	6	0.5%	27	2.2%
Bethany (T)	1,780	147	8.3%	165	9.3%
Byron (T)	2,302	871	37.8%	281	12.2%
Corfu (V)	689	0	0.0%	166	24.1%
Darien (T)	3,010	1,117	37.1%	1,028	34.2%
Elba (T)	1,606	0	0.0%	127	7.9%
Elba (V)	558	0	0.0%	123	22.0%
Le Roy (T)	3,362	0	0.0%	144	4.3%
Le Roy (V)	4,300	0	0.0%	501	11.7%
Oakfield (T)	1,333	217	16.3%	45	3.4%



Jurisdiction	Total Population (2020 Decennial Census)	Estimated Population Located Within the Wildland-Urban Interface/Intermix (WUI) Wildfire Hazard Areas			
		Number of People in the WUI Interface Wildfire Hazard Area	Percent of Total	Number of People in the WUI Intermix Wildfire Hazard Area	Percent of Total
Oakfield (V)	1,812	0	0.0%	107	5.9%
Pavilion (T)	2,290	0	0.0%	216	9.4%
Pembroke (T)	3,575	647	18.1%	1,235	34.5%
Stafford (T)	2,424	0	0.0%	244	10.1%
Tonawanda (R)	241	34	14.1%	68	28.2%
Genesee County (Total)	60,838	4,371	7.2%	7,875	12.9%

Source: US Census Bureau 2020 Decennial; NYS GIS Clearinghouse 2023; NYS DHHS 2023; SILVIS Lab, Department of Forest and Wildlife Ecology, University of Wisconsin-Madison 2020; MRLC Consortium 2021; US Census Bureau 2020; Genesee County Planning 2023

Socially Vulnerable Population

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

Of the population exposed, the most vulnerable include the economically disadvantaged and the population over age 65. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on net economic impacts on their families. The population over age 65 is also more vulnerable because they are more likely to seek or need medical attention that may not be available due to isolation during a wildfire event, and they may have more difficulty evacuating. Smoke and air pollution from wildfires can be a severe health hazard, especially for sensitive populations, including children, the elderly, and those with respiratory and cardiovascular diseases. Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, and nitrogen oxides), and toxics (formaldehyde and benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility.

Table 19-3 presents the estimated socially vulnerable populations located in the WUI hazard area. Of the 4,371 persons located in the WUI hazard area, there are 778 persons over the age of 65 years, 232 persons under the age of 5, 22 non-English speakers, 617 persons with a disability, and 323 living in poverty.

Table 19-4 presents the estimated socially vulnerable populations located in the wildland-urban intermix hazard area. Of the 7,875 persons located in the wildland-urban intermix hazard area, there are 1,563 persons over the age of 65 years, 433 persons under the age of 5, 47 non-English speakers, 1,076 persons with a disability, and 642 living in poverty.



Table 19-5. Estimated Number of Vulnerable Person Located in the WUI Hazard Area

Jurisdiction	Persons Over 65	Percent of Total	Persons Under 5	Percent of Total	Non-English-Speaking Persons	Percent of Total	Persons with a Disability	Percent of Total	Persons in Poverty	Percent of Total
Alabama (T)	133	52.2%	45	52.3%	4	42.7%	121	52.4%	92	52.3%
Alexander (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Alexander (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Attica (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Batavia (C)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Batavia (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Bergen (T)	75	25.7%	26	25.0%	0	0.0%	82	25.7%	22	25.6%
Bergen (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Bethany (T)	21	8.0%	6	8.1%	1	5.3%	15	7.8%	16	7.9%
Byron (T)	111	37.8%	72	37.5%	0	0.0%	91	37.6%	32	36.8%
Corfu (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Darien (T)	239	37.0%	62	36.7%	0	0.0%	166	36.9%	14	35.0%
Elba (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Elba (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Le Roy (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Le Roy (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Oakfield (T)	43	16.0%	1	9.1%	6	16.0%	41	16.0%	59	16.3%
Oakfield (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Pavilion (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Pembroke (T)	133	18.0%	19	17.6%	6	16.0%	87	17.9%	78	17.9%
Stafford (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Tonawanda (R)	23	14.2%	1	7.7%	5	14.2%	14	13.7%	10	13.2%
Genesee County (Total)	778	6.6%	232	7.5%	22	5.2%	617	6.8%	323	5.3%

Source: SILVIS Lab, Department of Forest and Wildlife Ecology, University of Wisconsin-Madison 2020; Genesee County Planning 2023; NYS GIS Clearinghouse 2023; US Census Bureau 2022 ACS Vulnerable Population Totals; MRLC Consortium 2021; NYS DHHS 2023

Note: % = Percent; Exposed population statistics are rounded down to the nearest whole number.



Table 19-6. Estimated Number of Vulnerable Person located in the Wildland-Urban Intermix Hazard Area

Jurisdiction	Persons Over 65	Percent of Total	Persons Under 5	Percent of Total	Non-English-Speaking Persons	Percent of Total	Persons with a Disability	Percent of Total	Persons in Poverty	Percent of Total
Alabama (T)	1	0.4%	0	0.0%	0	0.0%	1	0.4%	1	0.6%
Alexander (T)	61	26.4%	81	26.6%	0	0.0%	60	26.7%	19	25.7%
Alexander (V)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Attica (V)	176	43.2%	48	42.9%	12	42.7%	91	43.1%	64	43.2%
Batavia (C)	41	1.3%	6	1.1%	1	0.7%	37	1.3%	25	1.3%
Batavia (T)	340	19.6%	53	19.4%	0	0.0%	209	19.6%	141	19.6%
Bergen (T)	55	18.8%	19	18.3%	0	0.0%	60	18.8%	16	18.6%
Bergen (V)	3	1.9%	0	0.0%	0	0.0%	2	1.9%	3	2.0%
Bethany (T)	24	9.1%	6	8.1%	1	5.3%	17	8.8%	18	8.9%
Byron (T)	35	11.9%	23	12.0%	0	0.0%	29	12.0%	10	11.5%
Corfu (V)	47	23.9%	5	22.7%	0	0.0%	26	23.4%	9	22.5%
Darien (T)	220	34.1%	57	33.7%	0	0.0%	153	34.0%	13	32.5%
Elba (T)	18	7.8%	12	7.5%	6	7.1%	14	7.8%	10	7.9%
Elba (V)	15	20.8%	6	21.4%	0	0.0%	13	21.3%	6	21.4%
Le Roy (T)	22	4.1%	4	3.9%	0	0.0%	2	0.7%	1	2.1%
Le Roy (V)	103	11.6%	38	11.4%	4	9.5%	102	11.6%	67	11.5%
Oakfield (T)	9	3.3%	0	0.0%	1	2.7%	8	3.1%	12	3.3%
Oakfield (V)	13	5.8%	6	5.5%	0	0.0%	11	5.8%	15	5.9%
Pavilion (T)	37	9.4%	14	9.3%	0	0.0%	23	9.1%	24	9.3%
Pembroke (T)	255	34.5%	37	34.3%	12	32.1%	168	34.6%	150	34.4%
Stafford (T)	42	10.0%	15	9.7%	0	0.0%	21	9.9%	17	9.9%
Tonawanda (R)	46	28.4%	3	23.1%	10	28.5%	29	28.4%	21	27.6%
Genesee County (Total)	1,563	13.3%	433	13.9%	47	11.0%	1,076	11.9%	642	10.5%

Source: SILVIS Lab, Department of Forest and Wildlife Ecology, University of Wisconsin-Madison 2020; Genesee County Planning 2023; NYS GIS Clearinghouse 2023; US Census Bureau 2022 ACS Vulnerable Population Totals; MRLC Consortium 2021; NYS DHHS 2023

Note: % = Percent; Exposed population statistics are rounded down to the nearest whole number.



19.2.2 General Building Stock

The most vulnerable structures to wildfire events are those located within the WUI areas. If a wildfire occurs at a WUI, it can also cause an urban fire, and in this case, has the potential for great damage to infrastructure, because of the high density of population and structures in these areas. Buildings constructed of wood or vinyl siding are generally more likely to be damaged by the fire hazard than buildings constructed of brick or concrete. The hazard areas were overlaid on the building inventory in the County (Census block) to estimate the buildings exposed to the wildfire hazard. The replacement cost value of the structures with their center in the hazard area were totaled.

Table 19-5 summarizes the number of buildings exposed by municipality. The limitations of this analysis are recognized, and as such, the analysis is only used to provide a general estimate. Approximately 10.0 percent of the County's buildings are located in the WUI interface hazard area, and approximately 13.2 percent of the County's buildings are located in the WUI intermix hazard area. Table 19-6 summarizes the replacement cost value by municipality. The limitations of this analysis are recognized, and as such the analysis is only used to provide a general estimate. Approximately 7.7 percent (\$1.5 billion) of the County's replacement cost value is located in the WUI interface hazard area, and approximately 9.3 percent (\$1.8 billion) of the County's replacement cost value is located in the WUI intermix hazard area.

Table 19-7. Building Stock within the WUI in Genesee County

Jurisdiction	Total Number of Buildings	Estimated Number of Structures Located in the Wildfire Hazard Areas			
		Number of Buildings in the WUI Interface Wildfire Hazard Area	Percent of Total	Number of Buildings in the WUI Intermix Wildfire Hazard Area	Percent of Total
Alabama (T)	1,315	659	50.1%	6	0.5%
Alexander (T)	1,423	0	0.0%	479	33.7%
Alexander (V)	213	0	0.0%	1	0.5%
Attica (V)	52	0	0.0%	10	19.2%
Batavia (C)	5,548	0	0.0%	82	1.5%
Batavia (T)	3,680	0	0.0%	731	19.9%
Bergen (T)	1,248	323	25.9%	224	17.9%
Bergen (V)	511	2	0.4%	12	2.3%
Bethany (T)	1,330	92	6.9%	227	17.1%
Byron (T)	1,578	649	41.1%	140	8.9%
Corfu (V)	360	0	0.0%	78	21.7%
Darien (T)	2,434	1,017	41.8%	686	28.2%
Elba (T)	1,230	0	0.0%	80	6.5%
Elba (V)	373	0	0.0%	81	21.7%
Le Roy (T)	2,242	0	0.0%	80	3.6%
Le Roy (V)	1,742	0	0.0%	200	11.5%
Oakfield (T)	1,002	160	16.0%	24	2.4%
Oakfield (V)	735	0	0.0%	45	6.1%



Jurisdiction	Total Number of Buildings	Estimated Number of Structures Located in the Wildfire Hazard Areas			
		Number of Buildings in the WUI Interface Wildfire Hazard Area	Percent of Total	Number of Buildings in the WUI Intermix Wildfire Hazard Area	Percent of Total
Pavilion (T)	1,577	0	0.0%	119	7.5%
Pembroke (T)	2,373	374	15.8%	823	34.7%
Stafford (T)	1,668	0	0.0%	139	8.3%
Tonawanda (R)	284	23	8.1%	88	31.0%
Genesee County (Total)	32,918	3,299	10.0%	4,355	13.2%

Source: Genesee County Planning 2023; NYS GIS Clearinghouse 2023; RS Means 2024; MRLC Consortium 2021; US Census Bureau 2020; University of Wisconsin-Madison 2023

Table 19-8. Building Stock Replacement Cost Value within the WUI in Genesee County

Jurisdiction	Total Replacement Cost Value (RCV)	Estimated Total Replacement Cost Value of Structures Located in the Wildfire Hazard Areas			
		Total RCV of Buildings Located in the WUI Interface Wildfire Hazard Area	Percent of Total	Total RCV of Buildings Located in the WUI Intermix Wildfire Hazard Area	Percent of Total
Alabama (T)	\$722,040,029	\$333,239,992	46.2%	\$1,997,952	0.3%
Alexander (T)	\$610,663,199	\$0	0.0%	\$165,753,314	27.1%
Alexander (V)	\$107,407,186	\$0	0.0%	\$118,595	0.1%
Attica (V)	\$65,949,240	\$0	0.0%	\$2,823,507	4.3%
Batavia (C)	\$4,822,536,729	\$0	0.0%	\$108,915,171	2.3%
Batavia (T)	\$2,447,128,797	\$0	0.0%	\$304,760,561	12.5%
Bergen (T)	\$591,610,057	\$126,739,685	21.4%	\$79,459,236	13.4%
Bergen (V)	\$156,058,577	\$603,906	0.4%	\$2,858,055	1.8%
Bethany (T)	\$628,307,466	\$32,025,475	5.1%	\$61,883,466	9.8%
Byron (T)	\$658,336,626	\$218,423,671	33.2%	\$39,538,149	6.0%
Corfu (V)	\$147,589,112	\$0	0.0%	\$31,988,104	21.7%
Darien (T)	\$1,285,847,435	\$537,730,496	41.8%	\$287,784,112	22.4%
Elba (T)	\$753,135,361	\$0	0.0%	\$26,582,284	3.5%
Elba (V)	\$125,049,373	\$0	0.0%	\$23,069,762	18.4%
Le Roy (T)	\$1,465,434,853	\$0	0.0%	\$26,750,524	1.8%
Le Roy (V)	\$1,128,112,213	\$0	0.0%	\$101,987,464	9.0%
Oakfield (T)	\$490,544,840	\$90,940,319	18.5%	\$11,781,560	2.4%
Oakfield (V)	\$374,066,224	\$0	0.0%	\$10,240,126	2.7%
Pavilion (T)	\$798,918,335	\$0	0.0%	\$41,125,991	5.1%
Pembroke (T)	\$1,079,428,778	\$143,850,730	13.3%	\$399,734,244	37.0%
Stafford (T)	\$775,606,282	\$0	0.0%	\$38,534,389	5.0%



Jurisdiction	Total Replacement Cost Value (RCV)	Estimated Total Replacement Cost Value of Structures Located in the Wildfire Hazard Areas			
		Total RCV of Buildings Located in the WUI Interface Wildfire Hazard Area	Percent of Total	Total RCV of Buildings Located in the WUI Intermix Wildfire Hazard Area	Percent of Total
Tonawanda (R)	\$148,395,154	\$18,049,887	12.2%	\$37,885,469	25.5%
Genesee County (Total)	\$19,382,165,867	\$1,501,604,160	7.7%	\$1,805,572,036	9.3%

Source: Genesee County Planning 2023; NYS GIS Clearinghouse 2023; RS Means 2024; MRLC Consortium 2021; US Census Bureau 2020; University of Wisconsin-Madison 2023

19.2.3 Community Lifelines and Other Critical Facilities

A number of critical facilities are within the wildfire hazard area and are also vulnerable to the threat of wildfire. Many of these facilities are locations of vulnerable populations (schools and senior facilities) and agencies that respond to wildfire events (fire and police). Table 19-7 summarizes the number of critical facilities and lifelines within the WUI Intermix and Interface hazard areas by jurisdiction. Overall, 311 critical facilities are located in the wildland-urban intermix hazard area and 392 critical facilities are located in the WUI hazard area. The Town of Darien has the greatest number of critical facilities built both in the WUI hazard area (149) and in the wildland-urban intermix hazard areas (117). Total number of community lifelines in the WUI Interface and Intermix hazard areas are summarized in Table 19-8.



Table 19-9. Facilities within the WUI (Intermix or Interface) in Genesee County

Jurisdiction	Total Critical Facilities Located in Jurisdiction	WUI Interface Wildfire Hazard Area		WUI Intermix Wildfire Hazard Area	
		Critical Facilities	Percent of Total Critical Facilities	Critical Facilities	Percent of Total Critical Facilities
Alabama (T)	123	47	38.2%	0	0.0%
Alexander (T)	153	0	0.0%	44	28.8%
Alexander (V)	20	0	0.0%	0	0.0%
Attica (V)	6	0	0.0%	0	0.0%
Batavia (C)	237	0	0.0%	8	3.4%
Batavia (T)	288	0	0.0%	36	12.5%
Bergen (T)	70	13	18.6%	11	15.7%
Bergen (V)	32	0	0.0%	3	9.4%
Bethany (T)	181	8	4.4%	8	4.4%
Byron (T)	96	27	28.1%	13	13.5%
Corfu (V)	31	0	0.0%	6	19.4%
Darien (T)	486	149	30.7%	117	24.1%
Elba (T)	81	0	0.0%	6	7.4%
Elba (V)	22	0	0.0%	1	4.5%
Le Roy (T)	122	0	0.0%	2	1.6%
Le Roy (V)	79	0	0.0%	4	5.1%
Oakfield (T)	71	3	4.2%	4	5.6%
Oakfield (V)	23	0	0.0%	1	4.3%
Pavilion (T)	279	0	0.0%	26	9.3%
Pembroke (T)	330	63	19.1%	91	27.6%
Stafford (T)	115	0	0.0%	2	1.7%
Tonawanda (R)	17	1	5.9%	9	52.9%
Genesee County (Total)	2,862	311	10.9%	392	13.7%

Source: Genesee County 2017, 2021, 2023, 2024; NYS GIS Clearinghouse 2021, 2023, 2024; Genesee Orleans Wyoming Opioid Task Force 2021; Genesee Orleans Health Department 2024; NY Open Data 2024; US DOT 2023, Clark Patterson Lee Inc 2024; US EPA 2021; HIFLD 2021; US NPS 2021; USGS 2023; University of Wisconsin-Madison 2023, MRLC Consortium 2021, U.S. Census Bureau 2020

Note: % = Percent



Table 19-10. Lifeline Facilities within the WUI (Intermix or Interface) in Genesee County

FEMA Lifeline Category	Number of Lifelines	Number of Lifelines Located in the Wildland-Urban Interface Wildfire Hazard Area	Number of Lifelines Located in the Wildland-Urban Intermix Wildfire Hazard Area
Communications	56	3	5
Energy	1,086	111	178
Food, Water, Shelter	12	1	0
Hazardous Material	37	2	6
Health and Medical	71	4	6
Safety and Security	193	5	12
Transportation	229	18	45
Water Systems	928	152	118
Other Critical Facilities	250	15	22
Genesee County (Total)	2,862	311	392

Source: Source: Genesee County 2017, 2021, 2023, 2024; NYS GIS Clearinghouse 2021, 2023, 2024; Genesee Orleans Wyoming Opioid Task Force 2021; Genesee Orleans Health Department 2024; NY Open Data 2024; US DOT 2023, Clark Patterson Lee Inc 2024; US EPA 2021; HIFLD 2021; US NPS 2021; USGS 2023; University of Wisconsin-Madison 2023, MRLC Consortium 2021, U.S. Census Bureau 2020

19.2.4 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 many direct and indirect costs to local businesses that provide employees with time off to volunteer to fight these fires.

19.2.5 Natural, Historic, and Cultural Resources

Natural

Wildfire can lead to ancillary impacts such as landslides in steep ravine areas and flooding caused by the impacts of silt in local watersheds. According to the USGS, post-fire runoff polluted with debris and contaminants can be extremely harmful to ecosystem and aquatic life. Studies show that urban fires, in particular, are more harmful to the environment compared to forest fires (USGS 2018). The age and density of infrastructure within Genesee County can exacerbate consequences of fires on the environment because of the increased amount of chemicals and contaminants that would be released from burning infrastructure. These chemicals, such as iron lead, and zinc, may leach into the stormwater, contaminate nearby streams, and impair aquatic life.

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).

Historic

Wildfires are a major threat to historic resources, with the potential to cause extensive damage and, in some cases, complete destruction. The potential impacts on historic resources, particularly infrastructure, from wildfire depend



heavily on the materials used for construction. Many historic structures are made of wood, which is a highly flammable material.

Cultural

Wildfires are a major threat to cultural resources, with the potential to cause extensive damage and, in some cases, complete destruction. The potential impacts on cultural resources from wildfire depend heavily on the materials used to construct the facility in which cultural resources are located. In many instances, historic structures house cultural resources and artifacts; many historic structures are made of wood, which is a highly flammable material. Outdoor events are likely to be postponed or canceled as the result of wildfire conditions, as smoke conditions can have harmful impacts to the human body.

19.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure the establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

19.3.1 Potential or Planned Development

Areas targeted for potential future growth and development within the next 5 years have been identified across Genesee County at the jurisdiction level. Refer to the jurisdictional annexes in Volume II of this HMP. Any new development and new residents within the WUI are expected to be exposed to the wildfire hazard. Refer to the jurisdictional annexes in Volume II of this HMP for maps which include new development project areas and their proximity to the WUI/intermix hazard areas.

19.3.2 Projected Changes in Population

According to the 2020 Census, the population of the County has increased by approximately 2.85 percent since 2010. Population projections from Cornell University reveal the County's population is anticipated to continue decreasing. The population is projected to decline to 56,077 persons in 2030 and to 54,128 by 2040 (Cornell University 2018). Any changes in the density of population can impact the number of persons exposed to the wildfire hazard. 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.

19.3.3 Climate Change

According to the USDA Forest Service, climate change will likely alter the atmospheric patterns that affect fire weather. Changes in fire patterns will, in turn, impact carbon cycling, forest structure, and species composition (US EPA 2020). Climate change 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. Under a changing climate, wildfires exceeding 50,000 acres have increased over the past 30 years (USDA 2012a). Understanding the climate/fire/vegetation interactions is essential for addressing issues associated with climate change that include:

- Effects on regional circulation and other atmospheric patterns that affect fire weather;



- Effects of changing fire regimes on the carbon cycle, forest structure, and species composition; and
- Complications from land use change, invasive species, and an increasing WUI.

As discussed earlier, average temperatures are anticipated to increase in New York; therefore, the suitability of habitats for specific types of trees will potentially change, altering the fire regime and resulting in more frequent fire events and changes in intensity. Prolonged and more frequent heat waves have the potential to increase the likelihood of a wildfire. The increased potential combined with stronger winds may make it harder to contain fires and thus will increase the County's vulnerability to this hazard.

19.3.4 Change of Vulnerability Since 2019 HMP

The 2019 HMP has been updated to reflect 2020 Census and 2022 American Community Survey 5-year estimates for population changes. The building stock inventory was updated using data from Genesee County. Further, the building stock inventory replacement cost values were updated using RS Means 2024 values, providing an overall update to the assets assessed in this risk assessment.

DRAFT



20. 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 instance, a hazard might be rated as low in one jurisdiction, but due to variations in vulnerability and impact, it could be ranked as high for the County or another jurisdiction. Jurisdictional ranking results are presented in each jurisdictional annex in Volume II.

20.1 HAZARD RANKING METHODOLOGY

Each jurisdiction participating in this hazard mitigation plan (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 the Federal Emergency Management Agency's (FEMA) hazard mitigation planning guidance and input from all participating jurisdictions. Relative ranking scores were generated by FEMA's Hazus risk assessment tool.

20.2 CATEGORIES USED IN RANKING

The ranking methodology is based on four risk assessment categories, 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).
- **Benchmark value:** The benchmark values are clearly determinable quantities or descriptions that define which level should apply to each hazard.
- **Numeric value:** The numeric value is the hazard's score in each category, based on the assigned level.
- **Weighting:** 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).

The following sections describe the categories and their associated scoring parameters.

Probability of Occurrence

The probability of occurrence of the hazard scenario evaluated was estimated by examining the historical record or calculating the likelihood of annual occurrence. When no scenario was assessed, an examination of the historical record and judgment was used to estimate the probability of occurrence of an event that will impact the County. Table 20-1 summarizes the scoring parameters for probability of occurrence.

The hazard ranking methodology for some hazards of concern is based on a scenario event that only impacts specific areas (such as a floodplain), while others are based on their potential risk to the County as a whole. In order to account for these differences, the quantitative hazard ranking methodology was adjusted using professional judgement and subject matter input. The limitations of this analysis are recognized given the scenarios do not have the same likelihood of occurrence; nonetheless, there is value in summarizing and comparing the hazards using a standardized approach to evaluate relative risk.



Table 20-1. Values and Weights for Probability of Occurrence

Level	Benchmark Value	Numeric Value	Weighting
Unlikely	< 1% annual chance probability A hazard event is not likely to occur or is unlikely to occur with less than a 1 percent annual chance probability.	0	30%
Rare	Between 1 and 10 percent annual probability of a hazard event occurring.	1	
Occasional	Between 10 and 100 percent annual probability of a hazard event occurring.	2	
Frequent	100 percent annual probability; a hazard event may occur multiple times per year.	3	

Consequence

Consequence represents the expected vulnerability and impact associated with the hazard. This is rated for three subcategories: vulnerability of people; vulnerability of property; and economic impacts on the community. A numeric value based on defined benchmarks is assigned for each subcategory, and a factor is applied to those values representing the relative importance of each subcategory. The total numeric value for consequence is the sum of the factored numeric values for each subcategory.

Table 20-2 summarizes the scoring parameters for consequence.

Table 20-2. Values and Weights for Consequence

Level	Benchmark Value	Numeric Value	Factor	Weighting
Population (Numeric Value x 3)				30%
None	No population vulnerable to the hazard.	0	3	
Low	14 percent or less of population is exposed to a hazard with potential for measurable life-safety impact due to its extent and location.	1		
Medium	15 to 29 percent of population is exposed to a hazard with potential for measurable life-safety impact due to its extent and location.	2		
High	30 percent or more of population is exposed to a hazard with potential for measurable life-safety impact, due to its extent and location.	3		
Property (Numeric Value x 2)				
None	No property vulnerable to the hazard.	0	2	
Low	Property vulnerability is 14 percent or less of the total number of structures for your community.	1		
Medium	Property vulnerability is 15 to 29 percent of the total number of structures for the community.	2		
High	Property vulnerability is 30 percent or more of the total number of structures for the community.	3		
Economy (Numeric Value x 1)				
None	No estimated loss due to the hazard.	0	1	
Low	Loss estimate is 9 percent or less of the total replacement cost for the community.	1		
Medium	Loss estimate is 10 to 19 percent of the total replacement cost for the community.	2		



Level	Benchmark Value	Numeric Value	Factor	Weighting
High	Loss estimate is 20 percent or more of the total replacement cost for the community.	3		

Adaptive Capacity

Adaptive capacity describes a jurisdiction's administrative, technical, planning/regulatory, and financial ability to protect from or withstand a hazard event. Mitigation measures that can increase a jurisdiction's capacity to withstand and rebound from events include codes or ordinances with higher standards to withstand hazards due to design or location, deployable resources, or plans and procedures for responding to an event.

A rating of "weak" for adaptive capacity means a jurisdiction does not have the capability to effectively respond, which increases vulnerability. A "strong" adaptive capacity means the jurisdiction does have the capability to effectively respond, which decreases vulnerability. These ratings were assigned using the results of the core capability assessment, with input from each jurisdiction. Table 20-3 summarizes the scoring parameters for adaptive capacity.

Table 20-3. Values and Weights for Adaptive Capacity

Level	Benchmark Value	Numeric Value	Weighting
Weak	Weak, outdated, or inconsistent plans, policies, codes, or ordinances in place; no redundancies; limited to no deployable resources; limited capabilities to respond; long recovery.	1	30%
Moderate	Plans, policies, codes/ordinances in place and meet minimum requirements; mitigation strategies identified but not implemented on a widespread scale; county/jurisdiction can recover but needs outside resources; moderate county/jurisdiction capabilities.	0	
Strong	Plans, policies, codes/ordinances in place and exceed minimum requirements; mitigation/protective measures in place; county/jurisdiction has ability to recover quickly because resources are readily available, and capabilities are high.	-1	

Climate Change

Current climate change projections were evaluated as part of the hazard ranking to account for potential increases in severity or frequency of the hazard. This is important because the hazard ranking helps guide and prioritize the mitigation strategy as a long-term future vision for mitigating the hazards of concern. The potential impacts that climate change may have on each hazard of concern are discussed in the risk assessment chapters for each hazard. Table 20-4 summarizes the scoring parameters for climate change. The benchmark values are similar to confidence levels outlined in the National Climate Assessment 2023.

Table 20-4. Values and Weights for Climate Change

Level	Benchmark Value	Numeric Value	Weighting
Low	No local data are available; modeling projects are uncertain on whether there is increased future risk; confidence level is low (inconclusive evidence).	1	10%
Medium	Studies and modeling projections indicate a potential for exacerbated conditions due to climate change; confidence level is medium to high (moderate evidence).	2	
High	Studies and modeling projections indicate exacerbated conditions and increased future risk due to climate change; very high confidence level (strong evidence, well-documented, and acceptable methods).	3	



20.2.1 Total Ranking Score

The total ranking score based on the categories described above is calculated using the following equation:

Risk Ranking Score Equation

$$\text{Ranking Score} = [(\text{Consequence on Population} \times 3) + (\text{Consequence on Property} \times 2) + (\text{Consequence on Economy} \times 1) \times 0.3] + [\text{Adaptive Capacity} \times 0.3] + [\text{Climate Change} \times 0.1] + [\text{Probability of Occurrence} \times 0.3]$$

Using this equation, the highest possible ranking score is 6.9. The higher the number, the greater the relative risk. Based on the score for each hazard, a hazard ranking is assigned to each hazard of concern as follows:

- Low = Values less than 3.9
- Medium = Values between 3.9 and 4.9
- High = Values greater than 4.9

All Planning Partners applied the same methodology to develop the hazard rankings to ensure consistency in the overall ranking of risk. However, each jurisdiction had the ability to alter rankings based on local knowledge and experience in handling each hazard.

20.3 HAZARD RANKING RESULTS

Using the methodology described above, the hazard ranking for the identified hazards of concern was determined for each Planning Partner. The hazard ranking for Genesee County is detailed in the following tables that present the stepwise process for the ranking:

- Table 20-5 shows the unweighted numeric values assigned for the probability of occurrence for each hazard.
- Table 20-6 shows the numeric values assigned for each subcategory of consequence for each hazard. Results are shown for applying the subcategory factors, but not the category-wide weighting.
- Table 20-7 shows the unweighted numeric values assigned for adaptive capacity and climate change for each hazard.
- Table 20-8 shows the total weighted hazard ranking scores for each hazard of concern.

The countywide hazard ranking includes the entire planning area and may not reflect the highest risk for all Planning Partners. The preliminary ranking for each jurisdiction is included in Table 20-9; the final hazard rankings for each jurisdiction, with jurisdictional input, can be found in the annexes in Volume II.



Table 20-5. Probability of Occurrence for Hazards of Concern for Genesee County

Hazard of Concern	Probability	Numeric Value
Civil Unrest	Rare	1
Dam Failure	Occasional	2
Drought	Occasional	2
Earthquake	Rare	1
Epidemic	Occasional	2
Extreme Temperatures	Occasional	2
Flood	Frequent	3
Hazardous Materials	Occasional	2
Severe Storm	Frequent	3
Severe Winter Storm	Frequent	3
Terrorism	Rare	1
Transportation Accidents	Frequent	3
Utility Interruption	Frequent	3
Wildfire	Occasional	2



Table 20-6. Consequence Rating for Hazards of Concern for Genesee County

Hazard of Concern	Population			Property			Economy			Total Impact Rating (Population + Property + Economy)
	Consequence	Numeric Value	Multiplied by Factor (3)	Consequence	Numeric Value	Multiplied by Factor (2)	Consequence	Numeric Value	Multiplied by Factor (1)	
Civil Unrest	Low	1	3	Medium	2	4	Medium	2	2	9
Dam Failure	Medium	2	6	Medium	2	4	Medium	2	2	12
Drought	Medium	2	6	Low	1	2	Medium	2	2	10
Earthquake	Low	1	3	Medium	2	4	Medium	2	2	9
Epidemic	High	3	9	Low	1	2	Low	1	1	12
Extreme Temperatures	High	3	9	Low	1	2	Low	1	1	12
Flood	Medium	2	6	Medium	2	4	Low	1	1	11
Hazardous Materials	Medium	2	6	Medium	2	4	Medium	2	2	12
Severe Storm	High	3	9	Medium	2	4	Medium	2	2	15
Severe Winter Storm	High	3	9	Medium	2	4	Medium	2	2	15
Terrorism	Medium	2	6	Medium	2	4	Low	1	1	11
Transportation Accidents	High	3	9	Medium	2	4	Low	1	1	14
Utility Interruption	High	3	9	Medium	2	4	Medium	2	2	15
Wildfire	Medium	2	6	Medium	2	4	Medium	2	2	12



Table 20-7. Adaptive Capacity and Climate Change Ratings for Hazards of Concern for Genesee County

Hazard of Concern	Adaptive Capacity		Climate Change	
	Level	Numeric Value	Level	Numeric Value
Civil Unrest	Moderate	0	Low	1
Dam Failure	Moderate	0	Medium	2
Drought	Moderate	0	High	3
Earthquake	Moderate	0	Low	1
Epidemic	Moderate	0	High	3
Extreme Temperatures	Moderate	0	High	3
Flood	Moderate	0	High	3
Hazardous Materials	Moderate	0	Medium	2
Severe Storm	Moderate	0	High	3
Severe Winter Storm	Moderate	0	High	3
Terrorism	Moderate	0	Low	1
Transportation Accidents	Moderate	0	Low	1
Utility Interruption	Moderate	0	Medium	2
Wildfire	Moderate	0	High	3



Table 20-8. Total Hazard Ranking Scores for the Hazards of Concern for Genesee County

Hazard of Concern	Probability x 30%	Total Consequence x 30%	Adaptive Capacity x 30%	Changing Future Conditions x 10%	Total Hazard Ranking Score
Civil Unrest	0.3	2.7	0	0.1	3.1
Dam Failure	0.6	3.6	0	0.2	4.4
Drought	0.6	3	0	0.3	3.9
Earthquake	0.3	2.7	0	0.1	3.1
Epidemic	0.6	3.6	0	0.3	4.5
Extreme Temperatures	0.6	3.6	0	0.3	4.5
Flood	0.9	3.3	0	0.3	4.5
Hazardous Materials	0.6	3.6	0	0.2	4.4
Severe Storm	0.9	4.5	0	0.3	5.7
Severe Winter Storm	0.9	4.5	0	0.3	5.7
Terrorism	0.3	3.3	0	0.1	3.7
Transportation Accidents	0.9	4.2	0	0.1	5.2
Utility Interruption	0.9	4.5	0	0.2	5.6
Wildfire	0.6	3.6	0	0.3	4.5

Note: Low (yellow) = Values less than 3.9; Medium (orange) = Values between 3.9 and 4.9; High (red) = Values greater than 4.9



Table 20-9. Preliminary Hazard Ranking by Jurisdiction

	Civil Unrest	Dam Failure	Drought	Earthquake	Epidemic	Extreme Temperature	Flood	Hazardous Material	Severe Storm	Severe Winter Storm	Terrorism	Transportation Accident	Utility Interruption	Wildfire
Town of Alabama	Low	Medium	Medium	Low	Medium	Medium	Low	Medium	High	High	Low	High	High	High
Town of Alexander	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Village of Alexander	Low	Low	Medium	Low	Medium	Medium	High	Medium	High	High	Low	High	High	Medium
Village of Attica	Low	Low	Medium	Low	Medium	Medium	Low	Medium	High	High	Low	High	High	Low
City of Batavia	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Town of Batavia	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Town of Bergen	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Village of Bergen	Low	Low	Medium	Low	Medium	Medium	Low	Medium	High	High	Low	High	High	Low
Town of Bethany	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Town of Byron	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Village of Corfu	Low	Low	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Town of Darien	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Town of Elba	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Village of Elba	Low	Low	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Town of Le Roy	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Village of Le Roy	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Town of Oakfield	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Village of Oakfield	Low	Low	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Town of Pavilion	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Town of Pembroke	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Town of Stafford	Low	Medium	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium
Genesee County	Low	Low	Medium	Low	Medium	Medium	Medium	Medium	High	High	Low	High	High	Medium

Note: Low (yellow) = Values less than 3.9; Medium (orange) = Values between 3.9 and 4.9; High (red) = Values greater than 4.9

PART 3: CAPABILITY ASSESSMENT



21. 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 2003). This assessment is an integral part of the planning process. It enables identification, review, and analysis of current local and state programs, policies, regulations, funding, and practices that could either facilitate or hinder mitigation. Through assessing its capabilities, a jurisdiction learns how or whether it can implement certain mitigation actions by determining the following:

- Limitations that may exist on undertaking actions
- The range of local and/or state administrative, programmatic, regulatory, financial, and technical resources available to assist in implementing their mitigation actions
- Actions that are infeasible because they are outside the scope of current capabilities
- Types of mitigation actions that may be technically, legally, administratively, politically, or fiscally challenging or infeasible
- Opportunities to enhance local capabilities to support long-term mitigation and risk reduction

This chapter presents a summary and description of the existing plans, programs, and regulatory mechanisms at all levels of government (federal, state, county, local) that reduce hazard risks and support 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.

21.1 CAPABILITY ASSESSMENT PROCESS

Jurisdiction-specific capabilities are assessed in each jurisdictional annex in Volume II. All participating jurisdictions were tasked with developing or updating their capability assessment for this update, evaluating the effectiveness of their capabilities in supporting hazard mitigation, and identifying opportunities to enhance local 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.

The contracted consultant met with Genesee County and each jurisdiction virtually to review the capability assessment from the 2019 Hazard Mitigation Plan (HMP) and update accordingly. The consultant also reviewed plans, codes, and ordinances to enhance the information provided by the jurisdictions.

21.2 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 for Genesee County. Further information is provided in the jurisdictional annexes in Volume II.

21.2.1 State and Federal

Federal

Biggert-Waters National Flood Insurance Reform Act of 2012

Under the Biggert-Waters National Flood Insurance Reform Act of 2012, long-term changes to the National Flood Insurance Program (NFIP) have been adopted that have increased rates overall to reflect the flood risk more accurately to buildings in flood hazard areas. This has significantly influenced construction and reconstruction within flood hazard areas.

Property owners are encouraged to consider long-term insurance costs when undertaking reconstruction or elevation of damaged buildings. An investment to reconstruct the lowest floor of a building an additional foot or two higher today may translate into significant future flood insurance savings.

Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004

The Flood Insurance Reform Act of 2004 amended the 1994 National Flood Insurance Reform Act of 1968 to reduce losses to properties for which repetitive flood insurance claim payments have been made. This Act established a program for mitigation of severe repetitive loss properties and gave the Federal Emergency Management Agency (FEMA) the authority to fund mitigation activities for individual repetitive loss claims properties. The Act provides additional coverage for compliance with land use and control measures.

The New York State Department of Environmental Conservation (NYS DEC) is the lead coordinator of New York's NFIP efforts. NYS DEC is the agency working with New York communities with severe repetitive loss properties. This Statute helps New York residents with affordable flood insurance and gives additional tools to the states and communities to mitigate severe repetitive loss properties.

Community Risk and Resiliency Act

On September 22, 2015, Governor Andrew Cuomo signed bill A06558/S06617-B, the Community Risk and Resiliency Act (CRRRA). The purpose of the bill is to ensure that certain state monies, facility-siting regulations, and permits include consideration of the effects of climate risk and extreme weather events. The bill's provisions will apply to all applications and permits no later than January 1, 2017. CRRRA includes five major provisions (NYSDEC 2020):

- **Official Sea-Level Rise Projections:** CRRRA requires the DEC to adopt science-based sea-level rise projections into regulation.
- **Consideration of Sea-Level Rise, Storm Surge and Flooding:** CRRRA 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 and that DEC consider incorporating these factors into certain facility-siting regulations.
- **Smart-Growth Public Infrastructure Policy Act Criteria:** CRRRA 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 DEC, in consultation with the Department of State (DOS), to develop guidance on the use of natural resources and natural processes to enhance community resiliency.
- **Model Local Laws Concerning Climate Risk:** CRRA requires DOS, in cooperation with DEC, 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 DOS, to prepare guidance on the implementation of the statute. To meet its obligation to develop guidance for the implementation of CRRA, DEC is proposing a new document, State Flood Risk Management Guidance (SFRMG). The SFRMG is intended to inform state agencies as they develop program-specific guidance to require that applicants demonstrate consideration of sea-level rise, storm surge, and flooding, as permitted by program-authorizing statutes and operating regulations. The SFRMG 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 2020).

Code of Federal Regulations, Standard State Mitigation Plans (44 CFR PART 201.4)

FEMA has prepared policies and procedures for FEMA's review and approval of state and local emergency HMPs.

The State HMP provides actions based on risk assessments and capabilities of the State to achieve and fund mitigation activities based on those actions. Both the law and regulations have encouraged the counties to prepare plans.

Disaster Mitigation Act of 2000 P.L. 106-390

The Disaster Mitigation Act (DMA) is the current federal legislation addressing hazard mitigation planning. DMA 2000 provides an opportunity for states, tribes, and local governments to take a new and revitalized approach to mitigation planning. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Act) by repealing the previous mitigation planning provisions (Section 409) and replacing them with a new set of mitigation plan requirements (Section 322). This new section emphasizes the need for state, tribal, and local entities to closely coordinate mitigation planning and implementation efforts. It emphasizes planning for disasters before they occur. It specifically addresses planning at the local level, requiring plans to be in place before Hazard Mitigation Assistance grant funds are available to communities. HMPs designed to meet the requirements of DMA will remain eligible for future FEMA Hazard Mitigation Assistance funds. This plan is designed to meet the requirements of DMA, improving eligibility for future hazard mitigation funds.

The New York State Division of Homeland Security and Emergency Services (NYS DHSES) is the lead agency within New York to promote mitigation planning. The law sets forth a more granular review of mitigation planning. Once approved, the applicant is eligible to apply for federal funds for mitigation of hazards. The rules provide detailed guidance on what applicants should include in a plan.

Disaster Recovery Reform Act

This bill amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) to modify the Pre-disaster Hazard Mitigation Grant Program to permit the use of technical and financial assistance to establish and carry out enforcement activities to implement codes, specifications, and standards that incorporate the latest hazard-resistant designs; direct the President to establish a National Public Infrastructure Pre-disaster Mitigation Fund; authorize 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; and direct the FEMA to issue a final rulemaking that defines the terms "resilient" and "resiliency".

From a mitigation perspective of the Act, 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 damage from hazards.

Emergency Support Function #14, Long-Term Recovery Planning

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. Emergency Support Function (ESF) #14 accomplishes this by identifying and facilitating availability and use of sources of recovery funding and providing technical assistance (such as impact analyses) for community recovery and recovery planning (FEMA 2004).

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 (FEMA 2004).

Actions coordinated under ESF #14 include pre-incident planning and coordination, immediately prior to the incident, post-event planning, and operations (FEMA 2004).

Through ESF 14, Long-Term Recovery Planning, NYS 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.

Homeowner's Flood Insurance Affordability Act

This 2014 law repeals and modifies certain provisions of the Biggert-Waters Flood Insurance Reform Act, which was enacted in 2012, and makes additional program changes to other aspects of the program not covered by that Act. The new law lowers the recent rate increases on some policies, prevents some future rate increases, and implements a surcharge on all policyholders. The Act also repeals certain rate increases that have already gone into effect and provides for refunds to those policyholders. The Act also authorizes additional resources for the National Academy of Sciences (NAS) to complete the affordability study.

FEMA, Congress, private insurance companies, and other stakeholders work together to implement these Congressionally mandated reforms and to work toward shared goals of helping families maintain affordable flood insurance, ensuring the financial stability of the NFIP, and reducing the risks and consequences of flooding nationwide.

National Flood Insurance Program

The U.S. Congress established the NFIP with the passage of the National Flood Insurance Act of 1968 (FEMA 2003). The NFIP is a federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. The flood hazard profile in Chapter 12 provides further information on the NFIP as implemented in Genesee County.

There are three components to the NFIP: flood insurance, floodplain management, and flood hazard mapping. Communities participate in the NFIP 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. Community participation in the NFIP is voluntary. 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 2007).

All jurisdictions in Genesee County actively participate in the NFIP. NFIP Data was not provided by FEMA for this 2025 HMP update, therefore information from the 2019 Genesee County HMP was utilized. As of February 2018, there were 395 NFIP policies in Genesee County. There have been 171 claims made, totaling over \$1.4 million for damages to structures and contents. There are 11 Repetitive Loss (RL) properties, two Severe Repetitive Loss (SRL) properties in the County. Further details on the County's flood vulnerability can be found in the flood hazard profile in Chapter 12.

Municipal compliance with the NFIP is described in each of the jurisdictional annexes in Volume II (Jurisdictional Annexes). The County's municipalities have been compliant with the NFIP. To enhance their flood damage prevention programs and enhance compliance with the NFIP in the future, several municipalities propose actions in their mitigation strategies to ensure that their floodplain administrators complete training on floodplain management and the NFIP or update their flood damage prevention ordinance. Additional information on the NFIP program and its implementation throughout the County may be found in the flood hazard profile (Chapter 12).

The State and municipalities within it may adopt higher regulatory standards when implementing the provisions of the NFIP. Specifically identified are 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.
- **Freeboard:** By law, the State of New York requires Base Flood Elevation plus two feet (BFE+2) for all single- and two-family residential construction, and BFE+1 for all other types of construction. Communities may go beyond this requirement, providing for additional freeboard or requiring BFE+2 for all types of construction. A number of Genesee municipalities have supported property owners meeting and exceeding freeboard requirements through the site plan review and zoning board of approvals process; for instance, allowing overall structure heights to be determined from BFE+2 rather than grade within NFIP floodplains.
- **Cumulative Substantial Improvements/Damages:** The NFIP allows improvements valued at up to 50 percent of the building's pre-improvement value to be permitted without meeting the 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 (FEMA n.d.).

NFIP Community Rating System

As an additional component of the NFIP, the Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance (FEMA 2017).



As of January 2025, there is one community within Genesee County that participates in the CRS program: the City of Batavia. Genesee County is exploring the program requirements of the CRS through technical expertise and assistance to guide interested municipalities through the application process as well as help maintain and enhance their participation in the program.

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 (EMPG) funding. The NYS DHSES is the lead agency in preparing the State of New York's THIRA.

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 each community and may involve different products and services.

According to the Risk MAP Progress interactive map available online at the time of this plan update, there are numerous active Risk MAP projects taking place throughout New York (FEMA n.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 consider specific characteristics of a building to provide more modern, individualized, and equitable flood insurance rates. The new rating methodology considers frequency of flooding, multiple flood types, proximity to flood sources, and building characteristics such as first floor heights and costs to rebuilt. The update was rolled out in October 2021 through April 2022, and as of April 1, 2023, has been fully implemented (FEMA 2022). Homeowners that elect to drop NFIP insurance policies will no longer have access to Flood Mitigation Assistance (FMA) funding for future mitigation efforts. At the time of this HMP update, it is difficult to determine what the aggregate cost increase through Risk Rating 2.0 will be on post-mitigation properties.

Across the country, officials are finding it to be increasingly difficult to communicate the benefits of mitigation to some property owners where insurance rates are likely to stay high even after mitigation due to factors such as proximity to flood sources and frequency of flooding. Continued shifts in flood insurance costs, coverage, impacts to mitigation of flood-prone properties, and potential updates to Risk Rating 2.0 will be monitored by Genesee County throughout the period of performance of the 2025 HMP.

Robert T. Stafford Disaster Relief and Emergency Assistance Act

The Act provides an orderly and continuing means of assistance by the federal government to state and local governments in carrying out their responsibilities to alleviate the suffering and damage that results from disasters. The provisions of the Act include (1) revising and broadening the scope of existing disaster relief programs; (2) encouraging the development of comprehensive disaster preparedness and assistance plans, programs, capabilities, and organizations by state and local governments; (3) achieving greater coordination and responsiveness of disaster preparedness and relief programs; (4) encouraging individuals, and state and local



governments to protect themselves by obtaining insurance coverage to supplement or replace governmental assistance; (5) encouraging hazard mitigation measures to reduce losses from disasters, including development of land use and construction regulations; and (6) providing federal assistance programs for both public and private losses sustained in disasters.

From a mitigation perspective of the Act, 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.

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. 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 54 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 2017).

There are three types of USACE permits: standard, nationwide (described above), and regional. Standard permits are individual permits that involve full public interest review of an individual permit application and includes 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 (LOP). Regional general permits are for small, specialized projects. In New York State, there are six regional general permit categories (USACE Buffalo District 2019).

State

New York Power Authority

The New York Power Authority (NYPA) is America's largest state power organization, with 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, nonprofit 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.

New York State's Agricultural District Law

New York State's Agricultural District Law (enacted in 1971) conserves and protects agricultural land. This law allows landowners to propose agricultural districts, which provide protections such as relief from nuisance claims and certain local regulations. There are four Agricultural Districts in Genesee County, and participation is voluntary and free.

Landowners in these districts benefit from the legal protections provided by the program. Agricultural Districts are reviewed every eight years by the County Legislature, during which landowners may choose to enroll or withdraw their parcels.



New York State Floodplain Management

There are two departments that have statutory authorities and programs that affect floodplain management at the local jurisdiction level in New York State: the NYSDEC and the Department of State's Division of Code Enforcement and Administration.

The NYSDEC is charged with conserving, improving, and protecting the state's natural resources and environment, and preventing, abating, and controlling water, land, and air pollution. Programs that have bearing on floodplain management are managed by the Bureau of Flood Protection and Dam Safety, which cooperates with federal, state, regional, and local partners to protect lives and property from floods, coastal erosion, and dam failures. These objectives are accomplished through floodplain management and both structural and nonstructural means (NYSDEC 2023).

The Dam Safety Section is responsible for "reviewing repairs and modifications to dams and assuring [sic] that dam owners operate and maintain dams in a safe condition through inspections, technical reviews, enforcement, and emergency planning." The Flood Control Projects Section is responsible for reducing flood risk to life and property through construction, operation, and maintenance of flood control facilities (NYSDEC 2023).

The Floodplain Management Section is responsible for reducing flood risk to life and property through management of activities, such as development in flood hazard areas, and for reviewing and developing revised flood maps. The Section 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. The Section provides a wide range of technical assistance (NYSDEC 2023).

Stormwater Management Planning

When proper controls are not in place, research studies show a clear link between urbanization and increased flooding and pollutant export. 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 is not substantially altered from its pre-development conditions (NYSDEC 2023).

According to the federal law commonly known as Stormwater Phase II, permits are required for stormwater discharges from Municipal Separate Storm Sewer Systems (MS4s) in urbanized areas and those additionally designated by the New York State Department of Environmental Conservation (NYSDEC). Owners or operators of such MS4s 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 (SWMP) (NYSDEC 2023).

21.2.2 County and Local

County

Community Health Assessment 2022–2024

The 2022–2024 Genesee, Orleans, and Wyoming (GOW) Counties Community Health Assessment (CHA), Community Health Improvement Plan (CHIP) and Community Service Plan (CSP) is a collaborative process used to examine the current health status of GOW residents while also identifying a comprehensive plan for addressing health challenges (Genesee, Orleans, and Wyoming Counties 2022).



For the GOW 2022–2024 CHA, county, regional, and state data were analyzed to review trends and compare each County’s health indicators to national goals, state goals, and local averages. To reach this conclusion, the CHA Steering Committee and Community Workgroup facilitated and completed the following activities throughout Genesee, Orleans, and Wyoming Counties (Genesee, Orleans, and Wyoming Counties 2022).

Community Health Improvement Plan 2022–2024

The CHIP is a tri-County effort of Genesee-Orleans-Wyoming Counties that describes the collaborative and systematic effort to address health problems based on the results of community input and the assessment activities developed during the CHA. The CHIP identifies evidence-based strategies and evaluates efforts to measure outcomes and progress (GO Health 2024).

Genesee 2050

Genesee 2050 is Genesee County's Comprehensive Plan. The County's 2050 Comprehensive Plan shapes how the County will grow and change. The plan seeks to preserve and expand focus groups to guide the County with efficiency and vigor and to develop focus group transparency for greater understanding and support throughout the County and its communities. The Genesee County 2050 Comprehensive Plan Update includes planning goals, objectives, policies, and programs and consists of these elements (Genesee County 2021):

- Land Use, Environment, & Place Making
- Agriculture and Food Production
- Arts, Culture, Parks, & Recreation
- Housing Opportunities
- Transportation & Mobility
- Technology & Utilities
- Community Wellness
- Economic & Workforce Development
- Safety, Security, & Justice
- Education & Government Administration

Generating Growth in Genesee County

Genesee County Economic Development Center’s (GCEDC) strategic development model is built on five interrelated pillars: shovel-ready site development, workforce development, innovation support, economic incentives, and placemaking. This report reviews GCEDC’s performance in each of these five pillars through the creation of relevant metrics and comparison with peer regions. The report presents strategies and policy recommendations for consideration by GCEDC and other relevant policymakers and stakeholders.

Genesee County Agricultural and Farmland Protection Plan

This County Agricultural and Farmland Protection Plan is intended to reinforce and enhance agriculture in Genesee County and strongly support efforts to maintain its vitality.

Genesee County Comprehensive Emergency Management Plan

The Genesee County Office of Emergency Management (OEM) addresses evacuation and sheltering in its Comprehensive Emergency Management Plan (CEMP). The plan assigns responsibility for emergency



management to existing County departments and agencies. The assignments are made within the framework of the present County capability and existing organizational responsibilities. The Genesee County OEM Services is designated to provide the centralized coordination of all these management activities, including coordination of resources, manpower, and services and the centralized direction of requests for assistance.

County responsibilities are closely related to the responsibility of the local levels of government within the County, i.e., the city, towns, and incorporated villages, to manage all phases of disasters. The County has the responsibility to assist the local levels of government in the event that they have fully committed their resources and are still unable to cope with any disaster.

Evacuation and Sheltering

Evacuation routes are determined at the time of an incident by the Incident Commander or their designee. Generally, evacuation routes will be whatever major roads lead away from the evacuated area. Major roads are shown in Section 4.

Genesee County partners with the American Red Cross (ARC) to operate emergency shelters throughout the County, in accordance with the existing "Red Cross Sheltering Plan." The ARC has pre-identified a set of facilities that could be used as emergency shelters. Compliance with the Americans with Disabilities Act (ADA) is included in the criteria that the ARC uses to approve a facility to serve as a shelter, as is the requirement that facilities must be outside of the Special Flood Hazard Area (SFHA). During an incident that requires evacuation of an area, the County OEM will work with the ARC to activate one or more shelters (depending on the need and the resources available to operate a shelter) and will ensure that the location(s) of the shelter(s) is/are provided to evacuees. How evacuees will be notified of shelter locations is also addressed by the "Public Warning and Emergency Information" section of the CEMP.

During an incident, Genesee County's emergency management structure will establish a human needs resources group to address medical needs, access and functional needs, compliance with the ADA, and other issues that arise during an evacuation. This group is also described in the CEMP in the "Meeting Human Needs" section.

Genesee County Continuity of Operations Plan

The purpose of the Continuity of Operations (COOP) Plan is to establish policy and guidance to ensure that essential functions for an agency are continued in the event that man-made, natural, or technological emergencies disrupt or threaten to disrupt normal operations. Genesee County will have a COOP Plan established in the fall of 2025.

Genesee County Debris Management Plan

The debris management plan establishes procedures and guidelines for managing disaster debris in a coordinated, environmentally responsible, and cost-effective manner. The plan facilitates response and recovery activities, facilitates the quick return of a community to normalcy, reduces impacts to humans and the environment, ensures effective use of resources, helps to control and minimize costs, and aids in complying with applicable local, state/tribal/territorial, and federal regulations.

Genesee County Emergency Preparedness Assessment

The 2022 Genesee County Emergency Preparedness Assessment (CEPA) is a framework and tool to assess risk, capabilities, and the potential need for support during disasters. The CEPA is an initiative to better understand local emergency preparedness in a more systematic way in New York State.



Genesee County Forest Management Plan - Genesee County Park & Forest

The Genesee County Park & Forest Management Plan provides a roadmap for managing the forest to achieve long-term management goals, promote forest, water, and human health, and ensure sustainable ecosystems and resilient watersheds.

Genesee County Housing Needs Assessment and Market Analysis

Genesee County is updating its Housing Needs Assessment and Market Analysis. This update will help housing providers, housing developers, municipalities, Genesee County agencies, and not-for-profit organizations to better understand the County's housing market. The study is intended to guide housing policies and assist housing providers in designing projects that meet the County's full spectrum of current and future housing needs (Genesee County n.d.).

Genesee County Mass Casualty Incident Plan

The purpose of the Mass Casualty Incident Plan is to provide an orderly and efficient set of response procedures and guidelines for incidents that are of a larger magnitude than our normal day-to-day response. This plan, overall, encompasses fire/EMS and police agency responses. Although each agency has an individual plan of action, this document addresses pre-hospital medical care provided by a combined agency response through the use of the Incident Command System and Unified Command System.

Genesee County Recovery Plan

The Genesee County Recovery Plan is a guidance document that identifies policies, operational strategies, and roles and responsibilities to guide decisions and actions for long-term recovery and redevelopment following a major or catastrophic disaster. It provides planning and decision-making processes for recovery policies and programs within the County.

Genesee County Recreation Plan

The Genesee County Recreation Plan is a long-term strategy that evaluates the existing and ongoing recreational opportunities and assets in Genesee County while also providing a roadmap and vision for future development and enhancement to the County's recreational opportunities—all with an emphasis on promoting a vision of enhanced community livability, connectivity, health and safety. Genesee County recognizes the importance of parks, trails, and recreation in the lives of its residents. The County's vision is to be a community that improves public health through recreation, provides recreational opportunities for every resident and visitor, strategically invests in green space and play space, and works to promote the story of Genesee County's unique and abundant recreational assets. This plan is multi-jurisdictional and represents an important step toward achieving a desired vision and direction for the involvement of Genesee County and the surrounding local governments in the planning and support of parks, trails, and recreation throughout the County.

Genesee County Resiliency Plan

The purpose of the January 2023 Genesee County Countywide Resiliency Plan is to increase the resiliency of Genesee County communities by preparing our current and future generations to recover, adjust, and thrive in a changing world. The plan provides a list of recommended strategies and projects that will increase resiliency for Genesee County. Several priority projects include specific strategies and details to facilitate immediate implementation. The plan contains (Genesee County 2023):

- An overview and general understanding of current and future climate trends and impacts



- Identification of assets, risks, vulnerabilities, and opportunities
- Development and prioritization of resilience strategies
- Projects designed for immediate implementation

Genesee County Six-Year Capital Improvement and Asset Acquisitions Program

The Genesee County Capital Improvement Plan (CIP) consists of one or more capital improvement projects, which are financed through a capital budget. The CIP permits the County to plan strategically for community growth and transformation.

Genesee County Smart Growth Plan

The Genesee County Smart Growth Plan is designed to mitigate potential environmental impacts of the Genesee County Water Supply Project on the viability of agriculture. The plan encourages the revitalization of villages and hamlet areas while protecting valuable agricultural resources (Genesee County n.d.).

To ensure sustainable development, the plan requires the County to restrict water system hook-ups. Water access is available to existing and new development located within Smart Growth Development Areas but new development on land enrolled in an Agricultural District may be restricted due to lateral restrictions established during the formation of certain water districts (Genesee County n.d.).

New developments outside of the Smart Growth Development Area boundary are not automatically eligible for water system hook-up. However, the County has established an administrative review process for case-by-case evaluations. Businesses and residents seeking water system hook-ups can apply using the form linked below (Genesee County n.d.).

Genesee County Tourism Marketing Plan

The 2023 Tourism Marketing Plan outlines how the Chamber of Commerce is working on advertising various events and expanding program development to entice and encourage the tourism industry to rebound following the COVID-19 pandemic.

GO Health Public Health Emergency Preparedness and Response Plan

The Genesee and Orleans County Health Departments Public Health Emergency Preparedness and Response plan (GO Health PHEPR Plan) is a planning and operations-based document that provides guidance for all aspects of health-related emergency management activities and functions. The GO Health PHEPR Plan provides the basis for the planning, training, and use of state, regional, and county public and private public health resources to respond, mitigate, and recover from a public health emergency or disaster in either Genesee or Orleans County.

GO Health Strategic Plan 2020–2024

This plan forms the foundation to building a new approach to public health that moves toward becoming the chief health strategist for Genesee and Orleans Counties. The plan is enhanced by new communication tools and a “branding” initiative aimed at re-introducing GO Health to the public and connecting through social media and other sources that are most likely to resonate and create a necessary response. The intent of this plan is to shift from a limited focus on meeting basic regulatory requirements for public health to a broader agenda centered on population health. Additionally, it aims to collaborate with municipal, county, private sector, and regional partners to address the social determinants that impact overall health and well-being (Genesee and Orleans Health Departments 2020).



Green Genesee Road Map

Genesee County, being a rural county, is subject to the same pressures that many other rural areas are, most notably, increased development pressure, which can lead to unplanned fragmentation and sprawl and changing land use practices, including farming practices, that can lead to unintended loss of resources. This often undesirable but typical pattern of land development results from opportunistic instead of optimized land use decisions. The Green Genesee Road Map helps guide important land use decisions in a way that maintains, supports, and improves the quality of life currently enjoyed in Genesee County.

Local

Comprehensive Master Plans

Comprehensive planning is a process for achieving community goals and aspirations through community development. The outcome of comprehensive planning is a comprehensive plan, general plan, or master plan that directs public policy in terms of transportation, utilities, land use, recreation, and housing. 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. State statutes require that all land use laws in a municipality be consistent with a comprehensive plan (State of New York 2014).

Municipal Land Use Planning and Regulatory Authority

The County and municipalities have various land use planning mechanisms that can be leveraged to mitigate flooding and support natural hazard risk reduction. Specific County and local planning and regulatory capabilities are identified in their jurisdictional annexes in Volume II. These include, but are not limited to, comprehensive plans, flood damage prevention ordinances, local codes and regulations, stormwater regulations, and municipal level plans. A list of plans reviewed is provided in each annex.

Section 239 of New York State General Municipal Law requires the referral of certain local planning actions to the Genesee County Planning Board for the examination of possible intermunicipal impacts. The Genesee County Planning Board operates under New York State General Municipal Law §239 m and n to advise local boards on the potential intermunicipal or countywide impact of local land use decisions. The Planning Board uses the Genesee County Comprehensive Plan to direct recommendations on municipal land use referrals and to review proposed County capital improvement projects (State of New York 2014, Genesee County n.d.).

21.3 ADMINISTRATIVE AND TECHNICAL CAPABILITIES

This section summarizes administrative and technical capabilities in Genesee County. Further information is provided in the jurisdictional annexes in Volume II.

21.3.1 State and Federal

Federal

Federal Emergency Management Agency

FEMA is responsible for providing assistance before, during, and after disasters. FEMA is the federal reviewer of hazard mitigation plans and sets federal standards for local and state hazard mitigation plans.



Community Assistance Visits and Community Assistance Contacts

FEMA evaluates NFIP minimum compliance through compliance audits known as Community Assistance Visits (CAVs) or Community Assistance Contacts (CACs). CAVs and CACs are performed to ascertain community compliance with the NFIP, at entry into the CRS, and to maintain participation in the CRS. FEMA may conduct these with Region 2 staff, with NYS DEC staff under the Compliance Assistance Program – State Support Services Element (CAP-SSSE) grant, or with private contractors. While there is some flexibility in how a CAV or a CAC is conducted, 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) has the largest dam safety program in the United States, cooperating with many federal and state agencies to ensure and promote dam safety and, more recently, homeland security, on 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, administered by FEMA, the USACE, and the National Atmospheric and Oceanic Administration (NOAA) National Hurricane Center used for tracking hurricanes (HURREVAC n.d.). HURREVAC permits governmental agencies to work as a unified team, coordinate notification, communication, activations, public warning, and evacuation and sheltering efforts. By operating together, the government agencies serve the public better by providing the same advisories and actions.

National Weather Service (NWS)

The NWS monitors weather and delivers weather forecasting for New York. The State of New York is serviced by five weather forecast offices (WFO): Albany (NY), Binghamton (NY), Buffalo (NY), Burlington (VT), and New York (NY). Genesee County, along with Allegany, Cattaraugus, Cayuga, Chautauqua, Erie, Jefferson, Lewis, Livingston, Monroe, Niagara, Chautauqua, Orleans, Oswego, Seneca, St. Lawrence, Wayne, Wyoming, and Yates Counties, is covered by the Buffalo WFO. NYS DHSES uses conference calling with the NWS and County OEMs to share specific information and needs when severe weather is forecast. The NWS also offers various education and training programs on weather-related hazards (NWS 2023).

StormReady Program

The NWS operates the StormReady program, which encourages communities to take a new, proactive approach to improving local hazardous weather operations by providing emergency managers with clear-cut guidelines on



how to improve their hazardous weather operations. To be recognized by the program, 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 the importance of public readiness through community seminars; and develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises. Genesee County is a StormReady community (NWS n.d.).

U.S. Army Corps of Engineers

The USACE works to strengthen the nation's security by building and maintaining America's infrastructure and providing military facilities where servicemembers train, work, and live. Projects include dredging, storm damage reduction, and ecosystem restoration in and near waterways (USACE n.d.). New York is serviced by the Buffalo, Pittsburgh, and New York districts, with Genesee County represented by the Buffalo District. USACE has numerous initiatives to support hazard mitigation measures, including the Silver Jackets, planning assistance, and inspections and repair of flood control structures. USACE also maintains the National Inventory of Dams and the National Levee Database.

Silver Jackets

Silver Jackets, developed by USACE, is the state-level implementation program for the National Flood Risk Management Program. The program's goals are to leverage information and resources from federal, state, and local agencies to improve flood risk management; improve public risk communication through a united effort; and create a mechanism to collaboratively solve issues and implement initiatives beneficial to local communities. The USACE Buffalo District organizes this program in Genesee County.

Climate Preparedness and Resilience Community of Practice

The Practice develops and implements practical, nationally consistent, and cost-effective approaches and policies to reduce potential vulnerabilities to the nation's water infrastructure resulting from climate change and variability (USACE n.d.).

Planning Assistance to States Program

Section 22 of the 1974 Water Resources Development Act provides authority for the USACE to assist 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, flood plain management studies, coastal zone management/protection studies, harbor/port studies, or other water resource planning investigations. The individual non-federal sponsors determine the needed planning assistance (USACE n.d.).

Flood Plain Management Services Program

Section 206 of the 1960 Flood Control Act (PL 86-645), as amended, provides the authority for the USACE to provide assistance and guidance on all aspects of floodplain management planning. The program develops or interprets site-specific data on obstructions to flood flows, flood formation and timing, and the extent, duration, and frequency of flooding. Upon request, program services are provided to the state, regional, and local governments, Native American Tribes, and other non-federal public agencies without charge (USACE n.d.).



Inspection of Completed Works Program

Civil works structures whose failure, or partial failure could jeopardize the operational integrity of the project, endanger the lives and safety of the public, or cause substantial property damage are periodically inspected and evaluated to ensure their structural stability, safety, and operational adequacy. For those structures constructed by the USACE and turned over to others for operation and maintenance, the operating entity is responsible for periodic inspection and evaluation. The USACE may conduct the inspection on behalf of the project sponsor provided appropriate reimbursement to the USACE is made. However, the USACE may participate in the inspection with the operating entity at the government's expense.

Rehabilitation and Inspection Program

The Rehabilitation and Inspection Program is a USACE program that 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

The 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

U.S. Geological Survey (USGS) maintains a network of gauges across New York that continuously measure lake, reservoir table, stream, and tidal levels. These datasets 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 2023). USGS provides data to the Department of Environmental Protection for drought determinations. USGS also recovers high water marks post-coastal flooding (USGS 2018).

State

New York State Division of Homeland Security and Emergency Services

For more than 50 years, NYS DHSES (formerly New York State OEM) and its predecessor agencies have been responsible for coordinating the activities of all state agencies to protect New York's communities, the State of New York's economic well-being, and the environment from natural and human-caused disasters and emergencies. NYS DHSES routinely assists local governments, voluntary organizations, and private industry through a variety of emergency management programs, including hazard identification, loss prevention, planning, training, operational response to emergencies, technical support, and disaster recovery assistance.

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 HMP. NYS DHSES prepared the 2023 New York State HMP, working with input from other state agencies, authorities, and organizations. It was approved by FEMA in 2023, and it 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 grant programs. The 2023 New York State HMP was used as guidance in completing the Genesee County HMP Update.



New York State Department of Environmental Conservation Region 8

NYSDEC Region 8 is located in western New York and includes Genesee, Chemung, Livingston, Monroe, Ontario, Orleans, Schuyler, Seneca, Steuben, Wayne, and Yates Counties. The main Department of Environmental Conservation (DEC) office is located in Avon, with sub-offices in Bath and Elmira. DEC staff have two main areas of responsibility: natural resource management and environmental quality protection. As part of natural resource management, staff oversee state fish and wildlife resources as well as state forests (NYSDEC 2023).

New York State Department of Environmental Conservation Division of Water—Bureau of Dam Safety, Coastal & Flood Protection

Within the NYSDEC Division of Water, the Bureau of Flood Protection and Dam Safety 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 2023). The Bureau consists of the following sections (NYSDEC 2023):

- Coastal Erosion and Flooding: Works to reduce coastal erosion and storm damage to protect lives, natural resources, and properties through structural and nonstructural means.
- Dam Safety: Responsible for reviewing repairs and modifications to dams and assuring that dam owners operate and maintain dams in a safe condition through inspections, technical reviews, enforcement, and emergency planning.
- Flood Protection and Floodplain Management: Works with communities throughout the state in finding ways to reduce or protect against physical and property damage caused by flooding.

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 2023).

Northeast Regional Climate Center

The Northeast Regional Climate Center (NRCC) partnered with the New York State Energy Research and Development Authority (NYSERDA) to compare various methods of downscaling global climate model (GCM) output and create extreme precipitation projections for New York State. These projections will ultimately be incorporated into climate change adaptation planning. 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 (NRCC 2014).

NRCC also maintains the Extreme Precipitation in New York & New England website, 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). These data are interpolated to a 30-second grid. Confidence intervals for these values are included, as are the partial duration rainfall series used in their computation. Regional extreme rainfall maps and graphic products are available. Precipitation distribution curves can be generated for each grid either directly or from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Win TR-20 software, eliminating the need to use a static Type II or Type III curve (NRCC n.d.). 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).



Department of State's Division of Building Standards and Codes

The New York State Department of State's Division of Building Standards and Codes provides a variety of 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). These codes provide for the construction of safe, resilient, and energy-efficient buildings throughout New York State.

The statutory responsibility for developing and maintaining the Uniform Code and the Energy Code is vested in the State Fire Prevention and Building Code Council (Code Council). If the Code Council decides to amend either code, it commences a process for rulemaking set forth in the State Administrative Procedure Act. The Code Development Unit administers statutory functions and 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 Council is empowered to approve these more restrictive standards and codes when they comply with Executive Law §379 and Energy Law §11-109. The Code Development Unit assists with reviewing the technical aspects of these local laws and ordinances and reporting its findings to the Code Council.

The Division of Building Standards and Codes' Code Enforcement Disaster Assistance Response (CEDAR) Program provides requesting communities with post-disaster assistance under the leadership of the DHSES OEM and in accordance with Executive Law 2-B. The program's initial disaster response focuses on performing rapid evaluation safety assessments of damaged structures in affected communities for use as part of 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.

New York State Department of Transportation

It is the mission of the New York State Department of Transportation (NYSDOT) to provide a safe, reliable, equitable, and resilient transportation system that connects communities, enhances quality of life, and supports the economic well-being of New York State. Genesee County is served by the Genesee Valley, Region 4 NYSDOT office, which is based in the City of Rochester.

NYSDOT offers a variety of 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.

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 climate change impacts, particularly coastal flooding. 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.



Climate Smart Communities

Climate Smart Communities (CSC) is a New York State program that helps local governments take action to reduce greenhouse gas emissions and adapt to a changing climate. The program offers grants, rebates for electric vehicles, and free technical assistance. The CSC certification program recognizes leaders of local governments that have undergone a rigorous review process to confirm their completion of a suite of actions that mitigate and adapt to climate change at the community level. The goals of the CSC certification program are to engage and educate local governments in New York State, provide a robust framework to guide their climate action efforts, and recognize their achievements.

The structure of the certification program is based on the CSC pledge elements that were developed in 2009. Participation in the program is voluntary. The program is designed to encourage ongoing implementation of actions that reduce greenhouse gas emissions and help communities adapt to the effects of climate change.

While there are no CSC-certified jurisdictions in Genesee County, the following are registered with the CSC but have not been ranked:

- Village of Attica
- City of Batavia
- Town of Batavia

Resilient NY

In November 2018, New York State launched the Resilient NY program. The overall goal of the program is to improve community resiliency to extreme weather events that result in flooding and ice jam formations.

NYS DEC and NYS OGS retained two consulting firms to prepare the Resilient NY studies. The consultants will work with NYS DEC experts, municipalities, and interested stakeholders to collect relevant information about flooding and ice jam formations in each priority watershed and use this information to develop specific mitigation projects and actions.

New York State Department of State's Division of Building Standards and Codes

Technical Bulletins for the 2020 Codes of New York State

The Department of State Division of Building Standards and Codes (DBSC) publishes 14 technical bulletins including two recent bulletins with guidance related to flood hazard areas: Electrical Systems and Equipment in Flood-damaged Structures and Accessory Structures. One archived bulletin from October 31, 2017, Flood Venting in Foundations and Enclosures Below Design Flood Elevation, 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 Division of Homeland Security & Emergency Services – Office of Fire Prevention and Control (OFPC), has implemented a joint outreach program that is intended to guide and educate code users. The program will provide concise, easily digestible information on:

- New topics that code users must be aware of,
- Frequently overlooked or misunderstood code requirements, and



- Concerns relating to the administration and enforcement of the Uniform Code and Energy Code.

The DBSC and OFPC hope the program will continue to foster professional growth and support the efforts of the code enforcement community and provide helpful guidance to all code users.

The Code Outreach Program publications are expected to be distributed at the beginning of every month. If you have ideas for future topics to be addressed by the Code Outreach Program, email Cop.Codes@dos.ny.gov.

The DBSC posts several 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’ 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 International Code Series published by the International Code Council and FEMA (2008).

21.3.2 County and Local

Agricultural and Farmland Protection Board

The Agricultural and Farmland Protection Board was established by the Genesee County Legislature in 1993 under Resolution No. 19 in accordance with NYS Agriculture and Markets Law, Section 302. The Board consists of 11 members and provides critical advice to the Legislature on the creation, modification, continuation, or termination of Agricultural Districts in Genesee County. The Board also issues recommendations on the Agricultural District Annual Enrollment and Smart Growth Plan revisions. Additionally, the Board reviews local plans and responds to utility extension Notices of Intent from municipalities regarding water and sewer line extensions through Agricultural District lands (Genesee County n.d.).

Genesee County Water Resources Agency

The Genesee County Water Resources Agency was created in 1998 by the County Legislature, evolving from the Water Supply Task Force. The agency was established to support the Legislature in implementing water improvements across the County. It consists of 10 members, each appointed for a three-year term by the Legislature. The Genesee County Water Resources Agency’s responsibilities include (Genesee County n.d.):

- Assemble data related to available water resources within and beyond County boundaries.
- Assist in planning and designing coordinated water resource and transmission projects in Genesee County and make recommendations on such projects.
- Develop intermunicipal agreements and grant applications for water supply and transmission under Article 5-G of the General Municipal Law.
- Contract for engineering and related technical services within the County’s budget appropriation and provide said services to municipalities within the County under contract.
- Contract for necessary services to carry out its functions, adhering to County Legislature audit requirements.
- Serve as the administrative head of any County water district that may be created.
- Coordinate County water resource or transmission projects with comprehensive planning and land use regulation, ensuring consistency with intermunicipal agreements.
- Exercise any other powers conferred upon the agency by the County legislature.



Genesee County Public Works Department

With 57 full-time employees, the Genesee County Public Works Department is responsible for maintaining over 260 miles of County roads, 379 bridges and culverts, 343 County-owned vehicles and equipment, the Genesee County Airport, and the Genesee County Parks, Recreation and Forestry Division, the Facility Management Division, and Countywide Water (Genesee County n.d.).

The Genesee County Public Works Department uses new technologies to maintain one of the highest quality County highway networks in the state without a growth in expenditures, secures federal and state funds to assist with new development, fosters economic growth with new infrastructure, and continually reviews its operations to maintain and improve productivity (Genesee County n.d.).

Genesee County Office of Emergency Management

Genesee County OEM is responsible for the overall coordination of 17 volunteer fire departments, EMS, and one career department. The coordination of services these agencies provide represents a geographical area of 501 square miles, which includes a population of approximately 61,000 people. Genesee County OEM also serves as the liaison between local governments and state and federal agencies during natural disasters and/or man-made emergencies. Additionally, the office provides numerous Fire/EMS training programs required by the NYS OFPC and the NYS Department of Health to our local emergency responders (Genesee County n.d.).

Genesee County OEM continues to update and revise emergency response plans, which are designed to assist local jurisdictions during emergencies. Additionally, Genesee County OEM provides the services of specialized response teams to jurisdictions during times when local resources have been exhausted or specialized equipment may be required (Genesee County n.d.).

Genesee and Orleans Health Departments

Genesee and Orleans Health Departments (GO Health) is a shared services arrangement that promotes the necessary safe and healthy environment, and health behaviors, that lead to improved health outcomes and quality of life. GO Health staff are the chief health strategists, partnering across multiple sectors and leveraging data and resources to address social, environmental, and economic conditions that affect health and health equity (GO Health n.d.).

Genesee, Livingston, Orleans, and Wyoming Region Solid Waste

Genesee, Livingston, Orleans, and Wyoming (GLOW) Region Solid Waste was created in 1987 as a cooperative effort between the Counties of Genesee, Livingston, Orleans, and Wyoming to develop strategies for the management of solid waste in the region. Orleans County ended its affiliation with the GLOW at the end of 2003. GLOW is an inter-county agency that provides leadership in solid waste issues for residents, businesses, and municipalities. GLOW's leadership includes education, resources, and direct services (Genesee County n.d.).

Genesee County Information Technology

The Genesee County Information Technology Department is responsible for delivering secure, accurate, timely information and services to County departments, offices, municipalities, residents, visitors, and businesses at work, at home, and in the community. The department is committed to delivering services at the lowest possible cost while providing quality solutions that streamline operations and enable County employees to conduct business effectively and efficiently. County technical staff, consultants, and outsourcing partners support central, public safety, and distributed systems and are responsible for the following (Genesee County n.d.):



- Cyber Security, Business Continuity, and Compliance
- Strategy and Project Management
- Public Safety, Financial and Business Applications, and Database Support
- Infrastructure Applications, Systems, Server, and Storage Administration
- Voice and Data Network Administration
- Help Desk, Desktop Support, and Customer Training
- Asset and Contract Management and Technology Equipment Lifecycle

Genesee County Office for the Aging

It is the mission of the Genesee County Office for the Aging to provide information, support, and advocacy to our residents 60 years of age and older, their caregivers, and persons with disabilities of all ages. The office's goal is to promote independence and improve quality of life (Genesee County n.d.).

The work of Genesee County Office for the Aging is made possible through funds from the NY State Office for the Aging, NY Connects, Administration on Community Living, and the support of the Genesee County Legislature (Genesee County n.d.).

Genesee County Parks, Recreation, and Forestry

Genesee County Parks, Recreation, and Forestry offers educational and recreational programs for schools, scouts, 4H, seniors, private groups, and the general public. The department issues the "Seedlings" newsletter to highlight the happenings and information, including volunteer opportunities, rentals and reservations, seedling and sapling sales, and promoting upcoming programs (Genesee County n.d.).

Genesee County Planning Department

The Genesee County Planning Department provides planning services to the County and its municipalities and disseminates information to private agencies and citizens. The department is involved in County planning projects, local technical assistance, housing, environment, transportation, economic development, capital programming, education, data dissemination, SEQR reviews, County Water System, Smart Growth, agriculture and farmland protection, the County's Comprehensive Plan, and other special County projects. The department is also the staff to the County Planning Board, which is responsible for undertaking reviews of local planning actions, including construction and development projects under Section 239 L, M & N of New York State General Municipal Law (Genesee County n.d.).

Genesee County Planning Board

The Genesee County Planning Board serves as the reviewing authority for local development projects and land use actions, as mandated by New York State General Municipal Law (GML). Municipal boards are required to refer certain planning actions to the County Planning Board for review before taking final action, as per GML Article B, Sections 239-m and 239-n. These laws help ensure local land use decisions consider broader countywide and intermunicipal impacts (Genesee County n.d.).

Genesee County Sheriff's Office

The mission of the Genesee County Sheriff's Office is to provide public service and protection to the citizens of the community. The responsibilities associated with this mission include (Genesee County n.d.):



- The enforcement of all federal, state, and local laws
- Maintaining peace and order in the County
- Protecting property and personal safety
- Providing professional public safety dispatching services, animal control generally assisting citizens in need
- Providing a safe and secure jail, ensuring proper care, custody, treatment, supervision, and discipline for all persons committed to the custody of the Sheriff
- Properly receive and execute any and all legal civil processes referred to the Sheriff's Office

Genesee County Department of Social Services

The Genesee County Department of Social Services provides a wide range of financial assistance and social service programs to the needy and vulnerable citizens of our County. The department is responsible for a significant part of the social safety net that helps ensure that basic human needs will be met. Federal and state laws and regulations mandate virtually all programs and services (Genesee County n.d.).

Genesee County Soil and Water Conservation District

The Genesee County Board of Supervisors created the district in 1944 to "conserve soil resources and control and prevent soil erosion." This was done according to state law known as the Soil Conservation Districts Law. A 1964 amendment to the state law added "water" and the title became the Soil and Water Conservation Districts Law. Another amendment in 1989 added language regarding water quality improvement and abatement of nonpoint sources of water pollution. In 1989 the Genesee County Legislature designated the district as "the local planning, management, and implementing agency responsible for (1) erosion and sediment control on potential nonpoint sources such as streambanks, construction sites, forestry, mined land, road banks, urban sources and agriculture; (2) stormwater runoff; (3) fertilizer and pesticide management; (4) agricultural waste." (Genesee County n.d.)

It is the mission of the Genesee County Soil and Water Conservation District to work directly with County landowners to provide for the conservation of soil and water resources, improvement of water quality, and prevention of floodwater and sediment damages, thereby protecting the natural resource base and promoting health, safety, and general welfare of the County residents (Genesee County n.d.).

Ready Genesee

Genesee County has developed a personal preparedness program called READYGenesee. This program is designed to help residents learn how to protect themselves from the impacts of all hazards, including developing family emergency plans and creating disaster supply kits. The County developed a "Ready Genesee" smartphone app that provides information on road closures, weather events, and preparedness reminders.

21.4 FISCAL CAPABILITIES

This section summarizes fiscal capabilities in Genesee 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 mitigation-related funding administered by state agencies that eligible jurisdictions can use to fund mitigation actions.



21.4.1 State and Federal

Federal

Federal Emergency Management Agency

As noted on the FEMA Hazard Mitigation Assistance website (FEMA n.d.), FEMA administers five programs that provide funding for eligible mitigation planning and projects that reduces disaster losses and protect life and property from future disaster damages. The programs are the Hazard Mitigation Grant Program (HMGP), and the HMGP Post Fire Grant, the FMA Program, and the Pre-Disaster Mitigation (PDM) Program,. Table 21-1 provides an overview of program funding eligibility and cost share.

Table 21-1. FEMA HMA Grant Cost Share Requirements

Programs	Cost Share (Percent of Federal/Non-Federal Share)
HMGP	75/25
HMGP Post Fire	75/25
FMA (community flood mitigation, project scoping, individual mitigation of insured properties, and planning grants)	75/25
FMA—repetitive loss property ⁽²⁾	90/10
FMA—severe repetitive loss property ⁽²⁾	100/0
PDM	75/25
PDM—small and impoverished community	Up to 90/10
BRIC	75/25
BRIC—small and impoverished community	Up to 90/10

Source: FEMA 2023; FEMA 2023

Sub-applicants should consult their State Hazard Mitigation Officer (SHMO) for the amount of percentage of HMGP subrecipient management cost funding their State has determined to be passed through subrecipients.

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.

HMGP assists in implementing long-term hazard mitigation planning and projects following a presidential major disaster declaration. PDM provides funds for hazard mitigation planning and projects on an annual basis. FMA provides funds for planning and projects to reduce or eliminate risk of flood damage to buildings that are insured under the NFIP on an annual basis. BRIC supports jurisdictions in hazard mitigation projects, reducing the risks they face from disasters and natural hazards. The BRIC program will replace the existing PDM program. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency (FEMA 2023).

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. PDM and FMA funding depends on the amount Congress appropriates each year for those programs. BRIC is funded by a 6 percent (\$500 million) set-aside from federal post-disaster grant funding.

Individual homeowners and business owners may not apply directly to FEMA. Eligible local governments may apply on their behalf (FEMA 2023).



Federal mitigation grant funding is available to all communities with a current HMP (this plan); however, most of these grants require a “local share” in the range of 10–25 percent of the total grant amount. The FEMA mitigation grant programs are described below.

Hazard Mitigation Grant Program

The HMGP is a post-disaster mitigation program. It is made available to states by FEMA after each federal disaster declaration. The HMGP can provide up to 75 percent funding for hazard mitigation measures. The HMGP can be used to fund cost-effective projects that will protect public or private property in an area covered by a federal disaster declaration or that will reduce the likely 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. All applicants must have a FEMA-approved HMP (this plan).

Applicants who are eligible for the HMGP are state and local governments, certain nonprofit organizations or institutions that perform essential government services, and Indian tribes and authorized tribal organizations. Individuals or homeowners cannot apply directly for the HMGP; a local government must apply on their behalf. 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.

Flood Mitigation Assistance Program

The FMA program combines the previous Repetitive Flood Claims and Severe Repetitive Loss Grants into one grant program. The FMA 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 very 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.

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 eligible rehabilitation activities that reduce dam risk and increase community preparedness.

The HHPD grant program will provide assistance for technical, planning, design, and construction activities toward:

- Repair
- Removal
- Structural/nonstructural rehabilitation of eligible HHPD

Extraordinary Circumstances

For BRIC and FMA project subawards, the FEMA Region may apply extraordinary circumstances when justification is provided and with concurrence from FEMA Headquarters (Risk Reduction and Risk Analysis Divisions) prior to



granting an exception. If this exception is granted, a local mitigation plan must be approved by FEMA within 12 months of the award of the project subaward to that community.

For HMGP, BRIC, and FMA, extraordinary circumstances exist 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 (Standard or Enhanced) Hazard Mitigation Plan and that the jurisdiction meets at least one of the criteria below. If the jurisdiction does not meet at least one of these criteria, the Region must coordinate with FEMA Headquarters (Risk Reduction and Risk Analysis Divisions) for HMGP; however, for BRIC and FMA, the Region must coordinate and seek concurrence prior to granting an exception:

- The jurisdiction meets the small, impoverished community criteria (see Part VIII, B.2).
- 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 the local or Tribal Mitigation Plan.

For HMGP, BRIC, 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 shall acknowledge in writing to the Regional Administrator that a plan will be completed within 12 months of the subaward. The Recipient must provide a work plan for completing the local or Tribal Mitigation Plan, including milestones and a timetable, to ensure that the jurisdiction will complete the plan in the required time. This requirement shall be incorporated into the award (both the planning and project subaward agreements if a planning subaward is also awarded).

Assistance to Firefighters Grant Program

The goal of the Assistance to Firefighters Grants is to enhance the safety of the public and firefighters with respect to fire-related hazards by providing direct financial assistance to eligible fire departments, nonaffiliated emergency medical services organizations, and state fire training academies. This funding is for critically needed 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 EMPG provides state, local, tribal, and territorial emergency management agencies with the resources required for implementation of the National Preparedness System and works toward the National Preparedness Goal of a secure and resilient nation. The EMPG's allowable costs support efforts to build and sustain core capabilities across the prevention, protection, mitigation, response, and recovery mission areas.



Homeland Security Grant Program

The HSGP plays an important role in the implementation of the National Preparedness System by supporting 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 two priorities: building and sustaining law enforcement terrorism prevention capabilities and maturation and enhancement of state and major urban area fusion centers. HSGP is composed of three interconnected grant programs, including the State Homeland Security Program (SHSP), Urban Areas Security Initiative (UASI), and the Operation Stonegarden (OPSG). Together, these grant programs fund a range of preparedness activities, including planning, organization, equipment purchase, training, exercises, and management and administration.

Individual Assistance

Individual Assistance (IA) provides help for homeowners, renters, businesses, and some nonprofit entities after disasters occur. This program is largely funded by the U.S. Small Business Administration. For homeowners and renters, those who suffered uninsured or underinsured losses may be eligible for a Home Disaster Loan to repair or replace damaged real estate or personal property. Renters are eligible for loans to cover personal property losses. 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. For businesses, loans may be made to repair or replace disaster damages 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. 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.

Public Assistance

Public Assistance (PA) 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

The Small Business Administration (SBA) provides low-interest disaster loans to homeowners, renters, businesses of all sizes, 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.

Homeowners may apply for up to \$200,000 to replace or repair their primary residence. Renters and homeowners 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. Physical disaster loans of up to \$2 million are available to qualified businesses or most private nonprofit organizations.

National Park Service

Land and Water Conservation Fund

The Land and Water Conservation Fund (LWCF) was established by Congress in 1964 to fulfill a bipartisan commitment 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 LWCF 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. The LWCF was permanently reauthorized in 2019 and permanently funded in August 2020.

Restore America's Estuaries

Coastal Watersheds Grant Program

Restore America's Estuaries, in close coordination with and financial support from the U.S. Environmental Protection Agency (EPA), administers the National Estuary Program (NEP) Coastal Watersheds Grant Program. This grant program funds projects within the geographic areas shown here and supports the following Congressionally set priorities:

- 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 affordable 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. Also, farmers located in counties that are contiguous to the declared, designated, or quarantined area 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, a federal emergency recovery program, helps local communities recover after a natural disaster. The EWP Program offers technical and financial assistance to help local communities relieve imminent threats to life and property caused by floods, fires, windstorms, and other natural disasters that impair a watershed. EWP does not require a disaster declaration by federal or state government officials for program assistance to begin. The 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 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

Additional information regarding the EWP is detailed below and available on the website: <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/>.

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 must be a legal subdivision of the state, such as a city, County, township, or conservation district, and Native American Tribes or 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 work is not limited to any one set of measures. The program is designed 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 EWP 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

Privately owned lands or lands owned by local and state governments might be eligible for participation in the EWP – Floodplain Easement program. To be eligible, lands must 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

Through this program, easements are restored 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.

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 (SSBG) is a flexible funding source that allows states and territories to tailor social service programming to their population's needs. Through the SSBG, states provide essential social services that help achieve a myriad of goals 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 to 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, as 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 the times of "urgent need" (e.g., post-disaster) as defined by the CDBG National Objectives, CDBG funding may be used to acquire a property located 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. Additional information regarding CDBG is available on the website: <https://www.hudexchange.info/programs/cdbg-entitlement/>.

Community Development Block Grant Disaster Recovery (CDBG-DR) grant funds are appropriated by Congress and allocated by the U.S. Department of Housing and Urban Development (HUD) to rebuild disaster-impacted areas and provide crucial seed money to start the long-term recovery process. These flexible grants help cities, counties, Indian tribes, and states recover from presidentially declared disasters, especially in low-income areas, subject to



the availability of supplemental appropriations. Since CDBG-DR assistance may fund a broad range of recovery activities, HUD 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 the 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 that communities use—often in partnership with local nonprofit groups—to fund a wide range of activities, including 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 (Section 108) 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. This flexibility of use makes it one of the most potent and important public investment tools that HUD offers to states and local governments.

Section 108 assistance can be deployed in two ways:

- Directly by the community or its governmental or nonprofit 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. For information regarding the FHWA Emergency Relief Program, refer to: <https://www.fhwa.dot.gov/programadmin/erelief.cfm>



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 PA. Additional information regarding the FTA Emergency Relief Program is available on the website: <https://www.transit.dot.gov/funding/grant-programs/emergency-relief-program/emergency-relief-program>.

Federal Highway Administration Recreational Trails

The Recreational Trails Program is an assistance program of the FHWA that 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 nonmotorized 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 Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grant program provides an opportunity for the U.S. Department of Transportation (USDOT) to invest in road, rail, transit, and port projects that promise to achieve national objectives. The RAISE program enables USDOT to examine these projects on their merits to help ensure that taxpayers are getting the highest value for every dollar invested.

The eligibility requirements of RAISE allow project sponsors at the state and local levels to 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 the 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. Through its Public Works Program, USED A invests in key public infrastructure, such as in traditional public works projects, including water and sewer systems 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, and development facilities. Through its Economic Adjustment Program, USED A administers its Revolving Loan Fund (RLF) 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.

Public Works Program

Through its Public Works Program, USED A 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, USEDPA administers its RLF 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, green building, and climate change. 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.

Many Partners for Fish and Wildlife projects take place on working landscapes such as forests, farms, and ranches. Efforts are focused on areas of conservation concern, such as upland forests, wetlands, native prairies, marshes, rivers, and streams. Projects are designed to benefit federal trust species, including migratory birds and endangered, threatened, or at-risk species.

State

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 associated with project development and brownfield remediation and redevelopment (NYS ESD 2023).



Local Waterfront Revitalization Program

The Waterfront Revitalization of Coastal Areas and Inland Waterways Act offers local governments the opportunity to participate in the State's Coastal Management Program (CMP) (pdf) on a voluntary basis by preparing and adopting a Local Waterfront Revitalization Program (LWRP), providing more detailed implementation of the State's CMP through use of such existing broad powers as zoning and site plan review. 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.

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. Also, funding to advance preparation, refinement, or implementation of Local Waterfront Revitalization Programs is available under Title 11 of the New York State Environmental Protection Fund (EPF) LWRP, among other sources.

In addition, State permitting, funding, and direct actions must be consistent, to the maximum extent practicable, with an approved LWRP. Within the federally defined coastal area, federal agency activities are also required to be consistent with an approved LWRP. 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 (NYS DOS 2023).

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 (EFC) 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 EFC to finance new projects, and the funds “revolve” over time.

Climate Smart Communities Grant Program

CSC grants support mitigation and adaptation projects to reduce greenhouse gas emissions and prepare for the effects of climate change. 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 resiliency measures
 - Relocation or retrofit of climate-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

As of January 2024, 432 communities have committed to acting on climate through the CSC program. In Genesee County, three communities participate in the program:

- Village of Attica – No current rating
- City of Batavia – No current rating
- Town of Batavia – No current rating



Environmental Protection Fund

New York State's 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 funds 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 as follows:

- Median household income of \$65,000 or less in the Regional Economic Development Council (REDC) regions of Capital District, Southern Tier, North Country, Mohawk Valley, Central New York, Finger Lakes, or Western New York (Jefferson County is located in the North Country region)
- Median household income of \$85,000 or less in REDC regions of Long Island, New York City, or Mid-Hudson

Grants with a 20 percent required local match could finance activities, including engineering and consultant fees for engineering and planning services to produce an engineering report. 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 on-site 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. Details regarding this program can be found on the website: <https://www.dec.ny.gov/pubs/81196.html>.

Water Quality Improvement Project Program

The Water Quality Improvement Project (WQIP) 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 (NYS DEC n.d.):

- 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 (MS4)

New York State Department of Transportation

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 the BRIDGE NY Initiative are evaluated based on the resiliency of the structure, including such factors as hydraulic vulnerability and structural resiliency; 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. Information regarding the program can be found on the following website: <https://www.dot.ny.gov/BRIDGENY>.

New York State Division of Homeland Security and Emergency Services

The New York State Emergency Services Revolving Loan

The New York State Emergency Services Revolving Loan Account was established under the State Finance Law to make 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 once 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.

New York State Office of Parks, Recreation, and Historic Preservation

Recreational Trails Grant Program

The Recreational Trails Program (RTP) provides funds to the states to develop and maintain recreational trails and trail-related facilities for both nonmotorized and motorized recreational trail uses. The RTP is an assistance program of the U.S. Department of Transportation's FHWA. In New York State, the RTP is administered by the Office of Parks, Recreation and Historic Preservation (OPRHP).

The RTP legislation requires that states use 30 percent of funds for nonmotorized recreation, 30 percent for motorized recreation, and 40 percent for diverse recreational trail use.



21.4.2 County and Local

Genesee County and individual jurisdictions are (legally, not necessarily practically) able to fund mitigation projects through 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.

DRAFT

PART 4: MITIGATION STRATEGY



22. MITIGATION STRATEGY

This chapter presents mitigation strategies for Genesee County to reduce potential vulnerability and losses identified as concerns in the risk assessment portion of this plan. The Steering Committee reviewed the risk assessment and capability assessment to identify and develop these mitigation strategies.

Hazard mitigation reduces the potential impacts of, and costs associated with, emergency and disaster-related events. Mitigation actions address a range of impacts, including impacts on the population, property, the economy, and the environment.

Mitigation actions can include activities such as revisions to land-use planning, training and education, and structural and nonstructural safety measures.

22.1 PAST MITIGATION ACCOMPLISHMENTS

The 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 Genesee County Hazard Mitigation Plan (HMP). The current planning process represents the regulatory five-year plan update process, which includes the participation of 21 jurisdictions in the County, along with key County and regional stakeholders.
- All municipalities 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 Genesee County have been reviewed and incorporated into this plan update as appropriate, as discussed in Chapter 2 (Planning Process) and References.

22.2 REVIEW AND UPDATE OF MITIGATION GOALS AND OBJECTIVES

This section describes the process of updating hazard mitigation goals and objectives for reducing or avoiding long-term vulnerabilities to identified hazards. For the purposes of this plan, goals and objectives are defined as follows:

"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)

- **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 plan 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).
- **Objectives** are short-term aims that form a strategy or course of action to meet a goal. Unlike goals, objectives are stand-alone measurements of the effectiveness of a mitigation action. The objectives are also used to help establish priorities. Broadly defined mitigation objectives were eliminated from the updated strategy unless accompanied by discrete actions.



The Steering Committee reviewed the 2019 goals and objectives and made revisions for the 2025 update based on the following considerations:

- Hazard events and losses since the 2019 Genesee County HMP
- 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 plan with other planning mechanisms, including Genesee 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, and resources
- Support for mitigation through the protection of natural systems

As a result of this review process, the goals and objectives for the 2025 HMP update were updated to the following, with *italicized text* indicating changes to the 2019 HMP goals:

- Goal 1: Reduce the likelihood and impacts of hazards on life, property, and the environment.
 - Objective 1.1: Develop and/or update local regulations based on current information and best practices.
 - Objective 1.2: Maintain natural systems to reduce the impacts of hazards.
 - *Objective 1.3: Strengthen understanding of, and adaptation to, a changing climate.*
 - *Objective 1.4: Encourage the use of green and natural infrastructure.*
- Goal 2: Protect life, property, critical infrastructure, the environment, and the economy from the impacts of natural, technological, and human-caused disasters.
 - Objective 2.1: Acquire, retrofit, or relocate structures from flood-prone areas.
 - Objective 2.2: Retrofit critical infrastructure to protect against hazard impacts.
 - Objective 2.3: Ensure that critical facilities can continue to function during and after hazard impacts.
 - Objective 2.4: Work with residents to maintain drainage ditches on private property.
 - Objective 2.5: Encourage residents and business owners to insure their property against hazard impacts, including through flood insurance through the NFIP.
- Goal 3: Educate the public, officials, and other stakeholders about the hazards they face and what can be done to mitigate hazard impacts.
 - Objective 3.1: Work with legislators to develop and enact legislation that reduces long-term vulnerability to hazards.
 - Objective 3.2: Increase public awareness of the hazards and risks faced by the County's residents and businesses, and what measures they can take to protect their property.
 - *Objective 3.3: Increase local government official awareness regarding funding opportunities for mitigation and participating/contributing to plan updates.*
- Goal 4: *Reduce the risk of natural, technological, and human-caused hazards for socially vulnerable populations.*
 - *Objective 4.1: Identify and provide additional resources to vulnerable and marginalized populations that have reduced capacity to respond to hazards compared with the general population.*



- *Objective 4.2: Encourage the establishment of policies to help ensure the prioritization and implementation of mitigation actions and/or projects designed to benefit socially vulnerable populations and underserved communities.*
- *Goal 5: Address long-term vulnerabilities from hazardous dams.*
 - *Objective 5.1: Ensure dam infrastructure is maintained.*
 - *Objective 5.2: Support the identification of and access to funding for the repair or replacement of dams.*
 - *Objective 5.3: Ensure emergency action plans are developed and updated.*

22.3 MITIGATION STRATEGY DEVELOPMENT AND UPDATE

22.3.1 Update of Local Jurisdiction Mitigation Strategies

Review of Previous Actions

To evaluate progress on local mitigation actions, each planning partner was provided with a Mitigation Action Plan Review Worksheet, pre-populated with the actions identified for their jurisdiction in the 2019 HMP. The Planning Partners were asked to indicate the status of each action (“No Progress,” “In Progress,” “Continuous,” “Completed,” “Discontinued”). They were requested to provide comments to quantify the extent of progress and provide reasons for the level of progress or why actions were discontinued. This information is included in the jurisdictional annexes.

FEMA defines **Mitigation Actions** as specific actions that help to achieve the mitigation goals and objectives.

Mitigation actions identified as “Complete” or “Discontinued” have been removed from the Planning Partners’ updated mitigation strategies. Actions identified as “No Progress” or “In Progress” have been carried forward in their local updated mitigation strategies. Planning partners were asked to provide further details on these projects to help better define the projects, identify benefits and costs, and improve implementation.

Certain continuous or ongoing actions (Ongoing Capabilities) from the previous plan that represent programs that are now fully integrated into the normal operational and administrative framework of the community are identified in the capabilities assessment of each annex and removed from the updated mitigation strategy (marked as “Discontinued”).

Identifying New Actions

At the kickoff and during subsequent local-level planning meetings, all participating jurisdictions were further surveyed to identify completed mitigation actions, in-progress actions, or ongoing capabilities, as well as potential new actions. Communities also were made aware of potential new mitigation actions as such actions became evident during the plan update process (e.g., through the capability assessment, risk assessment, or the public and stakeholder outreach process).

Developing the Overall Strategy

Beginning in March 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 careful consideration of benefits (risk reduction, losses avoided), costs, and possible funding sources (including mitigation grant programs).

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 plan update process by planning partner representatives, through review of available plans and reports, or through the hazard profiling and risk assessment process.

A mitigation strategy workshop was conducted on March 18, 2025, for all participating jurisdictions to support the development of focused problem statements based on the impacts of natural 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.

Incorporating a Range of Action Types

Concerted 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 “Local Mitigation Planning Handbook” March 2013):

- **Local Plans and Regulations**—These actions include government authorities, policies or codes that influence the way land and buildings are developed and built.
- **Structure and Infrastructure Project**—These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as community lifelines and other critical facilities. This type of action also involves projects to construct structures to reduce the impact of hazards.
- **Natural Systems Protection**—These are actions that minimize damage and losses to natural systems and preserve or restore their functions.
- **Education and Awareness Programs**—These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as the NFIP, Community Rating System (CRS), StormReady (NOAA), and Firewise (NFPA) Communities.

Efforts were also made to develop mitigation strategies that cover the range of mitigation action types described in recent CRS guidance (FEMA 2018):

- **Preventive Measures**—Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.
- **Property Protection**—These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.



- **Public Information**—Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.
- **Natural Resource Protection**—Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Structural Flood Control Projects**—Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.
- **Emergency Services**—Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities.

Protecting Critical Facilities

Planning partner mitigation actions that address vulnerable critical facilities have been proposed in consideration of protection against 500-year events or worst-case scenarios. However, in the case of projects funded through federal mitigation programs, the level of protection may be influenced by cost-effectiveness as determined through a formal benefit-cost analysis. In the case of “self-funded” projects, local jurisdiction discretion must be recognized. Further, 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 Climate Change

As discussed in the hazard profiles in this HMP, the long-term effects of climate change are anticipated to exacerbate the impacts of weather-related hazards (e.g., flood, severe storm, severe winter storm, and wildfire). Communities are working to evaluate and recognize these long-term implications and to incorporate their mitigation strategies into planning and capital improvement updates.

22.3.2 Update of County Mitigation Strategy

The update of the County-level mitigation strategies included a review of progress on the actions/initiatives identified in the 2019 HMP using a process similar to that used to review local jurisdiction mitigation strategy progress. The County, through their various department representatives, was provided with a Mitigation Action Plan Review Worksheet identifying all County-level actions and initiatives from the 2019 HMP. The County reviewed each action and provided progress. For each action, relevant County representatives were asked to indicate the status of each action (*No Progress*, *In Progress*, *Ongoing*, *Completed*, or *Discontinued*), and provide review comments on each.

Projects/initiatives identified as “*Complete*”, as well as those actions identified as *Discontinued*, have been removed from this plan update. Those actions the County has identified as *No Progress*, *In Progress*, or *Ongoing* have been carried forward in the County’s updated mitigation strategy. Actions considered ongoing capabilities were marked as *Discontinued* and included in the plan as ongoing capabilities.

Throughout the course of the plan 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:
 - Genesee County Manager's Office
 - Genesee County Legislature
 - Genesee County Emergency Management Services
 - Genesee County Planning Department
 - Genesee County Sheriff's Office
 - Genesee County Highway Department
 - Genesee County Economic Development Corporation
 - Genesee County Public Health
 - Genesee County Soil and Water Conservation District
 - Genesee County Department of Social Services and Youth Bureau
 - City of Batavia
- Input received through the public and stakeholder outreach process

As discussed within the hazard profiles in this HMP, the long-term effects of climate change are anticipated to exacerbate the impacts of weather-related hazards, including drought, flood, severe storm, and severe winter storm. The County has included mitigation actions, including continuing and long-term planning and emergency management support, to address these long-term implications and potential impacts.

Various County departments and agencies included mitigation actions to address vulnerable critical facilities. These actions were proposed in consideration of protection against 0.2 percent annual chance (500-year) events, or worst-case scenarios. It is recognized, however, that in the case of projects being funded through federal mitigation programs, the level of protection can be influenced by cost-effectiveness, as determined through a formal benefit-cost analysis. In the case of "self-funded" projects, local government authority can affect the ability to implement. Further, the County has limited authority over privately-owned critical facility owners regarding mitigation at any level of protection.

22.3.3 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 in two ways:

- By who would have responsibility for implementation:
 - Individuals—personal scale
 - Businesses—corporate scale
 - Government—government scale
- By 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 climate change. Hazard mitigation actions recommended in this plan were selected from among the alternatives presented in the catalogs. 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. 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 I.

22.3.4 Mitigation Strategy Evaluation and 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 plan 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 a set of 14 evaluation criteria for this process:

1. 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?
2. 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?
3. Cost-Effectiveness—Are the costs to implement the action commensurate with the benefits achieved?
4. 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?
5. Legal—Does the jurisdiction have the authority to implement the action?
6. 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?
7. Environmental—What are the potential environmental impacts of the action? Will it comply with environmental regulations? Are there co-benefits of this action?
8. Social Vulnerability—Does the action benefit socially vulnerable populations and underserved communities? Additional considerations can include appropriate numerical measures of social vulnerability.
9. 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?
10. Hazards of Concern—Does the action address one or more of the jurisdiction's high-ranked hazards?



11. Climate Change—Does the action incorporate climate change projections? Is the action designed to withstand/address long-term conditions?
12. Timeline—Can the action be completed in less than five years?
13. Community Lifelines—Does this action benefit community lifelines?
14. 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?

Participating jurisdictions 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. Mitigation actions in the prior (2019) Genesee County HMP were “qualitatively evaluated against the mitigation goals and objectives and other evaluation criteria. They were then prioritized into three categories: high, medium, and low. 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 plan 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. With active support from NYS DHSES planning staff, 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 notwithstanding. In general, actions that would have had *low* priority rankings were appropriately screened out during the local action evaluation process.

22.3.5 Benefit/Cost Review

Section 201.6.c.3iii of 44 CFR requires the prioritization of the mitigation strategy to emphasize the extent to which benefits are maximized according to a benefit/cost review of the proposed projects. 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 attributed to project implementation. These can include life safety, structure and infrastructure damages, 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 as follows:

Low < = \$10,000

Medium = \$10,000 to \$100,000

High > = \$100,000

Often, numerical costs and/or benefits were not identified and may be impossible to quantify. In this case, jurisdictions were asked to evaluate project cost-effectiveness using qualitative *high*, *medium*, and *low* ratings based on the definitions in Table 22-1.

Table 22-1 Qualitative Cost and Benefit Ratings

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 Genesee 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 applied 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



23. PLAN MAINTENANCE AND IMPLEMENTATION PROCEDURES

This chapter details the formal process that will ensure that the hazard mitigation plan (HMP) 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 plan 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 plan 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.

23.1 HMP COORDINATOR AND JURISDICTION POINTS OF CONTACT

The HMP Coordinator is assigned to manage the maintenance and update of the plan during its approval period (the five-year period between the Federal Emergency Management Agency's [FEMA] approval of the plan and its expiration), with the following responsibilities:

- Convene the Planning Partnership.
- Be the prime point of contact for questions regarding the plan 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 Genesee County HMP Coordinator is designated as:

Timothy Yaeger, Director
Genesee County Office of Emergency Management
7690 State Street Road
Batavia, NY 14020
(585) 344-0078
Email: tim.yaeger@geneseeny.gov

As of the date of this plan, primary and secondary mitigation planning representatives (points of contact) 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.

23.2 MAINTENANCE AND IMPLEMENTATION TASKS

The procedures for monitoring, evaluating, and updating the plan are provided below. The plan maintenance matrix shown in Table 23-1 provides a synopsis of responsibilities for plan monitoring, integration, evaluation, and update, which are discussed in further detail in the sections below.



Table 23-1. 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 presidentially 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 10-2) for annual review and update by all participating jurisdictions.	June each year with interim email reminders to address integration in Genesee County and municipal activities	HMP Coordinator and jurisdictional points of contact identified in Volume II	HMP Coordinator
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 June 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 five 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

23.2.1 Monitoring

The Planning Partnership will be responsible for monitoring and documenting annual progress on the plan. Each year, beginning one year after plan development, Genesee 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 (the BAToolSM), 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, providing an incentive for 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 participating jurisdictions
- 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 BAToolSM or manually.

23.2.2 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 22) 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 Genesee 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, each participating jurisdiction 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 also 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 present in Table 23-2, 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 23-2. 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?			



23. Plan Maintenance and Implementation Procedures

Planning Mechanisms	Yes	No	How is it being done or how will this be utilized in the future?
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?			
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)?			



Planning Mechanisms	Yes	No	How is it being done or how will this be utilized in the future?
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?			

23.2.3 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 (“Implementation of Mitigation Plan through Existing Programs” subsection below discusses this process). 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

The Planning Partnership should refer to evaluation forms in the FEMA 386-4 guidance document to assist in the evaluation process (Worksheets #2 and #4; see Appendix F – Plan Review Tools). Further, the Planning Partnership should refer to any process and plan review deliverables developed by the County or participating jurisdictions as a part of the plan review processes established for prior or existing local HMPs within Genesee 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 whether 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 plan 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.

23.2.4 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 DMA 2000. It is the intent of the Genesee County HMP Planning Partnership to update this plan 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 Division of Homeland Security and Emergency Services to provide guidance on plan update procedures. At a minimum, this will establish who will be responsible for managing and completing the plan 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 five-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.

23.2.5 Grant Monitoring and Coordination

Genesee County intends to be a resource to the Planning Partnership in the support of project grant writing and development. The degree of this support will depend on the level of assistance requested by the Planning Partners during openings for grant applications. As part of grant monitoring and coordination, Genesee 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.

23.2.6 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 link: <https://www.geneseecountynyhmp.com/>. In addition, public outreach and dissemination of the HMP will include the following:

- Links to the plan on local websites of each jurisdiction with capability
- Continued utilization of existing social media outlets (Facebook, Twitter) 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 plan via the hazard mitigation website at any time. The HMP Coordinator will ensure the following actions take place:

- Public and stakeholder comments and input on the plan, and hazard mitigation in general, are collected, recorded, and addressed as appropriate.
- The Genesee County HMP website is maintained and updated as appropriate.
- Copies of the latest approved plan are available for review at appropriate Genesee 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.

DRAFT



REFERENCES

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ACRONYMS AND ABBREVIATIONS

ACS	American Community Survey
ADA	Americans with Disabilities Act
ALICE	Asset Limited, Income Constrained, Employed
APA	Approvable Pending Adoption
ARC	American Red Cross
BCA	Benefit-Cost Analysis
BFE	Base Flood Elevation
BTS	Bureau of Transportation Statistics
CAC	Community Assistance Contacts
CAV	Community Assistance Visits
CDBG	Community Development Block Grants
CDMS	Comprehensive Data Management System
CEDAR	Code Enforcement Disaster Assistance Response
CEMP	Comprehensive Emergency Management Plan
CEPA	County Emergency Preparedness Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CHA	Community Health Assessment
CHIP	Community Health Improvement Plan
CIP	Capital improvement plan
CMP	Coastal Management Program
COOP	Continuity of Operations
CRRA	Community Risk and Resiliency Act
CRREL	Cold Regions Research and Engineering Laboratory



CRS	Community Rating System
CSC	Climate Smart Communities
CSP	Community Service Plan
CWSRF	Clean Water State Revolving Fund
DBSC	Division of Building Standards and Codes
DEC	Department of Environmental Conservation
DFIRM	Digital Flood Insurance Rate Map
DHSES	Division of Homeland Security and Emergency Services
DMA	Disaster Mitigation Act
DOT	Department of Transportation
DR	Presidential Disaster Declaration Number
EAP	Emergency action plans
EAS	Emergency Alert System
ECL	Environmental Conservation Law
EFC	Environmental Facilities Corporation
EM	Presidential Disaster Emergency Number
EMPG	Emergency Management Program Grant
EMS	Emergency medical services
EPA	Environmental Protection Agency
EPF	Environmental Protection Fund
EPZ	Emergency Planning Zone
EWP	Emergency Watershed Protection
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FDRA	Fire Danger Rating Areas
FEMA	Federal Emergency Management Agency



FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FM	Fuel Moisture
FMA	Flood Mitigation Assistance
FPI	Fire Potential Index
FTA	Federal Transit Authority
GCEDC	Genesee County Economic Development Center
GCM	Global climate model
GIS	Geographic Information System
GLOW	Genesee, Livingston, Orleans, and Wyoming
GML	General Municipal Law
GOW	Genesee, Orleans, and Wyoming
Hazmat	Hazardous Materials
HHPD	High Hazard Potential Dams
HIFLD	Homeland Infrastructure Foundation-Level Data
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
IA	Individual Assistance
KBDI	Keetch-Byram Drought Index
LCSN	Lamont-Doherty Cooperative Seismographic Network
LOP	Letter of Permission
LWCF	Land and Water Conservation Fund
LWRP	Local Waterfront Revitalization Program



MCWA	Monroe County Water Authority
MMI	Modified Mercalli Intensity
MOSF	Major Oil Storage Facilities
MRLC	Multi-Resolution Land Characteristics Consortium
MRP	Mean Return Period
NAS	National Academy of Sciences
NCDC	National Climatic Data Center
NCEI	National Centers for Environmental Information
NDSP	National Dam Safety Program
NEHRP	National Earthquake Hazard Reduction Program
NEP	National Estuary Program
NFDRS	National Fire Danger Rating System
NFIP	National Flood Insurance Program
NHC	National Hurricane Center
NHS	National Highway System
NIDIS	National Integrated Drought Information System
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NPS	National Parks Service
NRCC	Northeast Regional Climate Center
NRCS	Natural Resources Conservation Service
NSIDC	National Snow and Ice Data Center
NTAS	National Terrorism Advisory System
NTSB	National Transportation Safety Board
NWIS	National Water Information System
NWS	National Weather Service



NY	New York
NYCEM	New York City Area Consortium for Earthquake Loss Mitigation
NYDOT	New York Department of Transportation
NYPA	New York Power Authority
NYS HMP	New York State Hazard Mitigation Plan
NYSDEC	New York State Department of Environmental Conservation
NYSDHSES	New York State Division of Homeland Security and Emergency Services
NYSDOT	New York State Department of Transportation
NYSDPC	New York State Disaster Preparedness Commission
NYSERDA	New York State Energy Research and Development Authority
NYSGIS	New York State Geographic Information Systems
NYSIC	New York State Intelligence Center
OEM	Office of Emergency Management
OFA	Office for the Aging
OFPC	Office of Fire Prevention and Control
OPRHP	Office of Parks, Recreation and Historic Preservation
PA	Public Assistance
PBS	Petroleum Bulk Storage
PDM	Pre-Disaster Mitigation
PDSI	Palmer Drought Severity Index
PGA	Peak Ground Acceleration
PPE	Personal protective equipment
RAISE	Rebuilding American Infrastructure with Sustainability and Equity
RCRA	Resource Conservation Recovery Act
RCV	Replacement Cost Value
REDC	Regional Economic Development Council



RG&E	Rochester Gas and Electric
RL	Repetitive loss
RLF	Revolving Loan Fund
RSI	Regional Snowfall Index
RTP	Recreational Trails Program
RTS	Regional Transit Service
SAFE Act	Secure Ammunition and Firearms Enforcement Act
SARA	Superfund Amendments and Reauthorization Act
SBA	Small Business Administration
SDI	State Drought Index
SFHA	Special Flood Hazard Area
SFRMG	State Flood Risk Management Guidance
SHMO	State Hazard Mitigation Officer
SHSP	State Homeland Security Program
SPC	Storm Prediction Center
SSBG	Social Services Block Grant
SUNY	State University of New York
SVI	Social Vulnerability Index
THIRA	Threat Hazard Identification and Risk Assessment
TPQ	Threshold Planning Quantity
UASI	Urban Areas Security Initiative
US EPA	U.S. Environmental Protection Agency
USACE	United States Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDHS	United States Department of Homeland Security
USDOT	U.S. Department of Transportation



USFA	United States Fire Administration
USGS	United States Geological Survey
WCT	Wind Chill Temperature
WEA	Wireless Emergency Alert
WFAS	Wildland Fire Assessment System
WHO	World Health Organization
WMA	Wildlife Management Areas
WNV	West Nile Virus
WQIP	Water Quality Improvement Project
WUI	Wildland-Urban Interface

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