Discovery Report

Seneca River Watershed, HUC 04140201

Cayuga, Chemung, Cortland, Livingston, Monroe, Onondaga, Ontario, Schuyler, Seneca, Steuben, Tioga, Tompkins, Wayne, and Yates Counties*, New York

These counties may span more than one watershed; please see following page for list of communities fully or partially located in the watershed.

Report Number 01

June 1, 2015

FEMA

Project Area Community List

Cayuga County
- Auburn, City of
- Aurelius, Town of
- Aurora, Village of
- Brutus, Town of
- Cato, Town of*
- Cato, Village of*
- Cayuga, Village of
- Conquest, Town of*
- Fleming, Town of
- Genoa, Town of
- Ira, Town of*
- Junius, Town of[1]
- Ledyard, Town of
- Locke, Town of
- Mentz, Town of
- Meridian, Village of
- Montezuma, Town of
- Moravia, Town of
- Moravia, Village of
- Niles, Town of
- Owasco, Town of
- Scipio, Town of
- Sempronius, Town of
- Sennett, Town of
- Springport, Town of
- Summerhill, Town of
- Throop, Town of
- Union Springs, Village of
- Venice, Town of
- Victory, Town of*
- Weedsport, Village of

Chemung County
- Catlin, Town of*
- Horseheads, Town of*[2]
- Horseheads, Village of*[2]
- Millport, Village of
- Veteran, Town of*

Cortland County
- Cortlandville, Town of*
- Harford, Town of*
- Homer, Town of*
- Preble, Town of*
- Scott, Town of*
- Virgil, Town of*

Livingston County
- Springwater, Town of*

Monroe County
- Penfield. Town of*
- Perinton, Town of*

Onondaga County
- Baldwinsville, Village of
- Camillus, Town of
- Camillus, Village of
- Cicero, Town of*
- Clay, Town of*
- DeWitt, Town of*
- East Syracuse, Village of*
- Elbridge, Town of
- Elbridge, Village of
- Geddes, Town of
- Jordan, Village of
- LaFayette, Town of*
- Liverpool, Village of
- Lysander, Town of*
- Manlius, Town of*
- Marcellus, Town of
- Marcellus, Village of
- North Syracuse, Village of*
- Onondaga Nation[3]
- Onondaga, Town of*
- Otisco, Town of
- Salina, Town of
- Skaneateles, Town of
- Skaneateles, Village of
- Solvay, Village of
- Spafford, Town of*
- Syracuse, City of*[2]
- Tully, Town of*
- Tully, Village of*
- Van Buren, Town of

Ontario County
- Bloomfield, Village of
- Bristol, Town of*
- Canandaigua, City of
- Canandaigua, Town of
- Clifton Springs, Village of
- East Bloomfield, Town of*
- Farmington, Town of
- Geneva, City of
- Geneva, Town of
- Gorham, Town of
- Hopewell, Town of
- Manchester, Town of
- Manchester, Village of

Ontario County (con't)
- Naples, Town of*
- Naples, Village of
- Phelps, Town of
- Phelps, Village of
- Richmond, Town of
- Rushville, Village of
- Seneca, Town of
- Shortsville, Village of
- South Bristol, Town of*
- Victor, Town of*
- Victor, Village of*
- West Bloomfield, Town of*

Schuyler County
- Burdett, Village of
- Catharine, Town of*
- Cayuta, Town of*
- Dix, Town of*
- Hector, Town of*
- Montour, Town of
- Montour Falls, Village of
- Odessa, Village of
- Orange, Town of*
- Reading, Town of
- Tyrone, Town of*
- Watkins Glen, Village of

Seneca County
- Covert, Town of
- Fayette, Town of
- Interlaken, Village of[1]
- Junius, Town of[1]
- Lodi, Town of
- Lodi, Village of
- Ovid, Town of
- Ovid, Village of[1]
- Romulus, Town of
- Seneca Falls, Town of[4]
- Tyre, Town of
- Varick, Town of
- Waterloo, Town of
- Waterloo, Village of

Steuben County
- Bath, Town of*
- Bath, Village of*
- Cohocton, Town of*
- Hammondsport, Village of
- Prattsburg, Town of*
- Pulteney, Town of*
- Urbana, Town of*
- Wayne, Town of*
- Wheeler, Town of*

Tioga County
- Spencer, Town of*

Tompkins County
- Caroline, Town of*
- Cayuga Heights, Village of
- Danby, Town of*
- Dryden, Town of*
- Dryden, Village of
- Enfield, Town of[1]
- Freeville, Village of
- Groton, Town of

Tompkins County (con't)
- Groton, Village of
- Ithaca, City of
- Ithaca, Town of
- Lansing, Town of
- Lansing, Village of
- Newfield, Town of*
- Trumansburg, Village of
- Ulysses, Town of

Wayne County
- Arcadia, Town of*
- Butler, Town of*
- Clyde, Village of*
- Galen, Town of*
- Lyons, Village of
- Lyons, Town of*
- Macedon, Village of
- Macedon, Town of*
- Marion, Town of*
- Newark, Village of
- Palmyra, Town of*
- Palmyra, Village of

Wayne County (con't)
- Rose, Town of*
- Savannah, Town of
- Sodus, Town of
- Walworth, Town of*
- Williamson, Town of*

Yates County
- Barrington, Town of*
- Benton, Town of
- Dresden, Village of
- Dundee, Village of
- Italy, Town of*
- Jerusalem, Town of*
- Middlesex, Town of
- Milo, Town of
- Penn Yan, Village of
- Potter, Town of
- Rushville, Village of
- Starkey, Town of
- Torrey, Town of

**Partially within the Seneca Watershed*

[1]*The towns of Enfield and Junius and the villages of Interlaken and Ovid do not participate in the National Flood Insurance Program (NFIP)*

[2]*This jurisdiction participates in the Community Rating System*

[3]*While shown on the preliminary FIRM for Onondaga County, the Onondaga Nation Reservation is shown as an "Area Not Included". The Onondaga Nation is not a participating jurisdiction of the NFIP*

[4]*Includes the former village of Seneca Falls, dissolved in 2011*

This list includes all communities within the Seneca watershed. While all communities may be under consideration for a revised FEMA Flood Insurance Rate Map (FIRM) and/or Flood Insurance Study (FIS), not all communities will receive new/updated FEMA FISs or FIRMs as a result of the Discovery process.

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Data Disc

ACRONYMS AND ABBREVIATIONS

AAL	Average Annualized Loss
BFE	Base Flood Elevation
CAC	Community Assistance Contact
CAV	Community Assistance Visit
CEO	Code Enforcement Officer
CFR	Code of Federal Regulations
CFS	cubic feet per second
CIS	Community Information System
CNMS	Coordinated Needs Management System
COOP	Cooperative Observer Program
CRS	Community Rating System
DFIRM	Digital Flood Insurance Rate Map
DOT	Department of Transportation
FEMA	Federal Emergency Management Agency
FHBM	Flood Hazard Boundary Map
FIPS	Federal Information Processing Standard
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GIS	Geographic Information System
Hazus-MH	Multi-Hazard Risk Assessment and Loss Estimation Program
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HUC	Hydrologic Unit Code
HWM	High Water Mark
IA	Individual Assistance
LIDAR	Light Detection and Ranging
LOMA	Letter of Map Amendment
LOMC	Letter of Map Change
LOMR-F	Letter of Map Revision based on Fill
MSA	Metropolitan/Micropolitan Statistical Area
MS4	Municipal Separate Storm Sewer System
NAD27	North American Datum of 1927
NAVD88	North American Vertical Datum of 1988
NFHL	National Flood Hazard Layer
NFIP	National Flood Insurance Program
NGO	Non-Governmental Organization
NGVD29	North Geodetic Vertical Datum of 1929
NHD	National Hydrologic Dataset
NOAA	National Oceanographic and Atmospheric Administration
NWS	National Weather Service
NYSDEC	New York State Department of Environmental Conservation
NYSERDA	New York State Energy Research and Development Authority
OFA	Other Federal Agency
PA	Public Assistance
PDM	Pre-Disaster Mitigation Grant Program
RL	Repetitive Loss
SFHA	Special Flood Hazard Area
SHMO	State Hazard Mitigation Officer
SPDES	State Pollutant Discharge Elimination System
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geologic Survey

GLOSSARY OF TERMS USED IN, AND ASSOCIATED WITH, THE DISCOVERY REPORT AND PROCESS

1-Percent-Annual-Chance Flood: The flood having a one percent chance of being equaled or exceeded in any given year. This is the regulatory standard also referred to, as the "100-year flood". The base flood is the national standard used by the National Flood Insurance Program (NFIP) and all Federal agencies for the purposes of requiring the purchase of flood insurance and regulating new development. Base Flood Elevations (BFEs) are typically shown on Flood Insurance Rate Maps (FIRMs). The standard constitutes a reasonable compromise between the need for building restrictions to minimize potential loss of life and property and the economic benefits of floodplain development. (FEMA)

0.2-Percent-Annual-Chance Flood: A flood that has a 0.2 percent chance of being equaled or exceeded in any given year; also known as a 500-year flood. (FEMA)

Base Flood Elevation (BFE): The computed elevation to which floodwater is anticipated to rise during the base flood. BFEs are shown on a community's FIRM and on the flood profiles in the Flood Insurance Study (FIS) as the 1-Percent-Annual-Chance (100-Year) flood. The BFE is the regulatory requirement for the elevation or floodproofing of structures. The relationship between the BFE and a structure's elevation determines the flood insurance premium. (FEMA)

Approximate Study: A flood hazard study that results in the delineations of floodplain boundaries for the 1-percent-annual-chance flood, but does not include the determination of base flood elevations or floodways. (Delta Flood Council) An approximate study is represented on a FIRM by a Zone A. (FEMA)

Average Annualized Loss (AAL): The AAL is the mean value of a loss exceedance probability (EP) distribution. It is the expected loss per year, averaged over many years. (Air Worldwide)

Declared Disaster: An emergency declaration triggers aid that protects property, public health, and safety, and lessens or averts the threat of an incident becoming a catastrophic event. A major disaster declaration, issued after catastrophes occur, constitutes broader authority for federal agencies to provide supplemental assistance to help state and local governments, families and individuals, and certain nonprofit organizations recover from the incident. (FEMA)

Detailed Study: A flood hazard mapping study that is done using hydrologic and hydraulic methods that produces base flood elevations, floodways, and other pertinent flood data. Detailed study areas are shown on the FIRM as Zones AE, AH, AO, AR, A99, A1-A30, and in coastal areas Zones V, VE, and V1-30. (FEMA)

Flood Insurance Rate Map (FIRM) Panel: In order to print the FEMA FIRM at a scale of (generally) 1-inch to 500- or 1,000-feet, the FIRM for a community is broken out into several physical paper or electronic maps that together form a community's complete FIRM. (Harris County Flood Control District)

Flood Insurance Study (FIS): A compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community. When a flood study is completed for the NFIP, the information and maps are assembled into an FIS. The FIS report contains detailed flood elevation data in flood profiles and data tables. (FEMA)

Floodway: A "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations. For streams and other watercourses where FEMA has provided Base Flood Elevations (BFEs), but no floodway has been designated, the community must review floodplain development on a case-by-case basis to ensure that increases in water surface elevations do not occur, or identify the need to adopt a floodway if adequate information is available. (FEMA)

Geocode: Geocoding is the process of transforming a description of a location—such as a pair of coordinates, an address, or a name of a place—to a location on the earth's surface. You can geocode by entering one location description at a time or by providing many of them at once in a table. The resulting locations are output as geographic features with attributes, which can be used for mapping or spatial analysis. (ArcGIS Resource Center)

Hazus or Multi-Hazard Risk Assessment and Loss Estimation Program: A nationally applicable standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. Hazus uses Geographic Information Systems (GIS) technology to estimate physical, economic, and social impacts of disasters. It graphically illustrates the limits of identified high-risk locations due to earthquake, hurricane, and floods. (FEMA)

Hydrology: The science that encompasses the occurrence, distribution, movement and properties of the waters of the earth and their relationship with the environment within each phase of the hydrologic cycle. The water cycle, or hydrologic cycle, is a continuous process by which water is purified by evaporation and transported from the earth's surface (including the oceans) to the atmosphere and back to the land and oceans. (USGS)

Letter of Map Amendment (LOMA): An official revision to a FEMA FIRM done by describing the property affected and amending the FIRM by letter, rather than by physically changing the map. LOMAs are generally issued when properties have been inadvertently included in the floodplain. (FEMA)

Letter of Map Change (LOMC): A Letter of Map Change is a letter which reflects an official change to an effective Flood Insurance Rate Map (FIRM). LOMCS are issued in response to a request of FEMA to revise or amend its effective flood map to remove a property or reflect changed flooding conditions on the effective map. (FEMA)

Letter of Map Revision (LOMR): Is used to modify an effective FIRM and are generally based on the implementation of physical measures that affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective BFEs, or the SFHA. The LOMR officially revises the FIRM and sometimes the FIS report, and when appropriate, includes a description of the modifications. (FEMA)

Letter of Map Revision Based on Fill (LOMR-F): Is used to determine the flood risk to a structure or property in situations where fill material (in most cases fill-dirt) has been placed after the first floodplain (FBHM or FIRM) map of the area was established. Like the LOMA process, the LOMR-F uses elevations of the finished property or structure to the elevation of the base flood to determine if the subject of the LOMR-F is at risk of inundation. (FEMA)

Levee: FEMA defines a levee as "a man-made structure, usually an earthen embankment, *designed and constructed in accordance with sound engineering practices* to contain, control, or divert the flow of water in order to reduce the risk from temporary flooding." (FEMA)

Light Detection And Ranging (LiDAR): LiDAR is an active remote sensing technique similar to radar, but uses light pulses instead of radio waves. LiDAR is typically "flown" or collected from planes and produces a rapid collection of points (more than 70,000 per second) over a large collection area. Collection of elevation data using LiDAR has several advantages over most other techniques. Chief among them are higher resolutions, centimeter accuracies, and penetration in forested terrain. (NOAA)

Limited Detailed Study: A flood hazard study that is assigned to certain areas previously designated as approximate Zone A flood zones where communities have requested upgraded flood hazard analyses, but due to the low level of projected development or budget limitations, a detailed study is not performed. It is also applied to lakes that do not have level gauge data. In New York these enhanced zones are created using the following data and methodologies: digital orthophotos, LiDAR, limited survey of structures, nomination of flow rates, and the development of HEC-RAS hydraulic models.

The term "limited survey" refers to the survey of man-made hydraulic obstructions, such as dams, bridges and culverts, and to the survey of the outlet channels of lakes with natural outlet controls. The purpose of collecting "limited survey" is to enhance the accuracy of the hydraulic model thus allowing the development of Advisory BFEs at selected cross sections. Engineering drawing plans and Department of Transportation (DOT) hydraulic studies may have been substituted for limited survey, where appropriate and available. (FEMA, Cayuga County, NY FIS)

Mitigation: Any cost-effective action taken to eliminate or reduce the long-term risk to life and property from natural and technological hazards including, but not limited to flooding. (Pennsylvania Emergency Management Agency) Acceptable flood mitigation measures are elevation, floodproofing, relocation, demolition, or any combination thereof. (FEMA)

National Hydrography Dataset (NHD): The NHD is the surface water component of The National Map. The NHD is a digital vector dataset used by geographic information systems (GIS). It contains features such as lakes, ponds, streams, rivers, canals, dams and stream gages. These data are designed to be used in general mapping and in the analysis of surface-water systems. (National Hydrography Dataset)

Repetitive Loss (RL): A Repetitive Loss property is any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP. Currently there are over 122,000 RL properties nationwide. (FEMA)

Severe Repetitive Loss (SRL): A Severe Repetitive Loss property is a residential property that is covered by NFIP Flood Insurance and has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or for which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building. For both conditions noted above, at least two of the referenced claims must have occurred within any ten-year period, but must be greater than 10 days apart. (FEMA)

Special Flood Hazard Area (SFHA): SFHAs are high-risk areas subject to inundation by the base (1-percent-annual-chance) flood; they are also referred to as 1-percent-annual-chance floodplains, base floodplains, or 100-year floodplains. (FEMA)

Stakeholder: An individual or group that has an interest in a decision or proposed action. A stakeholder may have none, one, or more of the following roles: Has authority or decision-making power over some aspect of the project; is affected by the outcome of the project; will be a part of implementing the project; and/or can stop or delay the project (through litigation or other means). A project may have multiple stakeholders, and these stakeholders often have conflicting interests and want competing outcomes. (US Department of the Interior)

Vertical Datum: A vertical datum is a base measurement point (or set of point) from which all elevations of points on the Earth's surface are determined. Without a common datum, surveyors would calculate different elevation values for the same location. Vertical datums are either tidal, that is, based on sea levels, or geodetic, based on the same ellipsoid models of the earth used for computing horizontal datums (FEMA). Common vertical datums used on FIRMs are NGVD29 and NAVD88.

Watershed: A watershed is a basin-like landform defined by highpoints and ridgelines that descend into lower elevations and stream valleys. A watershed carries water from the land after rain falls and snow melts. Drop by drop, water is channeled into soils, ground waters, creeks, and streams, making its way to larger rivers and eventually the sea. (Watershed Atlas)

As defined by the US Geological Survey, the Seneca watershed is those lands ultimately drained by the Seneca River, not just the Seneca Lake or Seneca River sub-basins. More information on the geographical extent of the basin can be found in SECTION THREE.

Water Year: The 12-month period beginning October 1, for any given year, through September 30, of the following year. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 2011 is called the "2011" water year. (USGS)

SECTION ONE DISCOVERY OVERVIEW

Seneca Discovery Project

The Federal Emergency Management Agency (FEMA) Risk Mapping, Assessment, and Planning, or Risk MAP, program helps communities identify, assess, and reduce their flood risk. Through Risk MAP, FEMA provides information to enhance local mitigation plans, improve community outreach, and increase local resilience to floods. During the Discovery phase of Risk MAP project development, FEMA:

Gathers information about local flood risk and flood hazards

Reviews mitigation plans to understand local mitigation capabilities, hazard risk assessments, and current or future mitigation activities

Collects information from communities about their flooding history, development plans, daily operations, and stormwater and floodplain management activities

Uses all information gathered to determine which areas require mapping, risk assessment, or mitigation planning assistance through a Risk MAP project

Develops Discovery Map and Report that summarize and display the Discovery findings

Purpose of the Seneca Watershed Discovery Project

The aim of the Seneca Watershed Discovery project is to cultivate a strong working relationship between the basin's communities, counties, Tribal Nations, major environmental, business, and other watershed-wide stakeholders during the process of updating National Flood Insurance Program (NFIP) products, such as the Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS). Discovery also seeks to increase public awareness of short- and long-term flood risk and to improve community resiliencies related to flood losses (life, property, and business).

Seneca Discovery Project Products

The result of the project will provide Federal, state, and local officials with three flood risk products to help them understand flood risk and its potential impact on communities and individuals. These products will also enable communities to take effective mitigation actions appropriate to their flood hazard threat to reduce this risk. The three products are:

Discovery Report
Discovery Maps
Discovery Data Package

These products will summarize information captured during the Discovery Process. The associated datasets include information pertaining to, be not limited to:

Average Annualized Loss
Community-Identified Areas of Concern
Dams
Demographics
Floodplains and Floodways
Letters of Map Change
Levees and Floodwalls
LiDAR coverage
Municipal Separate Storm Sewer Systems
Repetitive Loss
State Pollutant Discharge Systems
Streams
Stream Gages
Streets

SECTION TWO SENECA OUTREACH STRATEGY

Seneca Discovery Stakeholder Coordination

As part of this process, the New York State Department of Environmental Conservation's (NYSDEC) Floodplain Management Section compiled an extensive list of contact information for community officials within the watershed. In an effort to gather as much feedback from as many public officials and jurisdictions as possible, over 1,200 local officials from individual communities, counties, Federal agencies, non-governmental organizations, Congressional staff members, and other interested stakeholders were invited to participate in the Discovery process. A list of those invited to the meetings is located in Appendix A: *Pre-Discovery Conference Call Invitee List*. Following the completion of this list, in cooperation with the Federal Emergency Management Agency's (FEMA) Region II office in New York, New York, the NYSDEC initiated a Discovery project in January 2014 for the Seneca Watershed. (Please note, a printed copy of all hyperlinks referenced in this Discovery Report can be found in Appendix B: *List of Hyperlinks Noted in Seneca Discovery Report.*)

NYSDEC conducted several pre-Discovery conference calls with individuals representing communities and organizations in Cayuga, Chemung, Cortland, Livingston, Monroe, Onondaga, Ontario, Schuyler, Seneca, Steuben, Tioga, Tompkins, Wayne, and Yates counties in March 2014 for the purpose of explaining the Discovery process and examining the flood mapping, mitigation, planning, and other needs of communities within the counties comprising the Seneca Watershed. During this time, the term "Finger Lakes Discovery" was used to clarify the geographic extent of the watershed. Please see SECTION THREE SENECA WATERSHED OVERVIEW for further explanation of the watershed.

Like Discovery meetings, the pre-Discovery conference calls shared the goal and objective of speaking with communities to explain the Discovery process and its impacts and benefits to residents, and to interview and survey public officials as to the mapping and mitigation needs of their communities. These meetings are designed to act as a focus group for community officials and other professionals engaged in the planning and administration of floodplains and associated lands. As such, while not excluded, the general public is generally not in attendance at these meetings. A record of the dates and times, participants of these meetings, and the issues

discussed can be found in the Attachments as *Pre-Discovery Conference Call Summaries*. These notes provide the comments from those interviewed by NYSDEC and other staff to determine flood mapping priorities from each community in attendance on the Pre-Discovery conference calls. The findings of the meetings are discussed in SECTION FIVE PRE-DISCOVERY CONFERENCE CALLS. Recordings of these meetings can be found online at https://www.youtube.com/watch?v=qU-tSUvXdMI&feature=youtu.be. A copy of the PowerPoint presentation broadcast to attendees can be found in the Attachments titled *Pre-Discovery Conference Call PowerPoint Presentation*.

Other Stakeholders

Others, beyond municipal officials, planning and emergency agencies, and citizens have an interest in floodplain mapping and management: Major landowners, large employers, academic institutions, environmental, and sporting organizations all have a role to play, and sometimes valuable information to provide, when developing both pre-mapping data and final mapping products.

Who should be included in any compilation of watershed stakeholders is necessarily both a debatable and incomplete list. In order to identify other stakeholders, all those invited to the pre-Discovery conference call were asked who else should be included in this effort. Identified relevant stakeholders in the watershed are shown in Appendix A: *Pre-Discovery Conference Call Invitee List.* This appendix, including other stakeholders, will be added to and amended as further outreach is conducted with the communities.

SECTION THREE SENECA WATERSHED OVERVIEW

Geography

As described by the U.S. Geological Survey (USGS), watersheds in the United States are "divided and sub-divided into successively smaller hydrologic units (watersheds) which are classified into four levels: regions, sub-regions, accounting units, and cataloging units. The hydrologic units are arranged within each other, from the smallest (cataloging units) to the largest (regions). Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to eight digits based on the four levels of classification in the hydrologic unit system"[1].

[1] *Hydrologic Unit Maps*, last modified March 6, 2014. US Geological Survey. *usgs.gov*. http://water.usgs.gov/GIS/huc.html. (Accessed October 31, 2012).

The Seneca Watershed is one of the 378 hydrologic cataloging units, or HUC-8s, in this classification system. The watershed's HUC number, 04140201, can be used as a "key" both to map its location and to define its place in successively greater watersheds. The watershed's HUC breaks down as such:

04 = Region, Great Lakes

14 = Sub-Region, Southeast Lake Ontario

02 = Accounting Unit, Oswego

01 = Cataloging Unit, Seneca

Please note while the term "Finger Lakes" may be used in conversation when discussing this watershed, the USGS officially uses the term "Seneca Watershed" to denote the area ultimately drained by the Seneca River. This area is substantially larger than the area drained by Seneca Lake.

The Seneca Watershed covers 3,430 square miles[2] in central upstate New York and encompasses all or part of 14 counties and over 175 towns, cities, villages, and Onondaga Nation territory. Of the 14 counties, only Seneca County, located in the heart of the basin, is fully within the watershed. Cayuga, Ontario, Yates, Tompkins, and Onondaga counties are largely within the Seneca Watershed. The watershed covers about half of Schuyler and Wayne counties, with significantly smaller areas of Steuben, Chemung, and Cortland counties within the basin. The watershed is a minor presence in Monroe, Livingston, and Tioga counties, covering no more than five square miles in each of these counties.

With the exception of Syracuse and its suburbs in its northeast corner and the Rochester suburbs in its northwest corner, the watershed is primarily rural, dotted with smaller cities such as Ithaca, Geneva, and Canandaigua, and a host of villages and hamlets. Outside of these areas the majority of the land in the watershed is covered with farms, forest, orchards, and vineyards.

The Seneca Watershed is a complex basin and, unlike most basins, is dominated by the numerous large lakes in the watershed, rather than riverine systems. The presence of the long, narrow lake sub-basins is reflected in the relatively short distances of most streams in the basin. In addition, the watershed is highly regulated. Along with the man-made New York State Barge (Erie) Canal's use of some of the longer streams in the basin (specifically the Seneca River) in the northern tier of the watershed, dams control the water levels of all seven of the Finger Lakes and Onondaga Lake in the watershed. This regulation has a great deal of importance in the water management of the basin.

The Seneca watershed is the core of the Finger Lakes region of New York and contains seven of the 11 recognized Finger Lakes. The seven lakes from east to west are Otisco, Skaneateles, Owasco, Cayuga, Seneca, Keuka, and Canandaigua. While another large lake, Onondaga is also

[2] *Boundary Descriptions and Names of Regions, Subregions, Accounting Units and Cataloging Units*, last modified March 5, 2014. *US Geologic Survey. usgs.gov.* http://water.usgs.gov/GIS/huc_name.html#Region04 (Accessed October 31, 2012).

in the watershed, due to geological differences[3], it is not traditionally considered one of the Finger Lakes.

The entire watershed is drained by the Seneca River which has its origin at the northern end of Seneca Lake in the town of Waterloo near the city of Geneva. The river flows in a generally northeasterly direction for approximately 60 miles to its confluence with the Oneida River, near Lysander, forming the Oswego River. The Oswego River, which is the second largest river flowing into Lake Ontario, also drains the entire Oneida (04140202) and Oswego (04140203) basins for a total of 5,100 square miles[4]. The Oswego then flows northward for 24 miles to Lake Ontario.

Other larger streams in the watershed include Canandaigua Outlet which flows from Canandaigua Lake to the Erie Canal at Lyons; Skaneateles Creek, the outlet of its namesake lake, flows northward meeting the Seneca River near Jordan; and the Owasco Outlet, running from the northern end of Owasco Lake to the Seneca River near Port Byron.

Figure 1: *The Seneca Watershed* highlights the lakes, rivers, and the Erie Canal System of the watershed. For a more detailed map of the watershed, please see the watershed and community maps in the attachments to this document.

[3]Kirst, Sean. "Spooning and the Onondaga Finger Lake." Syracuse Post-Standard June 15, 2009. http://www.syracuse.com/kirst/index.ssf/2009/06/spooning_and_the_onondaga_fing.html. (Accessed December 28, 2012).

[4] *Oswego River Remedial Action Plan Stage 3 – Delisting*, January 2006. New York Department of Environmental Conservation. *pibpac.org*. http://www.pibpac.org/wp-content/uploads/2012/06/2006-Oswego-River-Remedial-Action-Plan-Stage-3-Delisting-short-version_Part1.pdf. (Accessed October 28, 2014).

Figure 1: *The Seneca Watershed*

The Finger Lakes

The 11 basins that make up the Finger Lakes were formed approximately two million years ago by glacial carving of old stream valleys.[5] Seneca and Cayuga are particularly deep with low points below sea level, with Seneca's deepest point (630 feet) located 185 feet below sea level.

During the various cycles of "ice ages" that affected the earth and what would become New York, from two million to about 11,000 years ago, the ancient river valleys were repeatedly gouged-out by sheets of ice advancing and retreating as the earth's climate cooled and warmed. The results of these actions can be seen in the creation of the deep valleys later filled with water to form the lakes, but also in the moraines at the southern end of the lakes and the numerous drumlins found throughout western New York.[6]

Table 1: *Finger Lake Statistics*, offers some information regarding geographic characteristics of the seven Finger Lakes in the Seneca Watershed

Table 1: *Finger Lake Statistics*[7]

Lake Name[1]	Length[2]	Width[2]	Shoreline length[2]	Water Surface Elevation[3]	Maximum Depth[3]	Surface Area[4]	Volume of Water[5]
Otisco	6	1	5.5	788	60	2.9	21 b
Skaneateles	16	0.75	34	863	315	13.8	424 b
Owasco	11	0.5 to 1	28	711	177	10.3	212 b
Cayuga	38	1.75	95	382	435	66.4	2.5 t
Seneca	35	3.5	81	445	630	67.7	4.2 t
Keuka	20	0.5 to 2	60	715	186	18.1	375 b
Canandaigua	15.5	1.5	38	688	276	16.3	429 b

[1] In order from east to west. [2] In miles. [3] In feet. [4] In square miles. [5] In gallons (b – billion, t – trillion).

The Erie Canal and Feeder Canals

In 1817, New York State began work on the Erie Canal. As is well documented, the original Erie Canal ran 363 miles from Albany, south of the confluence of the Mohawk and Hudson Rivers, westward to Buffalo on Lake Erie. The completion of the canal in 1825, allowed the development and settlement of western New York and the then "Northwest Territories" of the Ohio River Valley. The canal enabled the transportation of goods from the interior of the continent to the port at New York for as much as 95 percent less than had previously been

[5] *Formation of the Finger Lakes.* Paleontological Research Institution. *Museumoftheearth.org*. http://www.museumoftheearth.org/outreach.php?page=Edu_Prog/earth101/flg/formation (Accessed November 2, 2012).
[6] *Ibid.*
[7] *Quick Lake Facts.* Finger Lakes Institute, Hobart and William Smith Colleges. *hws.edu*. http://www.hws.edu/fli/images/lakes.swf. (Accessed November 5, 2012).

possible. For example the cost to ship a ton of cargo, such as wheat, oats, or logs from Buffalo to New York dropped from about $100 to $4![8]

Because motorized propulsion was not yet available, a tow path for pack animals (primarily mules) was required for its entire length. The need for a relatively narrow waterway with an immediately adjacent walkway for animals generally precluded the use of natural waterways for the canal's route; therefore, the original canal was located entirely within a man-made channel.

However, by the start of the canal's second complete reconstruction in 1903 (the first occurring from 1836 to 1862), the use of motorized propulsion for transport had removed the need for a tow path for pack animals. This freed the canal's engineers to move the canal, to the extent possible, to natural water courses, especially in eastern and central New York.

This third iteration of the Erie Canal is still in use today as the New York State Barge Canal. The canal uses the Mohawk River from just upstream of its confluence with the Hudson River (the first 2.5 miles at Waterford are in canal to avoid the 90-foot drop at Cohoes Falls) to Frankfort, a distance of over 90 miles or about a third of the canal's total length. From Frankfort westward, the canal follows in close proximity the natural course of the river until at Rome the canal leaves the Mohawk River valley for the first time to reach Oneida Lake.

After traversing the approximately 21 miles of Oneida Lake, at the western end of the lake the canal utilizes the heavily engineered Oneida River to its confluence with the Seneca River northwest of Syracuse, entering the Seneca Watershed for the first time.

The entire length of the Seneca River is maintained for use as major sections of the Canal System. From its confluence with the Oneida River westward to the town of Montezuma it is part of the Main Stem of the Erie Canal. West of Montezuma, the river is used as the Cayuga-Seneca Branch of the canal system to reach its namesake lakes.

Westward of Montezuma, the canal leaves natural watercourses and utilizes a man-made channel for the approximately 40 miles to the western boundary of the watershed just west of Macedon. For the majority of its remaining journey to Buffalo, the canal uses a manmade channel.

In the watershed, the canal flows eastward, from a high elevation of about 473 feet above sea level at Macedon to 363 feet at the junction with the Oswego Canal/River near Phoenix. An elevation profile of the entire New York State Canal System can be seen in Figure 2: *New York State Canal System Profiles.*

[8] *Erie Canal Time Machine.* New York State Archives. *archives.nysed.gov*. http://www.archives.nysed.gov/projects/eriecanal/ec_1830.shtml. (Accessed November 5, 2012).

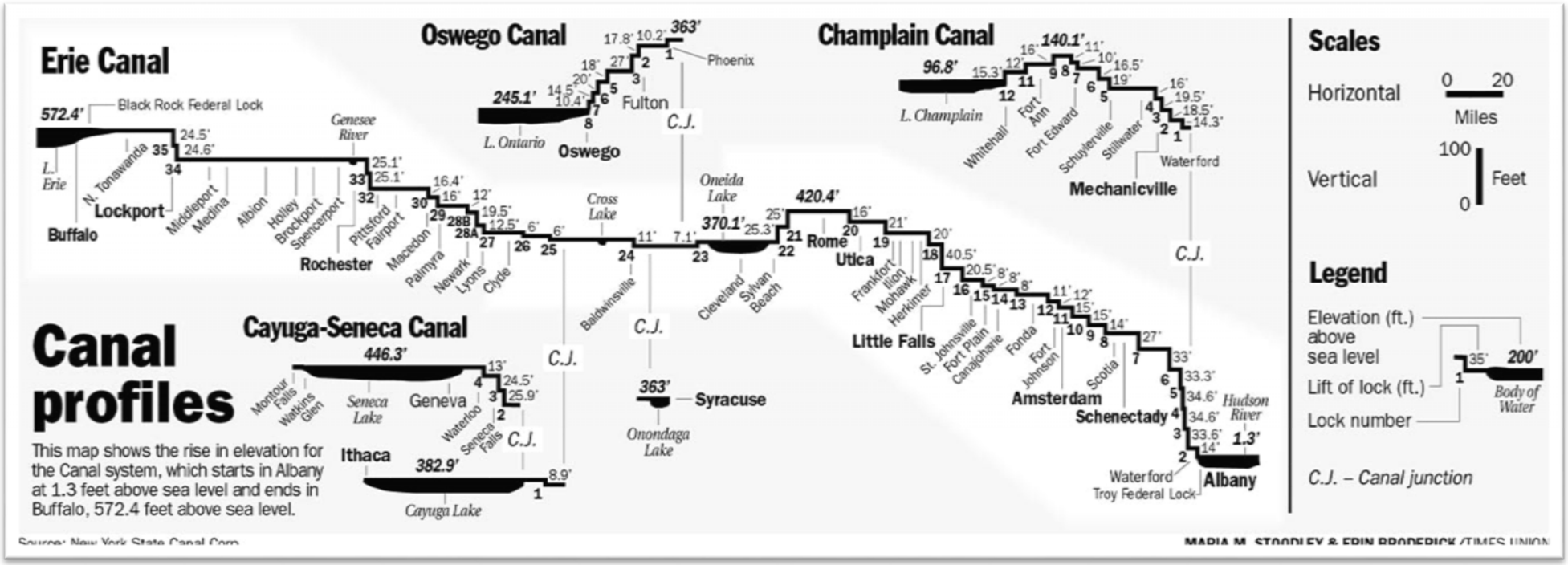

Figure 2: *New York State Canal System Profiles*

Property Ownership

Land ownership in the watershed is extremely diverse with little land (as a percentage of total ownership) concentrated into any unified holdings. A description of the dispersal of property holdings in the watershed follows.

Like many watersheds in the northeastern United States, the Federal government controls very little of the land within the basin. The US Government does, however, have two parcels of size within the watershed both are centrally located within the watershed, and are located at each end of Seneca County. These holdings are the Montezuma National Wildlife Refuge (7,068 acres) located in the towns of Tyre and Seneca Falls and Finger Lakes National Forest (16,259 acres), the second smallest national forest in the United States, which is found mostly in the town of Hector with smaller parcels in Lodi and Covert. The Federal government also has two smaller properties in the Syracuse area, the US Air Force's Hancock Field, consisting of about 350 acres in the town of Cicero and the US Marine Corps Reserve Training Center in the towns of Salina and DeWitt.

The former Seneca Army Depot, a property of over 10,000 acres in the towns of Varick and Romulus, was transferred to the Seneca County Industrial Development Agency, which leases it to Seneca County Economic Development Corp.

At the state level, the NYSDEC owns numerous parcels in and on the margins of the watershed, especially in an arc along the southern boundary of the watershed between Otisco and Canandaigua Lakes. The majority of the acreage controlled by New York consists of State Reforestation and Wildlife Management Areas. In addition to these areas, multiple other sites such as State Parks and Historic Areas, boat launches, and other open space areas can be found across the watershed.

County and municipal lands are generally smaller parcels and are scattered throughout the watershed. The location of various public lands can be seen on Figure 3: *Public Lands in the Seneca Watershed*.

Private ownership within the watershed is greatly decentralized with few large holdings.

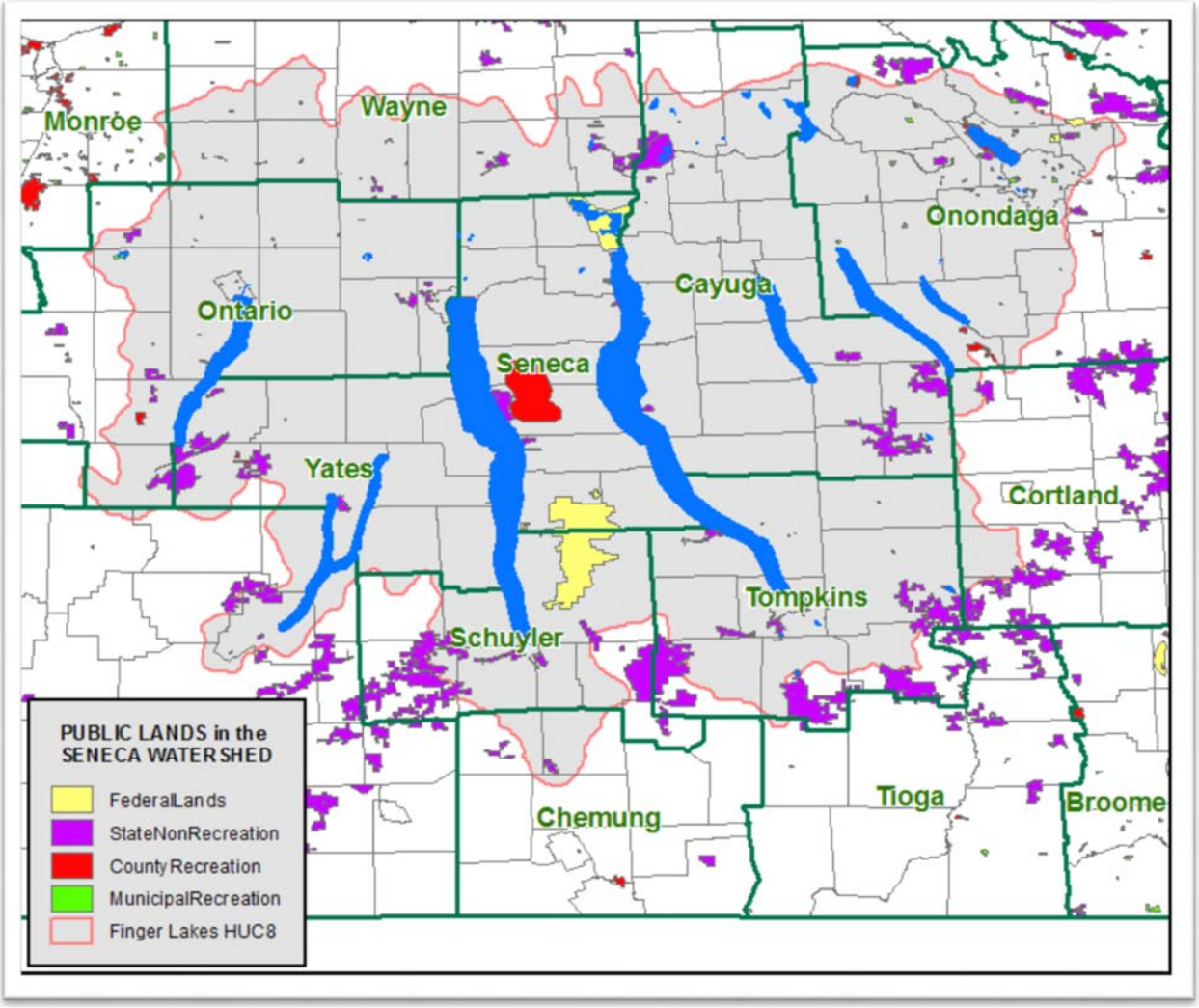

Figure 3: *Public Lands in the Seneca Watershed*

More information on property ownership can be found on each county's Real Property webpage as noted in Table 2: *Links to County Real Property Webpages* below.

Table 2: *Links to County Real Property Webpages*

County Name	Hyperlink to Real Property Webpage
Cayuga	http://www.cayugacounty.us/CountyGovernment/RealProperty.aspx
Chemung	http://www.chemungcounty.com/index.asp?pageId=254
Cortland	http://www.cortland-co.org/rpts/index.html
Livingston	http://www.co.livingston.state.ny.us/real_property.htm
Monroe	http://www2.monroecounty.gov/property-index.php
Onondaga	http://www.ongov.net/rpts/propertyTaxInfo.html
Ontario	http://www.co.ontario.ny.us/index.aspx?nid=96
Schuyler	http://www.schuylercounty.us/rptdept.htm
Seneca	http://www.co.seneca.ny.us/dpt-finadmin-real-property-tax.php
Steuben	http://www.steubencony.org/pages.asp?PGID=40
Tioga	http://www.tiogacountyny.com/departments/real-property.html
Tompkins	http://tompkinscountyny.gov/assessment
Wayne	http://www.co.wayne.ny.us/departments/realproptax/realproptax.htm
Yates	http://www.yatescounty.org/display_page.asp?pID=85

Demographics

The 2010 population of the approximately 175 communities all or partially within the Seneca Watershed was 1,176,956[9]. By far, the largest single jurisdiction in the watershed is the city of Syracuse, with a 2010 population of 145,170. Other larger jurisdictions mostly in the watershed include Clay, Salina, Camillus, Onondaga, and Lysander all within the Syracuse suburbs. The population of these six communities constitutes approximately 30 percent (306,113) of the population of jurisdictions *mostly* within the watershed[10]. The location of the larger Syracuse area communities is shown in Figure 4: *Largest Communities in the Seneca Watershed*. Outside the above named urban areas, the cities of Ithaca, Auburn, and the town of Horseheads are the largest jurisdictions all or partially in the watershed. In the watershed as a whole, however, outside of the Syracuse and Rochester areas, 70 percent of the communities within the watershed have populations under 5,000 persons. Appendix C: *Population and Housing in the Seneca Watershed*, shows the population and housing totals for all jurisdictions affected by the watershed.

Figure 4: *Largest Communities in the Seneca Watershed*

Although most of the jurisdictions within the counties

[9]This figure includes the total population of all communities regardless of the percentage of the community physically located within the watershed.

[10]The populations of the towns of Cicero, Manlius, Penfield, and Perinton have been removed from this total as they are mostly *outside* the watershed. The watershed's population without these communities is approximately 1,036,000.

are primarily rural, every county in the watershed, with the exception of Schuyler and Yates counties, is part of a US Census Bureau Metropolitan or Micropolitan Statistical Area (MSA). MSAs are geographic entities defined by the Office of Management and Budget (OMB) for use by Federal statistical agencies in collecting, tabulating, and publishing Federal statistics. MSAs are also used to indicate the primary "center of gravity" for an area and can be useful in determining development pressures and the direction of future growth that may occur in a community or group of communities. Table 3: *MSAs in the Seneca Watershed*, names the MSA, what counties are within the MSA, and their populations.

Table 3: *MSAs in the Seneca Watershed*

Statistical Area Name	County(ies)	Type	County Population[1]	Total MSA Population
Auburn	Cayuga	Micro	80,026	80,026
Binghamton	Tioga	Metro	51,125	251,725[2]
Corning	Steuben	Micro	98,990	98,990
Cortland	Cortland	Micro	49,336	49,336
Elmira	Chemung	Metro	88,830	88,830
Ithaca	Tompkins	Metro	101,564	101,564
Rochester	Monroe	Metro	744,344	969,923[3]
	Livingston		65,393	
	Ontario		107,931	
	Wayne		93,772	
Seneca Falls	Seneca	Micro	35,251	35,251
Syracuse	Onondaga	Metro	467,026	662,577[4]

[1]Population figure may include areas beyond Seneca Watershed
[2]Total MSA population also includes Broome County.
[3]Total MSA population also includes Orleans County.
[4]Total MSA populations also include Madison and Oswego counties.

A map of the MSAs of the watershed is shown in Figure 5: *MSAs in the Seneca Watershed*.

The Onondaga Reservation, located adjacent to the towns of LaFayette and Onondaga, south of the city of Syracuse, is a Federally-recognized tribal area within Onondaga County and has a population of 468. The Native American population of the watershed as a whole is under one percent.

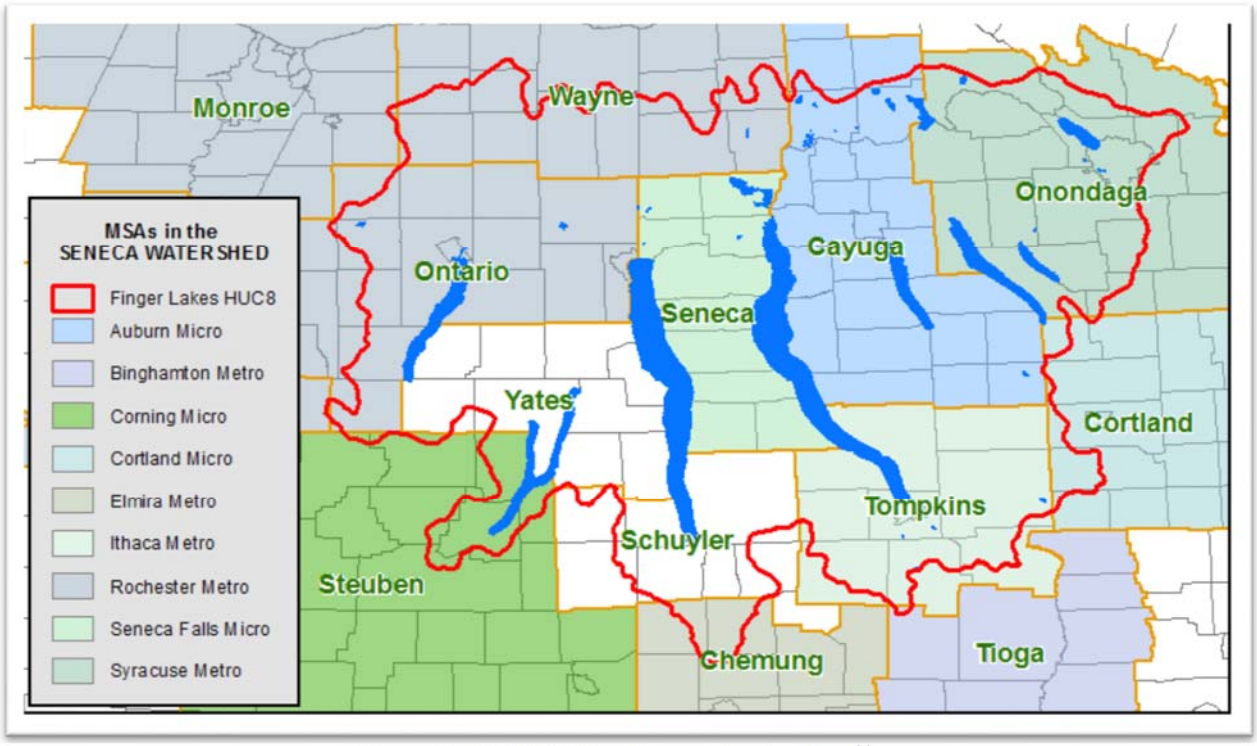

Figure 5: *MSAs in the Seneca Watershed*[11]

Approximately 6 percent of the population of communities all, or partially, in the watershed, speak a language other than English at home with the highest concentrations of non-English speaking persons being in Tompkins County. Home of Cornell University, the 2000 US Census reports that approximately 5.7 percent of Tompkins County's population speaks various Asian languages at home, 2.8 percent speak Spanish, and 5.4 percent of the county's population speaks other languages. The census also reports that while these populations may speak a language other than English at home, the majority of these residents understand English "reasonably well".[12]

Approximately 88 percent of the population in the watershed holds a high school diploma, and around 25 percent have a college degree[13]. As of January 2014, the unemployment rate in the Seneca Watershed ranged from a low of 5.0 percent to a high of 8.8 percent with an average of about 7.4 percent across the 14 counties of the watershed.[14] The median household income in

[11] Metropolitan and Micropolitan Statistical Areas of the United States and Puerto Rico, revised May 6, 2013. United States Census Bureau, US Department of Commerce. *census.gov*. https://www.census.gov/population/metro/data/def.html. (Accessed December 27, 2012).

[12] American FactFinder. *Profile of Selected Social Characteristics: 2000 Census Summary File 3, Tompkins County, New York.* United States Census Bureau, US Department of Commerce. *census.gov.* http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk. (Accessed December 31, 2012).

[13] Ibid.

[14] Labor Force Data by County, Not Seasonally Adjusted, December 2012-January 2014. March 28, 2014. Bureau of Labor Statistics US Department of Labor. *bls.gov*. http://www.bls.gov/lau/#tables. (Accessed April 4, 2014).

the area is just over $50,200 annually. Residents across the watershed worked primarily in public education and government service, retail trade, manufacturing, health and social services, farming, and tourism.

There are approximately 525 Old Order Mennonite families in Yates County. In addition to typical housing and farm-related buildings, the community has eight churches and over 30 schoolhouses across the county[15]. Due to the size of this community, a conversation with Yates County officials may be in order to determine if any personal outreach should be conducted to this group that often eschews electronic communication.

Additional detailed demographic information for each county in the watershed can be found in Table 4: *Demographics of the Seneca Watershed by County*.

[15] Dewey, Rachel E. "Mennonite Neighbors: Different, but Similar". *Keuka College News – Around the Tower*, published August 1, 2012. http://news.keuka.edu/features/mennonite-neighbors-different-but-similar. (Accessed April 9, 2014).

Table 4: *Demographics of the Seneca Watershed by County*[16]

County	% of Population over 65	% Speaking language other than English at home	% High School Graduate	% Obtaining Bachelor's degree or higher	Median Household Income (2007-2011)	Home Ownership Rate	% in Multi-unit Structures (Apartment, Condo, other)	Median Value of Owner Occupied Housing Units	% Persons Below Poverty Level
Cayuga	15.5	4.1	85.0	18.3	$50,140	72.2	20.8	$100,200	12.4
Chemung	15.7	4.6	87.9	20.8	$46,589	67.1	25.9	$89,400	16.5
Cortland	13.3	4.3	89.6	24.0	$45,956	66.2	29.3	$98,400	15.0
Livingston	14.1	4.9	88.2	23.3	$53,231	75.1	18.4	$114,300	11.7
Monroe	14.2	12.5	88.6	35.3	$52,260	66.0	30.9	$132,800	14.4
Onondaga	14.2	9.9	89.0	32.5	$52,636	65.8	32.8	$128,600	13.8
Ontario	15.8	6.0	91.6	30.5	$57,069	75.3	20.1	$133,600	9.7
Schuyler	16.9	3.7	88.2	17.0	$47,804	79.8	9.0	$89,400	9.0
Seneca	15.7	6.5	83.0	18.3	$47,266	75.3	14.0	$90,600	11.7
Steuben	16.1	4.7	87.4	19.6	$44,967	71.7	18.1	$84,200	15.0
Tioga	16.0	3.1	90.5	22.4	$53,789	79.2	13.9	$105,600	9.5
Tompkins	11.1	16.0	92.6	49.8	$49,789	55.3	38.0	$165,900	20.4
Wayne	14.8	5.5	87.2	20.8	$54,380	77.4	17.0	$108,400	11.1
Yates	17.1	10.0	84.6	23.4	$48,125	77.4	10.2	$117,000	15.4
AVERAGE	**15.04**	**6.84**	**88.1**	**25.43**	**$50,285.79**	**71.7**	**21.31**	**$111,314**	**13.26**
NEW YORK	13.7	29.5	84.6	32.5	$56,951	54.8	50.5	$301,000	14.5
UNITED STATES	13.3	20.3	85.4	28.2	$52,762	66.1	25.9	$186,200	14.3

[16] State and County QuickFacts, New York, revised July 8, 2014. United States Census Bureau, US Department of Commerce. *census.gov*. http://quickfacts.census.gov/qfd/states/36000.html. (Accessed October 28, 2014).

Cornell University's Program on Applied Demographics (PAD) has projected population trends for all 14 of the counties in the watershed. A review of the data shows that over the past 20 years population growth has been mixed across the watershed, with the Rochester suburbs in Monroe and Ontario counties growing most quickly. Furthermore, population projections for the watershed show the population of the Syracuse area (Onondaga County) remaining steady through 2020 with other areas of the watershed decreasing in population over the next six years. The total population of the watershed is projected to increase by about three percent by 2020.

It is important to note that a flat or decreasing population for a particular location is not necessary indicative of the growth of a jurisdiction. As explained in the Finger Lakes Land Trust publication, *A Greenprint for Seneca County*, while the county's population has remained essentially flat since 1970, nearly 3,000 new homes have been built in the county during that time[17]. In addition, the growth of typically suburban infrastructure and services, such as big box stores and other commercial buildings continue, placing stress on the region's ability to handle runoff from rainfall and snow melt.

Population estimates for each county are shown in Table 5, *Population and Projections 1990-2020 in the Seneca Watershed.*

Table 5: *Population and Projections 1990-2020 in the Seneca Watershed*

County	Population 1990	Population 2000	Population 2010	Population 2020	% Change 1990-2020
Cayuga	82,313	81,963	80,026	76,946	-7%
Chemung	95,195	91,070	88,830	85,524	-9%
Cortland	48,963	48,599	49,336	49,008	0%
Livingston[1]	2,407	2,322	2,439	2,488*	2%
Monroe[2]	73,234	80,735	82,704	92,629*	12%
Onondaga	468,973	458,336	467,026	472,385	0%
Ontario	95,101	100,224	107,931	111,494	15%
Schuyler	18,662	19,224	18,343	17,331	-1%
Seneca	33,683	33,342	35,251	34,167	1%
Steuben	99,088	98,726	98,990	96,181	-1%
Tioga[3]	2,979	2,881	3,153	3,437*	9%
Tompkins	94,097	96,501	101,564	101,732	8%
Wayne	89,123	93,765	93,772	92,446	4%
Yates	22,810	24,621	25,348	25,845	12%
TOTALS	**1,226,628**	**1,232,309**	**1,254,713**	**1,261,613**	**3%**

[1]Includes only information for the town of Springwater.
[2]Includes only information for the towns of Penfield and Perinton.
[3]Includes only information for the town of Spencer
*Projection based on 1990-2010 trends.

Additional demographic details and breakdowns can be found by visiting PAD's website.

[17] West, Kristine. "A Greenprint for Seneca County", published March 2010. Finger Lakes Land Trust. *fllt.org*. http://www.fllt.org/linkfiles/senecacountyreport.pdf. (Accessed December 28, 2012).

Media in the Seneca Watershed

Because the Seneca watershed is "sandwiched" between two larger metropolitan areas (Rochester and Syracuse), and the smaller urban area of Elmira, the Seneca watershed overlaps several media markets, making broadcast outreach a bit more complicated than perhaps a typical watershed centered on one large city. The Syracuse (Cayuga, Cortland, Onondaga, Seneca, and Tompkins counties), Rochester (Livingston, Monroe, Ontario, Wayne, and Yates counties), and Elmira (Chemung, Schuyler, and Steuben counties) markets cover approximately 58 percent, 25 percent, and 16 percent of the watershed's population, respectively. The Binghamton (Tioga County) market covers much less of the population at only about 1 percent of the watershed's residents. A map illustrating the market coverage is shown in Figure 6: *Media Markets Covering the Seneca Watershed*.

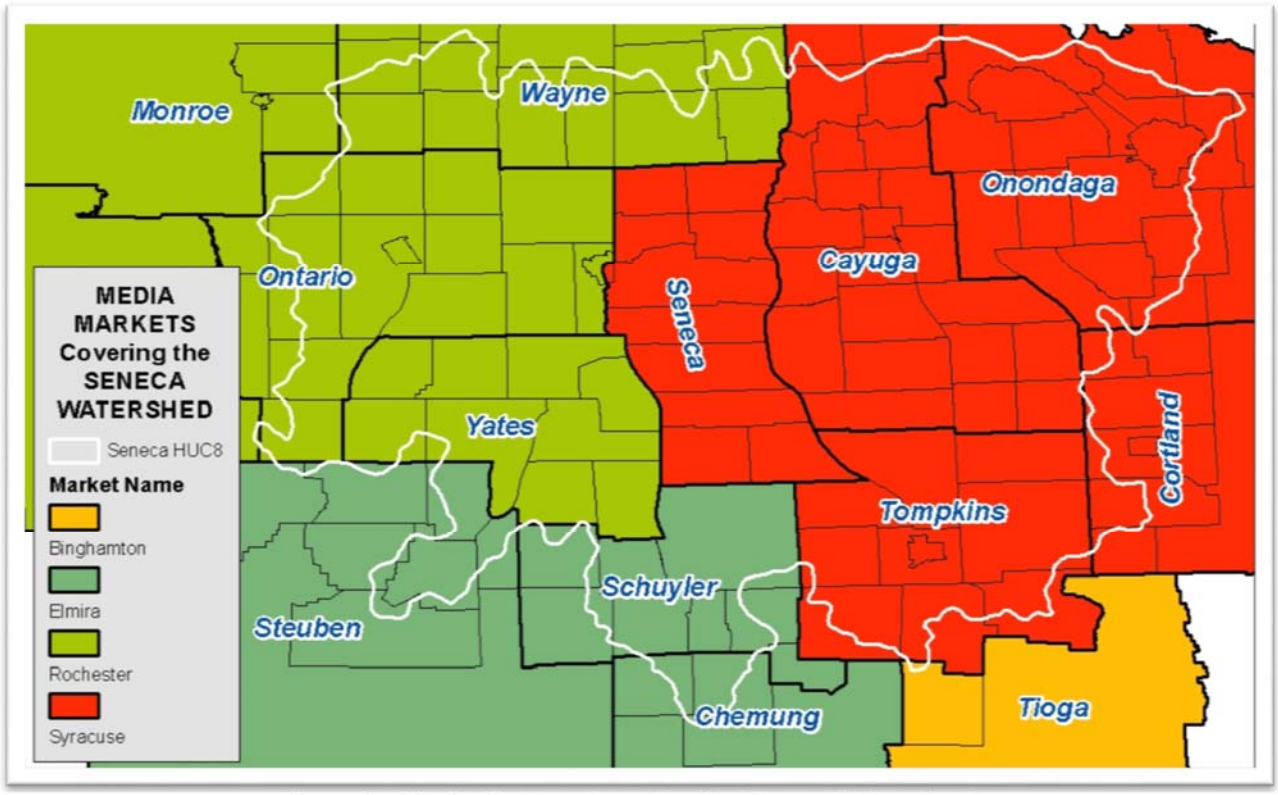

Figure 6: *Media Markets Covering the Seneca Watershed*

Due to this overlap, there are a multitude of television and radio stations in the watershed. Syracuse has eight television stations and 45 radio stations; Rochester, seven television and 52 radio stations; and Elmira, five television and 47 radio outlets[18]. These totals reflect stations that can be received in the market and may represent some overlap between markets, (for example, a radio station's signal broadcast out of Geneva, NY may be heard in portions of all three main markets. In addition, Time Warner Cable News, a 24-hour local news station is also carried on many local cable systems.

[18] Elmira, Rochester, Syracuse, New York media market pages. On The Radio.Net. http://www.ontheradio.net. (Accessed November 9, 2012).

The primary newspapers in the watershed include the major dailies of Syracuse and Rochester, the *Post-Standard* and *Democrat and Chronicle*. Other newspapers in the watershed include the Auburn *Citizen*, Steuben *Courier* (Bath), Finger Lakes *Times* (Geneva), and Ithaca *Journal*. Further information on media outlets in the watershed can be found in Appendix D: *Media in the Seneca Watershed*.

SECTION FOUR SUMMARY OF DATA

During the Discovery portion of the Seneca project, a large collection of tabular and spatial data was compiled for all communities from Federal, state, and local sources, as well as information collected through personal interviews. Table 6: *Data Collection for the Seneca Watershed*, lists the types of data that the project team collected for the study area before the Discovery Meeting and their sources. The Summary of Data that follows Table 6 is divided into two sections: "Data that can be Used for Risk Map Products" describes the data that can be used for inclusion in final Risk MAP products and "Other Data" describes the information that helped the study team form a better understanding of the Project Area.

Table 6: *Data Collection for the Seneca Watershed*

Data Types	Deliverable/Product	Source
Average Annualized Loss	Discovery Map Geodatabase and Appendix E: *Average annualized Losses in the Seneca Watershed*	FEMA – Region II
Boundaries: Community, New York	Discovery Map Geodatabase	New York State
Boundaries: County and State	Discovery Map Geodatabase	ESRI
Boundaries: Watersheds	Discovery Map Geodatabase	U.S. Geologic Survey (USGS)
Community Assistance Calls	Appendix I: *CACs in the Seneca Watershed*	FEMA – Community Information System (CIS)
Community Assistance Visits	Appendix H: *CAVs in the Seneca Watershed*	FEMA – Community Information System (CIS)
Community Rating System	Community Fact Sheet	FEMA – Community Rating System (CRS)
Requested and Completed Mitigation Proposals	Appendix N: *FEMA Mitigation Grant Proposals*	FEMA – Region II
Contacts	Appendix A: *Pre-Discovery Conference Call Invitee List,* Attachments: *Pre-Discovery Conference Call Summaries*, and: *Discovery Meeting Sign-In Sheets*	Community interviews, Community websites, NYSDEC, FEMA, Other various sources
Dams	Discovery Map Geodatabase and Appendix G: *Dams in the Seneca Watershed*	NYSDEC
Declared Disasters	Appendix L: *Known Declared Disasters in the Seneca Watershed*	FEMA
Demographics	Discovery Report; Appendix C: *Population and Housing in the Seneca Watershed*	U.S. Census Bureau
Effective Floodplains:	Discovery Map Geodatabase	FEMA

Data Types	Deliverable/Product	Source
Future or recent highway improvement, bridge, culvert, levee locations	List of possible locations noted in Discovery Report, Hazard Mitigation Plans, and Attachment Pre-Discovery Conference Call Summaries	Based on community interviews and data noted in Hazard Mitigation Plans
Hazards	Discussed in Discovery Report	FEMA, New York State, Other Sources
Hydrography: New York	Discovery Map Geodatabase	USGS, New York State
High Water Marks	N/A	Various
NFIP Insurance Policies	Appendix M: *NFIP Insurance in the Seneca Watershed*	FEMA – CIS
Letter of Map Change (LOMCs)	Appendix P: *Total Number of LOMCs by Community,* Discovery Map Geodatabase, and Discovery Report	FEMA
Mitigation Plans Status	List of Links to County Websites	NYSDEC through Counties
Planned Mitigation Projects: Recent, ongoing, planned, desired FEMA/OFA/local projects	Discovery Report	Based on community interviews
Municipal Separate Storm Sewer Systems	Discovery Map Geodatabase and Discovery Report	NYSDEC and the Environmental Protection Agency
Recent land changes (development, wildfires, landslides, etc.)	Discovery Map Geodatabase	Based on community interviews
Recently developed or planned high growth areas	Discovery Map Geodatabase	Based on community interviews
Repetitive Loss	Appendix R: *Repetitive Losses in the Seneca Watershed*	FEMA – CIS
State Pollutant Discharge Elimination Systems	Discovery Map Geodatabase	NYSDEC
Stream Gages	Appendix F: *Complete USGS Gages in the Seneca Watershed*	USGS[1]
Study Needs: FEMA	Discovery Map Geodatabase and Appendix K: *Valid CNMS Stream Segments in the Seneca Watershed*	Coordinated Needs Management System (CMNS)
Study Needs: Recent, ongoing, planned, desired FEMA/OFA/local studies	Discovery Report	Based on community interviews
Transportation: Railroads, New York	Discovery Map Geodatabase	National Atlas
Transportation: Roads, New York	Discovery Map Geodatabase	New York State
Zone B, C, and X Claims	Discovery Report	FEMA – CIS

[1]Additional stream gage data may be available from other agencies or sources, but was unavailable for this report.

Data That Can Be Used for Risk MAP Products

Average Annualized Loss Data

Average Annualized Loss (AAL) data is used to demonstrate the estimated possible dollar losses associated with a particular-sized flood event (such as a 1- or 0.2-percent-annual-chance flood) by census block and is used to show a relative comparison of flood risk. They are determined by FEMA's Multi-Hazard Risk Assessment and Loss Estimation Program, otherwise known as Hazus-MH. The current Hazus-MH analysis is based on approximate flood boundaries and national datasets. The calculation is based on flood elevation estimates using the 10-meter Digital Elevation Model on streams with drainage areas of at least 10 square miles. Additional information about the Hazus-MH process and tool can be found at http://www.fema.gov/protecting-our-communities/hazus.

The countywide results for the watershed were obtained from FEMA and are shown in Table 7: *Hazus AAL Data for the Seneca Watershed*. AAL data summarized at the census block level can be found in the geodatabase files. It is important to emphasize that the figures noted in Tables 7 and 8 are estimates of potential damages only and do not reflect actual damages in the counties or census blocks shown.

Table 7: *Hazus AAL Data for the Seneca Watershed*

FIPS Code	County	Total in Dollars	Building in Dollars	Contents in Dollars	Business Disruption
36011	Cayuga*				
36015	Chemung	$702,000	$362,000	$333,000	$7,000
36023	Cortland	$7,000	$5,000	$2,000	$0
36051	Livingston*				
36055	Monroe*				
36067	Onondaga	$68,385,000	$24,235,000	$41,392,000	$2,758,000
36069	Ontario	$5,150,000	$2,232,000	$2,787,000	$131,000
36097	Schuyler	$4,794,000	$1,933,000	$2,708,000	$153,000
36099	Seneca	$995,000	$418,000	$550,000	$27,000
36101	Steuben	$282,000	$141,000	$140,000	$1,000
36107	Tioga[4]				
36109	Tompkins	$29,830,000	$9,525,000	$18,961,000	$1,344,000
36117	Wayne	$3,031,000	$1,032,000	$1,878,000	$121,000
36123	Yates	$1,129,000	$463,000	$635,000	$31,000

*No reported losses within census tracks in county

In addition, Figure 7: *Average Annualized Losses for the Seneca Watershed*, illustrates the distribution of AAL results by U.S. Census block.

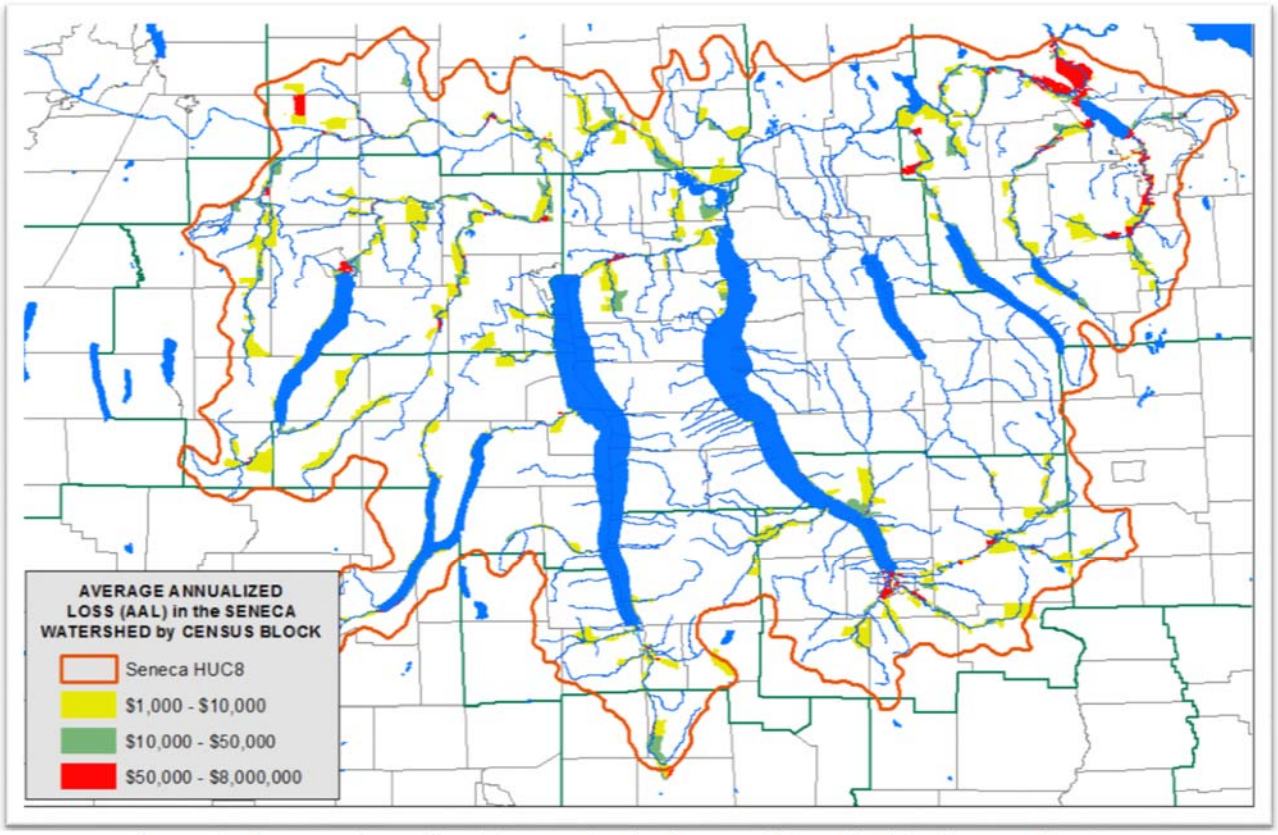

Figure 7: *Average Annualized Losses for the Seneca Watershed by Census Block*

As would be expected, the majority of census blocks suffering losses are located on or near the major streams of the watershed including the Seneca River, Onondaga Creek, Canandaigua Outlet, and the historic valley of the Clyde River (which it now shares with the manmade Erie Canal). These "hot spots" of loss may simply be caused by the higher population density in those areas. Table 8: *Top 15 AAL Areas by Census Block*, lists the top 15 census tracts with the highest total dollar amount of losses.

Table 8: *Top 15 AAL Areas by Census Block*

Census Block	Jurisdiction	County Name	Flooding Source	Total Losses
360670032001016	Syracuse	Onondaga	Onondaga Creek	$7,974,000
360670042003018	Syracuse	Onondaga	Onondaga Creek	$3,262,000
360670001001015	Syracuse	Onondaga	South Branch Ley Creek	$2,540,000
360670032001056	Syracuse	Onondaga	Onondaga Creek	$2,508,000
360670030002001	Syracuse	Onondaga	Onondaga Creek	$2,134,000
360670166002017	Skaneateles	Onondaga	Multiple	$1,956,000
360670001001084	Syracuse	Onondaga	Onondaga Creek	$1,878,000
360670001001088	Syracuse	Onondaga	Onondaga Creek	$1,878,000
360670112012001	Clay	Onondaga	Seneca River/Erie Canal	$1,830,000
360670042003006	Syracuse	Onondaga	Onondaga Creek	$1,602,000
360670030001034	Syracuse	Onondaga	Onondaga Creek	$1,422,000
360670042003014	Syracuse	Onondaga	Onondaga Creek	$1,202,000
361090001001009	Ithaca (T)	Tompkins	Cayuga Inlet and Tributaries	$1,185,000
360670042003013	Syracuse	Onondaga	Onondaga Creek	$1,147,000
361090001001005	Ithaca (T)	Tompkins	Cayuga Inlet and Tributaries	$1,132,000

A review of the top 15 census blocks shows that 11 of the 15 are located in the city of Syracuse and furthermore, all but one of the city's most problematic areas are along Onondaga Creek. A complete table of all census blocks within the watershed with reported AAL can be found in Appendix E: *Average Annualized Losses in the Seneca Watershed*.

Stream Gages in the Seneca Watershed

There are approximately 65 known operating and historic gages in the watershed and 18 are currently active and being monitored by the USGS or the NYSDEC. As noted by the USGS, stream gages are "an important resource which aids in preventing loss of life, saves one billion dollars a year in property losses, and allows bridges to be properly designed and drinking water allocated".[19]

According to the USGS, most USGS stream gages operate by measuring the elevation of the water in the river or stream and then converting the water elevation (called "stage") to a stream flow ("discharge") by using a curve that relates the elevation to a set of actual discharge measurements. This is done because currently the technology is not available to directly measure the flow of the water accurately enough.

The USGS standard is to measure river stage to 0.01 inches. This is accomplished by the use of floats inside a stilling well, by the use of pressure transducers that measure how much pressure is required to a push a gas bubble through a tube (related to the depth of water), or with radar[20]. Figure 8: *Typical Modern USGS Stream Gage* illustrates the design of a river gaging station.

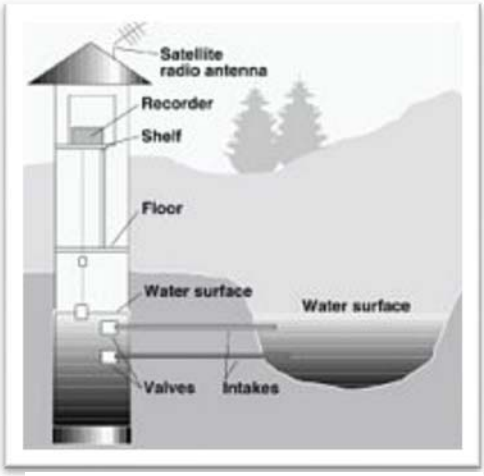

Figure 8: *Typical Modern USGS Stream Gage*

At most USGS stream gages, the stage is measured every 15 minutes and the data is stored in an electronic data recorder, most often powered by solar energy. At set intervals, usually every 1 to 4 hours, the data is transmitted to the USGS using satellite, phone, or radio. At the USGS offices, the curves relating stage to stream flow are applied to determine estimates of the stream flow and both the stage and stream flow data are then displayed on the USGS website.

For more information on how stream gages work, please see: http://pubs.usgs.gov/fs/2005/3131/.

In the Seneca Watershed, the active gages offer upwards of 86 years' worth of data for a single location with the median number of years being 14 and the average years of data, 26. In addition, a great deal of data is available for gage sites no longer active in the

[19] "How Does Everyone Benefit From Stream Gages?", published April 11, 2013. Delaware River Basin Commission. http://www.state.nj.us/drbc/gage/gageshp.htm. (Accessed June 24, 2014).

[20] "How a USGS Streamgage Works?", published February 25, 2014. United State Geological Survey. *Usgs.gov.* http://water.usgs.gov/nsip/definition9.html. (Accessed June 24, 2014).

watershed. While any amount of yearly record for a particular stream is helpful, historical flow data collected at continuous stream flow-gaging stations, sufficient in quality and quantity, are fundamental to the accurate calculation of flow statistics. Therefore, when calculating percentiles, the USGS requires a minimum of 30 river years of data. The records of individual gages should be reviewed prior to developing any calculations.

As outlined on the USGS's website, a percentile is a value on a scale of one hundred that indicates the percent of a distribution that is equal to or below it. For example, a river discharge at the 90th percentile is equal to or greater than 90 percent of the discharge values recorded on this day of the year during all years that measurements have been made. In general, a percentile greater than 75 is considered above normal, while a percentile between 25 and 75 is considered normal, and a percentile less than 25 is considered below normal. In some hydrological studies, particularly those related to floods, a variation of the percentile known as the "percent exceedance" is used. It is simply obtained by subtracting the percentile scale value from 100 percent. For example, a discharge at the 75th percentile is the same as a discharge at the 25th percent exceedance (100-75=25).[21]

Table 9 below, *USGS Gages in the Seneca Watershed*, shows the gage identification number, location, drainage area, status, and county for all active and recently active (generally active until 2005 or later) USGS gages identified in the Seneca Watershed. Historical stream flow information from the USGS gages listed in Table 9 will be employed for use in hydrological analysis where it is determined to be applicable. A more comprehensive table of past and active gage locations within the watershed is available in Appendix F: *Complete USGS Gage Sites in the Seneca Watershed*. Additional information on gages in the watershed may be found by visiting the USGS's website at http://waterdata.usgs.gov/nwis/rt.

The New York State Canal Corporation also operates several stream gages, however that data has not been made available for this Discovery Report. Prior to any future mapping projects, all available sources of stream data will be requested from the owners of gaging and other monitoring facilities.

[21]"What is a Percentile?", published November 9, 2011. United State Geological Survey. *usgs.gov.* http://help.waterdata.usgs.gov/faq/surface-water/what-is-a-percentile?searchterm=percentile. (Accessed July 16, 2014).

Table 9: *USGS Gages in the Seneca Watershed*

Station Number	Station Name	Drainage Area (Sq. Miles)	Station Latitude	Station Longitude	Gage Status	County	Years of Record*
04235440	OWASCO OUTLET AT GENESEE ST., AUBURN NY	206.7	42.932	-76.565	Active	Cayuga	14
04235600	SENECA RIVER (ERIE CANAL) NEAR PORT BYRON NY	2,815.0	43.079	-76.646	Active	Cayuga	16
04235300	OWASCO INLET AT MORAVIA NY	106.0	42.718	-76.438	Inactive	Cayuga	8
04235500	OWASCO OUTLET NEAR AUBURN NY	206.0	42.947	-76.599	Inactive	Cayuga	85
04235500	OWASCO OUTLET NEAR AUBURN NY	205.6	42.947	-76.599	Inactive	Cayuga	85
04235820	GROUT BROOK TRIB SOUTHEAST OF FAIR HAVEN NY	0.3	42.758	-76.245	Inactive	Cortland	3
04237500	SENECA RIVER AT BALDWINSVILLE NY	3,138.0	43.157	-76.332	Active	Onondaga	63
04237500	SENECA RIVER AT BALDWINSVILLE NY	3,131.4	43.157	-76.332	Active	Onondaga	10
04237962	ONONDAGA CREEK NEAR CARDIFF NY	38.9	42.900	-76.169	Active	Onondaga	7
04239000	ONONDAGA CR AT DORWIN AVE., SYRACUSE NY	88.5	42.983	-76.151	Active	Onondaga	62
04240010	ONONDAGA CR AT SPENCER ST., SYRACUSE NY	110.0	43.058	-76.162	Active	Onondaga	43
04240100	HARBOR BROOK AT SYRACUSE NY	10.0	43.036	-76.182	Active	Onondaga	54
04240105	HARBOR BK AT HIAWATHA BLVD., SYRACUSE NY	11.3	43.056	-76.185	Active	Onondaga	43
04240120	LEY CREEK AT PARK STREET, SYRACUSE NY	29.9	43.077	-76.170	Active	Onondaga	41
04240300	NINEMILE CREEK AT LAKELAND NY	115.0	43.081	-76.226	Active	Onondaga	43
04236500	SKANEATELES CREEK AT WILLOW GLEN NY	75.8	42.961	-76.440	Inactive	Onondaga	13
04237944	TRIBUTARY NO.6 UPSTREAM OF MUDBOIL AREA	0.3	42.854	-76.142	Inactive	Onondaga	3
04237946	TRIBUTARY NO.6 DOWNSTREAM OF MUDBOIL AREA	0.3	42.856	-76.139	Inactive	Onondaga	20
04239500	ONONDAGA CREEK AT SYRACUSE NY	95.0	43.010	-76.150	Inactive	Onondaga	9
04240145	SPAFFORD CREEK AT BROMLEY RD NR SPAFFORD NY	3.1	42.788	-76.197	Inactive	Onondaga	2
04240150	SPAFFORD CR AT OTISCO VALLEY NY	8.1	42.826	-76.235	Inactive	Onondaga	5
04240180	NINEMILE CREEK NEAR MARIETTA NY	45.1	42.921	-76.329	Inactive	Onondaga	47
04240200	NINEMILE CREEK AT CAMILLUS NY	84.3	43.039	-76.308	Inactive	Onondaga	49
04240503	ONONDAGA LAKE OUTLET NEAR LIVERPOOL NY	289.5	43.120	-76.246	Inactive	Onondaga	6
04245250	BUTTERNUT CREEK AT DEWITT NY	58.6	43.046	-76.085	Inactive	Onondaga	2
0424014980	SPAFFORD CR TRIB NR SAWMILL RD NR SPAFFORD NY	0.1	42.827	-76.232	Inactive	Onondaga	6
0424015305	RICE BROOK AT MOUTH AT RICE GROVE NY	2.4	42.852	-76.259	Inactive	Onondaga	27
0424016205	WILLOW BROOK AT LADER POINT NY	3.7	42.875	-76.306	Inactive	Onondaga	2
0424016825	AMBER BROOK AT AMBER NY	3.7	42.890	-76.297	Inactive	Onondaga	2

Station Number	Station Name	Drainage Area (Sq. Miles)	Station Latitude	Station Longitude	Gage Status	County	Years of Record*
0424016975	VAN BENTHUYSEN BROOK AT MOUTH AT AMBER NY	5.8	42.895	-76.302	Inactive	Onondaga	2
04245236	MEADOW BROOK AT HURLBURT RD, SYRACUSE NY	2.9	43.042	-76.100	Unknown	Onondaga	24
04235000	CANANDAIGUA OUTLET AT CHAPIN NY	195.0	42.918	-77.233	Active	Ontario	72
04235250	FLINT CREEK AT PHELPS NY	102.0	42.958	-77.068	Active	Ontario	46
04235250	FLINT CREEK AT PHELPS NY	100.6	42.958	-77.068	Active	Ontario	7
04234200	MUD CREEK AT EAST VICTOR NY	64.2	42.975	-77.383	Inactive	Ontario	4
04234232	GREAT BROOK BELOW VICTOR NY	16.8	42.978	-77.396	Inactive	Ontario	11
04232200	CATHARINE CR AT MONTOUR FALLS	41.1	42.328	-76.844	Active	Schuyler	29
04232630	KENDIG CR NR MACDOUGALL NY	13.8	42.849	-76.892	Active	Seneca	46
04234055	CANOGA CR AT CANOGA NY	3.2	42.862	-76.749	Inactive	Seneca	4
04235276	BLACK BROOK AT TYRE NY	19.0	42.992	-76.803	Inactive	Seneca	9
04233000	CAYUGA INLET NEAR ITHACA NY	35.2	42.393	-76.545	Active	Tompkins	76
04233286	SIXMILE CREEK AT BROOKTONDALE NY	26.4	42.381	-76.394	Active	Tompkins	7
04233300	SIXMILE CREEK AT BETHEL GROVE	39.3	42.403	-76.435	Active	Tompkins	18
04233300	SIXMILE CREEK AT BETHEL GROVE	38.0	42.403	-76.435	Active	Tompkins	7
04234000	FALL CREEK NEAR ITHACA NY	126.0	42.453	-76.473	Active	Tompkins	86
04234000	FALL CREEK NEAR ITHACA NY	123.8	42.453	-76.473	Active	Tompkins	7
04233000	CAYUGA INLET NEAR ITHACA NY	35.5	42.393	-76.545	Inactive	Tompkins	74
04233700	VIRGIL CREEK AT FREEVILLE NY	40.3	42.505	-76.350	Inactive	Tompkins	2
04234018	SALMON CREEK AT LUDLOWVILLE NY	81.7	42.554	-76.535	Inactive	Tompkins	4
0423401815	SALMON CREEK NEAR LUDLOWVILLE NY	89.2	42.553	-76.534	Inactive	Tompkins	3
04219000	ERIE (BARGE) CANAL AT LOCK 30, AT MACEDON	0.0	43.072	-77.296	Inactive	Wayne	42
04234270	RED CREEK NEAR WALWORTH NY	23.8	43.113	-77.254	Inactive	Wayne	4
04235271	CLYDE RIVER AT LOCK 26, CLYDE	845.0	43.060	-76.838	Inactive	Wayne	32
04232482	KEUKA LAKE OUTLET AT DRESDEN NY	207.0	42.680	-76.954	Active	Yates	46
04232482	KEUKA LAKE OUTLET AT DRESDEN NY	205.6	42.680	-76.954	Inactive	Yates	46
04235150	FLINT CREEK AT POTTER NY	31.0	42.703	-77.207	Inactive	Yates	13
01528700	DIVERSION FROM WANETA LK TO KEUKA LK AT KEUKA	45.5	42.485	-77.111	Unknown	Yates	30

*"Years of Record" indicate the availability of any available records. Please note that yearly totals of particular data sets may be considerably shorter and/or may have chronological gaps.

Figure 9: *Location of Active USGS Stream Gages in the Seneca Watershed*, shows the location of many of the active gages in the basin. From this map, it is clear that Onondaga County contains the greatest number of gages within the watershed

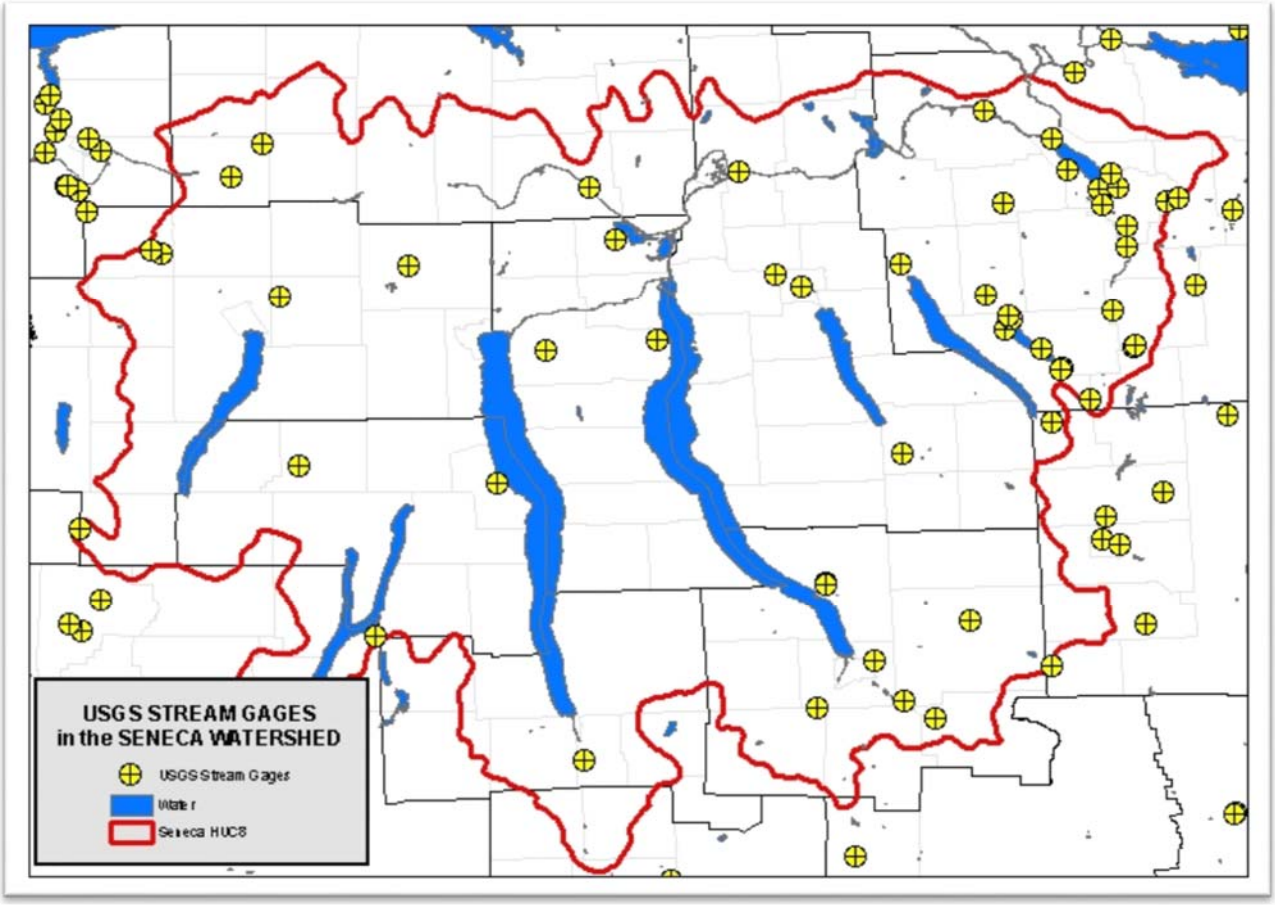

Figure 9: *Location of Active USGS Stream Gages in the Seneca Watershed*

Rain Gages in the Seneca Watershed

NOAA's Cooperative Observer Program (COOP) is a weather and climate observing network of more than 11,000 volunteers who take observations nationwide on farms, in urban and suburban areas, National Parks, seashores, and mountaintops. Within the whole of the fourteen counties all or partially in the Seneca Watershed, 46 locations are currently active.[22] When appropriate, FEMA will utilize the NOAA information from these gages in developing meteorological models for the watershed that will employ rainfall runoff models and calibration.

Additional information on rainfall in New York can be found in Technical Paper No. 49 and in the National Oceanographic and Atmospheric Agency's (NOAA) Technical Memorandum NWS HYDRO-35, both on NOAA's website. (Please note, the base data for both aforementioned

[22] *Cooperative Stations – Active Stations*. National Oceanic and Atmospheric Administration, National Climatic Data Center. *noaa.gov*. ftp://ftp.ncdc.noaa.gov/pub/data/inventories/COOP-ACT.TXT. (Accessed December 31, 2012).

documents are in the process of being revised and use of these documents as source information in any future analysis should be reviewed for updates.)

Levees

A levee or floodwall is defined in the Code of Federal Regulations (CFR), Title 44, Section 59.1 as "a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding".

A review of multiple sources, including the USACE's National Levee Database[23], FEMA's Mid-Term Levee Inventory (MLI), and the various effective and preliminary FIRM sets covering the watershed indicates that there are several levee systems within the basin. However, only two of these flood control structures are shown on the FIRM as accredited to at least the 1-percent-annual-chance flood. It is important to note that areas currently shown as being accredited on the current FIRM are subject to revision when the effective FIRM for a community is revised, as the requirements for levee certification and accreditation have changed since the date of the last FIRMs for the city of Ithaca (September 30, 1981) and village of Montour Falls (September 15, 1983).

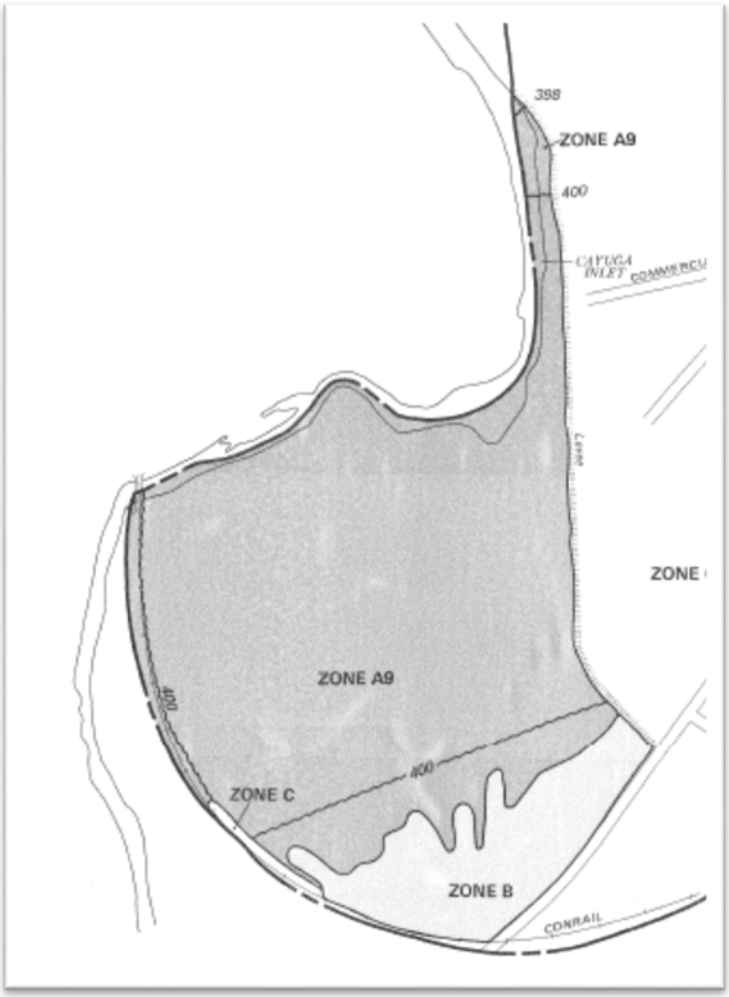

Figure 10: *Cayuga Inlet Levee in the City of Ithaca*

When a community protected by levees has been notified that a revised study will be conducted, it should be aware of the requirements currently in place for levee certification and accreditation. Specific information on FEMA's levee recertification and accreditation process may be found in a fact sheet explaining FEMA's role in levees, *Levee Certification vs. Accreditation*. This flyer is available on-line at fema.gov/media-library-data/20130726-1807-25045-0715/levee_certification_vs._accreditation.pdf or can be found in the attachments to this report.

[23] *National Levee Database* homepage. US Army Corps of Engineers (USACE), army.mil. http://nld.usace.army.mil/egis/f?p=471:1:. (Accessed November 29, 2012).

Ithaca

The city and town of Ithaca share a levee system found at the confluence of Cayuga Inlet and Coy Glen, southwest of downtown Ithaca. On the current FIRMs for these jurisdictions, however, only that portion of the levee on the east bank of Cayuga Inlet within the city of Ithaca is shown to provide protection for the area. Figure 10 shows the location of this levee in the city. The current effective FIRM for the town of Ithaca does not illustrate the levee in any way. More information on the Ithaca Flood Control Project, of which these levee structures are a part, may be found in the attached NYSDEC document, *Ithaca Flood Damage Reduction Project* or on-line.

According to the USACE's Basic System Reporting website[24], construction began in 1965 and was completed in 1977 and is rated as "Unacceptable". "Unacceptable", as defined by the USACE, means that one or more of the inspection items (such as operational adequacy, structural stability and other criteria) are rated as "Unacceptable" and would prevent the system from performing as intended, or a serious deficiency noted in past inspections (which had previously resulted in a "minimally acceptable" system rating) has not been corrected within the established time frame, not to exceed two years. More information on USACE inspection requirements can be found on the USACE's Levee Inspection website. Significantly, in 2014, the USACE noted that approximately 99 percent of all USACE levee inspections result in an "unacceptable" or "minimally acceptable" rating.

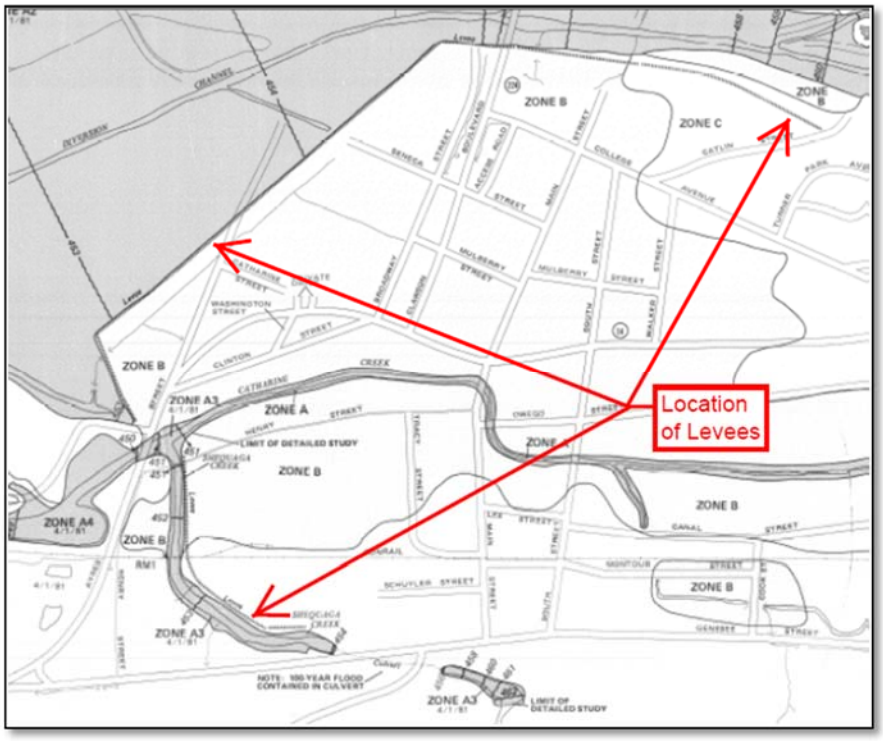

Figure 11: *Levee System in the Village of Montour Falls*

Montour Falls

Figure 11: *Levee System in the Village of Montour Falls* shows the extensive flood control system is in place to protect the village of Montour Falls from damage due to flooding from Catherine Creek. Surrounding the center of the village, a series of levees, constructed in 1950 by the USACE, have been built to aid the flow of water during a flood event from the creek into a diversion channel located to the east of the village. The channel also serves to intercept water from Catlin

[24] National Levee Database, Basic System Reporting. USACE. *army.mil*. http://nld.usace.army.mil/egis/f?p=471:60:0::NO. (Accessed November 29, 2012).

Mill Creek, alleviating flooding from that source, as well[25]. This water then flows into L'Hommedieu Creek, joining the channelized Seneca Inlet (Barge Canal) north of the village. The flow of water into Catherine Creek's natural channel though the village during high water is controlled by use of a gate structure that may be closed to divert all flood waters to the diversion channel.

The USACE's database notes that Montour Fall's project segments are "Minimally Acceptable". "Minimally Acceptable" means that one or more of the inspection items, as noted above in the description of Ithaca's levees, are rated as "Unacceptable", however, an engineering determination has concluded that the "Unacceptable" items would not prevent the system from performing as intended during the next flood event. At this time the state of New York and the city of Ithaca are working to correct those aspects of the levee that have caused the levee's "unacceptable" rating

In addition to the works for Catherine Creek, as part of the 1950s-era flood control project, a stilling basin was constructed for Shequaga Creek at the foot of the approximately 500-foot escarpment from which it descends west of the village. From this point, the creek flows via a culvert to a levee-banked channel downstream to its confluence with Catherine Creek at the northern end of the village.[26]

Other Levees in the Watershed

The following two levees are not shown in any way on the FIRM for their respective communities, but are noted for informational purposes.

The review of the databases indicates a levee on Onondaga Creek in Syracuse. The MLI shows the levee extending on both sides of the creek from Ballantyne Road southward approximately 1,500 feet upstream of Dorwin Avenue. This work was completed in 1951.[27] The National Levee Database rates the levees on both banks of the creek as "Unacceptable". These levees are not shown on the preliminary FIRM for Onondaga County, nor are they shown as providing protection from the 1-percent-annual-chance flood. Figure 12: *Area of Syracuse Levee*, shows the preliminary Onondaga County FIRM for the area.

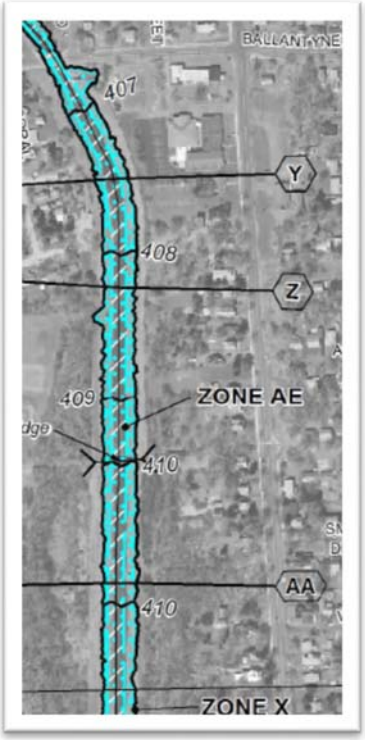

Figure 12: *Area of Syracuse Levee*

[25] *Flood Insurance Study, Village of Montour Falls*, published October 1, 1980. FEMA.
[26] *Ibid.*
[27] *Revised Preliminary Flood Insurance Study, Onondaga County (All Jurisdictions)*, published June 29, 2012. FEMA

Figure 13: *Area of Moravia Levee*

Secondly, the USACE's database[28] shows a levee in the village of Moravia, Cayuga County, extending approximately 2,000 feet on the north bank of Dry Creek near its crossing of South Main Street. This levee has have been rated as "Minimally Acceptable", but is not shown on the FIRM for the village. Figure 13: *Area of Moravia Levee*, shows the current effective FIRM in the area of the levee. In addition, approximately 600 feet downstream of South Main Street, the floodplain delineation shows a slight expansion that does not appear to represent the topography of the inside slope of the levee. A note will be added to CNMS to investigate this anomaly during the investigative phase at the next map revision cycle for this area.

Please note that while other levees or floodwalls (such as privately constructed agricultural levees) may exist within the watershed, they are not shown on any FIRM as providing protection from the 1-percent-annual-chance flood.
Please see FEMA's guidance on mapping levees online at *Analysis and Mapping Procedures for Non-Accredited Levee Systems*. This brochure may also be found in the "Attachments" portion of this Discovery Report.

Dams

According to the NYSDEC's Dam Safety Section's dam inventory, the Seneca Watershed contains over 560 dam structures. NYSDEC uses a classification scale of A-D and 0 (zero) to assign hazard potential to each of the dam structures contained within the inventory. Of the approximately 560 dams within the watershed, 48 are classified as having at least an intermediate (Classes B and C) hazard potential in accordance with this scale. The locations of dams in the watershed are shown in Figure 14: *Dams in Seneca Watershed*.

[28] National Levee Database, http://nld.usace.army.mil/egis/f?p=471:1:. USACE. *army.mil*. (Accessed November 29, 2012).

The NYSDEC hazard classification system is described as:

> Class A-Low Hazard Potential: Resulting damages from a dam failure would likely be minimal and not interfere with any critical infrastructure; personal injury and substantial economic loss is unlikely to occur.
>
> Class B-Intermediate Hazard Potential: A dam failure may result in damage to isolated homes, roads and railways; critical facilities may experience disruption; personal injury or substantial economic loss is likely, but loss of human life is not expected.
>
> Class C-High Hazard Potential: Dam failure may result in widespread or serious damage to homes; damage to roads, railroads, commercial buildings and critical infrastructure is expected; such that loss of human life and substantial economic loss is expected.
>
> Class D-Negligible or No Hazard Potential: Dam has been breached or removed or otherwise no longer material impounds waters, or the dam was planned but never constructed at this location.
>
> Class 0-Unclassified Hazard Potential: Hazard code has not yet been assigned.

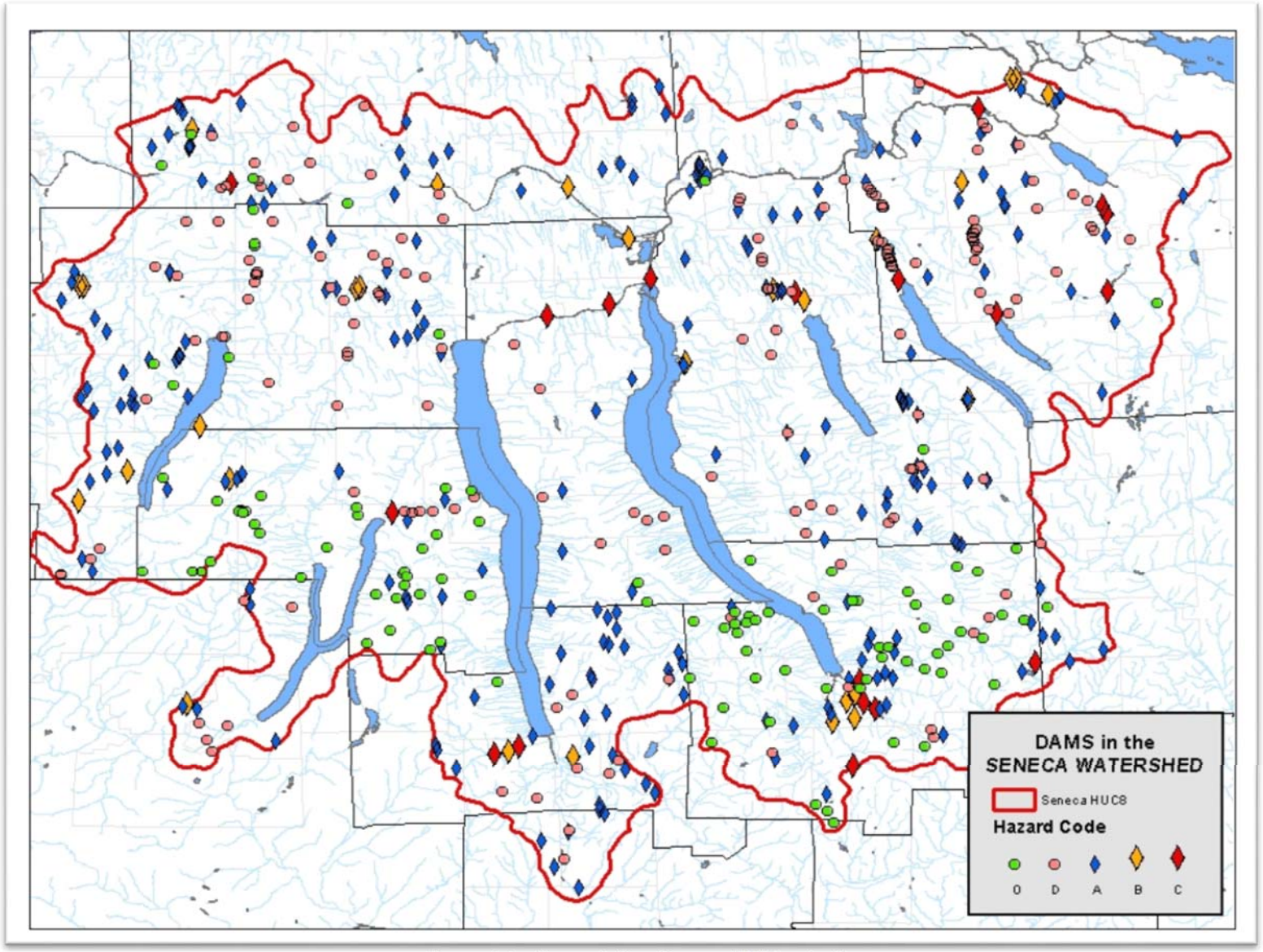

Figure 14: *Dams in the Seneca Watershed*

As seen in Figure 14, Class C dams are widely distributed across the watershed. Further examination of the data indicates clusters of dams in the Ithaca area and along Skaneateles and Ninemile Creeks to the west of Syracuse. Skaneateles Creek, while only about 10 miles long has 21 NYSDEC-inventoried dams as it falls from an elevation of 863 feet at its source at Skaneateles Lake to about 375 feet at its mouth at the Seneca River, a drop of nearly 500 feet. Figures 15 and 16 identify the locations of the concentration of dams in the Ithaca and Skaneateles & Ninemile Creeks areas. Like levees, while other private or otherwise unknown dams may exist in the basin, a list of the identified dams in the watershed can be found in Appendix G: *Dams in the Seneca Watershed*.

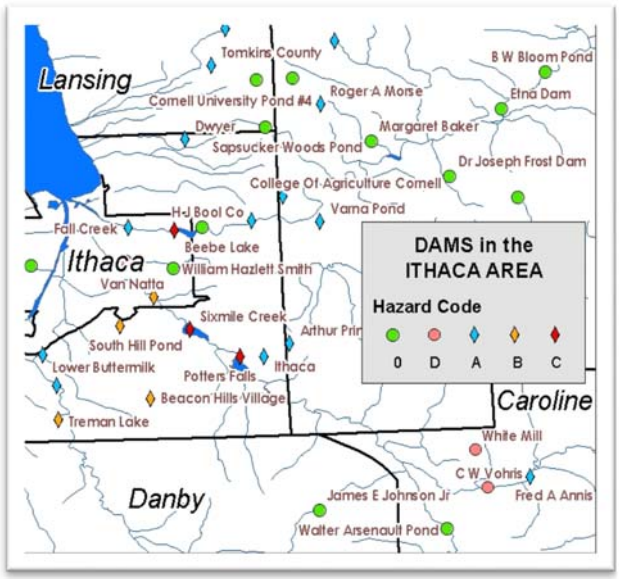

Figure 15: *Dams in the Ithaca Area*

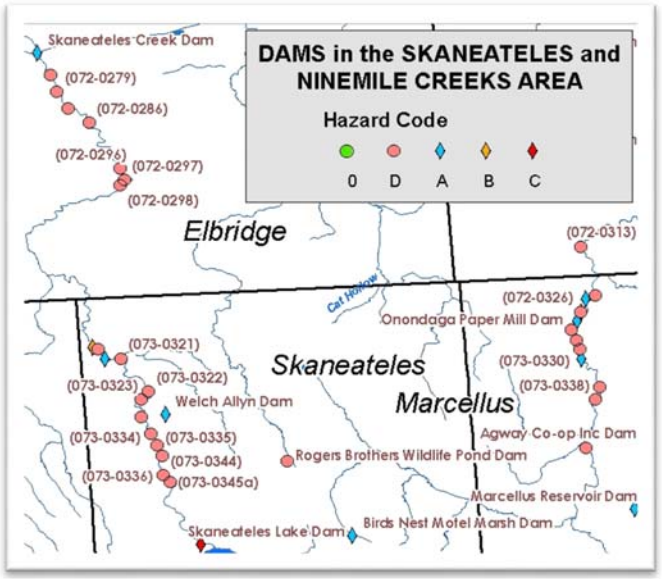

Figure 16: *Dams in the Skaneateles and Ninemile Creek Area*

Existing LiDAR Coverage in the Seneca Watershed

Light Detection and Ranging, or LiDAR, coverage in the basin has recently been completed for the entire basin and is currently (Fall 2014) being reviewed by FEMA Region II. Figure 17: *LiDAR Coverage Projects in the Seneca Watershed - 2012* shows the various LiDAR mapping projects completed between 2000 and 2012.

While additional LiDAR data sets covering the Seneca Watershed may have been flown for various non-flood mapping reasons, their location, availability, and usefulness is unknown at this time. In addition, it is important to note that any potential LiDAR data used in the creation of a FIRM must be available for use by local communities.

Available orthographic and digital elevation model (DEM) data for most counties in the watershed can be accessed by visiting the New York State GIS Clearinghouse's website at http://www.orthos.dhses.ny.gov. LiDAR data may be available by contacting the various watershed counties GIS department or the Soil and Water Conservation District office.

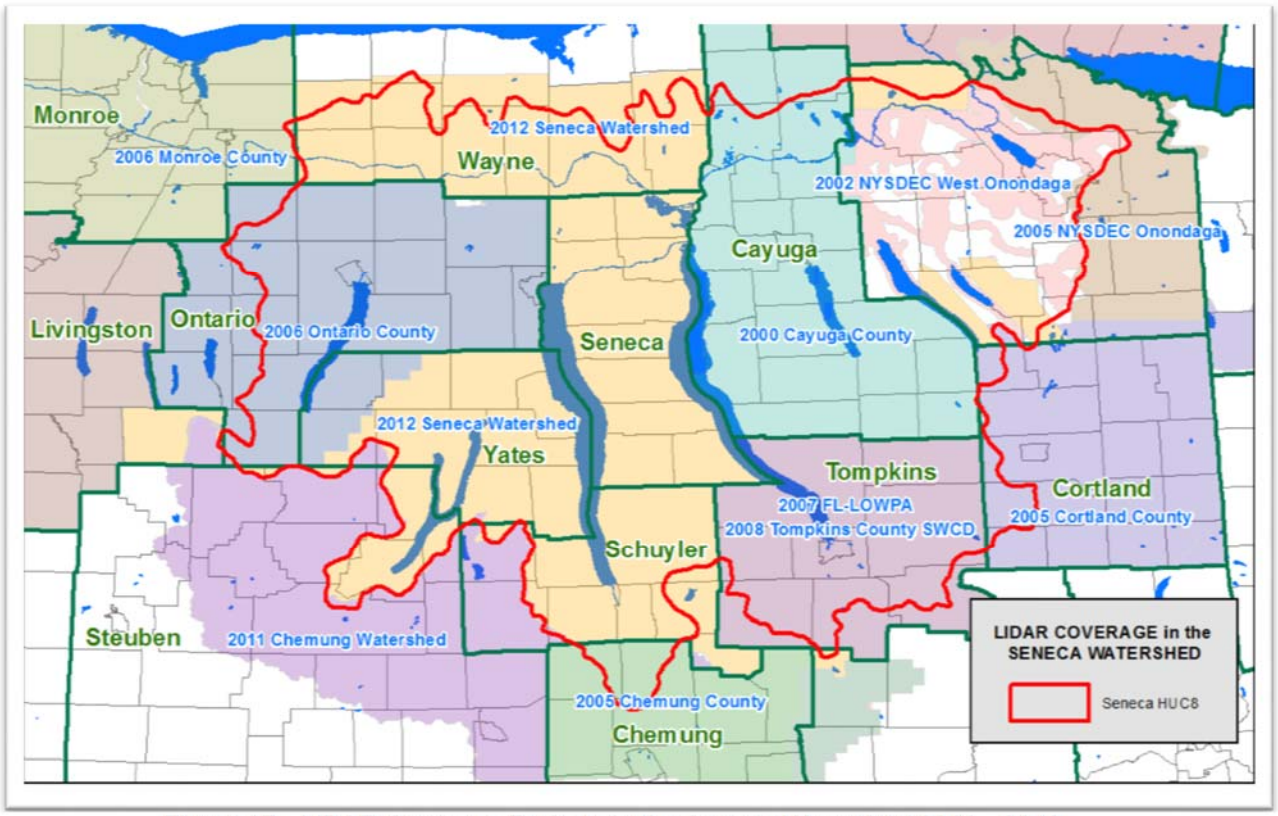

Figure 17: *LiDAR Coverage Projects in the Seneca Watershed 2000 - 2012*

Other Data and Information

Biennial Report

Prior to 2009, FEMA collected data from communities participating in the NFIP every two years through the Biennial Report process. The Biennial Report provided communities an opportunity to "speak" to FEMA to identify floodplain mapping needs and request assistance in implementing a floodplain management program. The Biennial Report provided FEMA information on a community's floodplain management program and changes in its flood hazard areas, which assists FEMA to evaluate the effectiveness of a community's floodplain management activities. The Biennial Report showed FEMA nationwide trends and patterns, which FEMA used to help guide improvements to the NFIP.

While active distribution of the Biennial Report to New York State communities seems to have ended in 2009, a review of the Biennial Reports filed indicate that several Seneca Basin jurisdictions over the years have requested assistance with ordinance changes, noted natural and man-made changes to their flood hazard, and other general assistance requests.

A FEMA fact sheet explaining the Biennial Report can be found at FEMA's webpage on the topic or by referring to the copy attached to this report.

Community Assistance Visits (CAVs)

A Community Assistance Visit (CAV) is a meeting between community representatives and FEMA or NYSDEC staff, on behalf of FEMA. The CAV serves the dual purpose of providing technical assistance to the community and assuring that the community is adequately enforcing its floodplain management regulations.

In most cases, a CAV consists of a tour of the floodplain, an inspection of community permit files, and meetings with local appointed and elected officials to discuss findings. During a CAV, observations and investigations focus on identifying issues in various areas, such as community's floodplain management regulations (ordinance), community administration and enforcement procedures, engineering, or other issues with the FIRM, other problems in the community's floodplain management, and formally, problems with the Biennial Report data.

Any administrative problems or potential violations identified during a CAV are documented in the CAV findings report. The community is notified and given the opportunity to correct those administrative procedures and remedy the violations to the maximum extent possible within established deadlines.

The summary of CAV findings in this report was extracted from FEMA's Community Information System and can be found in Appendix H: *CAVs in the Seneca Watershed.*

A review of approximately 100 CAVs conducted within the Seneca Watershed from 1992-2014 reveal that, in general, most of the communities in the watershed are regulating to at least the minimum requirements of the NFIP. Research further indicated that when violations have been found, the communities have agreed to take corrective action, and in some cases, attempt to retroactively find and correct the omissions and/or errors, if possible. Please see Appendix H for a list of CAVs and the findings of the visits.

Community Assistance Contacts (CACs)

Community Assistance Contacts (CACs) in the watershed provide communities another opportunity to discuss with FEMA and the NYSDEC any flooding, mapping, insurance, or other NFIP-related issues or concerns they may have. However, CACs have been much more sporadic during the last 22 years with just over 30 of the approximately 175 communities (17 percent) in the watershed contacted in the last 22 years. As explained above, a CAC is a tool employed by the state of New York and FEMA to periodically contact a community to see if they are having any difficulties in administering the local floodplain management ordinance or program and to assist in the determination that a CAV should be scheduled. CACs are also a means of encouraging Code Enforcement Officers (CEOs) to attend annual floodplain management workshops and call for assistance when they need it. For a list of known CACs in the watershed, please see Appendix I: *CACs in the Seneca Watershed.*

Community Rating System

FEMA's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted from 5 percent to 45 percent (5 percent to 10 percent for non-SFHA properties) to reflect the reduced flood risk resulting from community actions meeting the three goals of the CRS:

1. Reduce flood damage to insurable property;
2. Strengthen and support the insurance aspects of the NFIP, and
3. Encourage a comprehensive approach to floodplain management.

In the Seneca Watershed several communities are currently enrolled in the CRS program. The town and village of Horseheads in Chemung County, and the city of Syracuse in Onondaga County are currently actively participating with ratings of 9, 9, and 8, respectively meaning that most property owners located within the SFHA the Horseheads communities receive a 5 percent discount and citizens of Syracuse in SFHA-properties get a 10 percent discount on flood insurance policy premiums, with minor exceptions.

As of the spring of 2015, the CRS statuses of the towns of Catlin and Veteran, in Chemung County, and Pulteney in Steuben County have been rescinded.

The watershed's communities are invited to review the number of policies and the total dollars being spent on flood insurance for coverage in their community to determine if further investigation into the benefits of participating in the CRS is warranted. The CRS seeks to reward communities for actions that they may already be performing or might be able to begin that mitigate the risk of flooding. The CRS provides "Community Self-Assessment" and "Community Quick Check" tools that enable communities to examine their flood hazard, explore possible solutions to that risk and estimate, based on current and possible actions, the number of points that they might earn which are in turn used to establish a Class Rating for the jurisdiction and its flood insurance premium discount. For more information on CRS, please see the "Attachments" section of this report or visit crsresources.org.

Comprehensive and Land Use Management Plans

A Comprehensive or Land Use Management Plan is a land use document providing framework and policy direction for land use decisions. Comprehensive plans usually include chapters detailing policy direction affecting land use, transportation, housing capital facilities, utilities, and rural areas. Comprehensive plans identify where and how growth needs will be met. For the sake of floodplain management and hazard mitigation, a land use management plan can be a powerful tool to guide the community to increased/continued resilience.

As illustrated in Figure 18: *Comprehensive Plans in the Seneca Watershed (2008)*, a large majority of communities in the watershed had Comprehensive Plans as of that year. Links to those communities that have developed plans have been compiled in Appendix J: *Comprehensive and Land Use Management Plan Links*. Appendix J also has a map showing the prevalence of Land Use Plans statewide.

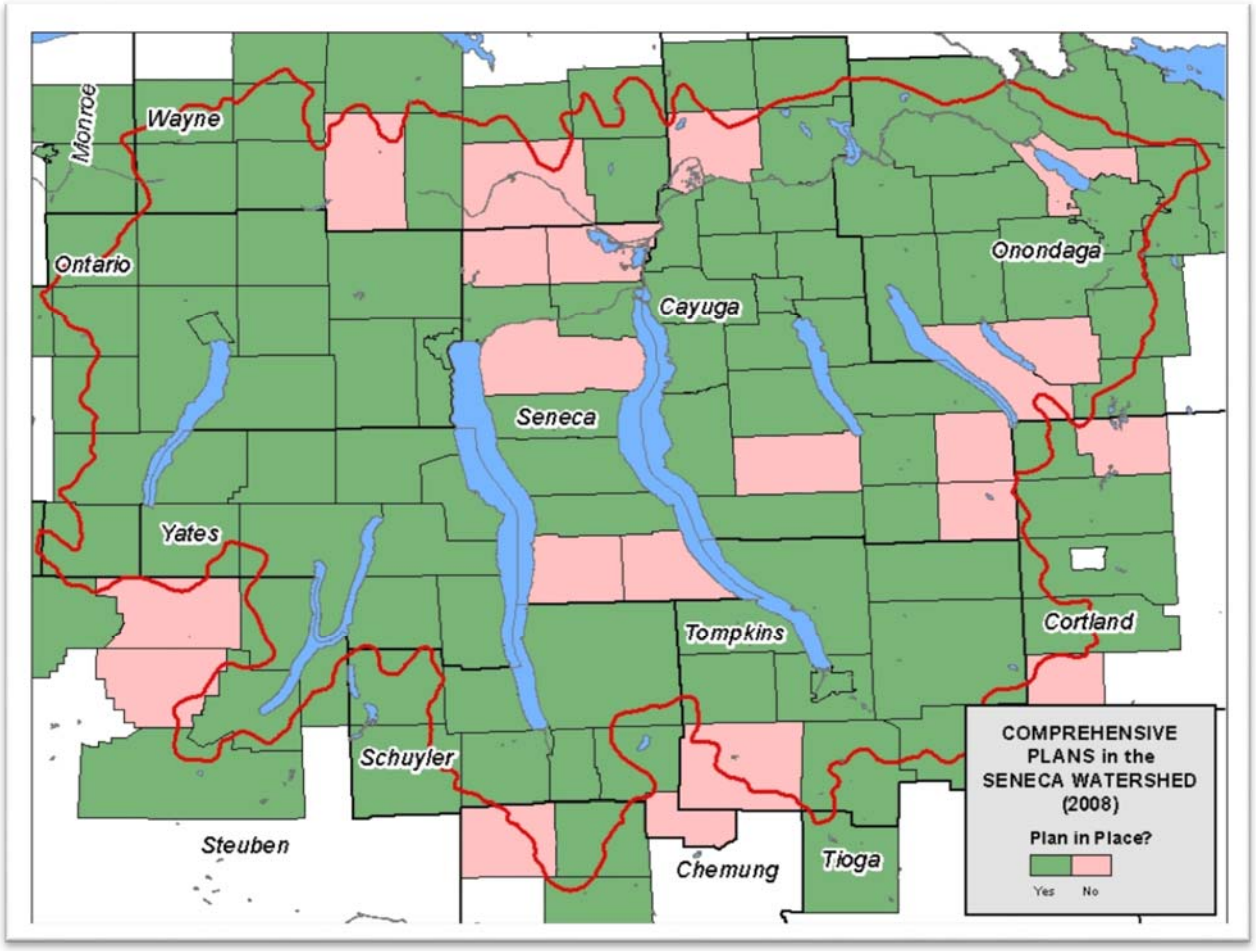

Figure 18: *Comprehensive Plans in the Seneca Watershed (2008)*[29]

Coordinated Needs Management Strategy (CNMS) and NFIP Mapping Needs

During FEMA's Flood Map Modernization program from 2003 to 2008, FEMA adhered to Procedure Memorandum No. 56 which states that, "Section 575 of the National Flood Insurance Program Reform Act of 1994 mandates that at least once every five years FEMA assess the need to review and update all floodplain areas and flood risk zones identified, delineated, or established under Section 1360 of the National Flood Insurance Act, as amended." This requirement was fulfilled through the Mapping Needs Assessment process. Other mechanisms such as the Mapping Needs Update Support System (MNUSS) and scoping reports were used to capture information on the FIRMs and the potential for a map update. Today, FEMA's Coordinated Needs Management Strategy (CNMS) initiated through FEMA's Risk MAP program in 2009 is used to coordinate the management of mapping needs in a comprehensive way.

[29] *New York Land Use Tools, Counties, Cities, Towns, and Villages*, published 2008. New York State Legislative Commission on Rural Resources, Senator George H. Winner, Jr., Chair. Albany, NY. http://www.dos.ny.gov/lg/publications/Rural_Resource_Survey.pdf. (Accessed January 7, 2013).

CNMS is a FEMA initiative to update the way FEMA organizes, stores, and analyzes flood hazard mapping needs information for communities. CNMS defines an approach and structure for the identification and management of flood hazard mapping needs that supports data-driven planning and the flood map update investment process in a geospatial (GIS) environment. The goal is to identify areas where existing flood maps are not up to FEMA's mapping standards.

There are three classifications within the CNMS: "Valid," "Unverified," and "Unknown". New and updated studies (those with new hydrologic and hydraulic models) performed during the Map Modernization program were automatically determined to be "Valid" and the remaining studies went through a 17-element validation process with 7 critical and 10 secondary elements. Validation elements apply physical, climatological, and environmental factors to stream studies determine validity. A stream study has to pass all of the critical elements and at least seven secondary elements to be classified as "Valid." The remaining streams are classified as "Unverified." Streams with a status of "Unknown" are those that have a study underway, will be evaluated in the future, or do not have sufficient information to determine if they are "Valid" or "Unverified".

The following seven Critical Elements data elements or "checks" must be answered satisfactorily in order for a stream reach to be determined "valid":

Change in the gage record: Has a major flood event caused a major change in gage record since effective analysis?

Change in Discharge: Do the updated and effective peak discharges differ significantly based on confidence limits criteria in *FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners*?

Model methodology: Is the model methodology no longer appropriate based on *Guidelines and Specifications for Flood Hazard Mapping Partners*?

Hydraulic Change: Has a major flood control structure (dam/levee/floodwall/other change) been added or removed from the reach?

Channel Reconfiguration: Current channel reconfiguration outside effective SFHA? (Has the stream moved?)

Other Hydraulic Changes: Have more than five hydraulic structures (bridge/culvert) been added or removed that impact BFEs on the reach?

Channel Area Change: Has there been significant channel fill or scour?

If one or more of the above noted elements are true then the flood hazard information for the reach is "unverified". Not all may be applicable for all flooding sources.

In addition to the seven Critical Elements, if four or more of the following Secondary Elements are true then Flood Hazard Information must be recorded as "Unverified".

Regression Equation: Has a rural regression equations been used in a (n) (now) urbanized area?

Repetitive Loss: Are there repetitive losses outside the SFHA?

Impervious Area: Has there been an increase in impervious area in the sub-basin of more than 50 percent (i.e., 10 percent to 15 percent, 20 percent to 30 percent, etc.)?

Hydraulic Structure: Have more than one, but less than five, hydraulic structures (bridge/culvert) been added or removed that impact BFEs on the reach?

Channel Improvements: Have there been channel improvements or shoreline changes?
Topography Data: Is better topography and/or bathymetry available?

Vegetation or Land Use: What changes to vegetation or land use have occurred in the area?

Coastal Dune: Failure to identify primary frontal dune in coastal areas?

High Water Mark: Have significant storms occurred with recorded High Water Marks?

Regression Equation: Are new regression equations available?

Using various sources, including the National Hydrography Dataset, existing FIRMs, and other data, CNMS is a living database that is continuously updated whenever new or revised studies become available. As part of that update, valid stream reaches will be reassessed every five years and invalid stream will be prioritized for potential funding. Watershed Discovery Meetings will provide input for CNMS community requests and help prioritize studies in the watershed. It is projected that the CNMS geodatabase will eventually be available to the public online.

An informational flyer regarding CNMS can be found on-line or in hard copy in the "Attachments" portion of this Discovery Report. More information about CNMS can also be found on FEMA's CNMS webpage or by viewing an informative CNMS PowerPoint presentation of the process created by the Illinois State Water Survey.

A review of the CNMS data in the Seneca Watershed shows that most of the stream reaches that meet the "Valid" classification, as outlined above, are located in Cayuga County, with several other segments found in Onondaga, Chemung, and Cortland counties. The only significant reach of "Invalid" stream is located on the Seneca River/Erie Canal in Onondaga County. In addition, virtually all of the streams west and south of Cayuga Lake are classified as "Unknown".

Figure 19: *CNMS Classification of Stream Segments in the Seneca Watershed* illustrates FEMA's classification of the status of stream reaches in the watershed at the beginning of the Discovery Process.

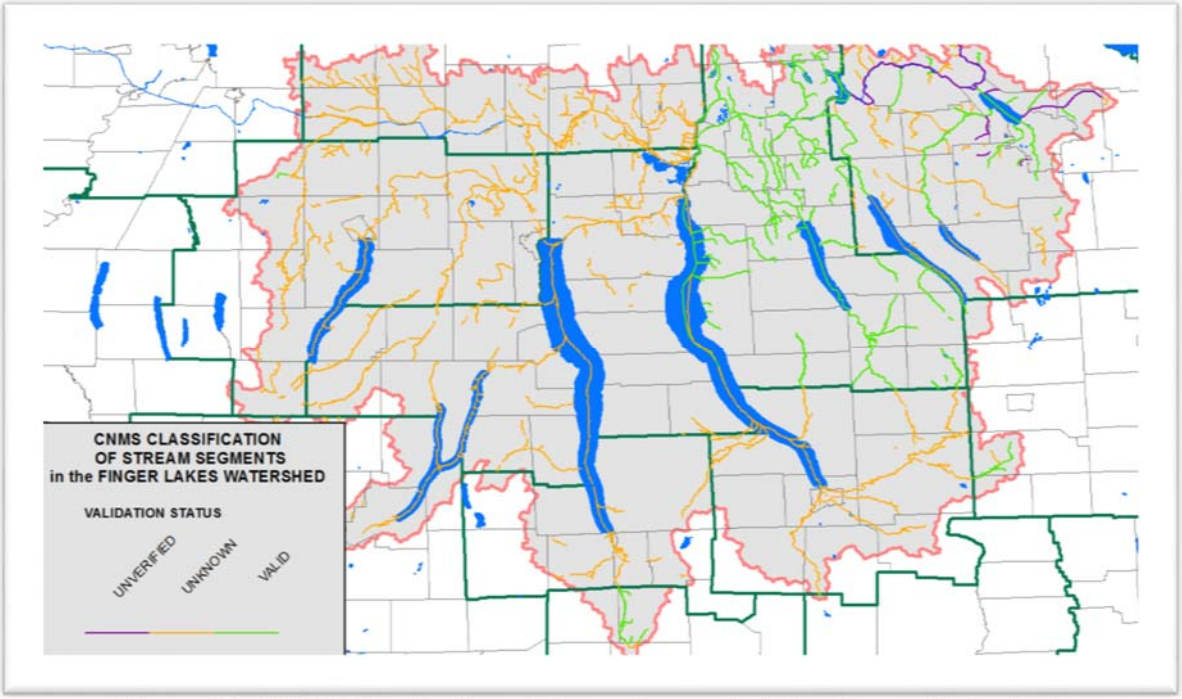

Figure 19: *CNMS Classification of Stream Segments in the Seneca Watershed*

A complete list of FEMA's classification of valid stream segments in the watershed with additional details can be found in Appendix K: *Valid CNMS Stream Segments in the Seneca Watershed* and the geo-database accompanying this report.

Declared and Natural Disasters in the Seneca Watershed

Like much of the eastern United States, flooding is one of the most frequent, wide-spread, and damaging natural disasters affecting the watershed. With full records beginning in the 1960s, most often flooding in the Seneca Watershed is caused by severe storms that are part of a frontal boundary. Occurring less often is flooding that is a result of a tropical system tracking inland from the Atlantic Seaboard during the late summer/early fall or from ice jams occurring in the late winter/early spring. Fortunately, the watershed's inland location spares it from the greater number of tropical systems that are a regular threat to eastern and southern New York, with only five tropical systems impacting central New York since 1970. A memorable exception to this general statement is Hurricane (later Tropical Storm) Agnes in 1972. Table 10: *Notable Tropical Storm Events in the Syracuse Area* lists the tropical storms to affect the Syracuse area.

Table 10: *Notable Tropical Storm Events in the Syracuse Area*

Name[30]	Date	Rainfall	Damage*
Agnes	June 1972	12 inches	$702 million**
Beryl	August 1994	3 inches	$1.5 million
Frances	September 2004	7 inches	$6 million
Katrina	August 2005	5 inches	
Tammy	October 2005	4 inches	
Lee	September 2011	3.25 inches	

*Damage in New York, if available.
**National Weather Service, National Hurricane Center

Agnes caused a great deal of destruction in the Seneca Watershed from the southern edge of the watershed in the Horseheads area northward to Skaneateles Lake and Syracuse. As Figure 20 shows, the greatest rainfall totals in the watershed (outlined in red) occurred in the southwest corner of the basin with rainfall amounts in excess of nine inches during the event. In addition, nearly half the watershed received at least six inches of rain.

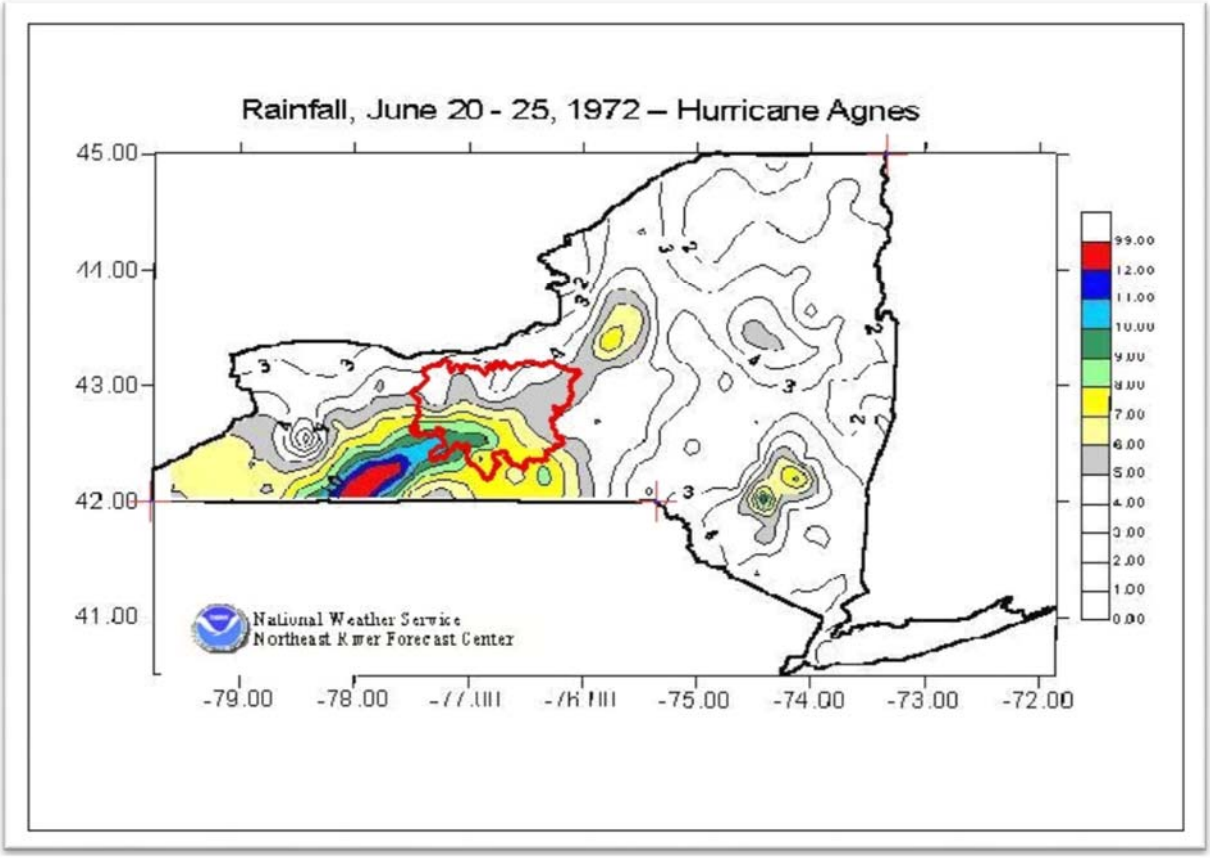

Figure 20: *Agnes Rainfall Totals in New York State*

[30] Dietrich, Larry, "As Irene Bears Down, A Look at Upstate Hurricanes" published August 23, 2011. Syracuse *Post-Standard.* Syracuse.com. http://www.syracuse.com/news/index.ssf/2011/08/as_irene_bears_down_a_look_at.html. (Accessed November 19, 2012).

At Auburn, while the average flow of the Owasco Outlet is 289 cfs, as a result of the storm on June 23, 1972, the Outlet's discharge was 3,250 cfs[31]. This figure was approximately 55 percent greater than any previously recorded flow in over 55 years of recordkeeping at the site (USGS Gage #04235500)[32]. This flow continues to be the largest on the Outlet. Figure 21: *Annual Peak Streamflow for Owasco Outlet*, shows how extraordinary this flow was. Please note, this gage was removed in 1998 and replaced by a nearby gage at Genesee Street (04225440) in Auburn. While relatively close (2.6 miles) to the location of the discontinued gage, the records for the two are not equivalent because of regulation between the sites. The 1972 peak flow remains the highest recorded on Owasco Outlet.

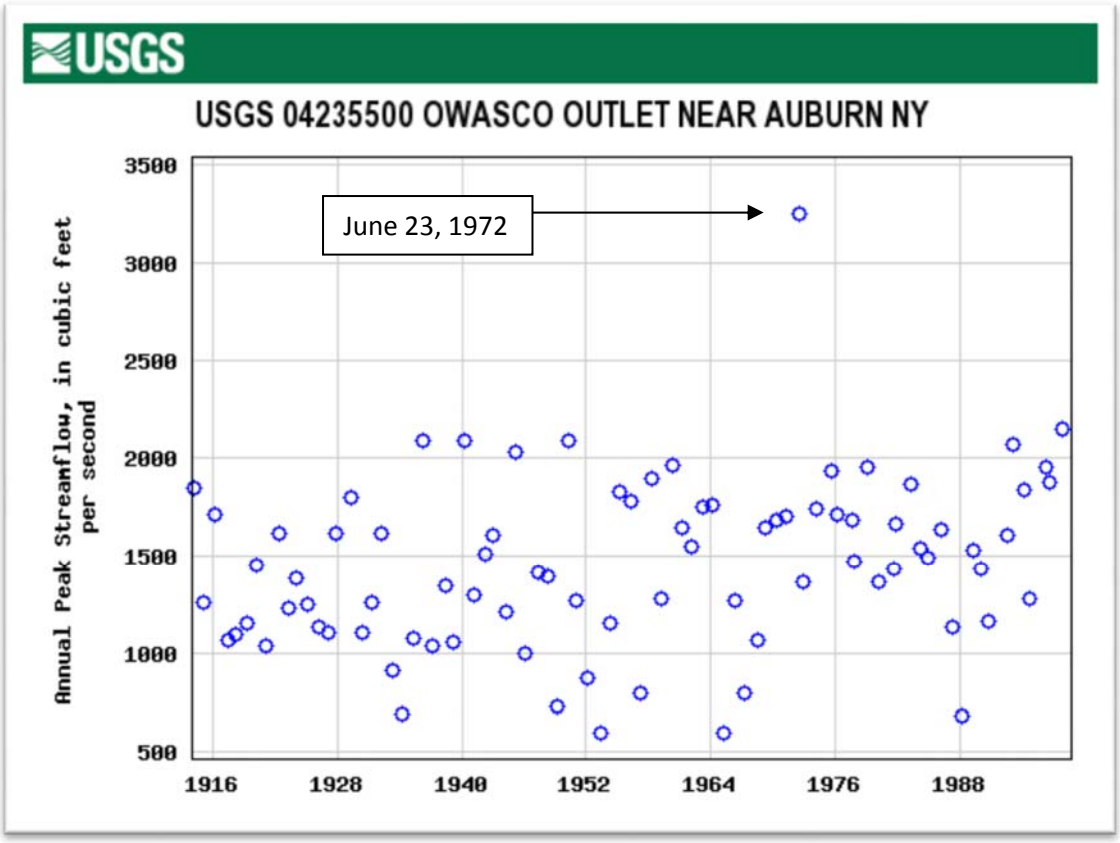

Figure 21: *Annual Peak Streamflow for Owasco Outlet*

Often in the aftermath of a major flooding event, the Federal government will make funding available for homeowners, businesses and local communities to aid in disaster relief and recovery. A list of declared flooding disasters in the watershed can be found in Appendix L: *Known Declared Disasters in the Seneca Watershed*.

[31] Myers, Jeff, NYSDEC, Email Correspondence to Lon Rogers, re: Owasco Lake. November 19, 2009. http://www.owla.org/NYSDEC_OwascoLakeLevels.pdf. (Accessed November 19, 2012).

[32] Water-Resources Investigations Report 92-4042, Maximum Known Stages and Discharges of New York Streams, 1865-1989, With Descriptions of Five Selected Floods, 1913-85. Lumia, Richard and Patricia Murray. USGS. https://www.dot.ny.gov/divisions/engineering/design/dqab/hdm/hdm-repository/USGSReport92-4042.pdf. (Accessed November 19, 2012).

Flood Insurance Policies

A community's agreement to adopt and enforce floodplain management ordinances as part of the NFIP, particularly with respect to new construction, is an important element in making Federally-backed flood insurance available to home and business owners. For this Discovery project, data on flood insurance policies in the communities within the watershed were gathered.

The number of NFIP policies varies from community to community with a high of 366 policies in force in the town of Cicero to none in four of the smaller villages and towns within the watershed. About half of the jurisdictions in the watershed have ten or fewer policies in place. Because the towns of Enfield and Junius, the villages of Interlaken and Ovid, and the Onondaga Nation do not participate in the NFIP, Federally-backed flood insurance is not available in those communities. Lastly, NFIP policy information was not found for eight communities in the basin.

Aggregated on FEMA's Community Information System as of January 2013, total structural and contents coverage for properties in the communities at least partially within the watershed exceeds $759 million, with coverage in Syracuse and four of its suburban towns (Cicero, Manlius, Dewitt, and Clay) accounting for $159 million of the total coverage in the basin. This figure constitutes nearly 25 percent of the total for the watershed. Other communities with significant policy amounts include the cities of Ithaca and Canandaigua, the Rochester suburb of Penfield in Monroe County and several towns on Keuka Lake: Jerusalem, Pulteney, and Urbana. Please see Appendix M: *NFIP Insurance in Seneca Watershed*, for more detailed information regarding coverage for each jurisdiction.

Figure 22: *Total NFIP Insurance Coverage Amounts in the Seneca Watershed*, shows the broad distribution of flood insurance in the Seneca Watershed.

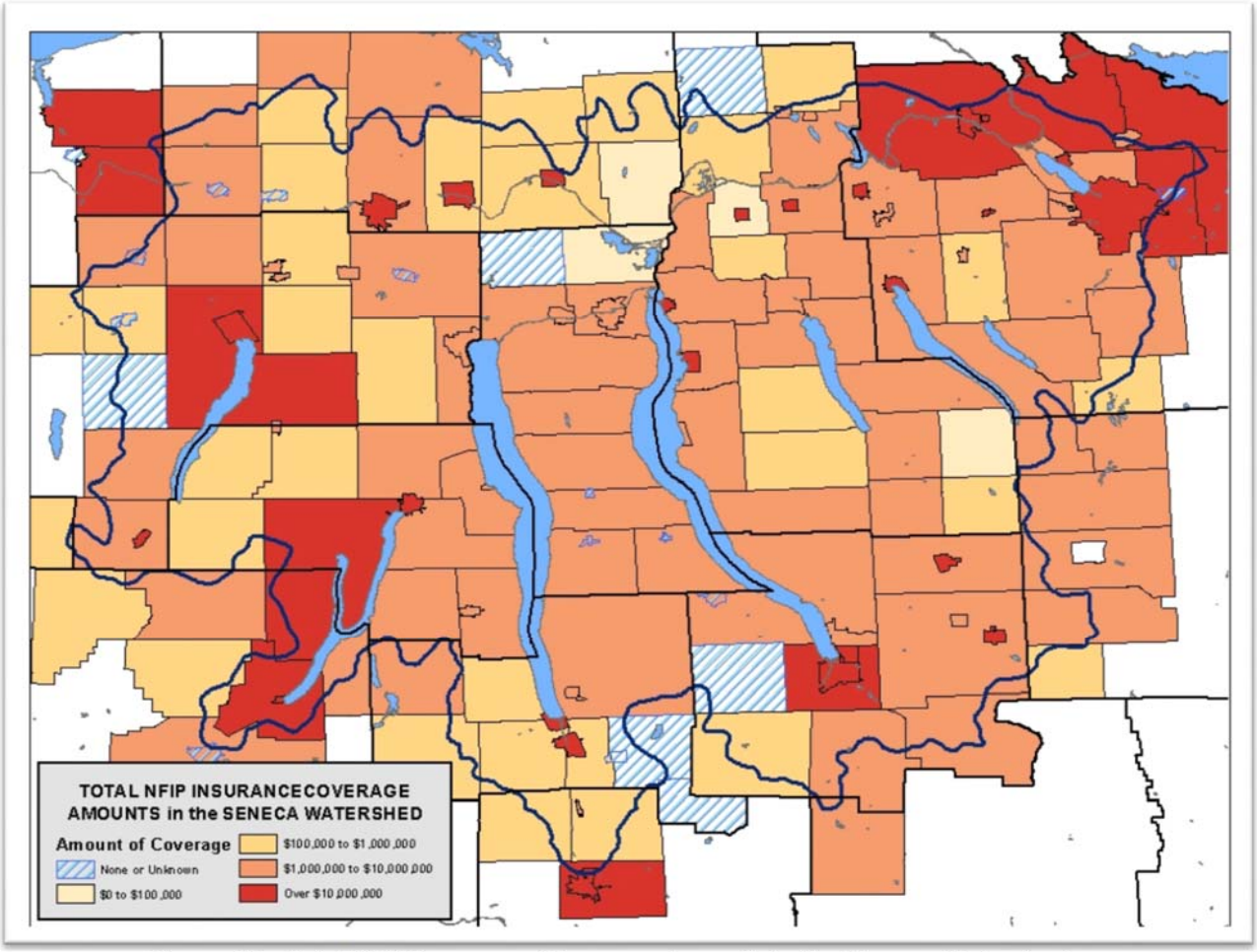

Figure 22: *Total NFIP Insurance Coverage Amounts in the Seneca Watershed*

High Water Marks

As explained by the USACE, to make risk assessments for flooding events, certain types of data are needed. This data consists of physical evidence, such as High Water Marks (HWMs) left by the event or ongoing process. Often, HWM evidence is transitory and can only be collected within a short span of time after an event, after which the evidence disappears. The HWM is the most important piece of information to describe the severity of a flood and it is essential that high water marks are recorded quickly after a flood event.

HWMs are required to assess the damage at the location and analyze the risk of similar events recurring in the community. Limited HWM data may be available from the USGS or USACE prior to the Discovery Meetings, however communities were asked to provide the locations of known HWMs during the Discovery Meetings. The few HWMs cited during the Discovery meeting are shown in Table 11: *High Water Marks*. The HWMs have also been plotted on a map that can be found in the Attachments as "*High Water Marks Noted During Discovery Meetings*".

Table 11: *High Water Marks*

County	Jurisdiction	HWM Location Description
Cayuga	Moravia (V)	U.S. Post Office, Main Street, Moravia, NY 13118
Seneca	Fayette (Town)	Conoga Island, 100-year HWM on a tree.
Tompkins	Ithaca (City)	Several known in city of Ithaca near Cayuga Inlet. Contact Guy Van Benschoen (gvanb@cityofithaca.org).
Wayne	Macedon (Town)	Route 31 flooded over in 1970s near O'Neil Road and also at Alderman Road area.
Yates	Penn Yan (V)	1972 - Building at outlet Keuka Lake near Carey's Lumber.

Watershed-Wide Historic Flooding in the Seneca Watershed

Throughout the recorded history of central New York, flooding has been a regular threat. As noted above in the Natural Disasters portion of this report, flooding in the watershed is often the result of rain-laden frontal boundary systems or tropical storms moving inland from the Atlantic coast. However, beyond Agnes, little information has been found to indicate that the watershed suffers from extensive, watershed-wide disasters as eastern did New York with Irene or Sandy. This does not imply that the watershed is not impacted by severe events or flooding, only that they are often localized, such as experienced in Penn Yan and surrounding areas in May 2014.

Ice Jams

As explained by Albany's National Weather Service (NWS) Office, ice jams cause localized flooding and can quickly cause serious problems for areas near an ice jammed river. Rapid rises behind the jams can lead to temporary lakes and flooding of homes and roads along rivers. A sudden release of a jam can lead to flash flooding below with the addition of large pieces of ice in the wall of water which will damage or destroy most things in its path.

Ice jams are of two forms: Freeze up and Break up. Freeze up jams usually occur early to mid-winter during extremely cold weather. Break up jams usually occur mid to late winter with thaws. The NWS notes the conditions of both below:

Freeze-up jams happen when extremely cold air temperatures occur over open water. This results in the rapid production of large amounts of river ice that can jam downstream. Conversely, rainfall or snowmelt with a thaw will enhance the potential for break up jams as rising water helps to lift and break up the ice. A very short thaw with little or no rain or snowmelt may not be enough to break up thick ice.

It is fundamentally important to note that flooding caused by ice jams is not calculated nor shown on FEMA's FIRMs. While noted by several communities during the pre-Discovery Conference Calls, a review of the hazard mitigation plans for the counties of the watershed indicate that ice jams, overall, are generally not a major issue in the basin.

Congressional and New York State Assembly Districts

It is critical that local officials and citizens understand that their voices are important in explaining to their elected representatives, both in the state and in Congress that understanding, mitigating, and mapping the flood risk hazard is an important priority to the residents of the Seneca Watershed.

New York is represented in the United States Senate by Charles E. Schumer and Kirsten E. Gillibrand. Information on the senators can be found at schumer.senate.gov and gillibrand.senate.gov, respectively.

As a result of the 2010 Census, the state of New York lost two seats in the United States House of Representatives. The subsequent redistricting of the state into 27 Congressional Seats has divided the Seneca Watershed into five Congressional Districts: The 22nd, 23rd, 24th, 25th, and 27th, with the 23rd and 24th covering the majority of the district. The Cortland County portion of the watershed is in the 22nd District; Chemung, eastern Ontario, Schuyler, Steuben, Tompkins, and Yates in the 23rd; Cayuga, Onondaga, and Wayne in the 24th; Monroe in the 25th; and western Ontario in the 27th district. Figure 23: *Congressional Districts for the 113th Congress in the Seneca Watershed,* show the geographical extent of each district.

The five members of the House of Representatives who represent portions of the Seneca Watershed in the 113th Congress are noted below:

22nd Congressional District	Representative Richard Hanna
23rd Congressional District	Representative Thomas Reed
24th Congressional District	Representative John Katko
25th Congressional District	Representative Louise Slaughter
27th Congressional District	Representative Chris Collins

Information on individual representatives can be found at Congress' Find Your Member webpage.

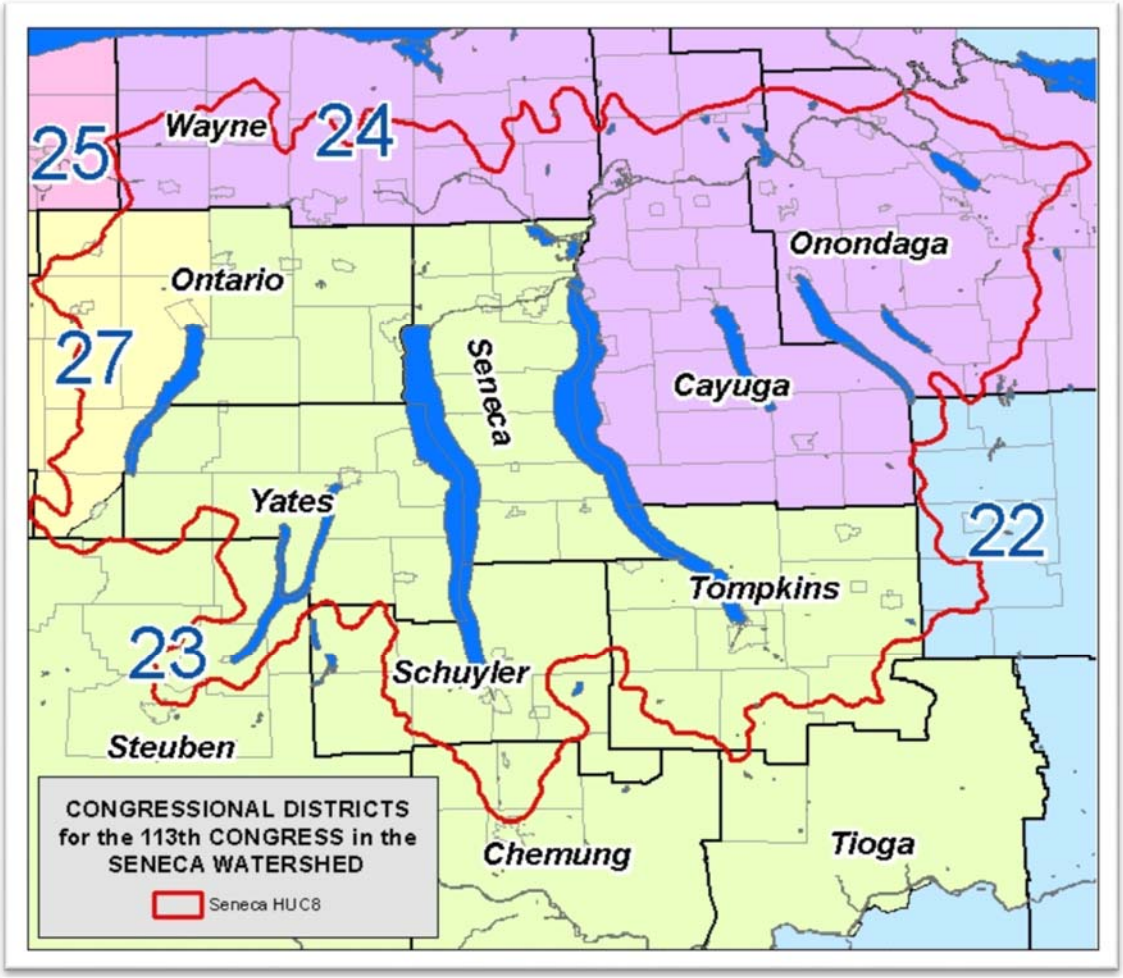

Figure 23: *Congressional Districts for the 113th Congress in the Seneca Watershed*

In New York State, the residents of the Seneca Watershed are represented by several members in the Assembly and Senate. In the New York State Senate, watershed citizens are represented by Districts 50- 55, 57, and 58 and by members of the Assembly from Districts 119, 123-132, and 134. The locations of both Senate and Assembly districts are shown on Figure 24: *NYS Senate and Assembly Districts in the Seneca Watershed*.

Links to members of the New York State Senate and Assembly can be found at nysenate.gov and assembly.state.ny.us.

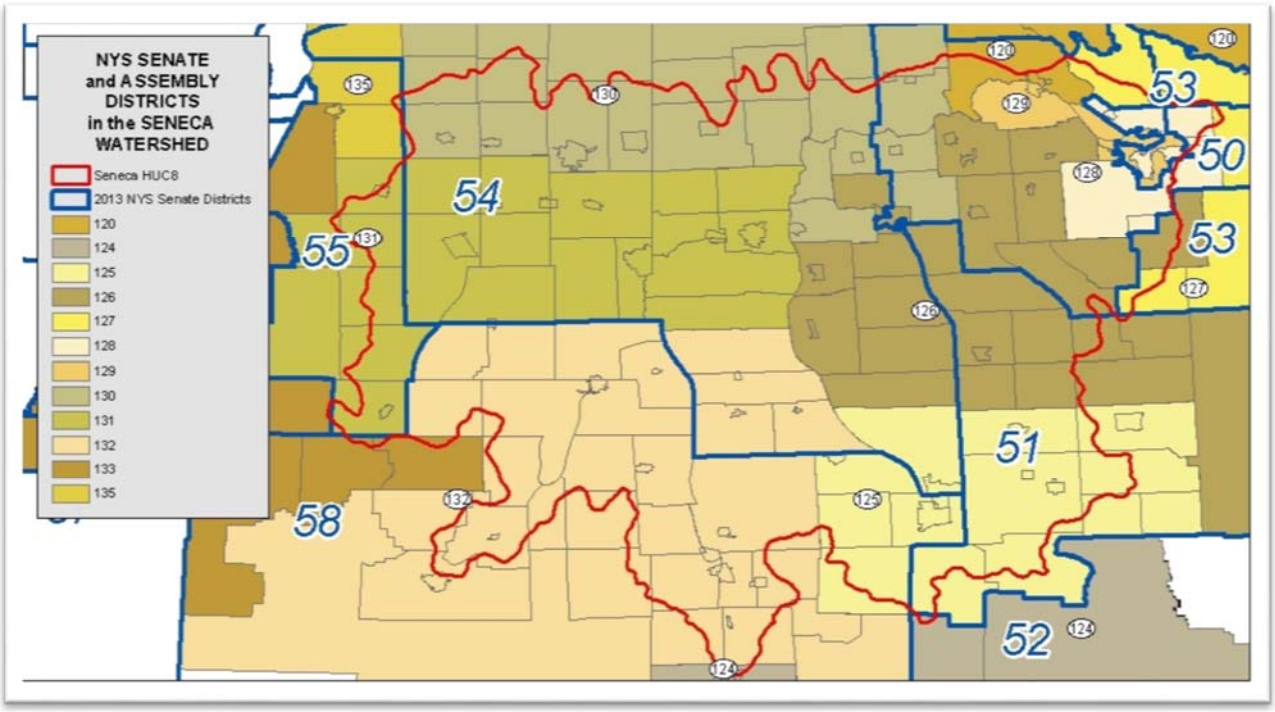

Figure 24: *NYS Senate and Assembly Districts in the Seneca Watershed*

Completed Mitigation Projects

FEMA provides funding for various types of mitigation projects. These funds are granted through several mechanisms including the Pre-Disaster Mitigation Grant Program (PDM), Hazard Mitigation Grant Program (HMGP), and Flood Mitigation Assistance (FMA).

FEMA describes the PDM as a program that provides to states, territories, and Tribal governments (and through them, local communities), funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event.

Funding these plans and projects reduce overall risks to residents and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

Like PDM, the HMGP provides grants to states (who may then award funding to local governments), to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented state-wide during the immediate recovery from a disaster.

Lastly, the FMA provides funds for projects to reduce or eliminate risk of flood damage to buildings that are insured under the NFIP on an annual basis through three type of grants: Planning Grants to prepare flood mitigation plans; Project Grants to implement measures to

reduce flood losses, such as elevation, acquisition or relocation of NFIP-insured structures; and Management Cost Grants so that the grantee may administer the FMA program and activities.

FMA grants are only available to state (and state-equivalent) and Tribal governments, however, local governments may be named as sub- applicants.

In the watershed, several mitigation projects have been funded through these programs. Completed projects include financial assistance to compile and publish the county's Hazard Mitigation Plans, reconstruction of culverts, and bridge repair.

A complete list of all projects applied for, but not necessarily funded, is shown in Appendix N: *FEMA Mitigation Grant Proposals*. A broad range of mitigation projects are proposed in this table including the replacement of undersized culverts, the funding of public outreach activities and materials, shoreline stabilization efforts, the elevation of homes at risk of flooding, the purchase of emergency generators, and many other projects, equipment, and activities. The list is offered as insight to the types of projects and activities proposed by various local governments in the watershed. It should not be used as a guide as to which type of project is worthy or likely to be funded.

Countywide Hazard Mitigation Plans/Status

Section 322 of the Federal Disaster Mitigation Act of 2000, entitled "Mitigation Planning," is an amendment to the Robert T. Stafford Disaster Relief and Emergency Assistance Act. According to this amendment (known as the Stafford Act amendments), all local governments must have an approved All-Hazard Mitigation Plan (HMP) in order to be eligible to receive Hazard Mitigation Grant Program (HMGP) funding.

The Stafford Act amendments established a national program for pre-disaster mitigation and streamlined the administration of federal disaster relief. Information regarding the specifics of mitigation planning and disaster assistance requirements may be found in the printed version of the Code of Federal Regulations (CFR), or online at 44CFR Parts 201 and 206.

Countywide (Multi-Jurisdictional) Hazard Mitigation Plans (HMPs) in the Seneca Watershed are prepared by the counties within the watershed and subsequently reviewed and adopted by each community. On occasion, individual communities within the county may supplement the county's HMP with information to address hazards specific or acute to that jurisdiction. To verify changes to an HMP, contact the community in question to determine if changes to the county HMP have been appended. The status of HMPs in the watershed is mixed with the plans in various states of completion or development. Please see Appendix O: *Community Status of Adoption of Hazard Mitigation Plans*, for more details regarding the status of adopted mitigation plans for each community. Links to each county's Mitigation Plan, if available online, are shown in Table 12: *Links to Hazard Mitigation Plans.*

Table 12: *Links to Hazard Mitigation Plans*

County Name	Hyperlink to Mitigation Plan
Cayuga	http://co.cayuga.ny.us/planning/hazmit/index.html
Chemung	http://www.chemungcounty.com/index.asp?pageId=522
Cortland	N/A
Livingston	http://www.gflrpc.org/Publications/LivingstonAllHazard/MitigationPlan/Index.htm
Monroe	http://www.monroecounty.gov/File/PUBLIC%20SAFETY/OEM/2010%20Pre-Disaster%20Mitigation%20Plan%20FEMA%20&%20MC%20approved.pdf
Onondaga	http://www.ongov.net/planning/haz/docs.html
Ontario	http://www.co.ontario.ny.us/DocumentCenter/View/3413
Schuyler	http://www.stcplanning.org/usr/Program_Areas/Hazard_Mitigation/SchuylerHazPlan2008WithMaps.pdf
Seneca	N/A
Steuben	http://www.steubencony.org/pages.asp?PID=286
Tioga	http://www.tiogacountyny.com/departments/emergency-management/tioga-county-all-hazards-mitigation-plan.html
Tompkins	http://www.tompkins-co.org/planning/haz_mit.htm
Wayne	http://www.gflrpc.org/Publications/WayneAllHazard/Index.htm
Yates	http://www.yatescounty.org/display_page.asp?pID=176

Details of Hazard Mitigation Plans

Cayuga County

Cayuga County is centrally located within the Seneca Basin and all but the most northerly communities in the county are in the Seneca Watershed. New York State ranks Cayuga County as moderately vulnerable to flooding.

The county does experience minor ice jams occasionally, the impacts of which are generally localized to nearby properties and structures.

The HMP for the county notes that the New York State Energy Research and Development Authority (NYSERDA) predicts that the amount of rainfall in a 100-year event is projected to increase, while the number of years between such storms (return period) is projected to decrease and with rainstorms becoming more severe and more frequent increasing the danger of flash flooding.[33] What this means is today's 100-year-event will be "tomorrow's" lesser-interval frequency weather event, occurring more often with great ferocity.

The HMP estimates that approximately 4.1 percent of the county's population is at risk of exposure to the 1-percent-annual chance flood, with 4.5 percent at risk to the 0.2-percent flooding event. With 40 percent of its citizens at risk to the 1-percent, the village of Moravia is by far the most exposed community in the county, with the towns of Cato (28.3 percent) and Fleming (10.8 percent) following.

[33] "Responding to Climate Change in New York State – Synthesis Report", published 2011. New York State Energy Research and Development Authority. *nyserda.ny.gov*. http://www.nyserda.ny.gov/climaid. (Accessed April 8, 2014).

Of note is the town of Brutus. The town is shown in the HMP as by far the largest area of potential new development in the county, but also has approximately 19 percent of its land area shown within the SFHA. Special attention to proper development will need to be shown in the town to avoid the potential for increased flood hazard risk to new and existing structures in the growth area and downstream.

Chemung County

The Seneca Watershed includes five communities in northwest Chemung County, the towns of Catlin, Veteran, and Horseheads, and the villages of Horseheads and Millport.

Unlike many HMPs, Chemung County, during the planning process, chose to narrow the focus of the county's plan to those hazards *most likely* to affect the county, rather than attempt to comprehensively discuss every possible hazard in detail. As a result of this culling the county's report ranked flooding number one of the five natural hazard categories studied.

Chemung's HMP also notes the decline in flood insurance policies countywide between 2004 and 2010 for the county as a whole. However, in the five jurisdictions partially within the Seneca Basin, the number of policies increased by 16 during that time, with 17 additional policies in the town of Horseheads and a loss of one in Catlin. It should be noted however that the majority of Horseheads is in the Chemung River Watershed (02050105).

The presence of many dirt roads in the towns of Catlin and Veteran are cited as a major concern during storms due to the need to constantly maintain them (keeping them in good repair and "in place") and because the risks associated with washout during storms/flooding could cause areas of the towns to be cut off from emergency and medical assistance.

Specific recommendations or the locations of critical facilities were not noted in the county's HMP.

Cortland County

A limited portion of Cortland County is drained by the Seneca Watershed with larger areas falling within the towns of Cortlandville, Virgil, and Scott, the first two in the Virgil Creek Watershed and the last forming the headwaters of Skaneateles Lake. Making an assessment of specifics within the county's Mitigation Plan has not been completed as Cortland County's Mitigation Plan has not been found on-line.

Livingston County

In Livingston County, the town of Springwater is the only jurisdiction in the Seneca watershed. A small sliver of land within the town, approximately 0.4 square miles, is drained by Eelpot Creek which flows eastward into to the town of Naples, Ontario County.

A review of aerial photos[34] of this area indicates that fewer than five structures are within the Seneca Watershed in Livingston County.

Appendix A of the Livingston County Multi-Jurisdictional All Hazard Mitigation Plan noted that while the town of Springwater does participate in the NFIP, at the time of publication of the plan, the town did not have a Flood Mitigation Plan.

Monroe County

Like Livingston County, the extent of the Seneca Watershed in Monroe County is extremely limited covering only about 1.6 square miles in the towns of Penfield and Perinton on the eastern edge of the county. However, unlike Livingston County, the portion of the watershed within Monroe County is thoroughly suburban and contains hundreds of structures.

Monroe County is primarily located in the Genesee River (04130003) and Lake Ontario and Minor Tributaries watersheds (04130001); therefore, most of the discussion of past flood events and mitigation efforts focus on those watersheds. In addition, a review of the FIRM for Monroe County indicates no SFHAs for those areas of Penfield and Perinton within the watershed.

Onondaga County

The Onondaga County HMP notes that Onondaga Creek, formerly a meandering 34-mile stream flowing from Tully northward to Onondaga Lake has been significantly altered by channelization and a flood control dam located within the Onondaga Nation Reservation. However, despite these efforts, the creek remains a danger during times of high water with very rapid flows in the creek and remains a flooding source of concern in the city of Syracuse and nearby areas.

Figure 25: *Onondaga Creek Channelization* (Source: Google Maps)

As shown in Figure 25: *Onondaga Creek Channelization*, the natural and beneficial effects of the creek's floodplain have been removed and the creek has been channelized for virtually its entire length downstream of this point through the city of Syracuse to the creek's mouth at Onondaga Lake.

The HMP identifies several areas of persistent flooding particularly in the area of Beartrap and Ley Creeks.

The villages of Manlius and Jordan, both with over 23 percent of their populations living in the SFHA

[34]GoogleEarth. Naples, New York area. http://www.google.com/earth/index.html. (Accessed January 14, 2013).

(2,500 people total) are noted in the HMP as having the highest percentage of population in harm's way. In total, over 16,000 people in Onondaga County are located in the SFHA, with another 5,000 within the 0.2-percent-annual chance flood boundary.

Finally, the county's HMP identifies residential property exposure "hot spots". Areas of note include northern portions of the town of Cicero, portions of the west side of the city of Syracuse, and the string of villages along Limestone Creek from Manlius northward to Minoa. The estimated value of properties in the SFHA in the town of Manlius and its three villages (Manlius, Fayetteville, and Minoa) alone is $169,185,000.00 and impacts over 1,200 residential structures.

Fortunately, the HMP only identified one mobile (or manufactured) home park within the boundaries of the 0.2-percent floodplain and none in the SFHA.

Ontario County

The County's HMP explains that six countywide floods occurred between 1993 and 2003 as a result of intense rain events causing the county nearly $1 million in losses associated with "closed businesses, employee absences, and impacts to farming operations".

The HMP acknowledges that not all areas subject to flooding have been identified on the current FIRMs for each community in the county and that the county is likely subject to additional flooding in the future.

Schuyler County

Schuyler County remains a largely rural county and with approximately 18,300 residents, the second least populated county in New York[35] and one of the smaller counties in the state, geographically, outside of New York City.

Identified as one of the three most likely threats to the county, flash flooding is noted in the county's HMP as the only hazard to be ranked as a "high priority". "Flash flooding" has been identified in the HMP as a separate threat from the more generic "flood. "Flood" is categorized as a "moderately low" priority hazard.

As described in the HMP, the "soils and topography of Schuyler County make it very susceptible to flash flooding". The county's loose soil, made up mostly of glacial drift deposits, make it prone to erosion of stream banks, scour, and collapse.

Tropical Storm Agnes dropped 12 to 18 inches of rain across the region and caused approximately $7.2 million ($40 million in 2014 dollars)[36] in damages within the county.

The HMP identifies several areas within the county as susceptible to flooding including lakeshore areas, Glen Creek in the village of Watkins Glen, and other areas where development

[35] National Association of Counties. Population Search. *naco.org.* http://www.naco.org/Counties/Pages/PopulationSearch.aspx. (Accessed on April 9, 2014).
[36] CPI Inflation Calculator. *bls.gov*. http://data.bls.gov/cgi-bin/cpicalc.pl. (Accessed on April 9, 2014).

is located near streams.

While not all the municipalities of the county have developed or adopted zoning, subdivision regulations and site-plan review ordinances or regulations, the county's limited projected growth should enable the county's towns and villages to manage floodplain development in a comprehensive, thoughtful manner. Much of the county's growth is due to second home construction.

Much of the county's mitigation strategy consists of a campaign for public information, training of community officials (including emergency response planning and training), proactively "hardening" critical facilities and infrastructure, and developing plans to keep current and future construction out of the SFHA (including enforcement of floodplain development standards, acquiring new data for use in planning, and anticipating the impacts of construction on future flooding).

Seneca County

At this time, a copy of the county's HMP has not been made available for review. The county's prior HMP, adopted in 2009, has since expired and is being updated at the current time.

Steuben County

In Steuben County, the Seneca Watershed is confined to the northeasterly corner of the county surrounding Keuka Lake and is limited mostly to portions of the towns of Pulteney, Urbana, and Wayne, and the village of Hammondsport.

Particular locations of concern were not noted in the text of the HMP for this small area of the county.

Tioga County

The Seneca Basin in Tioga County is limited to less than four square miles within the town of Spencer and includes fewer than 20 structures. Due to the limited spatial extent of the watershed in the town, no mitigation actives undertaken by the town affect the Seneca Basin.

Tompkins County

Due to the very different circumstances of lake and flash flooding, like Schuyler County, Tompkins County divides the risk of flooding into two categories, based on the source of flooding. In Tompkins County, due to the ability to forecast rising lake levels and because the New York State Canal Corporation can control the level of Cayuga Lake through outflow gates at the northern end of the lake, minimal damage has been reported in the county from lake flooding.

Flash flooding, with 24 incidences reported in the county between 1993 and 2012, is a major concern in the county and is ranked among the county's top three hazards. The HMP notes that the communities of the eastern side of the county (the towns of Groton, Dryden and their

constituent villages) are particularly at risk from flash flooding and associated landslides.

Tompkins County estimates that there are nearly 4,000 parcels fully or partially within the 1-percent or 0.2-percent annual chance flood zones in the county. While the location of a parcel in relationship to an SFHA does not mean any structures on the property are in the SFHA, it does indicate a possible proximity to heightened flood risk.

The county's mitigation goals include general outreach to the public to explain the risks, addressing drainage problems at road crossings, stream bank stabilization and buffer zones, a beaver management program, and retrofitting structures to prevent backflow flooding to basements.

Wayne County

Approximately 40 percent of Wayne County is in the Seneca Watershed including nearly all the territory of the towns making up the southern tier of communities in the county. The county's HMP does not specify specific areas or jurisdictions for risk, however flooding has been ranked as a moderately high hazard for all the towns and villages within the Seneca watershed except the towns of Butler and Savannah, and the town and village of Macedon.

Chapter 6, *Review of Past Hazard Events*, (pages 101-103), of the Wayne County All Hazard Multi-Jurisdictional Mitigation Plan gives detailed accounts of flooding events, stream crests locations and duration, and human and property impacts in the county from 1993 to 2006.

Yates County

Yates County's mitigation strategy seeks to manage growth in a thoughtful manner that removes the potential for development in areas vulnerable to flooding or have the potential to contribute to future flooding and to encourage future growth in the existing villages and hamlets of the county.

When purchasing new equipment, the county and its municipalities consider the value of the machinery in mitigating the flood damage. For example, the county and towns jointly purchased a second hydro-seeder for use in restoring those areas affected by erosion and other flood damaged soils. As explained in the HMP, the county works with other partners such as the local Yates County Soil and Water Conservation District which owns a bail mulcher to help with flood prevention projects. The county's Soil and Water District has also modified other equipment that is available to each of the towns.

Other mitigation efforts include town-wide culvert inventory to evaluate structure conditions and needs, engineering studies to identify areas of critical safety concerns, and drainage improvements.

The HMP also identified 15 economically feasible and environmentally appropriate flood control and mitigation projects at locations across the county. The full list of proposed projects can be found in Section VI, Page 6 (http://www.yatescounty.org/upload/12/4149.pdf) of the Yates County HMP.

Critical Facilities and Other Important Properties Located in the SFHA

A review of the county Multi-Jurisdictional Hazard Mitigation Plans found that the following facilities and properties were located in the 1-percent-annual-chance flood zone in the Seneca Watershed. It is not presumed that these are the only structures in the SFHA, but only the ones identified in the HMPs. Due to the limited geographic coverage of the watershed in some counties, not all counties are listed below.

Cayuga County

The Cayuga County HMP identified nearly 50 critical facilities located within the boundaries of the 1- and 0.2-percent annual chance flood areas. Among the properties listed were several apartment complexes, water and sewer treatment plants, municipal buildings (town halls), electrical supply infrastructure, and other properties with vulnerabilities. For a complete list of at-risk facilities, please refer to page 5.4.1-37 of the Cayuga County HMP at the link noted in Table 11 above.

Onondaga County

The County's HMP found well over 140 facilities and other structures at risk to flooding during the 0.2-percent chance flood including dozens of schools, several town halls, communication towers, fire stations, and other critical facilities. Those buildings and other structures identified in Onondaga County may be found in the HMP document on pages 5.4.3-68 to 5.4.3-74 at the website shown in Table 11. While the list is not meant to be exhaustive, it illustrates well the volume of vulnerable structures across the county.

Ontario County

Ontario County identified approximately 350 "vulnerable" facilities and systems across the county susceptible to flood damage. The vast majority of these assets consisted of links in the "Transportation System" with lesser numbers included in "Essential Facilities", "Lifeline Systems", and "Hazardous Material Facilities" categories. More information on these vulnerable assets can be found in the county's HMP, Chapter 5 – Risk Assessment, Section 5.3, Vulnerability Assessment.

Schuyler County

While the county's HMP did list critical facilities, no indication is given of their status during a flood. However, the HMP does note several structures with "increased vulnerability". These included a correctional facility, nursing homes, schools, and mobile (manufactured) housing parks.

Seneca County

At this time, county's HMP is being revised and updated. A draft copy of the HMP has not been made available for review.

Steuben County

In the limited Seneca Watershed area in Steuben County, the HMP shows several schools and other facilities in the SFHA, most in and around the village of Hammondsport.

Tompkins County

The county's HMP is currently undergoing revision; however a draft version is available online. The HMP has made it a goal to identify those critical structures and facilities at risk during a flooding event and while specific properties or facilities are not named in the HMP, the report notes that approximately 190 parcels in the floodplain are classified as being in "community" or "public" service.

Wayne County

Chapter 7 – *Risk Assessment*, in the Wayne County HMP lists 154 sites countywide, as vulnerable to flooding. These sites include "Essential Facilities", "Lifeline Transportation and Utility Systems", "Vulnerable Populations", and "Hazard Material Locations".

Yates County

Areas of concern in Yates County included the lakeshore areas and stream corridors. No specific buildings or other infrastructure were noted in the HMP.

Letters of Map Change (LOMC) in Watershed

Due to limitations in the scale or topographic detail of the source maps used to prepare a FIRM, on occasion, small areas of elevated land may be included in Special Flood Hazard Areas (SFHA). When a property owner feels that this has occurred, they may request a Letter of Map Change, or LOMC, for their property or structure.

A LOMC is the general term for a suite of methods FEMA uses to make an official flood hazard determination for a structure or property. The Letter of Map Amendment (LOMA) for properties on natural high ground and the Letter of Map Revision based on Fill (LOMR-F) for properties elevated by the placement of fill are the most common ways used by property owners to amend the FIRM. It is important to note that these methods do not physically change the FIRM for a community; rather they amend, *by letter*, the FIRM for the benefit of accurate site information without the cost of publishing a revised FIRM panel.

When a community's FIRM is revised, the results of a recorded LOMC may be incorporated into the new FIRM. The use of a prior LOMC is dependent on several factors that may include, but are not limited to, the spatial extent of the LOMC, the quality of the data provided in support of the original LOMC, whether the information provided in the LOMC has subsequently been superseded by more recent or relevant data, or any number of other factors.

When assessing the remapping needs of a community, the location of a LOMC or cluster of LOMCs may indicate that special attention should be directed to an area to determine if the flood

hazard at that site has changed. However, there are many reasons why a LOMC may have been filed; therefore, the mere existence of a LOMC at a particular location should not be interpreted as evidence of a deficiency in the FIRM or FIS.

More information on the LOMA and LOMR-F processes can be found on FEMA's LOMC web site or in hard copy by reviewing the attachment, *LOMA-LOMR-F Fact Sheet*, included with this Discovery Report.

A review of the LOMCs in the Seneca shows a wide dispersal of actions within the basin. Figure 26, *Mapped LOMCs in the Seneca Watershed*, shows the location of those LOMCs that have been mapped using GIS methods for the entire basin. This figure shows the general location of approximately 350 completed LOMCs within the watershed. Please note, because the location of every LOMC has not been geocoded, the map may not include all completed actions.

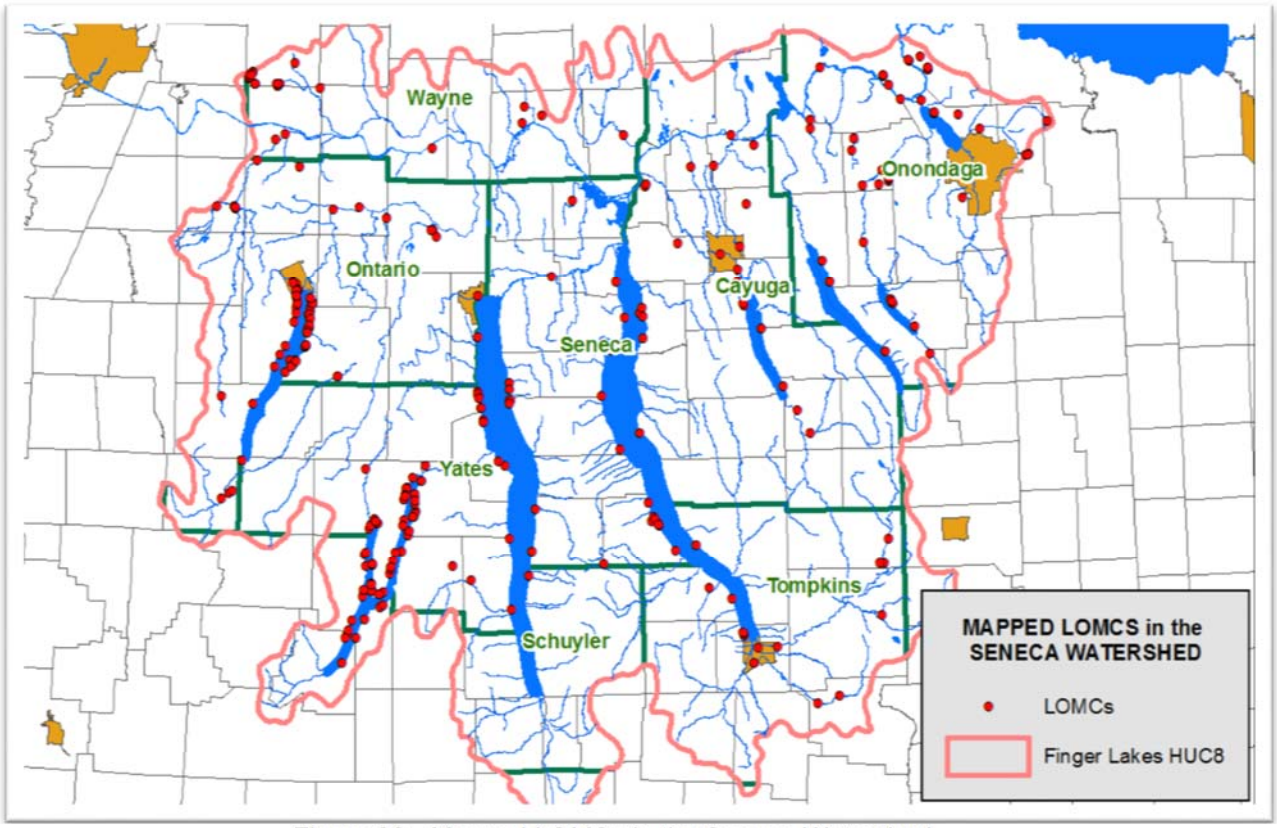

Figure 26: *Mapped LOMCs in the Seneca Watershed*

A review of Figure 26 shows that large clusters of LOMCs have been processed on Canandaigua and Keuka lakes, with smaller groups of LOMCs on Seneca and Cayuga lakes. The occurrence of LOMCs across the rest of the basin seems to be fairly even.

Of the 752 known LOMCs in communities *all or partially within* the watershed, approximately 275 (or about 36 percent) were recorded in ten communities in eight of the fourteen counties of the watershed, showing a great deal of dispersal of LOMCs. The five communities with the most

LOMC actions were: Walworth (Wayne County) with 36; Clay (Onondaga), 32; Wayne (Steuben) and Milo (Yates), both with 29; and the town of Canandaigua (Ontario) having 26 LOMCs. (Please note that the total LOMC figures for the towns of Clay, Walworth, and Wayne may include LOMCs completed outside of the Seneca Watershed.)

Appendix P: *Total Number of LOMCs by Community*, lists the total number of actions for each community in the watershed. Additional information on individual LOMCs may be found by visiting FEMA's Map Service Center, by obtaining FEMA's National Flood Hazard Layer (NFHL) (available for use with Google Earth) or the community's map repository. A copy of FEMA's informational flyer on the NFHL is available with this report as an attachment.

Number of Damage Claims in Zones B, C, and X

Moderate flood hazard areas, which may be labeled as Zone B or Zone X (shaded) are shown on the FIRM and are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood. The 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 Zone C or Zone X (unshaded). When a substantial number of properties located in areas outside or beyond the published SFHA (those areas shown as Zones B, C, and X on the FIRM) suffer flooding and file a flood damage claim, this may indicate a location that should be re-examined for previously unstudied flood hazard risk.

Only one jurisdiction, the town of Dewitt, shows a large number of claims in Zones B, C, and X on the FIRM, with 14 processed over the years. The watershed's remaining communities have no more than six recorded claims outside of the SFHA. Table 13: *Number of Claims Outside the SFHA* notes those communities with completed claims in areas shown on the effective FIRM as moderate or minimal flood risk. A number of factors may contribute to claims outside of the SFHA including additional development resulting in increased runoff; inadequate stormwater capacity; mapping limitations; and other unknown or unforeseen geographic or hydrologic changes.

Table 13: *Number of Claims Outside the SFHA*

Community	Number of Zone B, C, and X Claims*
DEWITT, TOWN OF	14
UNION SPRINGS, VILLAGE OF	6
CAROLINE, TOWN OF	5
ITHACA, TOWN OF	5
CORTLANDVILLE, TOWN OF	4
LYSANDER, TOWN OF	4
SYRACUSE, CITY OF	4
SENECA FALLS, TOWN OF	4
ITHACA, CITY OF	4
MANLIUS, TOWN OF	3
AURELIUS, TOWN OF	2
BRUTUS, TOWN OF	2
CATLIN, TOWN OF	2
PENFIELD, TOWN OF	2
ELBRIDGE, TOWN OF	2
RICHMOND, TOWN OF	2
SOUTH BRISTOL, TOWN OF	2
ULYSSES, TOWN OF	2

*Not all claims shown in this table may be within the Seneca Watershed

Regulatory Mapping

As noted above, the Seneca Watershed in New York covers portions of 14 counties in the state. The mapping in place is a mix of recently revised and older FIRMs. A FIRM's publication date does not imply that the information and data shown in the revised FIRM have been entirely revised. When updating a community's FIRM and, if applicable, its FIS, the flood hazard information expressed in those documents may have been reused from the previously effective FIRM/FIS, revised using additional or newly available data, may be a completely new analysis of the flooding source, or a mix of all of the above.

The Cayuga County FIRM was published in countywide format and is dated August 2, 2007. Other countywide FIRMs in the watershed include Cortland (published March 2, 2010), Monroe (August 28, 2008), and Tioga (April 17, 2012). In addition, preliminary FIRMs have been published for Onondaga County, but have not been published in final form at this time.

Currently, communities in Onondaga County are represented by FIRMs that were published between March 1979 (Dewitt) and May 1999 (town and village of Camillus).

The remaining effective FIRMs for communities within the watershed are all published in community-based format. The range of the other county' FIRMs for communities in the Seneca Watershed are shown below:

Chemung County	February 1983	to	September 1996
Livingston County	August 1984*		
Ontario County	September 1977	to	May 1998
Schuyler County	July 1978	to	June 1988
Seneca County	August 1979	to	January 1988
Steuben County	September 1977	to	May 1995
Tompkins County	January 1979	to	May 1988
Wayne County	November 1977	to	June 1992

*There is only one community in the Seneca Watershed in Livingston County

For a complete list of the effective dates for the FISs and FIRMs in the watershed, please see Appendix Q: *FIS and FIRM Effective Dates*.

Repetitive Losses

A Repetitive Loss (RL) is a property that has received two or more claim payments of more than $1,000 from the National Flood Insurance Program within any rolling 10-year period. In the Seneca Watershed there are 91 documented cases of RL structures ranging from two to upwards of 12 claims on a structure. Table 14, *Repetitive Losses by Community*, notes the number of RL properties by jurisdiction. Please see Appendix R: *Repetitive Losses in the Seneca Watershed*, for more detailed information on the RL history in the watershed by jurisdiction.

Table 14: *Repetitive Losses by Community*

Community	Number of Rep Loss Properties*	Community	Number of Rep Loss Properties*
CICERO, TOWN OF	48	SENECA FALLS, TOWN OF	4
DEWITT, TOWN OF	33	SYRACUSE, CITY OF	4
LANSING, TOWN OF	20	GALEN, TOWN OF	3
PENFIELD, TOWN OF	14	GORHAM, TOWN OF	3
PERINTON, TOWN OF	10	MERIDIAN, VILLAGE OF	3
CORTLANDVILLE, TOWN OF	9	AURELIUS, TOWN OF	2
RICHMOND, TOWN OF	8	BRUTUS, TOWN OF	2
NAPLES, VILLAGE OF	7	CANANDAIGUA, TOWN OF	2
ITHACA, CITY OF	6	CATLIN, TOWN OF	2
LYSANDER, TOWN OF	6	FAYETTE, TOWN OF	2
UNION SPRINGS, VILLAGE OF	6	HORSEHEADS, TOWN OF	2
CAROLINE, TOWN OF	5	LAFAYETTE, TOWN OF	2
CATO, TOWN OF	5	LEDYARD, TOWN OF	2
ITHACA, TOWN OF	5	MORAVIA, VILLAGE OF	2
MANLIUS, TOWN OF	5	SKANEATELES, VILLAGE OF	2
ELBRIDGE, TOWN OF	4	SOUTH BRISTOL, TOWN OF	2
HARFORD, TOWN OF	4	SPENCER, TOWN OF	2
OVID, TOWN OF	4	ULYSSES, TOWN OF	2

*Rep Loss Properties totals may include properties outside of Seneca Watershed

Structures that flood frequently strain the NFIP Fund. In fact, RL properties are the biggest draw on the fund. As noted on FEMA's NFIP "Frequently Asked Questions" page, "structures that flood frequently strain the National Flood Insurance Fund. In fact, the RL properties are the biggest draw on the Fund. FEMA has paid almost $3.5 billion dollars in claims for RL properties. RL properties not only increase the NFIP's annual losses and the need for borrowing; but they drain funds needed to prepare for catastrophic events".[37].

In communities at least partially within the Seneca Watershed, repetitive loss cases are concentrated in two towns in the Syracuse suburbs, two outside of Rochester, and the town of Lansing, north of Ithaca. These five communities constitute 51 percent of all Repetitive Losses found in communities at least partially within the watershed. Figure 27: *Repetitive Loss Properties in the Seneca Watershed* shows the general location of repetitive loss properties in the watershed.

An analysis of repetitive loss areas is particularly important in identifying areas that may need special flood hazard mitigation attention. If the RL property is located outside of the published SFHA for that area, then the hazard mapping of the flooding may need additional examination to determine its accuracy.

[37] "National Flood Insurance Program: Frequently Asked Questions", published October 2005. *fema.gov.* http://www.fema.gov/txt/rebuild/repetitive_loss_faqs.txt. (Accessed October 28, 2014).

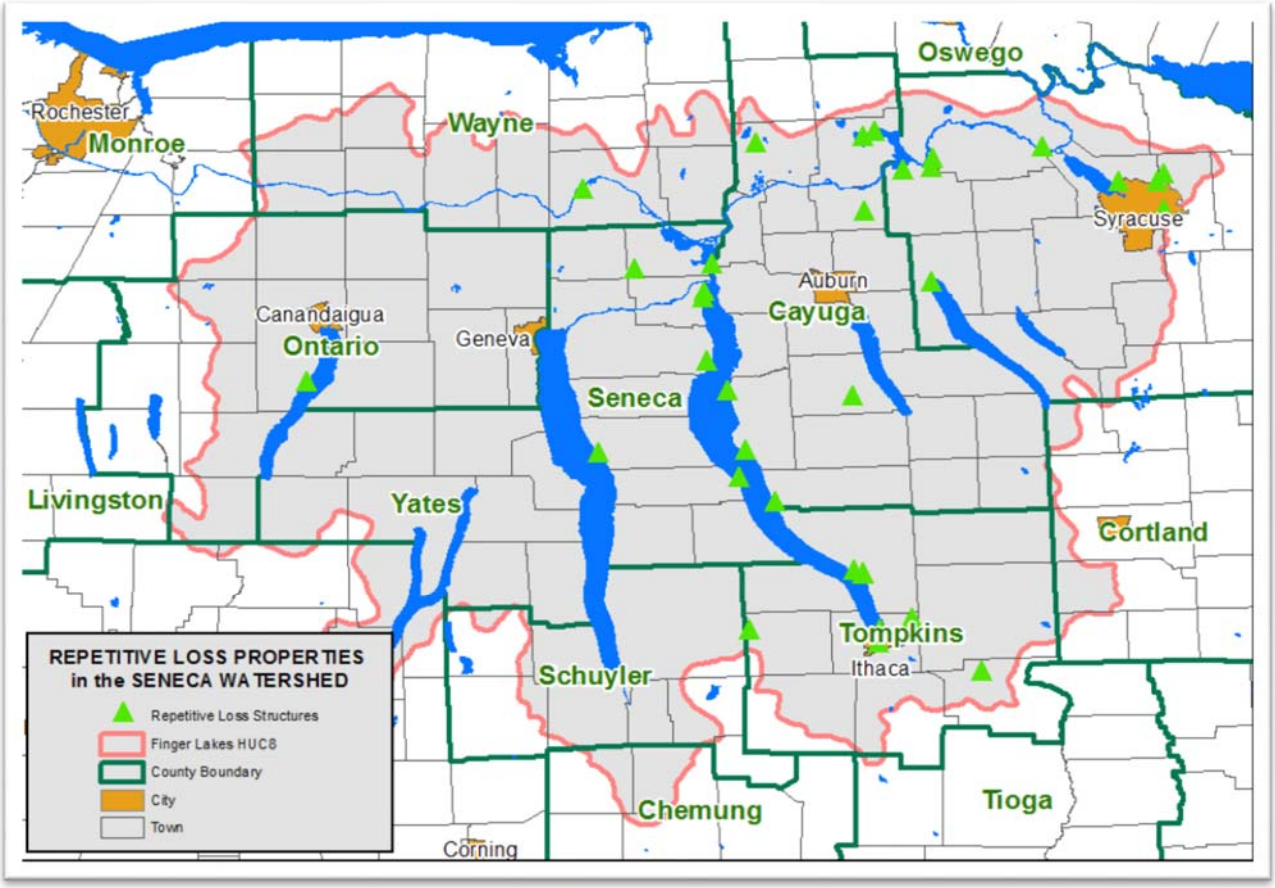

Figure 27: *Repetitive Loss Properties in the Seneca Watershed*

Municipal Separate Storm Sewer System (MS4)

As noted on the NYSDEC's website, Federal Stormwater Phase II regulations require permits for stormwater discharges from Municipal Separate Storm Sewer Systems (MS4s) in urban areas and for construction activities which disturb one or more acres of land. To implement the law, the NYSDEC has developed two general permits, one for MS4s in urbanized areas and one for construction activities. The permits are part of the State Pollutant Discharge Elimination System (SPDES). Operators of regulated MS4s and operators of construction activities must obtain permit coverage under either an individual SPDES permit or one of the general permits prior to commencement of construction.

Guidance for local officials on complying with state and federal stormwater management requirements, Minimum Measures 4 and 5 can be found on the NYSDEC's website at http://www.dec.ny.gov/chemical/9007.html.

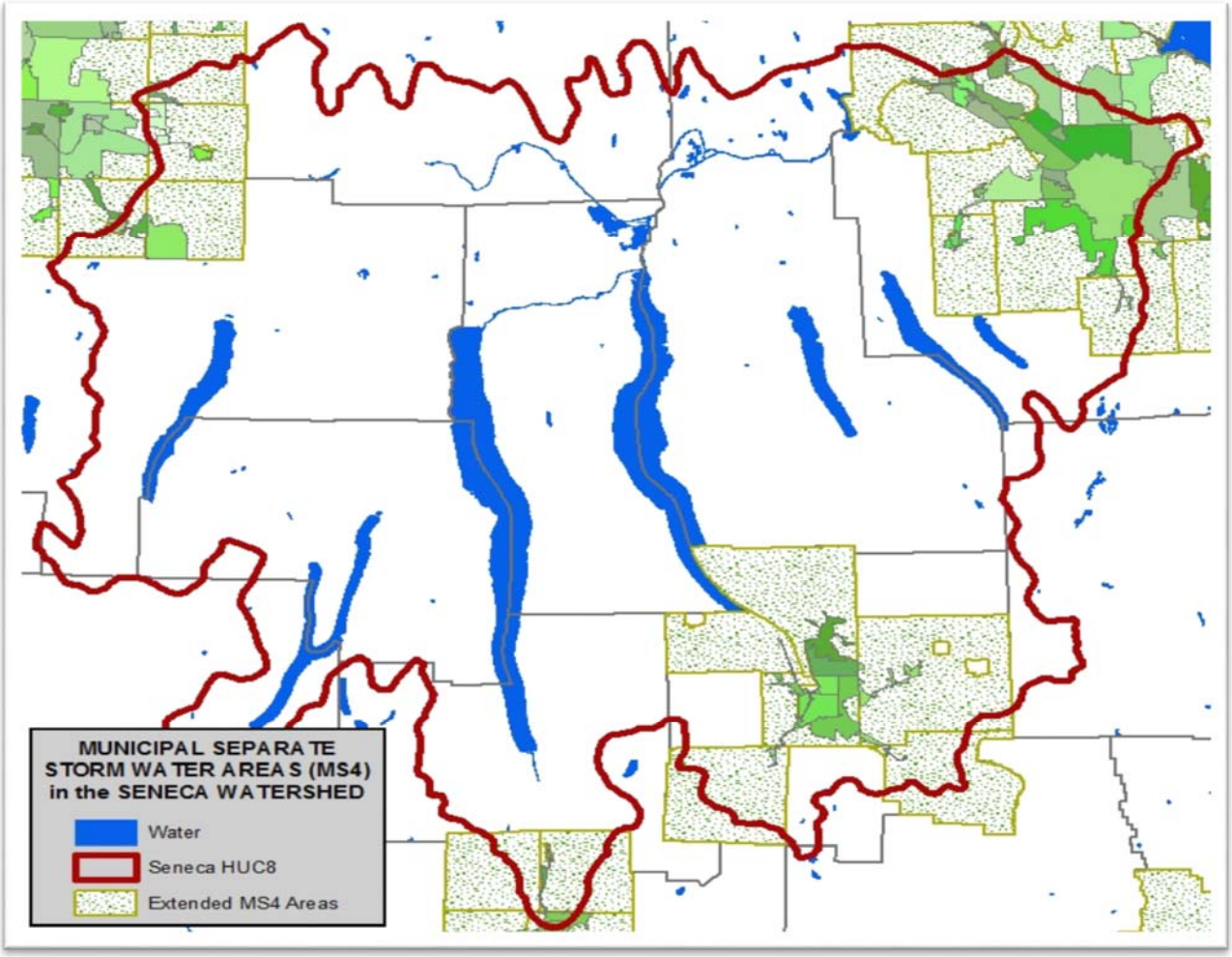

Figure 28: *Municipal Separate Stormwater Areas (MS4) in the Seneca Watershed*

Figure 28, *Municipal Separate Storm Sewer Areas (MS4) in the Seneca Watershed* shows the geographic coverage of MS4 systems in the watershed. In the Seneca Watershed, as might be expected, most of the area covered by MS4 regulation is found in the larger urban centers in and on the fringe of the watershed, concentrated in the Syracuse, Ithaca, Elmira, and Rochester metro areas.

SECTION FIVE PRE-DISCOVERY CONFERENCE CALLS

As noted in SECTION TWO, the NYSDEC conducted several conference calls with community officials representing the cities, towns, and villages within the watershed. A condensed list of the top concerns for each county is presented below. The complete list and text of areas of interest for each community interviewed during this series of calls can be seen in the Attachment *Seneca Pre-Discovery Conference Call Summaries.*

Synopsis of Conference Call Discussions

As a result of these calls, several areas were identified by the communities as needing additional scrutiny. While the complete notes from these calls can be found in the *Seneca Pre-Discovery Conference Call Summaries* attachment, a brief summary of some of the priorities mentioned by attendees is included below:

Community	Concern/Priority
Milo	Keuka Lake Outlet
Penn Yan	Sucker Brook
Chemung and Steuben Counties	Poor quality of topographic data
Veteran	Catherine Creek
Seneca Falls	Seneca Lake
Hector	Hector Falls Creek
Ontario County	Flint Creek
Canandaigua (T and V)	Sucker Brook
Geneva (T)	Castle Creek
Victor	Generalized local creek flooding
Groton (V)	Owasco Inlet
Caroline	Six Mile Creek

SECTION SIX DISCOVERY MEETINGS

A series of Discovery Meetings for the Seneca Watershed were held in May 2014 at various locations within the watershed and were grouped generally by communities within one or more adjacent counties. All communities within the watershed were invited to attend.

The schedule of meetings can be found in the table below:

Date	Time	Location	County(ies)
05/06/2014	1:00PM	Branchport	Livingston, Steuben, & Yates
05/07/2014	9:00AM	Waterloo	Seneca
05/07/2014	2:30PM	Ithaca	Cortland, Tioga, & Tompkins
05/08/2014	9:30AM	Montour Falls	Chemung & Schuyler
05/12/2014	1:30PM	Syracuse	Onondaga
05/13/2014	9:30AM	Lyons	Monroe & Wayne
05/13/2014	2:30PM	Auburn	Cayuga
05/14/2014	9:30AM	Hopewell	Ontario

The meetings were well attended with representatives from approximately 115 local jurisdictions, county government, regional watershed organizations, Federal, state, and county agencies, non-profit groups, and Congress staff members.

The primary objective of these meetings was to facilitate discussion about study needs, mitigation project needs, desired compliance support, and local flood risk awareness efforts with a strong emphasis on determining the flood mapping needs and priorities of the watershed's communities. Discovery Maps were displayed on the walls at the meetings to stimulate the discussion. In addition, table-sized maps were used in breakout discussions with communities based on geography (for example, a town with one or more villages within its geographic extent might be interviewed together as a natural pairing). Attendees, including all affected communities and selected other stakeholders, were asked to cooperatively identify Areas of Concern within the Seneca Watershed.

Discovery Meeting materials and the other items noted below may be found in the Attachments:

Meeting Times and Locations
Meeting Agenda
Meeting Sign-In sheets
Meeting Presentation
Discovery Meeting Wall Maps

Following the conclusion of the Discovery Meetings, the information gathered during the face to face consultations with community officials and others was combined with other watershed-specific data for use in two documents for future reference and guidance; the Seneca Watershed Floodplain Mapping Request Summary and the Seneca Watershed Recommended Scope of Work. Both memoranda may be found with this Discovery Report as Appendix V and U, respectively.

SECTION SEVEN CONCLUSIONS FROM MEETINGS AND DATA

Following an explanation and overview of the Discovery Process, at the conclusion of each Discovery Meeting, all communities and the representatives of other governments and organizations were offered the opportunity to discuss mitigation activities, development pressures, flooding needs, and other issues associated with flood mapping and prevention in break-out sessions generally in groups of one or two communities. Using individual maps for each community, local officials and other stakeholders were able to describe and annotate issues of concern on the base map to FEMA, the NYSDEC, and other specialists. No subject affecting the possibility of flooding in the community was off limits. Everything from beaver dams to undersized culverts to stream dredging was discussed.

At the conclusion of the mailing outreach, pre-Discovery Conference Calls, and eight Discovery meetings, the public officials, municipal staff, and other stakeholders of the approximately 175 communities of the watershed identified nearly 150 flooding sources that they felt warranted additional study or revision. As might be expected, updated, consistent flooding elevations', using current modeling technology for the major Finger Lakes themselves was the Number One priority for the communities of the watershed as a whole. Reasons for prioritizing the lakes range from inconsistent and patchwork BFEs shown on FIRMs from community to community; the sheer number of communities that have shoreline on the lakes; and the continued development of the shorelines of the lakes. A comprehensive list of the other streams, lakes, and other flooding sources cited as needing attention can be found in Appendix S: *Community Mapping Needs as Noted During Discovery Meetings*.

Due to the size of the scanned annotated work map files, the marked-up maps are not included in this report. However, a copy of any annotated work map from the Seneca Watershed Discovery Meetings may be requested by contacting the NYSDEC via email at floodplain@dec.ny.gov.

Conclusions from Discovery Meetings and Other Research

Based on the limited number of CACs and CAVs, it would appear that the communities of watershed could benefit from increased contact with FEMA and NYSDEC to assist in the continued compliance requirements of the NFIP.

In addition, it would appear that special outreach effort should be made for those communities with older housing stock including the suburbs of Rochester and Syracuse. These older communities constitute a large number of the flood insurance policies in force and while suburban areas are not often thought of as "older", much of the housing built in these cities, towns, and villages dates to before the science behind the NFIP was in place or regulations were rigorously enforced. Information on joining the CRS program would be of particular benefit to these and other watershed communities with relatively large flood insurance policy numbers.

Due to the number of flooding claims in Zones B, C, and X in the town of DeWitt, an examination of both the current SFHA and construction policy within the town may be warranted to be sure that the study is accurate and that inappropriate use of flood prone areas is not occurring within the town.

Long term, the general trend of growth in the watershed will be slow and has been even more so due to the recession that began in 2007. This gentle pace of growth offers local jurisdictions the opportunity for thoughtful floodplain mitigation and management. However, construction of new homes, second homes, and commercial properties has picked up in recent years. Continued vigilance will need to be maintained so that as the economy improves, good building practices continue for communities within the watershed.

The review of the Mitigation Grant Proposals seems to indicate that counties and local governments may need assistance in identifying and applying for HMGP and PDM grants that may be available, but underutilized by communities in the Seneca Watershed. Outreach by FEMA Region II and NYSDEC may be appropriate.

Because most of (and certainly the costliest) development in the watershed, beyond the immediate suburbs of Rochester and Syracuse, has occurred and will continue to be located along the shorelines of the large lakes of the watershed, all seven of the Finger Lakes within the watershed should have a scientifically up-to-date BFE developed for the entirety of each lake.

In addition, due to the general age of many of the effective FIRMs for the communities of the watershed, it is recommended that a thorough review of all effective mapping be conducted to determine if up-to-date flood hazard modeling and modern mapping technology would increase the accuracy of the flood hazard risk portrayed on the FIRM and if these updates would benefit various counties in the Seneca Basin.

In the future, communities should be instructed on the capturing and cataloging of high water marks. In conjunction with other data, such as rainfall totals, the collection of HWMs is invaluable for future planning and floodplain mapping. The USGS and the USACE offer several resources for the proper gathering of HWMs following a flooding event. Interested parties should visit those agencies websites for more information on the collection of HWMs.

Follow Up Events and Actions

On the evening of May 13, 2014, a series of severe rainstorms impacted the watershed with major flooding, especially in and around the towns and villages in the Penn Yan area. Among many other sites of damage, a culvert shown as *containing* the 1-percent annual chance flood on the effective FIRM for the village was blown out as a result of floodwaters.

As a result of this event, the town of Wayne in Steuben County wrote to the NYSDEC naming an area of concern within the town. The diamond-shaped area in question,

Figure 29: *Town of Wayne Area of Concern*

beginning at the northerly point and moving clockwise, is approximately bounded by Hyatt Hill Road, a power plant diversion canal, State Route 230, and Keuka Lake. Figure 29, *Town of Wayne Area of Concern* illustrates the location of this discussion.

In closing, the town asked what it could do to assist with new mapping. A copy of this letter may be found in Appendix T, *Post Discovery Meeting Correspondence from Communities*.

Due to the severity of the May 2014 storms, the NYSDEC Region 8 office made additional contact with local officials in the village of Penn Yan to determine if the community would like to amend the list of priority flooding sources provided during the Discovery Meeting only days before. The village replied that the streams noted during the Discovery Meetings continued to be of the highest priority to the community and that the list created for Discovery remained valid.

The town of Fayette provided via email several locations within the town that are subject to flooding, including Kendig Creek at River and Marshall Roads, an unnamed creek crossing County House Road, and other locations within the town. A copy of this email can be found in Appendix T.

The town of Victor, Ontario County, forwarded over two dozen photographs to illustrate the extent of flooding in the community during May 2014. Figure 30, *Flooding in the Town of Victor* show one of the photos. The remaining photos can also be found in Appendix T.

Figure 30: *Flooding in the Town of Victor*

Communities that have found that several properties in a particular area have been removed from the SFHA through the LOMC process, or communities or groups of property owners that feel that the current FIRM for their area is in error may wish to consider pooling resources and costs and submit to FEMA for consideration a multiple lot LOMC to more accurately determine the flood hazard risk using individualized data for each structure. As noted earlier, more information on FEMA's LOMC web site at or in hard copy by reviewing the attachment, *LOMA-LOMR-F Fact Sheet*, included with this Discovery Report

When the NYSDEC has completed its review of the information and data gathered during the Discovery process, it will summarize its Seneca Basin flood mapping recommendations in a letter to FEMA. Following its delivery to FEMA, a copy of this document will be available as Appendix U: NYSDEC Memo: *"Seneca Watershed Recommended Scope of Work"*.

The completion of the Discovery Process is not the end of FEMA's and the NYSDEC's interest or involvement in assisting the communities of the Seneca watershed to become more resilient to flooding and other disasters.

The requests, recommendations, and observations of the watershed's communities, FEMA, and the NYSDEC discussed and recorded during the Discovery process (conference calls, meetings, and other correspondence) will be cataloged and placed in FEMA's Mapping Information Platform and Coordinated Needs Management Strategy. These databases are used to store, evaluate, and prioritize the mapping needs for use in future projects.

In addition, should it be determined that a community in the watershed will be part of a remapping or other subsequent Discovery action, a partnership agreement letter will be sent to the elected leadership of the jurisdiction. This agreement simply requests an acknowledgment of the mapping process and asks that the community act as a fully engaged participant in the mapping process.