Final Discovery Report

Hudson-Hoosic Watershed, HUC 02020003

Albany, Rensselaer, Saratoga, Warren, and Washington Counties, New York*

These counties span more than one watershed; please see following page for a list of communities fully or partially located in the watershed. This report covers only the Hudson-Hoosic watershed in State of New York.

Report Number 01

March 31, 2014

FEMA

Project Area Community List

Albany County
- Cohoes, City of*
- Green Island, Town & Village of*[1]

Rensselaer County
- Berlin, Town of*
- Brunswick, Town of*
- Grafton, Town of*
- Hoosic, Town of
- Hoosick Falls, Village of
- Petersburgh, Town of
- Pittstown, Town of
- Schaghticoke, Town of
- Schaghticoke, Village of
- Stephentown, Town of
- Troy, City of*
- Valley Falls, Village of

Saratoga County
- Ballston, Town of*
- Ballston Spa, Village of
- Charlton, Town of*
- Clifton Park, Town of*
- Corinth, Town of*
- Corinth, Village of
- Galway, Town of*
- Galway, Village of[2]
- Greenfield, Town of*
- Hadley, Town of*
- Halfmoon, Town of*
- Malta, Town of
- Mechanicville, City of
- Milton, Town of
- Moreau, Town of
- Northumberland, Town of
- Providence, Town of*

Saratoga County *(continued)*
- Round Lake, Village of
- Saratoga, Town of
- Saratoga Springs, City of
- Schuylerville, Village of
- South Glens Falls, Village of
- Stillwater, Town of
- Stillwater, Village of
- Victory, Village of
- Waterford, Town of*
- Waterford, Village of
- Wilton, Town of

Warren County
- Glens Falls, City of*
- Lake Luzerne, Town of*
- Queensbury, Town of*

Washington County
- Argyle, Town of*
- Argyle, Village of
- Cambridge, Town of
- Cambridge, Village of
- Easton, Town of
- Fort Edward, Town of*
- Fort Edward, Village of
- Greenwich, Town of
- Greenwich, Village of
- Hartford, Town of*
- Hebron, Town of*
- Hudson Falls, Village of
- Jackson, Town of
- Kingsbury, Town of*
- Salem, Town of
- Salem, Village of
- White Creek, Town of

**Partially within the Hudson-Hoosic Watershed*
[1]The village and town of Green Island are coterminous
[2]The village of Galway does not participate in the National Flood Insurance Program (NFIP)

This list includes all communities located fully or partially within the Hudson-Hoosic watershed. While all communities may be under consideration for a revised FEMA Flood Insurance Study (FIS) and/or Flood Insurance Rate Map (FIRM), it is important to note that not all communities will receive new/updated FEMA FISs or FIRMs as a result of this Discovery process.

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Data Disc

The Data Disc includes this entire Discovery Report, all Appendices, and all Attachments

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
FEMA	Federal Emergency Management Agency
FHBM	Flood Hazard Boundary Map
FIPS	Federal Information Processing Standard
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GE	General Electric
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
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
NYSDOS	New York State Department of State
NYSDOT	New York State Department of Transportation
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
SLA	Saratoga Lake Association
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

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). 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)

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 done using hydrologic and hydraulic methods that produce 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)

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)

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)

Multi-Hazard Risk Assessment and Loss Estimation Program (HAZUS): 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)

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 New York State Department of Transportation (NYSDOT) hydraulic studies may have been substituted for limited survey, where appropriate and available. (FEMA, Cayuga County, NY FIS)

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 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)

Mitigation: "Any sustained 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 include but are not limited to structural projects such as elevation, floodproofing, relocation, or demolition, planning mechanisms such as modifications to zoning codes, ordinances or community plans, education and outreach actions, and natural resource protection. (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 involve in the implementation of 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). In other words, a watershed is the area of land where all of the water that is under it or drains off of it goes into the same place. (EPA)

Water Year: The 12-month period beginning on October 1, for any given year and ending on September 30, of the following year. The water year is designated by the calendar year in which it ends (i.e. 2011).. Thus, the water year ending September 30, 2011, began on October 1, 2010 and is called the "2011" water year. (USGS)

SECTION ONE DISCOVERY OVERVIEW

Hudson-Hoosic 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 Hudson-Hoosic Watershed Discovery Project

The aim of the Hudson-Hoosic Discovery project is to cultivate a strong working relationship between the watershed's communities, its major environmental, business, and other watershed-based stakeholders, to update NFIP products to increase public awareness of short and long term flood risk, and to improve community resiliencies related to flood losses (life, property, and business).

Hudson-Hoosic 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 proper mitigation actions 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, but not limited to:

Average Annualized Loss
Community-Identified Areas of Concern
Dams
Declared Disasters
Demographics
Discovery Meeting Information
Floodplains and floodways
Hazard Mitigation Plans
Identified Stakeholders
Letters of Map Change
Levees and Floodwalls
LiDAR coverage
Media
Municipal Separate Storm Sewer Systems
NIFP Insurance Statistics/Coverage/Claims
Repetitive Loss
State Pollutant Discharge Systems
Streams
Stream Gages

SECTION TWO HUDSON-HOOSIC OUTREACH STRATEGY

Hudson-Hoosic Discovery Stakeholder Coordination

Pre-Discovery Meetings

To begin this effort, 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, nearly 300 local officials from individual communities and the counties were invited to the proposed meetings. A list of the community leaders invited to the meetings is located in Appendix A: *Pre-Discovery Mailing List*. A sample invitation letter is also shown in this appendix. 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 March 2012 for that portion of the Hudson-Hoosic watershed located within the state of New York. (Please note, a printed copy of all hyperlinks referenced in this Discovery Report can be found in Appendix B: *List of Hyperlinks Noted in Hudson-Hoosic Discovery Report*.)

NYSDEC conducted nine pre-Discovery meetings with Rensselaer, Saratoga, Warren, and Washington County public officials in the spring of 2012 for the purpose of examining the flood mapping, mitigation, planning, and other needs of communities within the counties comprising the Hudson-Hoosic watershed. Because of the limited geographic extent of the watershed in Albany County, no meetings for this project where held in Albany County. These meetings were preceded by earlier Time and Cost meetings held in 2007 in Rensselaer and Saratoga Counties. Like pre-Discovery meetings, Time and Cost meetings share the goal and objective of meeting with communities, explaining the flood mapping 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 be focus groups for community officials engaged in the administration, planning, emergency, and public works of local jurisdictions. A record of the participants of these meetings can be found in Appendix C: *Hudson-Hoosic*

Watershed Pre-Discovery Stakeholder Meetings Sign in Sheets. As such, while not excluded, the general public is generally not in attendance at these meetings.

The notes from the meetings are shown in Appendix D: *Hudson-Hoosic Watershed Pre-Discovery Meeting Memo*. These notes provide the comments from those interviewed by NYSDEC and other staff to determine flood mapping priorities from each community in attendance at the Pre-Discovery meetings. The results of these meetings were summarized and forwarded to FEMA, Region II. The findings of the pre-Discovery Meetings are discussed in SECTION FIVE, PRE-DISCOVERY MEETINGS.

Other Stakeholders

Other stakeholders, in addition to 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.

An attempt to identify several relevant stakeholders in the watershed is shown in Appendix F: *Other Stakeholders in the Hudson-Hoosic Watershed*. It is assumed that this appendix of other stakeholders will be added to and amended as needed if/when further outreach is conducted with the communities during this project and any subsequent mapping efforts within the watershed.

Discovery Meetings

The pre-Discovery Meetings were followed by two Discovery Meetings held with watershed communities in October 2012, in two locations. More information on the results of the fall 2012 meetings can be found in SECTION SIX, DISCOVERY MEETINGS.

SECTION THREE HUDSON-HOOSIC WATERSHED OVERVIEW

Geography

As described by the U.S. Geological Survey (USGS), the "United States is divided and sub-divided into successively smaller hydrologic units 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.

The Hudson-Hoosic watershed is one of the 378 hydrologic accounting units, or HUC-8s, in this classification system. The watershed's HUC number, 02020003, can be used as a "key" to both map its location and to define its place in successively greater watersheds. The watershed's HUC breaks down as such:

02 = Region, Mid-Atlantic

02 = Sub-Region, Greater Upper Hudson Area (includes other smaller basins)

00 = Accounting Unit, Upper Hudson

03 = Cataloging Unit, Hudson-Hoosic

The Hudson-Hoosic watershed is located in east central New York, southwest Vermont, and extreme northwest Massachusetts, and covers approximately 1,900 square miles, two-thirds of which is contained in New York State. In New York, the watershed is primarily located in Rensselaer, Saratoga, and Washington Counties with small portions of Albany and Warren Counties also included. The watershed in New York is primarily rural, consisting of forestland and farms, with some suburban and small urban areas. Along Interstate 87 (Northway) however, from the Kosciusko (Twin) Bridges in Halfmoon northward to Glens Falls in southern Warren County there exists a corridor of fairly intense suburban development. This area extends the entire length of the watershed and is approximately 35 miles from north to south and is about five miles wide.

The main stem of the Hudson River in the watershed flows for approximately 65 miles from the town of Lake Luzerne to Troy/Green Island at the Federal Dam.

The Hudson-Hoosic watershed can be considered the middle reach of the 315 mile main stem of the Hudson River. It receives its flow from the Upper Hudson and Sacandaga watersheds emanating from the Adirondack Mountains and foothills and, in turn, at the Federal Dam, the Hudson-Hoosic watershed flows into the Lower Hudson watershed. Downstream of the dam, the Hudson, for a distance of approximately 150 miles to the Battery in New York City, becomes a tidal estuary of the Atlantic Ocean.

The major tributary to the Hudson River in the watershed is the Hoosic River. The headwaters of the Hoosic can be found in the Berkshire Hills of western Massachusetts near the city of Pittsfield. Other significant contributing streams of the Hoosic watershed are the Walloomsac River and the Little Hoosic River, which drain the western slopes of the southern Green Mountains in Vermont and the Taconic Range in New York, respectively.

Additional tributaries include the Batten Kill from the east and Fish Creek from the west. The Batten Kill, an internationally-recognized trout stream, has its headwaters in the Green Mountains of Bennington County, Vermont. Fish Creek is the outlet of Saratoga Lake, the largest lake in the watershed. (Please note, for consistency, the USGS style for the spelling of the Batten Kill will be used throughout this report, except in those cases where a variation is part of the name of an organization, other recognized entity, or landmark.) Figure 1: *The Hudson-Hoosic Watershed* shows the entire watershed within the state of New York.

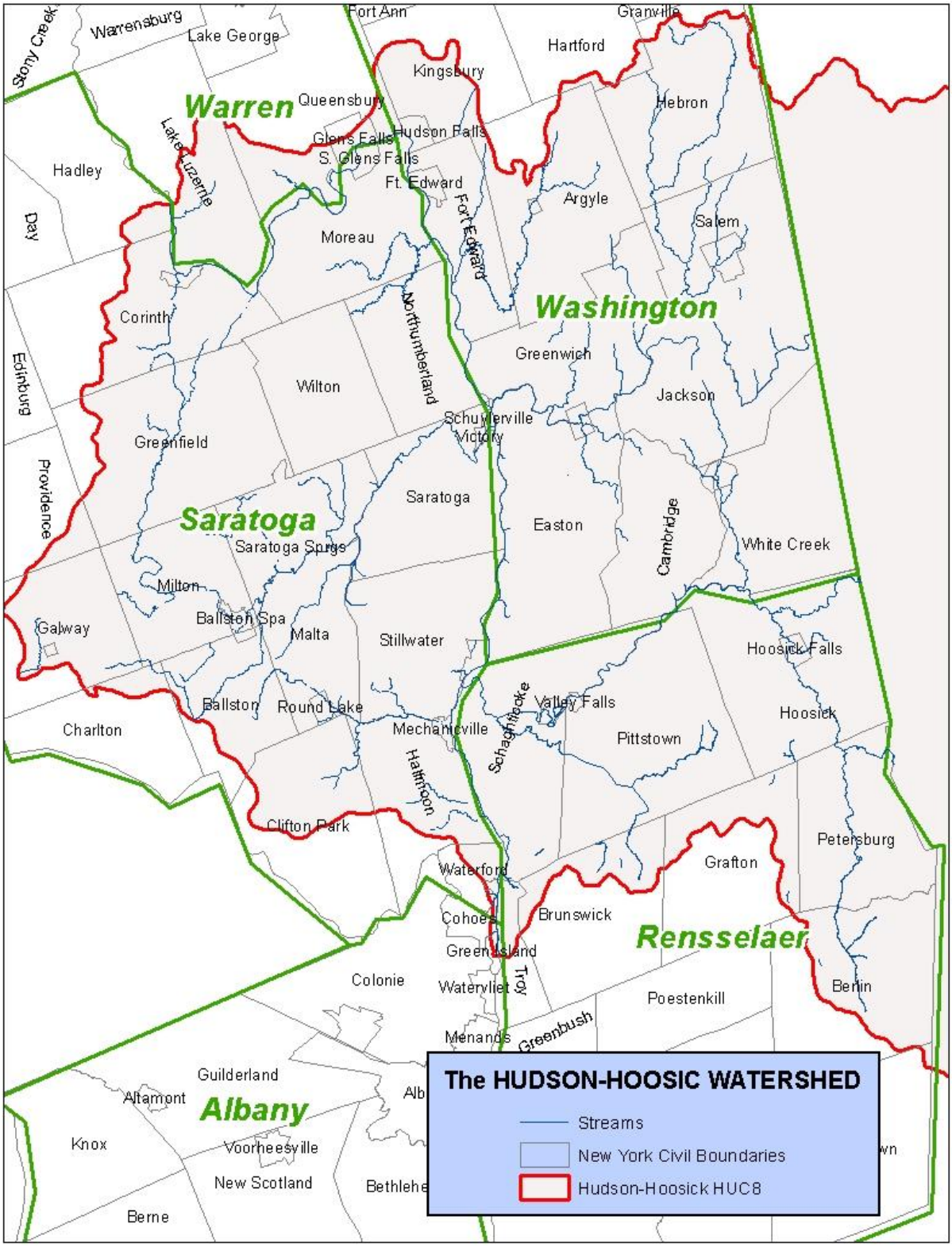

Figure 1: *The Hudson-Hoosic Watershed*

Property Ownership

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

Unlike many watersheds in the United States, the Federal government controls very little of the land within the New York State portion of the basin. Knolls Atomic Power Laboratory – West Milton Site, administered by the Department of Energy and the Saratoga National Historic Park and adjacent Saratoga National Cemetery are managed by the National Park Service and Department of Veterans Affairs, respectively. These two properties are the only large parcels of Federal land in the New York portion of the watershed and together constitute less than 1% of the total acreage in the watershed. Importantly, in Vermont, the U.S. Department of Agriculture, through the U.S. Forest Service, manages Green Mountain National Forest. This area contains many of the headwaters for streams originating on the west facing slopes of the Green Mountains.

At the state level, the NYSDEC owns approximately 70 parcels in the watershed, ranging in size from less than an acre at various locations to over 1700 acres in Mount Tom State Forest in the town of Cambridge. In total, the NYSDEC owns about 17,100 acres in the watershed, which accounts for about 1% of the watershed in New York.

Beyond the state level, using Saratoga County as an example, (whose land use is the most diversified of the five counties within the watershed), the largest landowner, a timber company, owns approximately 8100 acres within the watershed. This is equivalent of well under 1% of the watershed as a whole. Other significant holdings are controlled by development companies, such as the Luther Forest Technology Campus in the towns of Malta and Stillwater, lands managed for various purposes by municipalities and school districts, conservation lands managed by and/or owned by groups such as The Nature Conservancy and Saratoga P.L.A.N., and finally by regional utility and transportation companies such as National Grid and the Canadian Pacific Railway through its subsidiary, Delaware and Hudson Railway. The balance of the watershed is divided among thousands of private individuals, commercial and retail companies, and other property owners. There is no over-arching pattern of property ownership in the basin.

More information on property ownership can be found on each county's Real Property webpage as noted in the table below.

Table 1: *Links to County Real Property Webpages*

County Name	Hyperlink to Real Property Webpage
Albany	http://www.albanycounty.com/departments/clerk/default.asp?id=146
Rensselaer	http://www.rensco.com/departments_taxservices.asp
Saratoga	http://saratoga.sdgnys.com/search.aspx
Warren	http://warrencountyny.gov/rp/search.php
Washington	http://www.co.washington.ny.us/departments/rps/rps1.htm

A map showing the distribution of some of the larger parcels in Saratoga County and their ownership is shown in Figure 2: *Land Ownership in Saratoga County*.

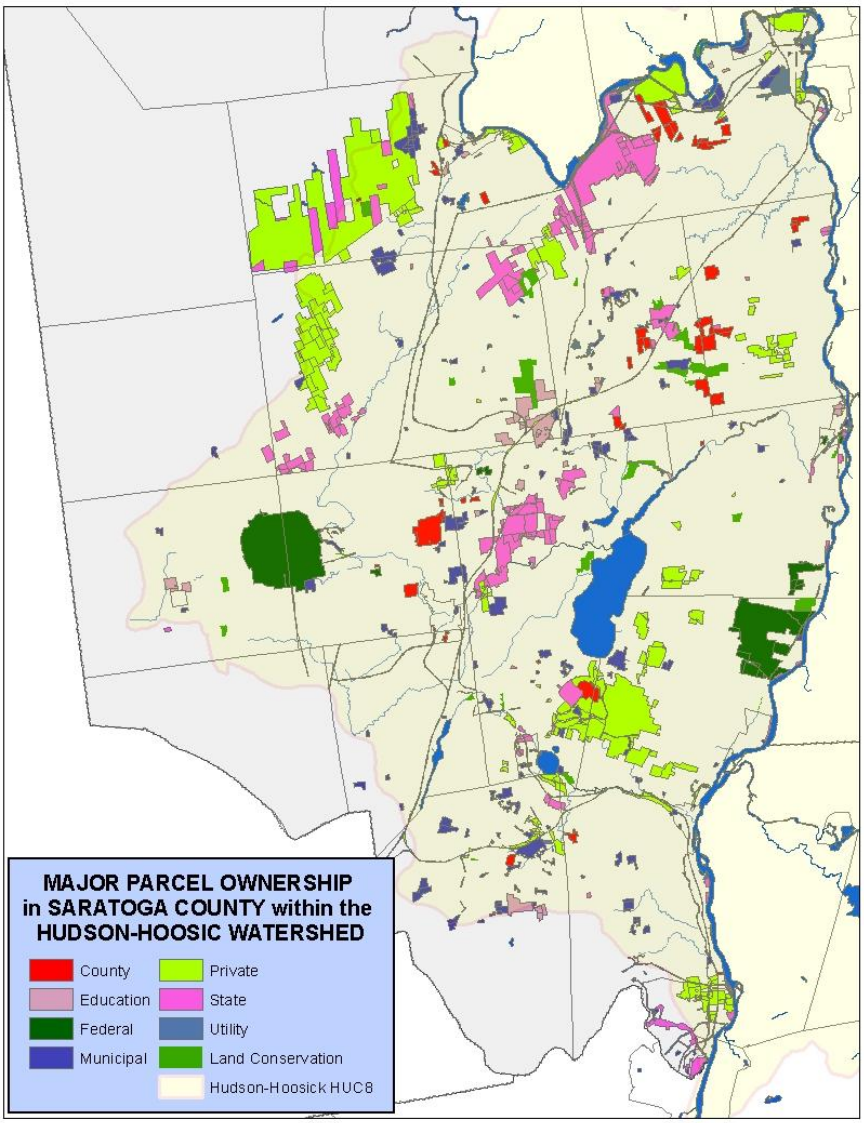

Figure 2: *Land Ownership in Saratoga County*

Demographics

In New York, the watershed covers all or part of over 60 cities, towns, and villages. Troy, Clifton Park, Glens Falls, Queensbury, and Saratoga Springs are the largest jurisdictions fully or partially in the watershed, however, only the city of Saratoga Springs is wholly within the watershed. The Albany, Rensselaer, and Saratoga Counties portion of the watershed fall within the Albany-Schenectady-Troy Metropolitan Statistical Area (which also includes Schenectady and Schoharie Counties), while the Warren and Washington County portions of watershed are part of the Glens Falls Micropolitan Statistical Area. The population of the New York portion of the watershed is approximately 280,000. Total community populations range from approximately 50,000 in the city of Troy (not all within the watershed) to 200 in the village of Galway. As noted earlier, a significant portion of the watershed's population lives in the suburban areas located along the Northway, from the towns of Clifton Park and Halfmoon in the south, to Glens Falls and Queensbury, north of Saratoga Springs. The distribution of population by county in the watershed can be seen in Table 2: *Approximate 2010 Population in the Hudson-Hoosic Watershed*.

Table 2: *Approximate 2010 Population in the Hudson-Hoosic Watershed*

COUNTY	TOTAL COUNTY POPULATION (2010 data)	PERCENT OF COUNTY POPULATION IN HUC 8	2010 ESTIMATED POPULATION IN THE HUDSON-HOOSIC WATERSHED (Based on % in watershed x Total Population)	SQUARE MILES WITHIN HUDSON-HOOSIC WATERSHED
Albany	304,204	0.89	2,700	0.85
Rensselaer	159,429	34.06	54,295	296.56
Saratoga	219,607	78.60	172,619	508.35
Warren	65,707	26.28	17,270	46.93
Washington	63,216	53.38	33,747	432.14
TOTALS	**812,163**		**280,631**	

The communities of the Hudson-Hoosic watershed in New York are generally small with most having well under 10,000 inhabitants. Only five communities in, or partially in, the watershed have more than 20,000 residents: Troy, Clifton Park, Queensbury, Saratoga Springs and Halfmoon. The median age in the watershed is 41.4 years, with around 14.8% of the population over 65 years old. Approximately 4.2% of the population of communities all, or partially, in the watershed, speak a language other than English at home with concentrations of non-English speaking persons being in Troy, Cohoes, Clifton Park, Green Island, and Halfmoon. The dominant languages, other than English, are Spanish and various Asian languages. There are no Federally- or State-recognized tribal areas in the watershed and Native Americans make up about 0.2% of the population.

Approximately 89% of the population holds a high school diploma, and around 28.6% have a college degree. As of 2012, the unemployment rate in Saratoga County was about 7.2% and the median household income in the area is just over $55,000 annually. Residents across the watershed worked primarily in public education and government service, retail trade,

manufacturing, health and social services, and tourism. There was nothing outstanding in the demographics data (such as an extra-ordinarily large elderly; non-English speaking population; or other distinctive demographic minority) to indicate that more than a limited amount of special outreach strategy to certain communities of residents would be necessary for the communities in the Hudson-Hoosic Watershed. Additional outreach considerations are discussed in Section Seven of this report. Complete demographic information can be found in Appendix E: *Demographic Information in the Hudson-Hoosic Watershed*.

Cornell University's Program on Applied Demographics (PAD) has projected population trends for all five New York counties in the watershed. This analysis has determined that during the past 20 years, population growth has been vigorous in the watershed, especially in Saratoga County. It is important to note that while population growth over the next 10 years is projected to increase at a slower rate, the vast majority of the communities in the watershed are currently mapped using flood hazard data that is 25, or more, years old.

Population estimates for each county are shown in Table 3, *Population and Projections 1990-2000 in the Hudson-Hoosic Watershed.*

Table 3: *Population and Projections 1990-2020 in the Hudson-Hoosic Watershed*

County	Population 1990	Population 2000	Population 2010	Population 2020	% Change 1990-2020
Albany	292,594	294,565	304,204	306,069	10%
Rensselaer	154,429	152,538	159,429	161,785	10%
Saratoga	181,276	200,635	219,607	231,815	22%
Warren	59,209	63,303	65,707	66,189	9%
Washington	59,330	61,042	63,216	63,148	9%
TOTALS	**746,838**	**772,083**	**812,163**	**829,006**	**9%**

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

Media in the Hudson-Hoosic Watershed

The entire watershed is served by the Albany-Schenectady-Troy media market, which is the 56th largest in the United States. The area has eight primary television stations, 30 full power FM and 16 AM radio stations. At the northern end of the watershed, five radio stations, (two FM, three AM), are licensed out of Glens Falls. Time Warner Cable News, a 24-hour local news station, is also available in most jurisdictions in the watershed.

The primary newspaper in the watershed is the daily Albany *Times-Union*, which covers the entire region. Other local newspapers include the *Gazette* originating out of Schenectady, the Troy *Record*, the *Saratogian* published in Saratoga Springs, and the *Post-Star*, based in Glens Falls and covering Warren and Washington Counties. All of the papers noted are dailies.

Further information on media outlets in the watershed can be found in Appendix G: *Media in the Hudson-Hoosic Watershed*.

SECTION FOUR SUMMARY OF DATA

During the Discovery portion of the Hudson-Hoosic 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 at the pre-Discovery and Discovery meetings. Table 4: *Data Collection for the Hudson-Hoosic Watershed*, lists the types of data that the project team has identified and/or collected for the study area and their sources. The Summary of Data that follows Table 4 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, such as the FIRM and FIS, and "Other Data" describes information that helped the study team form a better understanding of the watershed and its needs.

Table 4: *Data Collection for the Hudson-Hoosic Watershed*

Data Types	Deliverable/Product	Source
Average Annualized Loss	Discovery Map Geodatabase and Appendix H: *Average annualized Losses in the Hudson-Hoosic Watershed*	FEMA – Region II
Bathymetric Data	Hudson River Bathymetric Data	USEPA/GE
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 Visits	Appendix K: *CAVs in the Hudson-Hoosic Watershed*	FEMA – Community Information System (CIS)
Community Rating System	Community Fact Sheet	FEMA – Community Rating System (CRS)
Community Requested Areas of Interest	Discovery Map Geodatabase	Community interviews
Requested and Completed Mitigation Proposals	Appendix Q: *FEMA Mitigation Grant Proposals*	FEMA – Region II
Contacts	Appendix A: *Pre-Discovery Mailing List,* Appendix C: *Pre-Discovery Meeting Notes*, and Appendix V: *Discovery Meeting Sign-In Sheets*	Community interviews, Community websites, NYSDEC, FEMA, Other various sources
Dams	Discovery Map Geodatabase and Appendix J: *Dams in the Hudson-Hoosic Watershed*	NYSDEC
Declared Disasters	Appendix O: *Known Declared Disasters in the Hudson-Hoosic Watershed*	FEMA
Demographics: Population, Income, Employment, Housing, Etc.	Discovery Report and Data Disc	U.S. Census Bureau
Effective Floodplains:	Discovery Map Geodatabase	FEMA
Future or recent highway improvement, bridge, culvert, levee locations	List of possible locations noted in Discovery Report and Hazard Mitigation Plans	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, Vermont, Massachusetts	Discovery Map Geodatabase	USGS, New York State
Insurance Policies	Appendix P: *NFIP Insurance in the Hudson-Hoosic Watershed*	FEMA – CIS
LiDAR	LiDAR data	Various
Letter of Map Change (LOMCs)	Appendix S: *Total Number of LOMCs by Community,* Discovery Map Geodatabase, and Discovery Report	FEMA
Mitigation Plans Status	List of Links to County Websites	NYSDEC through NYS Office of Emergency Management
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
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 U: *Repetitive Losses in the Hudson-Hoosic Watershed*	FEMA – CIS
State Pollutant Discharge Elimination Systems	Discovery Map Geodatabase	NYSDEC
Stream Gages	Appendix I: USGS Gages in the Hudson-Hoosic Watershed	USGS
Study Needs: FEMA	Discovery Map Geodatabase and Appendix N: *CNMS Classifications of Stream Segments in the Hudson-Hoosic 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

Data That Can Be Used for Risk MAP Products

Hudson River Bathymetric/Structure Data Sources

FEMA has endeavored to locate sources of existing channel geometry and hydraulic structure data for the Hudson River and then evaluate its suitability for use in constructing flow models that will support the development of flood hazard information for the Hudson River within the Hudson-Hoosic watershed. Locating existing field data and evaluating its usability is done as a matter of course for all FEMA mapping projects and is an effective strategy that offers a substantial opportunity for savings in resources.

FEMA's team has located a source of bathymetric data that covers much of the Hudson River within the watershed. This data has been determined to be suitable for use in development of flood hazard information. The data is an outgrowth of a project conducted by the U.S. Environmental Protection Agency (USEPA) and General Electric (GE) and covers about 41 miles of the river between the Federal Dam at Troy in the south and the Fort Edward Dam located in the village of the same name at its northern extent.

Given the size of Hudson River, traditional field survey could potentially be very expensive. Instead, the use of bathymetric data could completely eliminate the need of surveying channel sections. Unlike traditional field survey, bathymetric data provides almost full spatial coverage of channel portions of the floodplains, whereas field survey sections are generally collected at a frequency of 1 per 2500 feet for a typical large river such as the Hudson. Another advantage of using bathymetric data is that it provides modeler flexibility to place model cross sections at all crucial locations and avoid geometry interpolations.

The bathymetry data provided by EPA/GE is sufficiently accurate to develop below water cross sections for flood insurance studies and has been recommended for use in a future Hudson River hydraulic analysis.

FEMA is currently coordinating with the NYS Canal Corporation, NYSDOT, and U.S. Army Corps of Engineers (USACE) to obtain "as built" plans for the structures currently identified within the study reach of the Hudson River floodplain. The final number of structures that will require survey will be determined depending upon the suitability of the data that is received.

Average Annualized Loss Data

Average Annualized Loss (AAL) data is used to demonstrate the 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. Dollar losses 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 5: *Hazus AAL Data for the Hudson-Hoosic Watershed*. AAL data summarized at the census block level can be found in the geodatabase files.

Table 5: *Hazus AAL Data for the Hudson-Hoosic Watershed*

FIPS Code	County	Total in Dollars	Building in Dollars	Contents in Dollars	Business Disruption
36001	Albany	$363,000	$213,000	$149,000	$1,000
36083	Rensselaer	$5,808,000	$2,383,000	$3,123,000	$302,000
36091	Saratoga	$12,640,000	$5,499,000	$6,745,000	$396,000
36113	Warren	$0	$0	$0	$0
36115	Washington	$3,314,000	$1,442,000	$1,747,000	$125,000

In addition, Figure 3, *Average Annualized Losses for the Hudson-Hoosic Watershed by Census Block,* illustrates the distribution of AAL results.

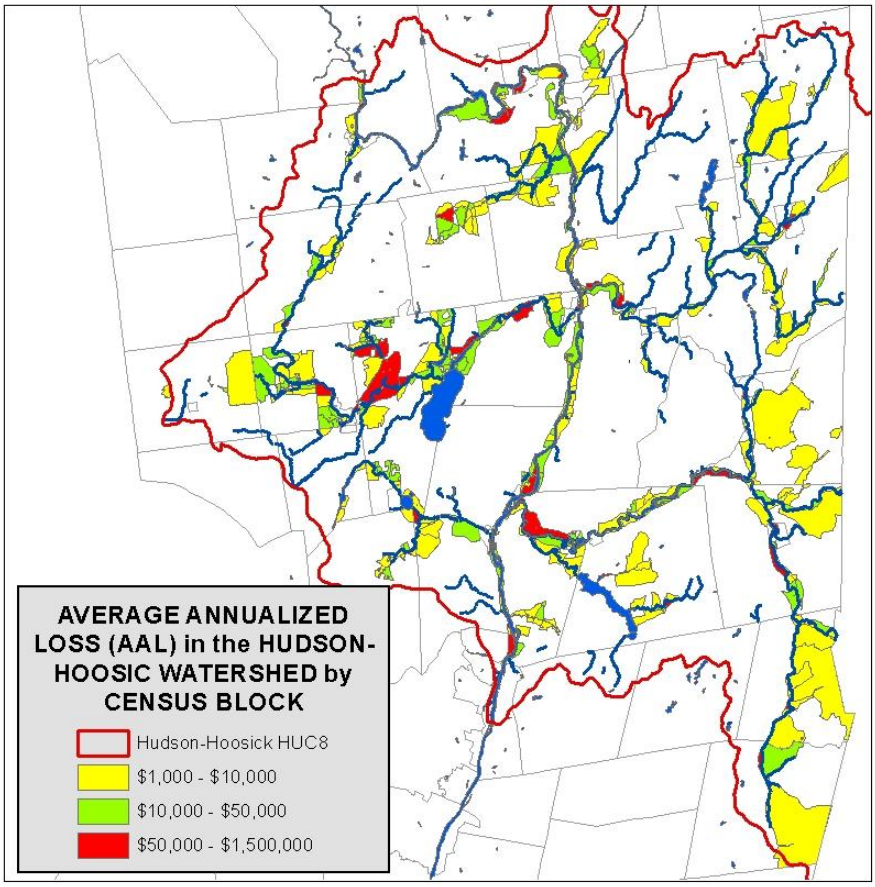

Figure 3: *Average Annualized Losses for the Hudson-Hoosic Watershed by Census Block*

Within the watershed, there were no reported losses for Warren County. As would be expected, the majority of census blocks suffering losses are located on or near the major streams of the watershed including the Hudson and Hoosic Rivers; however other blocks of larger losses also occur on Kayaderosseras and Geyser Creeks in, and around, the city of Saratoga Springs and the town of Milton. These "hot spots" of loss may simply be caused by the higher population

density in those areas. Table 6, *Top 15 AAL Areas by Census Block*, lists the top 15 census tracts with the highest total dollar amount of losses.

Table 6: *Top 15 AAL Areas by Census Block*

Census Block	Jurisdiction	County Name	Flooding Source	Total Losses
360830403003007	Troy	Rensselaer	Hudson River	$1,407,000.00
360830517012050	Hoosick	Rensselaer	Hoosic River	$1,222,000.00
360910620001000	Stillwater (T)	Saratoga	Hudson River	$1,159,000.00
360910601021000	Moreau	Saratoga	Hudson River	$1,152,000.00
360910621001000	Stillwater (V)	Saratoga	Hudson River	$688,000.00
360910625022005	Clifton Park	Saratoga	Dwaas Kill	$486,000.00
361150890002063	Greenwich (V)	Washington	Batten Kill	$379,000.00
360830517023012	Hoosick Falls	Rensselaer	Hoosic River	$369,000.00
360010127001000	Cohoes	Albany	Hudson River	$344,000.00
360910613012019	Saratoga Springs	Saratoga	Kayaderosseras Creek	$325,000.00
360830401004000	Troy	Rensselaer	Hudson River	$269,000.00
360830402001006	Troy	Rensselaer	Hudson River	$268,000.00
360910609021042	Schuylerville	Saratoga	Hudson River/Fish Creek	$257,000.00
360910627001015	Waterford (T)	Saratoga	Hudson River	$239,000.00
360910613022027	Saratoga Springs	Saratoga	Rowland Hollow Creek	$216,000.00

A review of the top 15 census blocks does not show a particular pattern of losses concentrated in any one area or jurisdiction. Even along the Hudson River, for those blocks noted in the top 15, the blocks in Troy and Moreau are separated by nearly 50 river miles. A complete table of all census blocks within the watershed with reported AAL can be found in Appendix H: *Average Annualized Losses in the Hudson-Hoosic Watershed*.

Stream Gages in the Hudson-Hoosic Watershed

There are 26 known current and past gages in the watershed and 12 are currently active and being monitored by the USGS and the NYSDEC.

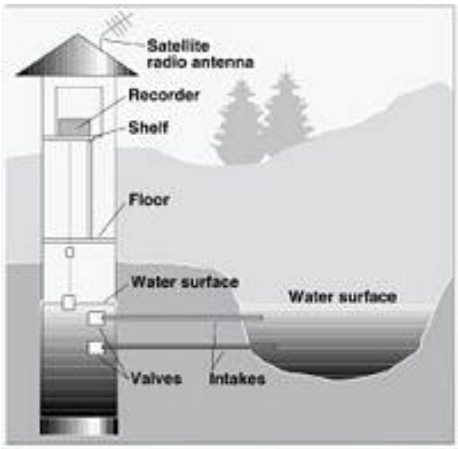

Figure 4: *Typical Modern USGS Stream Gage*

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 measure the flow of the water accurately enough directly.

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. Figure 4: *Typical Modern USGS Stream Gage* illustrates the design of a river gaging station.

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 between 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 the USGS's factsheet on stream gaging at http://pubs.usgs.gov/fs/2005/3131/.

In the Hudson-Hoosic watershed, the active gages offer upwards of 105 years worth of data for a single location with the median number of years being 81 and the average years of data, 82. While 14 of the historic gages in the watershed are no longer active, together the inactive gages provide over 400 water-year's worth of data for the watershed.

Table 7, *USGS Gages in the Hudson-Hoosic Watershed*, shows the gage identification number, location, drainage area, status, and county for all USGS gages indentified in the Hudson-Hoosic watershed. Past and active gage locations are also illustrated in Figure 5: *Location of Gages in the Hudson-Hoosic Watershed*. A more comprehensive table for gages in the watershed may be found in Appendix I: *USGS Gages in the Hudson-Hoosic Watershed*. Historical stream flow information from the USGS gages listed in Table 7 will be employed for use in hydrological analysis where it is determined to be applicable. Additional information on gages in the watershed may be found by visiting the USGS's website at http://waterdata.usgs.gov/nwis/rt.

Table 7: *USGS Stream Gages in the Hudson-Hoosic Watershed*

Site Number	Gage Location	Drainage Area (Sq. Miles)	Gage Status	County	State
1318500	HUDSON RIVER AT HADLEY	1664.00	Active	Saratoga	NY
1325000	SACANDAGA RIVER AT STEWARTS BRIDGE NR HADLEY	1055.00	Active	Saratoga	NY
1326500	HUDSON RIVER AT SPIER FALLS	2779.00	No Longer Active	Warren	NY
1327000	GLENS FALLS FEEDER AT GLENS FALLS	Unknown	No Longer Active	Warren	NY
1327500	GLENS FALLS FEEDER AT DUNHAM BASIN	Unknown	No Longer Active	Washington	NY
1327750	HUDSON RIVER AT FORT EDWARD	2810.00	Active	Washington	NY
1328000	BOND CREEK AT DUNHAM BASIN	14.10	No Longer Active	Washington	NY
1329000	BATTEN KILL AT ARLINGTON	152.00	No Longer Active	Bennington	VT
1329490	BATTEN KILL BELOW MILL AT BATTENVILLE	395.90	Active	Washington	NY
1329500	BATTEN KILL AT BATTENVILLE	396.50	No Longer Active	Washington	NY
1329650	HUDSON RIVER AT SCHUYLERVILLE	3440.00	No Longer Active	Saratoga	NY
1330000	GLOWEGEE CREEK AT WEST MILTON	26.00	Active	Saratoga	NY
1330500	KAYADEROSSERAS CREEK NR WEST MILTON	84.20	No Longer Active	Saratoga	NY
1331095	HUDSON RIVER AT STILLWATER	3773.00	No Longer Active	Rensselaer	NY
1331400	DRY BROOK NEAR ADAMS	7.67	No Longer Active	Berkshire	MA
1331500	HOOSIC RIVER AT ADAMS	46.70	Active	Berkshire	MA
1332000	NORTH BRANCH HOOSIC RIVER AT NORTH ADAMS	40.90	No Longer Active	Berkshire	MA
1332500	HOOSIC RIVER NEAR WILLIAMSTOWN	126.00	Active	Berkshire	MA
1333000	GREEN RIVER AT WILLIAMSTOWN	42.60	Active	Berkshire	MA
1333500	LITTLE HOOSIC RIVER AT PETERSBURG	56.10	No Longer Active	Rensselaer	NY
1334000	WALLOOMSAC RIVER NEAR NORTH BENNINGTON	111.00	Active	Bennington	VT
1334500	HOOSIC RIVER NEAR EAGLE BRIDGE	510.00	Active	Rensselaer	NY
1335000	HOOSIC RIVER AT BUSKIRK	577.00	No Longer Active	Rensselaer	NY
1335500	HUDSON RIVER AT MECHANICVILLE	4500.00	No Longer Active	Saratoga	NY
1335754	HUDSON R ABOVE LOCK 1 NR WATERFORD	4605.00	Active	Saratoga	NY
1358000	HUDSON RIVER AT GREEN ISLAND	8090.00	Active	Albany	NY

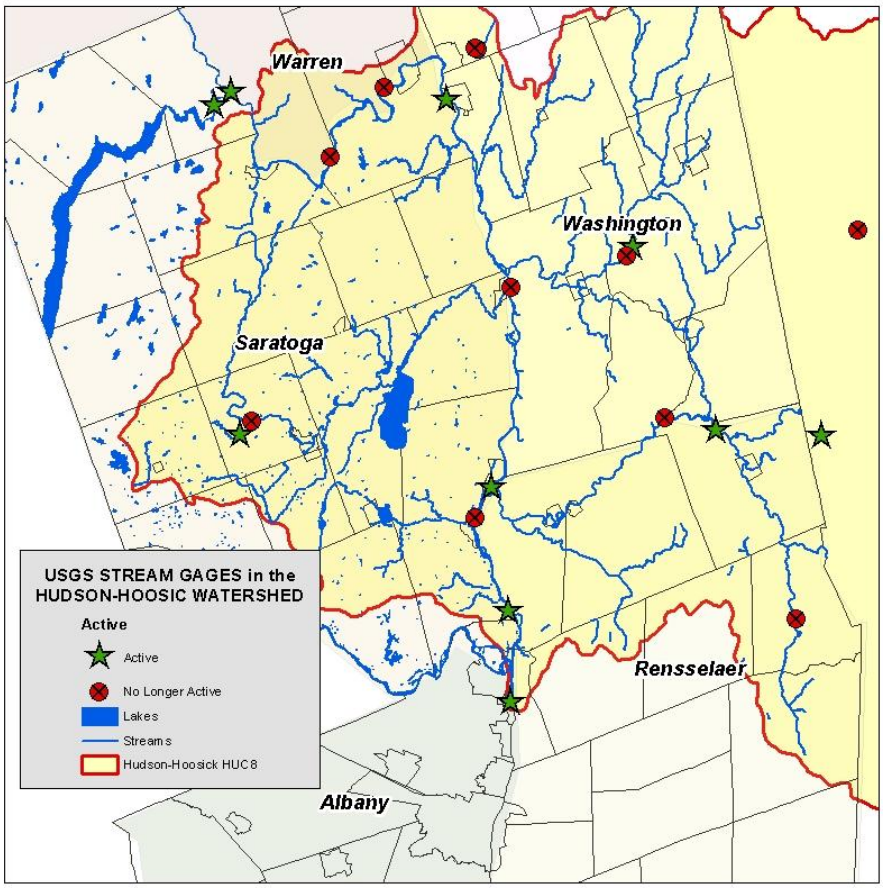

Figure 5: *Location of USGS Stream Gages in the Hudson-Hoosic Watershed*

Rain Gages in the Hudson-Hoosic 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 five counties of the Hudson-Hoosic watershed, 18 locations are currently active. 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.

Recognized 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 current and preliminary FIRMs and the USACE's National Levee Database finds that only one levee is shown as providing protection within the New York portion of the watershed. This levee is located in the village of Hoosick Falls. The levee, which is operated and maintained by New York State, is located on the right bank (or on the FIRM, east bank) of the Hoosic River and is shown to provide protection for a distance of one-half mile along the river in the village. The location of this levee, as illustrated on the current effective FIRM, dated February 4, 2005 is shown in Figure 6: *Location of Hoosick Falls Levee as shown on Current Effective FIRM.* More information on this levee is available on the USACE National Levee Database site.

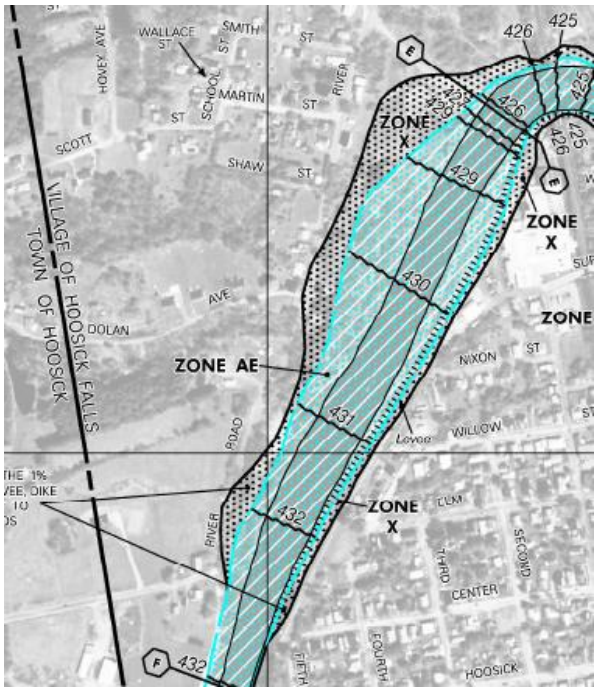

Figure 6: *Location of Hoosick Falls Levee as shown on Current Effective FIRM.*

According to the USACE's report on this levee, it was constructed in 1952 and is rated as "Minimally Acceptable". "Minimally Acceptable", as defined by the USACE, means that one or more inspection items are rated as Minimally Acceptable or one or more items are rated as Unacceptable and an engineering determination concludes that the Unacceptable inspection items would not prevent the [levee] from performing as intended during the next flood event.

A NYSDEC information sheet titled, *Hoosick Falls Flood Damage Reduction Project*, which can be found as Attachment 1 to this report, notes that the levee and its attendant structures were "designed to provide protection for the village of Hoosick Falls against floods up to and approximately equal to the largest discharge of record on the Hoosic River which occurred on December 31, 1948 and was estimated at 35,000 cubic feet per second (cfs)". However, the USACE's National Levee Database website rates the design flow of the levee at 28,000 cfs. Further investigation into the Hoosick Falls levee may be warranted to determine its worthiness during the 1-percent-annual chance event.

Uncertified/Unverified Levees

During the pre-Discovery meeting, a farm levee along the Batten Kill near the village of Greenwich was discussed by community officials. The levee is described as being about six to eight feet high and approximately 500 feet long. It was noted that this levee had breached at one location. No further information was available about this structure.

In the town of Greenwich, a property-owner on Hill Street Extension place berms and fill along the Batten Kill. Reportedly, the USACE and NYSDEC have been made aware of this structure.

Brunswick officials recalled that a berm has been constructed adjacent to NYS Route 2 near its intersection with NYS Route 77. The exact location of this structure has not been verified.

Washington County officials reported a farmer's berm in the village of Salem at the end of Park Place on White Creek. The county stated that this berm was built about a decade ago and was subsequently moved back away from the creek by approximately 50 feet several years ago resulting in a wider floodway.

In the town of Salem, a former railroad right of way built on a berm remains in place south of the village. This berm continues to impact the SFHA of White Creek and may actually increase the severity of flooding in the area.

Please note that while other levees or floodwalls may exist within the watershed they have not been identified and are not shown on any FIRM as providing protection from the 1-percent-annual-chance flood. In addition, FEMA is currently examining revised levee modeling procedures to ensure that the methods used are technically sound, credible, and cost effective. In the near future, these modeling procedures are expected to be implemented by FEMA nationwide, to supplement and/or replace FEMA's current method. The new procedures are expected to portray a more accurate flood risk analysis landward of levees and floodwalls, and to appropriately consider these structures within the analysis and may impact the Special Flood Hazard Area (SFHA) shown on revised FIRM panels.

A fact sheet explaining FEMA's role in levees, *Levee Certification vs. Accreditation*, is available on-line or can be found in Attachment 2 to this report.

Dams

According to the NYSDEC's Dam Safety Section's dam inventory, the Hudson-Hoosic watershed contains 168 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. Out of the 168 dams within the Hudson-Hoosic watershed, 30 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 on the Figure 7: *Dams in Hudson-Hoosic Watershed*.

The NYSDEC classifies dams in the state using the following criteria:

> 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 has failed or otherwise no longer materially impounds waters, or the dam was planned but never constructed at this location. Class D dams are considered to be defunct dams posing negligible or not hazard.

Class 0-Unclassified Hazard Potential: Hazard code has not yet been assigned.

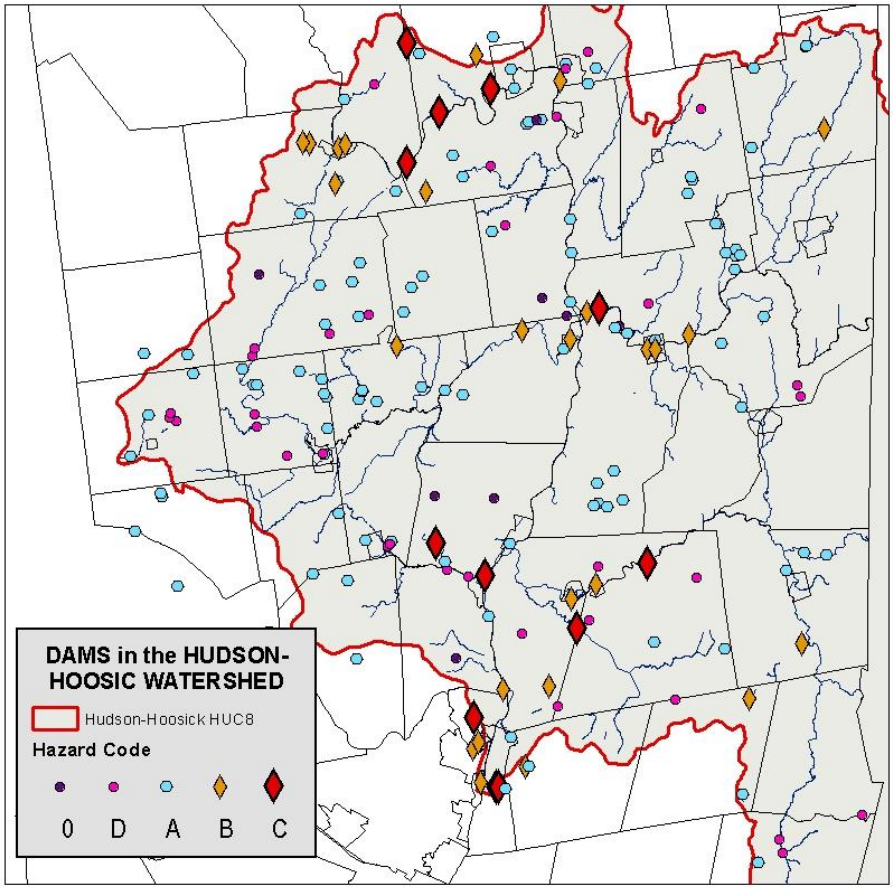

Figure 7: *Dams in Hudson-Hoosic Watershed*

As seen in Figure 7, the majority of dams rated as Class C are located on the Hudson, Hoosic, Batten Kill, and Tomhannock, with others located on smaller streams in the watershed. A complete list of the identified dams in the watershed can be found in Appendix J: *Dams in the Hudson-Hoosic Watershed*.

Existing LiDAR Coverage in the Hudson-Hoosic Watershed

As shown in Figure 8, *Existing LiDAR Coverage in the Hudson-Hoosic Watershed*, the entire watershed in New York State has LiDAR data. The majority of the basin in New York (outlined in red in Figure 8) was flown as part of the Hudson-Hoosic-Deerfield project in 2012. The remainder, covering northern Rensselaer County with coverage of its three northernmost towns, Hoosick, Pittstown, and Schaghticoke and the villages contained within those towns was part of the Rensselaer Hoosic River project of 2010 (shown in pink in Figure 8). While additional LiDAR data covering the Hudson-Hoosic watershed may have been flown for various non-flood mapping reasons, its location, availability, and usefulness is unknown at this time. In addition, any available LiDAR data used in the creation of a FIRM must be available for use by local communities.

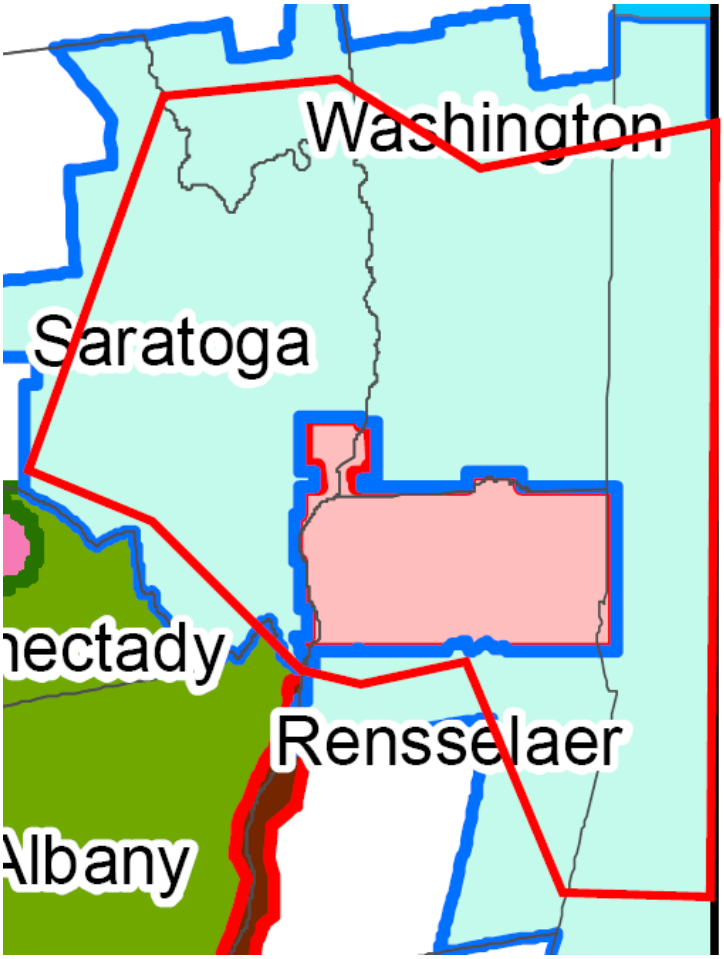

Figure 8: *Existing LiDAR Coverage in the Hudson-Hoosic Watershed*

In addition, the city of Troy has aerial photogrammetry with two foot contours for the city dated 2010-2011. This work was completed by CDM Engineering and H2H Survey Consultants.

Other Data and Information

Biennial Report

Every two years FEMA collects data from communities participating in the NFIP through the Biennial Report process. This provides communities an opportunity to identify floodplain mapping needs and request assistance in implementing a floodplain management program. The Biennial Report provides 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 shows FEMA nationwide trends and patterns, which FEMA uses to help guide improvements to the NFIP. A FEMA fact sheet explaining the Biennial Report can be found at FEMA's webpage on the topic or by referring to Attachment 3 of 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 a 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 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 were extracted from FEMA's Community Information System.

A review of CAVs conducted within the Hudson-Hoosic watershed from 1992-2012 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 K: *CAVs in Hudson-Hoosic Watershed, 1992-2012*, for a list of CAVs in the last 20 years and the findings of the visits.

Community Assistance Contacts (CACs)

Community Assistance Contacts (CACs) in the watershed have been more sporadic during the last 20 years. CACs are a tool employed by the state of New York and the NFIP to periodically contact a community to see if they are having any difficulties in administering the local floodplain management ordinance or program. A CAC is an additional way of determining if a CAV should be scheduled. CACs are also a means of encouraging Code Enforcement Officers (CEOs) to attend annual floodplain management workshops. CACs can serve to support local officials when they need help effective administrating the NFIP in their community. For a list of known CACs in the watershed, please see Appendix L: *CACs in the Hudson-Hoosic Watershed, 1991-2012*.

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% to 45% to reflect the reduced flood risk resulting from the 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.

At this time, none of the communities within the Hudson-Hoosic watershed participate in the CRS program. Communities interested in learning more about the CRS program may visit FEMA's CRS website. Additional information on the CRS program can be found in Attachment 4 - *Joining the CRS Program.*

Land Use Management Plans

A Land Use Management plan is a land use document providing framework and policy direction for land use decisions. Land Use Management plans usually include chapters detailing policy direction affecting land use, transportation, housing capital facilities, utilities, and rural areas. Land Use Management 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 resilience.

While many of the communities in the watershed do not have Land Use Management plans, links to those communities that have developed plans have been compiled in Appendix M: *Land Use Management Plan Links*. In New York, the state's Department of State (NYSDOS) is responsible for assisting communities interested in developing or updating a Land Use Management Plan. Interested jurisdictions should contact the NYSDOS.

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 (NFIP) 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 manner.

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 (or geographic information system (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 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 "invalid". Not all elements 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 "Invalid".

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 (HWMs)?

Regression Equation: Are new regression equations available?

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 streams 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 at or by reviewing Attachment 5 - *Coordinated Needs Management Strategy* in the digital version 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 Hudson-Hoosic watershed shows that the only stream reaches that meet the "Valid" classification, as outlined above, are several segments of the Hudson River, Hoosic River, and a few Hoosic tributaries in northern Rensselaer County. Another smaller group in the village of Cambridge has also been identified as "valid". These concentrations of valid stream reaches can be attributed to the relatively recent (January 2008) publication of the FIRM for the village of Cambridge and the ongoing development of the partial countywide FIRM involving the three northern towns of Rensselaer County.

Figure 9: *CNMS Classification of Stream Segments in the Hudson-Hoosic Watershed* illustrates the status of stream reaches in the watershed.

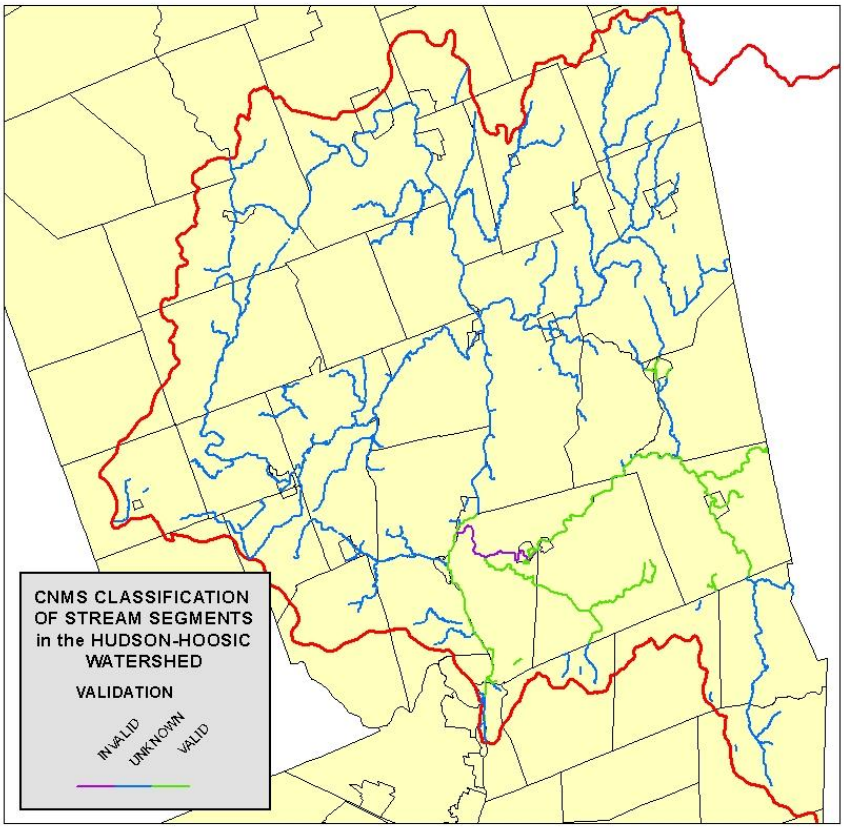

Figure 9: *CNMS Classification of Stream Segments in the Hudson-Hoosic Watershed*

Table 8: *Valid Stream Segments in the Hudson-Hoosic Watershed (as of June 2012)*, offers an overview of those stream segments in the basin that are classified as "Valid". A complete list of

stream segments in the watershed with additional details can be found in Appendix N: *CNMS Classifications of Stream Segments in the Hudson-Hoosic Watershed (as of June 2012).*

Table 8: *Valid Stream Segments in the Hudson-Hoosic Watershed (as of June 2012)*

Stream Name	Reach ID	Jurisdiction(s)	SFHA Zone	Segment Length	Source
Cambridge Creek	361150100003	Cambridge (V)	AE	0.833	DFIRM
Electric Lake	360830100642	Schaghticoke (T), Schaghticoke (V)	A	1.630	DFIRM Prelim
Fogarty Road Tributary	360830100644	Schaghticoke (T)	A	0.616	DFIRM Prelim
Fox Hollow	360830100639	Hoosick	A	1.672	DFIRM Prelim
Fox Hollow Tributary	360830100640	Hoosick	A	0.143	DFIRM Prelim
Fox Hollow Tributary	360830100641	Hoosick	A	0.532	DFIRM Prelim
Hoosic River	360830100250	Hoosick	A	5.476	NHD-High
Hoosic River	360830100637	Cambridge (T), Hoosick, Hoosick Falls, Pittstown, Schaghticoke (T), Valley Falls, White Creek	AE	19.756	NHD-High
Hoosic River Pool	360830100643	Schaghticoke (T)	A	1.052	DFIRM Prelim
Hudson River	360830100035	Halfmoon, Mechanicville, Schaghticoke (T), Stillwater (T), Stillwater (V), Waterford (T)	AE	13.000	NHD-High
Hudson River	360830100632	Cohoes, Green Island, Troy, Waterford (V)	AE	7.763	NHD-High
Lansingburgh Reservoir Outlet	360830100645	Schaghticoke (T)	A	0.593	DFIRM Prelim
Lansingburgh Reservoir Outlet Tributary	360830100646	Schaghticoke (T)	A	0.253	DFIRM Prelim
Owl Kill	361150100002	Cambridge (V)	AE	1.666	DFIRM
Sunkauissia Creek	360830100073	Pittstown	A	6.716	NHD-High
Tomhannock Creek	360830100554	Schaghticoke (T)	A	4.474	NHD-High
Tomhannock Creek	360830100613	Schaghticoke (T)	AE	1.733	NHD-High
Tomhannock Creek	360830100635	Pittstown	A	0.998	NHD-High
Tomhannock Reservoir	360830100636	Pittstown	AE	5.768	NHD-High
Unnamed Tributary to Sunkauissia Creek	360830100333	Pittstown	A	2.791	NHD-High
Walloomsac River	360830100391	Hoosick	A	7.196	NHD-High
White Creek	361150100589	Cambridge (T), Cambridge (V)	AE	0.660	DFIRM
Woods Brook	360830100638	Hoosick, Hoosick Falls	AE	3.133	DFIRM Prelim

Declared and Natural Disasters in the Hudson-Hoosic Watershed

Like much of the eastern United States, one of the most frequent, wide-spread, and damaging natural disasters affecting the watershed is flooding from rainfall events; especially tropical systems tracking inland from the Atlantic Seaboard. With full records beginning in the 1950s, the watershed has repeatedly been subject to flooding from tropical storms, hurricanes, and other non-cyclonic events, most recently Hurricane Irene, which struck the area in August 2011.

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 O: *Known Declared Disasters in the Hudson-Hoosic Watershed*.

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 664 policies in force in the city of Troy to none in a few of the smaller villages within the watershed. About half of the jurisdictions in the watershed have ten or less policies in place. Because the village of Galway does not participate in the NFIP, Federally-backed flood insurance is not available in the community.

Total structural and contents coverage for properties in the communities at least partially within the watershed exceeds 388 million dollars, with coverage in the city of Troy about 98 million dollars, constituting approximately 25% of the total insurance coverage within the watershed. With about 91 million dollars in coverage, Waterford (both town and village), Green Island, and Queensbury round out the top five communities in flood insurance coverage. These five communities total about 48 % of the flood insurance total for communities in the watershed. Please see Appendix P: *NFIP Insurance in Hudson-Hoosic Watershed*, for more detailed information regarding coverage for each jurisdiction.

High Water Marks

A limited number of verified High Water Mark (HWM) data were available from the USGS or USACE prior to the Discovery Meeting. Some HWMs for the Hoosic River were obtained by the NYSDEC and their locations are shown on Figure 10: *High Water Marks on the Hoosic River*. During the pre-Discovery and Discovery meetings, communities were asked about additional known HWMs. None of the HWMs or other documentary evidence noted below has been accurately verified in the field, but they may serve as a "starting point" for future investigation of local flooding hazards.

During the scoping meeting in the spring of 2012, Rensselaer County noted that there may be a recorded high water mark on the Buskirk Firehouse caused by flooding from the adjacent Hoosic River.

The city of Troy noted several locations where HWMs had been recorded: The former City Hall site at 1 Monument Square and the State Street parking garage in downtown Troy, the east abutment of the Green Island Bridge over the Hudson River, and the boat launch near the corner of 123rd Street and First Avenue in the Lansingburgh section of north Troy.

Town of Brunswick has photos of the Quackenkill area following Hurricane Irene.

The town of Grafton stated that three quarters of the bridges over the Quackenkill were destroyed during the recent floods. While the town did not collect HWM information, Tom Withcuskey, Brunswick CEO, may have some information on HWMs in the town.

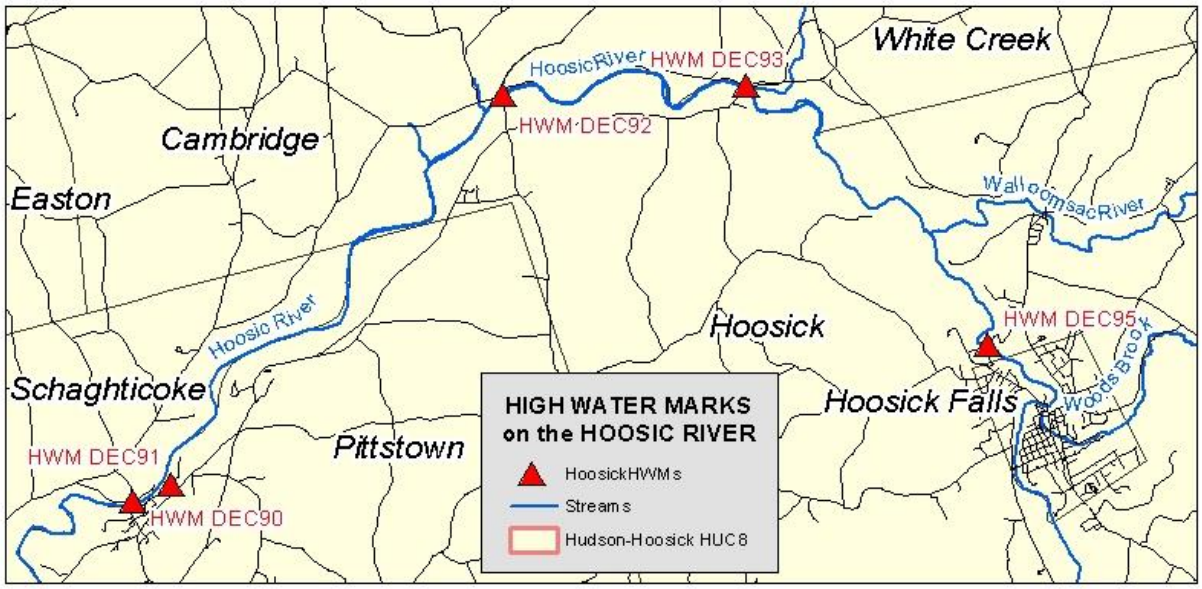

Figure 10: *High Water Marks on the Hoosic River*

The town of Cambridge explained that a HWM exists on the Eagleville bridge in the town of Jackson.

In Hoosick, the town reported during the pre-Discovery meeting held in the spring that there may be HWMs for the Hoosic River at wastewater treatment plant and in the hamlets of Eagle Bridge and Buskirk. The meeting notes verify that these HWMs several of the group shown above as part of the NYSDEC's Hoosic River effort.

The Pittstown's supervisor may have photos of HWMs within the town. In addition, a local farmer, Don Scott has HWMs on his property.

Several HWMs have been identified on private property in the town of Schaghticoke. Please see Appendix D: *Hudson-Hoosic Pre-Discovery Meetings Memo*, for more information.

In Queensbury, the Director of Building and Codes may have information on HWMs.

The Saratoga Springs Public Works Department may have information on HWMs within the city.

The village of Schuylerville may have information on a HWM on the Old Champlain Canal. The village building inspector can be contacted for more information.

The village of Waterford's Visitor Center has a HWM noting the elevation of the flood as a result of Irene and from the 2006 flood. In addition, two HWMs exist on the Second Street

bridge, the USGS has a marker in Knickerbocker Park, and one can be found on a Parker Lane house.

There are some homes along the Batten Kill on Academy Street in the town of Greenwich that have high water marks.

The town of Hartford noted that Washington County collected some HWMs within the town in the aftermath of Hurricane Irene.

Recent and Proposed Construction within the SFHA

The following larger projects were noted during the two rounds of meetings held with the communities of the Hudson-Hoosic watershed during 2012. The projects are listed by flooding source, list the jurisdiction of the project when known, and *may* impact the SFHA:

Anthony Kill	Central Avenue, Francis Street, and Main Street bridges to be replaced (Mechanicville)
Gordon Creek	Retaining wall rebuilt using FEMA funds, Ballston Spa
Hartshorn Creek	CR 52 bridge replaced (Greenwich (T))
Hoosic River:	New bridge on NYS Route 7 at NYS Route 22 (Hoosick)
	Proposed bridge on NYS Route 40 (Schaghticoke (V))
	New bridge on Sandbank Road, *(community not identified)*
	New bridge on County Road 111 at Johnsonville (Pittstown)
Little Hoosic River:	Proposed bridges on Elm Street (Berlin)
Hudson River	US Route 4 is being reconstructed (Hudson Falls)
Hudson River - Unnamed Tributary	400 feet of riprap placed along stream near Paul Court (Schaghticoke (T))
Kayaderosseras Creek	New bridge on Ralph Street (Ballston Spa)
New York State Barge (Erie) Canal	Ninth Street bridge rehabilitated in 2006, Waterford Visitor's Center, promenade, and boat launch (Waterford (V))
Old Champlain Canal	Division Street bridge rehabilitated in early 1990s (Waterford (V))
	Broad Street bridge rehabilitated in 1980s (Waterford (V))
Poesten Kill:	Spring Avenue bridge (Troy)
	Dater Mill Road (Brunswick)
Powamppokonk Creek:	New bridge on County Road 114 (Schaghticoke (T))
Saratoga Lake	Union Avenue (NYS Route 9P) bridge replaced (Saratoga Springs)

In addition, several dozen culvert replacement project and other smaller road projects have been completed in the watershed. However, due to the large number of locations, they are not listed here. Please refer to Appendix D for additional information on other projects.

Historic Flooding in the Hudson-Hoosic Watershed

Throughout the recorded 400 year history of the Hudson River and its tributaries, flooding has been a constant threat. As noted above in the Natural Disasters portion of this report, flooding in the watershed is often the result of tropical systems moving inland from the Atlantic coast.

In addition, because the Hudson-Hoosic watershed is located between two major mountain complexes, it is affected by additional factors beyond the threat of generalized regional rainfall. The eastern boundary of the watershed is formed by the westward-facing slopes of the Green Mountains of Vermont. The Greens rise from a general elevation of less than 500 above sea level in the Hudson Valley, to peaks of 3000 to 4000 feet, enabling the capture of a great deal of upward sweeping moisture emanating from storms tracking from the southwest. Rainfall and snowmelt from these slopes will flow into the tributaries of the Batten Kill and Hoosic River and then into the Hudson River.

To the northwest of the watershed lie the Adirondack Mountains. Like the Green Mountains, the height of the Adirondacks often serve to squeeze out copious amounts of rain and snow from storm systems flowing up from the midsection of the United States. While there are few streams in the watershed that flow directly from the Adirondack foothills into the Hudson, the impact of large rainfall events or swift snowpack melts directly impact the Hudson-Hoosic watershed as the Upper Hudson watershed is only partially regulated and distributes its entire flow immediately into the Hudson-Hoosic watershed at the town of Lake Luzerne.

Among the flood control structures contributing to some regulation of the Hudson is the Conklingville Dam in the town of Hadley, Saratoga County. Although located outside of the Hudson-Hoosic watershed, the dam, which impounds the Great Sacandaga Lake (formerly the Sacandaga Reservoir), is one of the few dams in the region specifically built of the purpose of flood control. Completed in 1930, the dam and the storage that the lake provide has reduced the threat of flooding from the Hudson River in the Hudson-Hoosic watershed by regulating the flow of water from a large portion of the basin of the Upper Hudson watershed in the Sacandaga River valley. However, as noted below, even the large storage capacity of the lake cannot eliminate all flooding, and several large floods have occurred on the Hudson River since its completion over 80 years ago.

The following list compiled by NOAA provides an overview of many of the flooding events that have occurred in the Hudson-Hoosic watershed and nearby areas. The broader list for all major flooding events in eastern New York and adjacent western New England can be found at http://www.erh.noaa.gov/aly/Past/Major_Flood_Events.htm. In addition, the digital version of this Discovery Report offers hyperlinks to data for many of the events listed below.

February 1857	Highest flood ever recorded in Albany (21.71 feet) caused by ice jammed on the sandbars south of the city.

March 1913	Major flooding in the Northeast. Highest water level on record for the Hudson River between Hadley and Glens Falls south to, and including, Troy. River stages of 29.7 feet at Troy and 21.45 ft at Albany were recorded.
November 3-5, 1927	Disastrous flooding in New England with devastation over northern Vermont. Flood of record for Batten Kill (17.7 ft) and major flood for Hoosic River (18.8 ft). This event also caused a significant flood on the Hudson River at Albany (15.96 feet). Flooding was the result of rains from the remnants of a late season hurricane.
March 12 -18, 1936	Considered two events by some sources, major flooding throughout the Northeast as a result of extremely heavy snowpack and a double dose of spring rains. Caused highest stages on Hudson River at Troy (29.5) and Albany (17.9) since completion of Conklingville Dam.
December 31, 1948 - January 2, 1949	New Years ice storm and flood which caused the flood of record on the Hoosic River at Kinderhook along with other streams. 17.5 foot crest in Albany.
March 14, 1977	Worst regional flood over the area since the New Years Flood nearly 30 years earlier. An early warm spell with temperatures into the 70s and 80s, combined with a heavy snowpack, and three inches of rain, produced near record floods on Kayaderosseras Creek in the Saratoga Springs area. Ramps to the then new Interstate 787 in downtown Albany were flooded, and the current in the Hudson River undermined the Green Island Bridge causing it to buckle and eventually collapse.
March 1979	Severe ice jamming caused flooding of many rivers including the Hudson, Mohawk, Susquehanna, and Chenango Rivers, as well as the Schoharie Creek.
April - May 1983	"Spring Monsoon" with over 18 inches of rain for the two months in Ellenville, Ulster County, and New York City. Sacandaga Reservoir spilled over on May 1 for the first time since the project was completed in 1930.
January 1996	Major flood event throughout the region as a result of rapid meltdown of snowpack, along with two to four inches of rain. Record flooding on Schoharie Creek and significant floods on Mohawk River at Schenectady, and on the Hudson River at Albany (15.5 feet, the greatest since the New Years flood of 1949).

September 1999 — Tropical Storm Floyd dumped very heavy rains (3 to almost 12 inches) across the region.

September 17-18, 2004
The remnants of Hurricane Ivan dumped heavy rains across the region, up to 6 inches in some locales.

April 2005 — Combination of high pre-storm flows, rain plus snowmelt. A slow moving storm moved up through the Appalachian Mountains and into the Northeast, producing an extended period rainfall on April 2-4th. The USGS estimated it as 100 year event for the Upper Hudson Basin. Sacandaga Lake and Indian lake were nearly empty and were able to cut half the peak flow off the Hudson River. As a result, moderate, as opposed to devastating, flooding resulted on the Hudson.

Tropical Storm Irene: August 28, 2011
Heavy to extreme rainfall resulted catastrophic flooding across portions of east central New York and adjacent western New England.

Remnants of Tropical Storm Lee: September 5-8, 2011
Heavy rainfall, combined with saturated soil from the excessive rains which fell in late August associated with the passage of Irene, led to widespread minor to moderate flooding on rivers, as well as small streams and creeks across eastern New York and adjacent western New England.

Ice Jams

Ice jam flooding generally occurs between mid-winter and early spring due to a prolonged warm spell, accelerating snowmelt. This enhanced runoff may lead to a rise in waters levels in rivers and streams, causing (stationary) river ice to break-up and eventually form an ice jam. Ice jams tent to develop along bends in a river or stream, at the intersection of rivers and streams, or where there is an obstruction to the natural flow of water, including man-made structures such as bridges. Ice jam can result in a rapid and dramatic rise in water levels. (National Weather Service (NWS))

As explained by Albany's NWS Office, "ice jams cause localized flooding and can quickly cause serious problems in the Capital District. 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".

There are two types of ice jams: 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:

> Albany Freeze Up Jam Criteria:
> Three Consecutive Days with daily average temperatures of less than 0°F.
>
> Albany Break Up Jam Criteria:
> 1; Ice around 1 foot thick or more (presumed) and 2; Daily Average Temperature forecast to be greater than 42°F or more.
>
> The daily average temperature is determined by the following equation: (Tmax (maximum temperature) + Tmin (minimum temperature))/2.

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 critically important to note that flooding caused by ice jams is not calculated nor shown on FEMA's FIRMs. Furthermore, the NWS's statement on ice jams in the Albany area also explains that river forecasts found on its website do not take into account the effect of ice on river levels.

The following list identifies some of the known "trouble spots" of ice jamming in the watershed. The complete list with fuller descriptions of the circumstances of jamming at each location can be found on the Albany NWS's Ice Jam Fact Sheet on-line or in Attachment 6 of this report.

Hudson River	Fort Edward to Waterford
Hudson River	Troy, Albany and south
Batten Kill	Washington County
Hoosic River	Washington and Rensselaer Counties

During the pre-Discovery meetings, Rensselaer County explained that a project is being planned to address the issue of ice jams at Eagle Bridge on the Hoosic River in the town of Hoosick.

Congressional and New York State Assembly Districts

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 Hudson-Hoosic Watershed into three Congressional Districts: The 19th, 20th, and

21st. In the watershed, Rensselaer County is in the 19th District, Albany and southern Saratoga Counties are in the 20th District, and Washington, Warren, and northern Saratoga are in the 21st.

As a result of the 2012 elections, it has been determined who will be representing each district through the 113th Congress which ends in January 2015. The three members of the House of Representatives are noted below:

19th Congressional District	Representative Chris Gibson
20th Congressional District	Representative Paul Tonko
21st Congressional District	Representative Bill Owens

Information on individual representatives can be found at Congress' Find Your Member webpage. Figure 11: *Congressional Districts for the 113th Congress in the Hudson-Hoosic Watershed* show the geographical extent of each district.

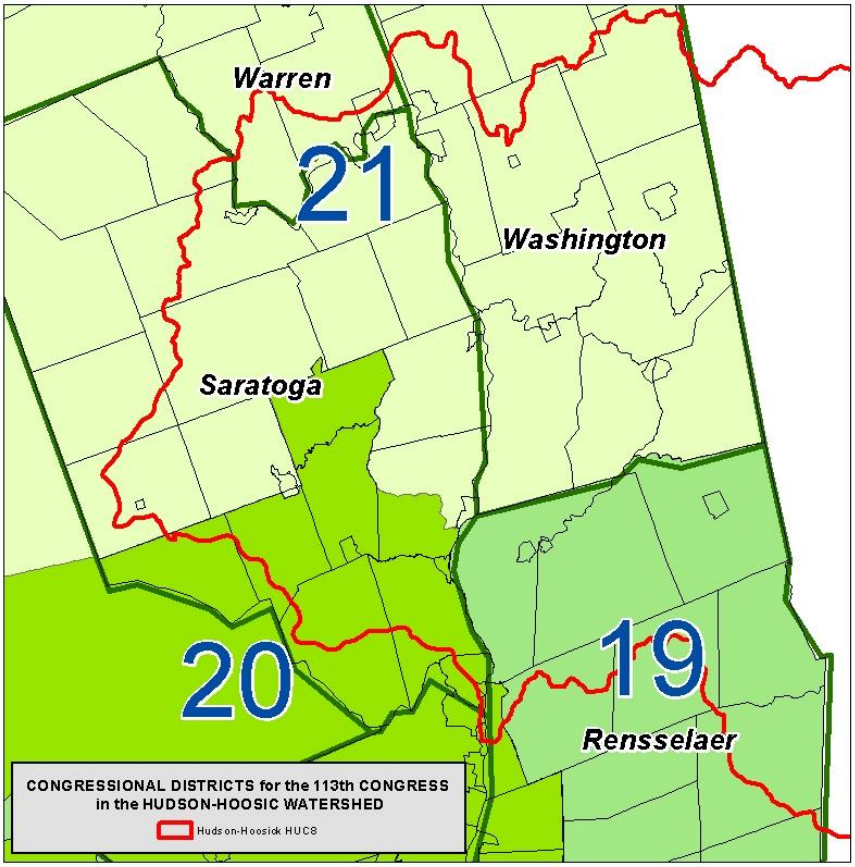

Figure 11: *Congressional Districts for the 113th Congress in the Hudson-Hoosic Watershed*

In New York State, the residents of the Hudson-Hoosic watershed are represented by several members in the Assembly and Senate. In the New York State Senate, watershed citizens are represented by Districts 43, 44, 45, and 49 and by members of the Assembly from Districts 107, 108, 112, 113, and 114. The locations of both Senate and Assembly districts are shown on Figure 12: *NYS Senate and Assembly Districts in the Hudson-Hoosic Watershed*.

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

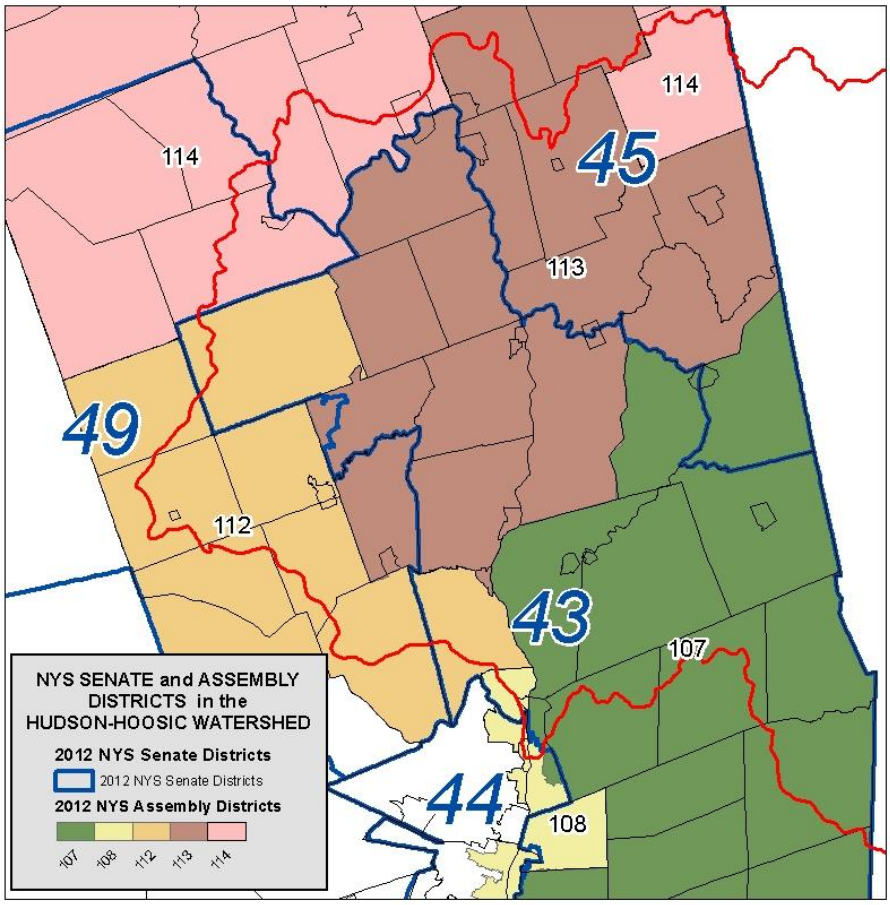

Figure 12: *NYS Senate and Assembly Districts in the Hudson-Hoosic Watershed*

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 Legislative Pre-Disaster Mitigation Program (LPDM).

FEMA describes the PDM as a program that provides funds to states, local communities, and others for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event.

The funding of 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.

The HMGP provides grants to states and 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 during the immediate recovery from a disaster.

Lastly, the LPDM is a pre-disaster grant program and is designed to assist States, Tribal, and local governments in implementing cost-effective hazard mitigation activities that complement comprehensive mitigation programs, reduce injuries, loss of life, and damage and destruction of property.

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 Q: *FEMA Mitigation Grant Proposals*. This list is offered as insight as to the types of projects 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. The interim Final Rule is detailed in the Code of Federal Regulations (CFR), specifically found at 44CFR Parts 201 and 206.

Countywide (Multi-Jurisdictional) Hazard Mitigation Plans in the Hudson-Hoosic watershed are prepared in conjunction with county government by the municipalities within a particular county and then reviewed and adopted by each community.

In general most communities within the five counties have adopted or are planning to adopt their counties coordinated county-wide plan. Albany and Washington Counties Mitigation Plans have been adopted through 2015, with Saratoga and Warren Counties plans valid through the second half of 2016. The Rensselaer County Mitigation Plan has been adopted by the county's communities and is valid through September 2017. Please see Appendix R: *Community Status of Adoption of 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 9: *Links to Mitigation Plans.*

Table 9: *Links to Mitigation Plans*

County Name	Hyperlink to Mitigation Plan
Albany	http://www.albanycounty.com/dpw/public-meeting-docs.asp?id=2080
Rensselaer	http://www.rensco.com/publicsafety_hmpp_draft.asp
Saratoga	http://www.saratogacountyny.gov/subpage.asp?pageid=707
Warren	http://warrencountyny.gov/emergency/hazard.php
Washington	(Not available online)

Details of Mitigation Plans

Albany County

Albany County's Hazard Mitigation Plan does not note any completed flood mitigation projects. Rather, the focus of the plan is on developing strategies and actions that will reduce the impact of flooding in the future. The activities and suggestions noted, such as "Implementation of New NYS Building Code", are not based on specific locations or facilities, but are a general discussion of actions that could be taken to mitigate harm to residents or property at any corresponding location or facility within the county.

Noted physical or "in the field" planned actions to reduce the impact of flooding within the county include:

- Properly manage and maintain stormwater drainage systems;
- Reduce the amount of impervious surface in critical areas;
- Ensure that critical care facilities such as hospitals and nursing homes have generators and other critical equipment above or protected from potential flooding;
- Encourage retrofitting of homes (including the filling in of basements) in floodprone areas and provide flood proofing assistance to homeowners;
- Consider the moving, raising, or purchasing of homes in floodprone areas;
- Regularly test all components of the county's emergency management plan;
- Increase roadway modification and drainage improvements to alleviate local flooding;
- Modifications and improvements to reservoir, dikes and levees; and
- Install tidal check valves along the Hudson River.

Other non-construction or strategies proposed in the HMD are rigorous planning and zoning regulations to mitigate the impacts of flooding on new or improved properties; encourage home owners to purchase flood insurance; and lastly, public outreach, especially to vulnerable citizens, such as residents of mobile home parks, the elderly, and non-English speakers on how to reduce injury and property damage

A comprehensive list of proposed mitigation actions for Albany County communities within the watershed can be found in the county's HMP link in Table 9.

Rensselaer County

As suggested by each community in the *Jurisdictional Prioritization of Actions* portion of the HMP, Rensselaer County's HMP provides hundreds of potential mitigation projects, goals, and other strategies to improve municipal and citizen awareness of potential hazards. Generalized actions include a review of each jurisdiction's HMP by county officers; regular workshops for municipal zoning and code officers; additional outreach to residents including the distribution of information and sale of NOAA weather radios to property owners at the Schaghticoke Fair (annual attendance 100,000+); expand and disseminate GIS and other hazard information to communities and on the internet; create a Hazard Information Center – a virtual and physical library that contains all technical studies, particularly of natural resources; implement public notification of hazard events using a reverse 911 system; and many other goals.

In addition to the countywide goals, each jurisdiction in the county provided specific actions that could be implemented or enacted to provide mitigation for those communities. An overview for each jurisdiction in the Hudson-Hoosic watershed follows:

Berlin:	Work with local watershed association to prevent debris jams from forming and causing flooding in the Little Hoosic River
Hoosick:	Relocate Buskirk Fire House out of SFHA
	Purchase two homes located in SFHA
	Complete culvert and drainage replacement and upgrades at several locations in town
Hoosick Falls:	Upgrade Wood Brook to mitigate current problems
	Update the village's Zoning and Building Code and increased enforcement
	Continued public outreach through an improved village website
Petersburgh:	Replacement of Broken Wheel Road bridge over Little Hoosick River and other road work
Pittstown:	Complete culvert and drainage replacement and upgrades at several locations in town
	Initiate more robust public outreach to town residents
Schaghticoke (T):	Determine if hazard/high-risk zoning in land use ordinances and staff training to enforce upgraded ordinances would be beneficial to mitigation
	Investigate joining FEMA's CRS program
Schaghticoke (V):	*No flood mitigation strategies noted*
Troy:	Remove critical systems from high hazard areas
	Continued maintenance of Tomhannock Reservoir (physically located in Pittstown)
Valley Falls:	Update floodplain management ordinance for better land use in SFHAs
	Work with county to develop plan for flooding at hydroelectric dam site

The complete HMP for Rensselaer County can be found by following the link noted in Table 9.

Saratoga County

The Saratoga County HMP offers a review of past flooding mitigation efforts for various communities within the county including drainage improvements in Ballston, Charlton, Halfmoon, Saratoga Springs, Stillwater (V), and Wilton.

As the Saratoga County HMP notes, while specific mitigation actions were identified to prevent future losses, current funding is not identified for all of these actions. Saratoga County has limited resources to take on new responsibilities or projects. The implementation of these mitigation actions is dependent on the approval of the local elected governing body and the ability of the community to obtain funding from local or outside sources. Actions such as supporting the retrofitting or relocation of structures in high hazard areas, should funds be available, and the consideration of participation in CRS were suggested countywide.

Specific actions and strategies are proposed by each community within the watershed. Several of the proposed mitigation projects or strategies are briefly outlined below. For a comprehensive listing of all actions, please refer to the Saratoga County HMP at the weblink shown in Table 9.

Ballston:	Improve embankment of Outlet Road to prevent flooding
	Continue outreach to residents and continued cooperation with neighboring jurisdictions
Ballston Spa:	Investigate and implement actions to protect the St. Mary's School from flooding
	Investigate and implement actions to protect the Union Fire Department from flooding
Charlton:	Develop and enhance stormwater management system
	Develop an upgraded GIS system to determine areas vulnerable to flooding for use in floodplain management
Clifton Park:	Investigate and implement actions to protect Arongen Elementary School from flooding *(Note: while Arongen School is not in the SFHA, it is located near an existing SFHA and is an area of high growth, elevating the potential for increased runoff since date of last study.)*
Corinth (T):	Purchase and install a siren warning system to alert citizens of dam breach
	Implement dam structure repairs
Corinth (V):	Implement dam structure repairs
Galway (T):	Prioritize roadwork to minimize flooding
	Consider implementing a stream buffer ordinance for the prevention of flooding and other environmental considerations
Galway (V):	Investigate a tree/debris management program
Greenfield:	Develop and maintain a drainage management plan
	Protect Kayaderosseras Ridge from erosion and negative drainage impacts
Halfmoon:	Continue to require stormwater management plans as part of site plan review procedures
	Increase the size of inadequately-sized bridge openings and culverts to mitigate localized flooding
Malta:	Mitigate flooding on Saratoga Lake

	Create and update town's Emergency Action Plan for dams
	Implement dam structure repairs
Mechanicville:	*No information available*
Milton:	Implement dam structure repairs
	Investigate and implement mitigation actions to mitigate flooding at Rock City Falls Fire Department Station #1
	Investigate and implement mitigation actions to mitigate flooding at the Sheriff's Department's Civil Division which is located in the flood hazard area
Moreau:	Investigate appropriate actions to mitigate flooding on Old Bend and West River Roads
	Strengthen Zoning Law to manage flooding
	Create and update town's Emergency Action Plan for dams
	Implement dam structure repairs
Northumberland:	Implement dam structure repairs
Round Lake:	*No plans specific to flooding*
Saratoga:	Create and update town's Emergency Action Plan for dams
	Implement dam structure repairs
	Support the installation and implementation of a Community Emergency Alert System
Saratoga Springs:	Upgrade storm sewer system to mitigate impacts of flooding
	Establish and maintain a stormwater management program
	Continued culvert replacement at various locations
	Support and enhance building codes to mitigate impacts of flooding
	Create action plan for dams in city
Schyulerville:	Investigate mitigation actions to protect the village's waste water treatment plant from flooding
South Glens Falls:	Implement dam structure repairs
Stillwater (T):	Investigate mitigation plan to alleviate ice jams on the Hudson River at Lock C-3
	Increase public outreach regarding flooding
	Amend town zoning law to require stormwater analysis and other mitigation strategies
	Develop bank improvement strategy for Old Champlain Canal and Schuyler Creek to mitigated flooding
	Improve storm sewer infrastructure
	Remove/replace NYS Route 67 bridge over Anthony Kill
Stillwater (V):	Explore potential passive uses for Old Champlain Canal area
	Develop bank improvement strategy for Old Champlain Canal and Schuyler Creek to mitigated flooding
	Provide channel improvements for the Old Champlain Canal for the accelerated conveyance of flood waters
Victory:	Implement dam structure repairs as needed
Waterford (T):	Implement dam structure repairs as needed
Waterford (V):	Investigate and implement mitigation actions to protect Waterford Volunteer Fire Company and Kavanaugh Hook and Ladder Company,

	both of which are located in the SFHA
Wilton:	Replace or upgrade the culvert on the Canadian Pacific Railway located upstream of Delegan Road to mitigate flooding
	Investigate and identify the appropriate mitigation action to alleviate flooding at US Route 9 at Snook Kill
	Preserve stream corridors for flood mitigation and water quality
	Prepare open space plan to identify areas for preservation that will aid in the mitigation of flooding
	Create and update town's Emergency Action Plan for dams
	Implement dam structure repairs

Warren County

Warren County states that its overall mitigation goals are to protect life and property, increase public awareness, and provide for emergency services. Warren County's HMP also indicates that a goal of mitigation should be to encourage participation in the CRS. Countywide actions include a program of maintaining cleared areas around roadways, eliminating obstructions to surface water drainage, clean and maintain stormwater drains, and to identify, evaluate, and implement activities to mitigate flooding "hot spots" in the county.

Specific physical projects in or affecting the watershed within Warren County, include:

- Repair and replacement of the Butler Storage Reservoir Dam and the Butler Pond Dam in the town of Queensbury;
- Replace defective culverts at Beartown Road, Glens Falls Road, and others in the town of Lake Luzerne;
- Replacement defective culverts at Homer Avenue in the town of Queensbury; and
- Widen and rebuild Corinth Road in the city of Glens Falls.

Other practical projects include using GIS to both identify locations and patterns of problems and then disseminating that data to local communities; using the county's website as a tool to aid in public awareness of flooding and other hazards in the county; maintain a current inventory of at-risk building and infrastructure; develop robust communication and collaboration between county officials and local community officers and residents; educate the public on the risks of flooding through various media (brochures and other materials, both print and electronic), person-to-person contact (such as school presentations); by maintaining a central library of all documents used in flood hazard and other mitigation and prevention; and lastly by continuing to enforce and implement building codes that reflect disaster resistant construction for new and improved buildings.

The entire HMP for Warren County can be found at the link noted in Table 9.

Washington County

Washington County has defined its strategic plan into four groups whose end results may overlap. The four groups are

- Develop mitigation goals and objectives
- Identify and prioritize mitigation actions
- Document the mitigation planning process
- Prepare an implementation strategy

Much of Washington County's strategy consists of planned construction activities and other practical projects. These projects include:

Develop engineering assessments for problem areas to determine feasibility of corrections;
Improve drainage at sites with a history of washouts;
Improve dams to prevent failure;
Complete a hydrological study of the flooding conditions in the village of Salem to develop an appropriate mitigation plan; and
Purchase the equipment needed for future drainage and other projects

Like all HMP's, Washington County's HMP outlines the plan's "after acceptance" maintenance. This includes monitoring the implementation of the plan and recommends annual reports from those agencies charged with the execution of the HMP. The second part of the plan's maintenance is an evaluation of the plan's effectiveness and if the goals outlined in the plan are being achieved and to determine if mid-term "course corrections" are needed. The evaluation consists of multiple objectives including, but not limited to: have the risks changed; have personnel changed; are additional resources to meet the goal available or have they changed; are schedules and budgets feasible; and many other review factors. Lastly, based on the evaluation, the HMP will be updated every five years, as required by statute, to reflect the results of the annual plan evaluations.

Critical Facilities and Other Important Properties Located in the SFHA

A review of the Multi-Jurisdictional Hazard Mitigation Plans, the pre-Discovery Meeting, and the follow-up Discovery Meeting notes found that the following facilities and properties were noted as being located in the 1-percent-annual-chance flood zone (or at a minimum, vulnerable to flooding) in the Hudson-Hoosic watershed. It is not presumed that this a complete list of structures in danger, but only the ones identified via meetings or HMPs.

Rensselaer County

Buskirk Fire Company Fire Station, 2217 Buskirk Road (Hoosick)
Pleasantdale Fire Company Fire Station, 1178 River Road (Schaghticoke (T))
Hoosick Area Senior Service Center, 69 Church Street (Hoosick Falls)
Bennington Battlefield, NYS Route 67 (Hoosick)

Buskirk Covered Bridge, near NYS Route 67 (Hoosick)
Knickerbocker Mansion, Knickerbocker Road (Schaghticoke (T))
Village of Hoosick Falls Historic District (Hoosick Falls)
Village water wells and pump house (Hoosick Falls)

Saratoga County

St. Mary's School, 40 Thompson Street (Ballston Spa)
Union Fire Department, 319 Milton Avenue (Ballston Spa)
Arongen Elementary School, 489 Clifton Park Center Road, (Clifton Park) *(Note: While Arongen School is not currently within the SFHA, changing land use in the area may make it more susceptible to flooding.)*
NYS Power Authority generating station at Vischer Ferry Dam (Clifton Park)
Village of Schuylerville Waste Water Treatment Plant (Schuylerville)
Waterford Volunteer Fire Company, 1 Pearl Street (Waterford (V))
Kavanaugh Hook and Ladder Company, 27 Division Street (Waterford (V))

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 a 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, processes 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.

More information on the LOMA and LOMR-F processes can be found on FEMA's LOMC web site or in hard copy by reviewing Attachment 7 - *LOMA-LOMR-F Fact Sheet,* included with the digital copy of this Discovery Report.

A review of the LOMCs, both completed and uncompleted, in the Hudson-Hoosic watershed between 1983 and 2012, shows a wide dispersal of actions within the basin. Figure 13, *Mapped LOMCs in the Hudson-Hoosic 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 130 completed LOMCs from 1997 to 2011 within the watershed. Please note, because the location of every LOMC has not been geocoded, the map may not include all completed actions within that time.

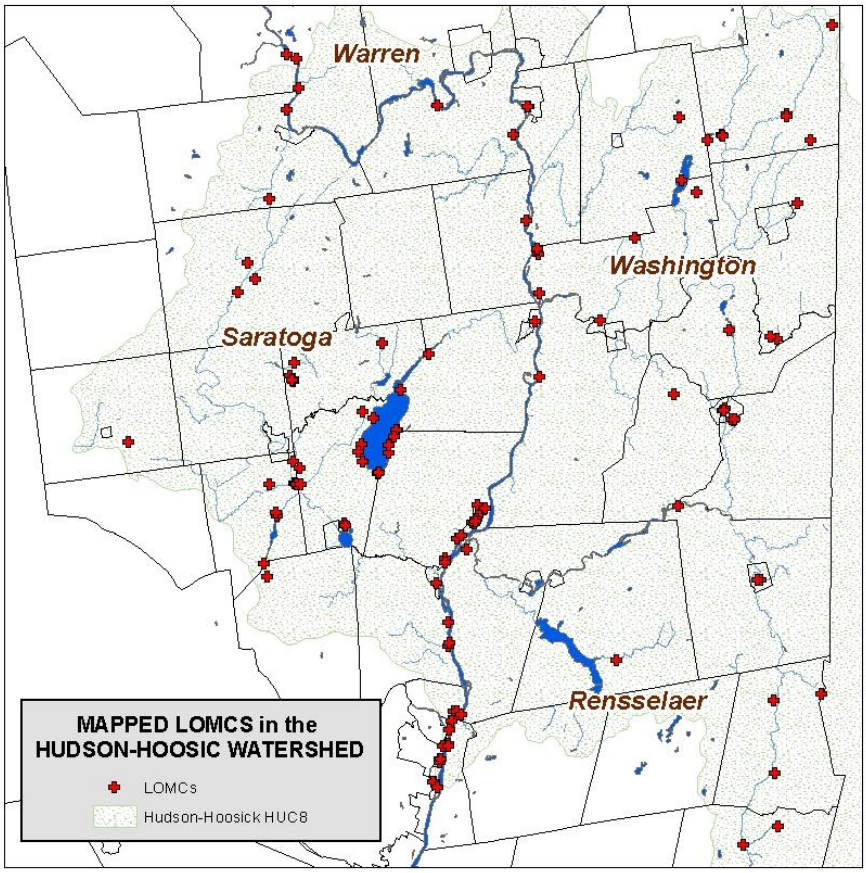

Figure 13: *Mapped LOMCs in the Hudson-Hoosic Watershed*

A brief overview of the communities with the most LOMCs follows.

The local maps on the next page show three clusters of LOMCs in the watershed: the town and village of Stillwater, the Saratoga Lake area, and Troy/Waterford.

In Queensbury, the majority of LOMCs completed in the town have been done for properties on Glen Lake which is in the adjoining Mettawee River watershed flowing northward to Lake Champlain.

The 23 reported LOMCs for the town of Malta were distributed between properties on Drummond Creek, Saratoga Lake, (see Figure 15: *LOMCs in the Saratoga Lake Area*), and an unnamed tributary to Round Lake. All of these flooding sources are within the Hudson-Hoosic watershed.

The city of Troy is divided between the Hudson-Hoosic watershed and the Middle Hudson watershed and the majority of the LOMCs processed for the city have been completed for properties in the latter. Those within the watershed are all affected by flooding from the Hudson River.

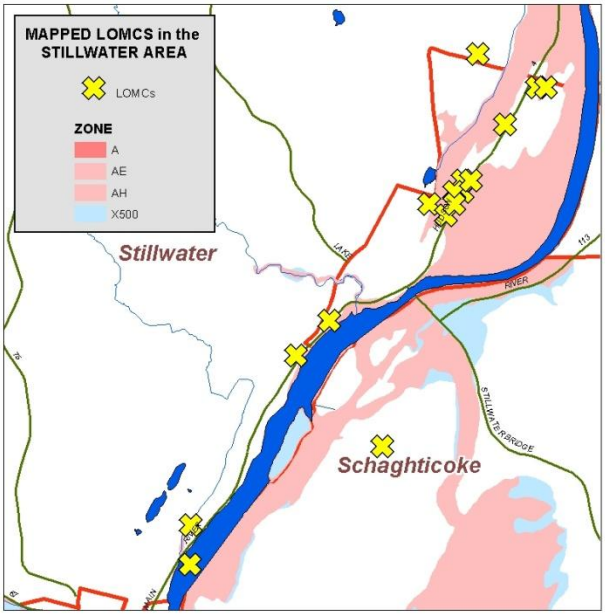

Figure 14: *LOMCs in the Stillwater Area*

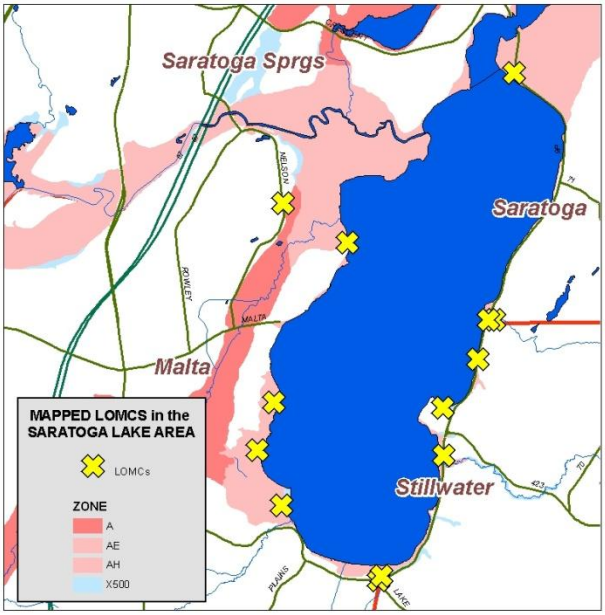

Figure 15: *LOMCs in the Saratoga Lake Area*

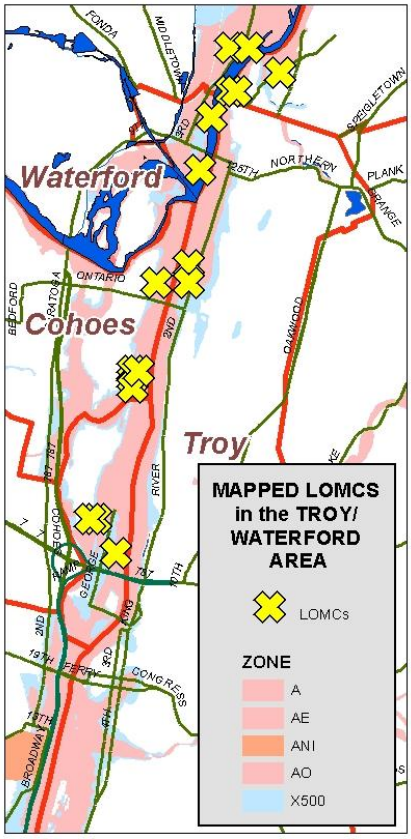

Figure 16: *LOMCs in the Troy/Waterford Area*

LOMC flooding sources in the village of Stillwater are fairly well divided between those on the Hudson River and those on Saratoga Lake, all within the watershed. See Figures 14: *LOMCs in the Stillwater Area* and Figure 15: *LOMCs in the Saratoga Lake Area*.

In Cohoes, all reported LOMCs were for properties on the Hudson River or for those areas at the mouth of the Mohawk River as it divides into multiple channels at its confluence with the Hudson. See Figure 16: *LOMCs in the Troy/Waterford Area*.

Lastly, in the town of Saratoga, the processed LOMCs were all for properties in low lying areas surrounding Saratoga Lake and the lake's outlet, Fish Creek.

The LOMCs in these five jurisdictions account for 168 of the actions recorded in the watershed. Appendix S: *Total Number of LOMCs by Community*, lists the total number of actions for each community in the watershed. Addition 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 by reviewing the community's map repository, generally located with the town clerk or building department. A copy of FEMA's informational flyer on the NFHL is available as Attachment 8 of this report.

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

When a substantial number of properties located in areas outside or beyond the published SFHA 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 Stillwater, shows a large number of claims in Zones B, C, and X on the FIRM, with 15 processed over the years. The watershed's remaining communities have no more than seven recorded claims outside of the SFHA. Table 10: *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.

Table 10: *Number of Claims Outside the SFHA*

Community	Number of Zone B, C, and X Claims
Stillwater (T)	15
Mechanicville	7
Hoosick Falls	7
Waterford (T)	6
Halfmoon	3
Cohoes	2
Troy	3
Brunswick	2
Schaghticoke (T)	2
Troy	2
Clifton Park	2
Waterford (V)	2
Salem (T)	2
Green Island	1

Regulatory Mapping

As noted above, the Hudson-Hoosic watershed in New York covers portions of five counties in the state, with Rensselaer, Saratoga, and Washington Counties the heart of the watershed. The mapping in place is a mix of recently revised and older FIRMs.

In Albany County, the current effective FIRMs for Cohoes and Green Island date back to 1979 and 1980, respectively. However, a revised countywide FIRM for the entirety of Albany County is expected to be published in the near future. No new study of the Hudson River was included in the forthcoming Albany County countywide FIRM.

A preliminary partial countywide FIRM has recently been published for Rensselaer County that includes some of the communities of the Hudson-Hoosic watershed. This new partial countywide is focused on a restudy of the Hoosic River as it flows through Rensselaer County's three northernmost towns, Schaghticoke, Pittstown, and Hoosick and the villages contained within those towns, Schaghticoke, Valley Falls, and Hoosick Falls. The remaining jurisdictions in the county are mapped using the community-based format and are from 27 to 34 years old.

The FIRMs for the three Warren County communities in the watershed are also mapped in a community-based format and have not been updated in some time. Their publication dates range from 1984 to 1996.

Like Warren County and most of Rensselaer County, Washington County's FIRMs are also community-based and the publication dates are generally from 1979 to the mid-1980s, with some exceptions. The FIRMs for the towns of Easton, Greenwich, Hebron, and Jackson were published in the 1990s and FIRMs for the villages of Cambridge and Greenwich have effective dates in 2008 and 2000. The village of Hudson Falls does not have a published FIRM.

Saratoga County was the recipient of one of the first countywide FIRMs published in the nation and has an effective date of August 15, 1995. Please note, the village of Galway does not participate in the NFIP and was not mapped as part of the 1995 Saratoga County FIRM.

For a complete list of the effective dates for the FISs and FIRMs in the watershed, please see Appendix T: *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 NFIP within any rolling 10-year period. In the Hudson-Hoosic watershed there are 64 documented cases of RL structures ranging from two to upwards of 11 claims on a structure. Table 11, *Repetitive Losses by Community in the Hudson-Hoosic Watershed*, notes the number RL properties by jurisdiction. Please see Appendix U: *Repetitive Losses by Community in the Hudson-Hoosic Watershed*, for more detailed information on the RL history in the watershed by jurisdiction.

Table 11: *Repetitive Losses by Community in the Hudson-Hoosic Watershed*

Community	Number of RL Properties
Waterford (T)	17
Waterford (V)	16
Troy	5
Clifton Park	4
Schaghticoke (T)	4
Halfmoon	3
Hoosick Falls	3
Stillwater (T)	3
Mechanicville	2
Brunswick	1
Charlton	1
Cohoes	1
Jackson	1
Queensbury	1
Salem (T)	1
Saratoga	1

Structures that flood frequently strain the NFIP Fund. In fact, while RL properties consist of only 1.3 percent of all flood insurance policies, they account for 15-20 percent of all claims! RL properties are the biggest draw on the fund and FEMA has paid almost $3.5 billion in claims for

RL properties. RL properties not only increase the NFIP's annual losses and the need for borrowing funds from Congress, they drain funds needed to prepare for future catastrophic events.

Of course, beyond monetary considerations, owners of properties that experience repetitive flooding often are locked into a cycle of damage and repair and then damage again, causing repeated mental and physical stress. In addition, when a community has a repetitive loss problem, individuals, businesses and others in nearby properties are directly impacted due to unhealthy sanitary conditions, possible decreased property values, and other negative, long-term effects of flood damage.

In the Hudson-Hoosic watershed, repetitive loss cases are concentrated in the town and village of Waterford, with over $1.8 million paid in the town and $899 thousand paid in the village. Figure 17: *Repetitive Loss Properties in the Waterford Area* shows the clusters of repetitive loss in and around the town and village of Waterford.

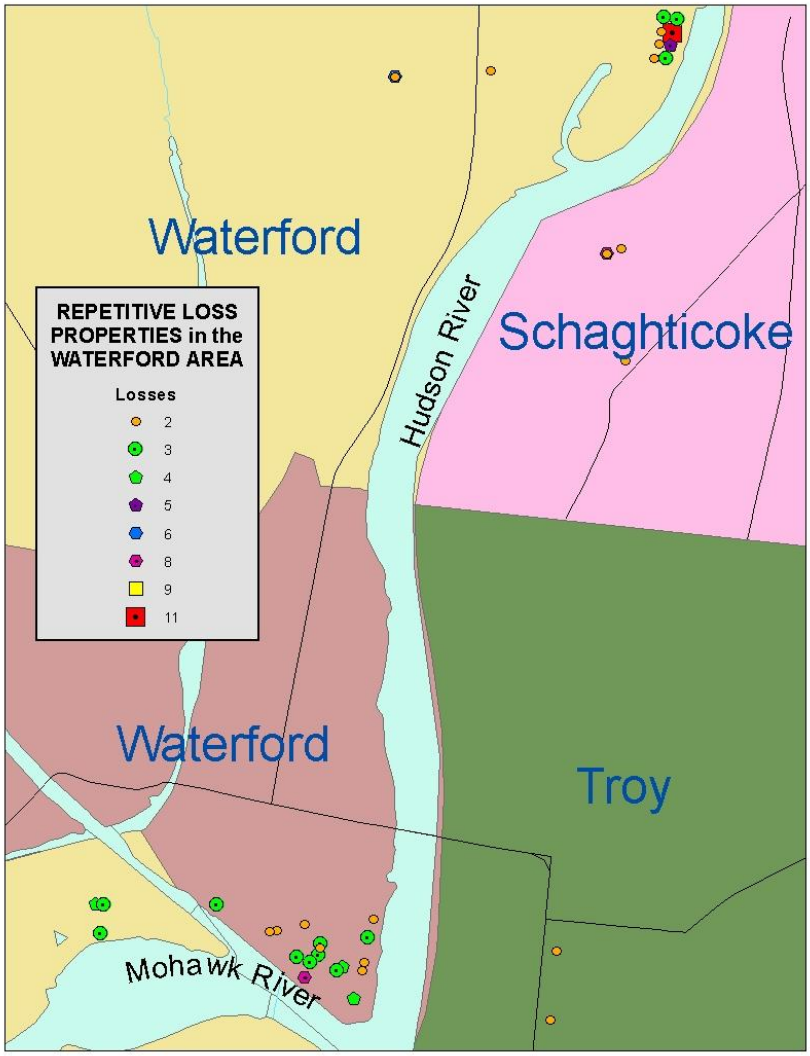

Figure 17: *Repetitive Loss Properties in the Waterford Area*

As noted earlier in this section and as shown in Figure 17, 37 of the 64 (57%) identified RL properties within the watershed are in a small area near the confluence of the Hudson and Mohawk Rivers.

Municipal Separate Storm Sewer Systems

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 18, *Municipal Separate Storm Sewer Areas in the Hudson-Hoosic Watershed* shows the geographic coverage of MS4 systems in the watershed. As noted earlier, much of the area covered by MS4 regulation follows the Interstate 87 (Northway) corridor from Glens Falls southward to the Twin Bridges in Halfmoon.

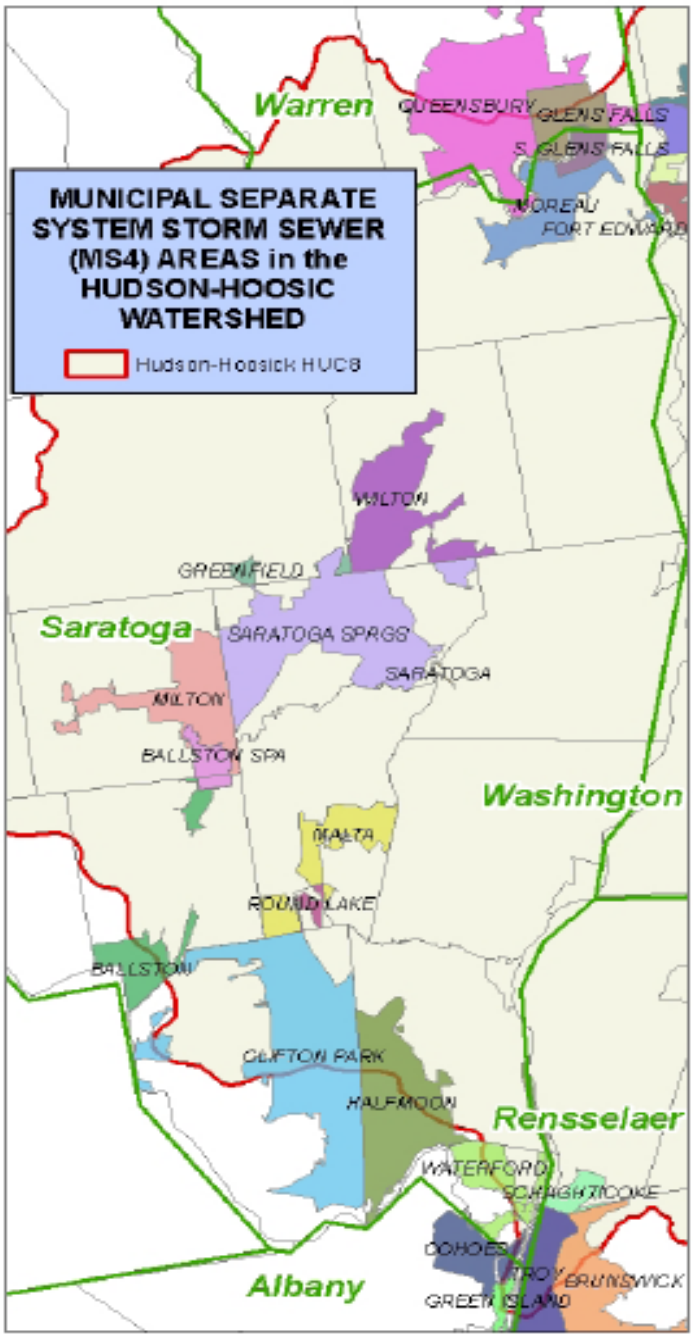

Figure 18: *Municipal Separate Storm Sewer Areas in the Hudson-Hoosic Watershed*

SECTION FIVE PRE-DISCOVERY MEETINGS

As noted in SECTION TWO, the NYSDEC conducted nine meetings with community officials representing the cities, towns, and villages of 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 meetings can be seen in Appendix D: *Hudson-Hoosic Discovery Meeting Notes.*

Synopsis of Meeting Discussions

As a result of these meetings, dozens of streams, lakes, and other flooding sources were identified by the communities as candidates for either new or revised study. The entire memorandum produced by the NYSDEC can be found as Appendix D: "Hudson-Hoosic Watershed Discovery Meeting Notes". A summary of the top five priorities grouped by county is listed below. Other data from the meetings, such as new construction, gage information, high water marks, etc., have been recorded in the appropriate sections earlier in this report.

All Counties:

Hudson River:	Restudy using detailed methods for its entire length within the watershed (Approximately 70 miles).

Rensselaer County:

Little Hoosic River:	Study using detailed methods in the towns of Petersburgh and Berlin (15 miles).
Sunkauissia Creek:	Study using detailed methods in the town of Pittstown (5 miles).
Kautz Hollow:	Study using limited detailed methods from its confluence with Sunkauissia Creek in Pittstown to the Pittstown-Grafton town line (Approximately 3 miles).
Hoosic River:	Study using detailed methods from the upstream corporate limit of the village of Hoosick Falls through the town of Hoosick (Approximately 3 miles).
Hoosic River:	Study using detailed methods from its confluence with the Hudson River for its entire length within the town of Schaghticoke (Approximately 9 miles).

Rensselaer County also stated that several areas within the county are subject to repeated flooding, including at the County Road 38 bridge as it crosses the Little Hoosic River and near the Mechanicville Golf Course in the town of Schaghticoke and the Pleasantdale area in the city of Troy.

Saratoga County

Kayaderosseras Creek: Study using detailed methods from its mouth at Saratoga Lake upstream through Ballston Spa (10.6 miles).

Fish Creek: Study using detailed methods from its mouth at the Hudson River to its source at Saratoga Lake (12.9 miles).

Dwaas Kill: Study using detailed methods from its confluence with Anthony Kill in the town of Halfmoon, upstream to its headwaters in the town of Clifton Park (8.25 miles).

Drummond Creek: Study using detailed methods from its confluence with Saratoga Lake to its headwaters in the town of Malta (7.25 miles).

Anthony Kill: Study using detailed methods from its confluence with the Hudson River in the town of Halfmoon to its source at Round Lake (6.8 miles).

Warren County

Wetlands Area: Bounded by NYS Route 254, Ridge Road (NYS Route 9L), and Warren County Airport: Studied using detailed methods. *(While Warren County officials did note several significant areas of concern in the county within the Upper Hudson Watershed, due to the limited extent of the Hudson-Hoosic watershed in Warren County, no other priorities are noted for this watershed.)*

Washington County

White Creek: Study using detailed methods for its entire length within the town and village of Salem (11 miles).

Ash Grove Brook: (AKA White Creek) Study using detailed methods for its entire length in the town of White Creek and the village of Cambridge (8.6 miles).

Batten Kill: Study using detailed methods for its entire length in the county from its confluence with the Hudson River to the Vermont state line (31.5 miles).

Owl Kill: Study using detailed methods in the towns of Cambridge and White Creek and village of Cambridge (10.6 miles).

Abandoned Champlain Canal: Study using detailed methods in the town of Kingsbury (7.4 miles).

During this meeting, officials from the County noted that Trout Unlimited funded a hydraulics report for White Creek. This study may have been completed by C.T. Male. The town of Salem may be contacted for further information about this report.

NOTE: A limited detailed study is an approximate flood study, and is shown on the FIRM for the community as "Zone A". A limited detail study, like traditional Zone A study, produces a 1-percent-annual chance (100-year) floodplain delineation, but also

produces an advisory 1–percent-annual chance (100-year) flood elevation or BFE for use by the community for planning and floodplain management purposes. A limited detail study is primarily a desktop analysis which includes field surveying of structures such as bridges and culverts, but does not include surveying of channel cross-sections, and thus is more approximate in nature than full detailed flood study.

As noted above, numerous other streams and lakes were also requested as candidates for new or restudy. Please see the complete memorandum in Appendix D: "Hudson-Hoosic Watershed Discovery Meeting Notes".

SECTION SIX DISCOVERY MEETINGS

On October 22 and 23, 2012, two Discovery Meetings were held in the watershed to meet with local communities and to introduce them to the Discovery process, gather feedback on recent flooding events, and to revisit priorities noted during earlier conversations with the watershed's cities, towns and villages.

These meeting were held in the towns of Malta and Fort Edward, and were generally scheduled so that communities west of the Hudson River (primarily Saratoga County) would attend the Malta meeting and with those communities east of the Hudson (Rensselaer and Washington Counties) attending the Fort Edward meeting. However, communities were free to attend the meeting of their choice, as it fit their schedule most conveniently.

Additional objectives of the meetings were to facilitate discussion about study needs, mitigation project plans, 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.

At the start of the meetings a PowerPoint presentation, entitled *Hudson-Hoosic Discovery Meeting Presentation* was delivered to those in attendance. A copy of this presentation can be found in Attachment 9: *Hudson-Hoosic Discovery Meeting Presentation*. In addition, several large Discovery Maps were displayed on the walls at the meetings to stimulate the discussion. Digital versions of those maps can be found in Attachment 10: *Wall Maps Used During the Hudson-Hoosic Discovery Meetings*.

Lastly, table-sized, community-based maps were used in breakout discussions with jurisdictions based on geography (for example, the town and village of Salem were mapped together as a natural pairing). Attendees, including all affected communities and selected other stakeholders, were asked to cooperatively identify Areas of Concern within the Hudson-Hoosic Watershed. The notated work maps resulting from these meetings can be found in Attachment 11: *Hudson-Hoosic Discovery Meeting Work Maps* in the digital version of this report. Due to the large number of maps and their size, the work maps have not been reproduced in hard copy for this report.

All communities within the watershed were invited to the meetings and approximately 33 of the 60+ jurisdictions of the watershed attended one of the two meetings. In addition, representatives of FEMA, various state agencies, county officials, and several non-governmental organizations were represented at these sessions. A copy of the sign-in sheets for these meetings is available in Appendix V: *Hudson-Hoosic Discovery Meeting Sign-In sheets.* The meeting agendas can be seen in Appendix W: *Hudson-Hoosic Discovery Meetings Agendas.*

Feedback from Discovery Meetings

Following the presentation to the meetings as a whole, representatives from FEMA, NYSDEC, and NYSDEC's Discovery contractor met with individual or small groups of communities. The purpose of these breakout sessions was to both follow up with the communities regarding the concerns expressed during the pre-Discovery meetings held in the spring of 2012 and to capture any new issues that a community might have. A compilation of notes from the meetings can be found in Appendix X: *NYSDEC Memo: "Revised Hudson-Hoosic Watershed Discovery Meetings Requests March 2014"*.

Brief overviews of some of the notable points made during the conversations with communities and other parties attending the meetings are shown below.

Malta (West of Hudson) Meeting

The meeting for those communities west of the Hudson River was meeting was held at the Malta Town Complex on Monday, October 22, 2012.

Ballston Spa

The village noted that Thompson Street at Gordon Creek was overtopped as a result of rains from Tropical Storm Lee. In addition, the culvert on Gordon Creek under Garrett Road failed during the tropical storm and contributed to increased flooding on the creek.

Ballston Spa also expressed interest in joining CRS.

Clifton Park

During the Discovery Meetings, the town of Clifton Park noted that the town has acquired several properties important to floodplain management including a property that will be managed as Dwaas Kill Nature Preserve. This property, located southwest of the intersection of Interstate 87 and Ushers Road (Exit 10), will provide critical open space in the Dwaas Kill floodplain and provide storage during flooding events to the benefit of both Clifton Park and downstream areas in the town of Halfmoon.

Following the meetings, Clifton Park provided a hand annotated map of the town showing public lands, private golf courses, properties with development easements held by the town of Clifton Park, and properties owned by conservation organizations such as Saratoga P.L.A.N. This map, titled *Public Lands in Clifton Park,* is available as Attachment 12 to this report.

Clifton Park continues to pursue increased density development in the Route 146/Interstate 87 area with infill projects especially in the vicinity of the Clifton Park (shopping) Center area.

Malta

The town of Malta noted that Silver Road near Saratoga Lake is subject to flooding.

Saratoga County

Saratoga County representatives noted the large amount of development in the county between Halfmoon and Malta. Much of this growth is occurring near, and because of, the Luther Forest Technology Park and associated development.

The county also referenced a study done by the Capital District Regional Planning Commission (CDRPC) that investigated land use in the Ballston Lake watershed. This study, completed in 2001, is available on the CDRPC's website at the hyperlink above.

The county also suggested that the Saratoga Lake Protection and Improvement District (SLPID) would be a good source of information on the lake and that their consulting firm, L.A. Group, P.C. created a watershed plan for the lake. It appears, however, that the focus of this report is management of invasive aquatic vegetation in the lake, rather than flood control or mitigation. The report is on the SLPID's website here.

Saratoga Lake Association

The Saratoga Lake Association (SLA) is a non-governmental organization (NGO) and represents property owners near the lake in the towns of Saratoga, Stillwater, Malta and the city of Saratoga Springs. Following the meeting the SLA provided the NYSDEC with information regarding a SLA-funded hydraulic study for the lake's outlet, Fish Creek. This study was completed in 2010 and was prepared by local engineering firm, C.T. Male. The Fish Creek Study can be found on the SLA's web site.

The SLA letter also noted a gage located at the New York State Route 9P bridge. The extent and quality of any data resulting from this gage is unknown.

A copy of the letter sent to the NYSDEC from the SLA is located as Attachment 13 of this report.

Saratoga Springs

Strong development continues in the city, with substantial in-fill in the city's center.

Stillwater

The town of Stillwater mentioned several streets in the town and village that experienced regular flooding issues. These roads are generally found in the Hudson River floodplain.

Waterford (Town and Village)

As reported by the representatives of the town and village, both jurisdictions have contacted FEMA for additional information on the CRS program. Unfortunately, neither jurisdiction has received a response. The town and village stated that they are not eligible for CRS due to repetitive loss claims. The official seems to believe that the CRS representative was based in western New York.

Both jurisdictions are interested in mitigation.

Fort Edward (East of Hudson) Meeting

The meeting for those communities east of the Hudson River was meeting was held at the Washington County Municipal Building on Tuesday, October 23, 2012.

Brunswick

The town of Brunswick reiterated several recommendations made during the pre-Discovery meeting in the spring of 2012 for new and/or revised studies for the following flooding sources: Piscawenkill, Quackenkill, and Poestenkill in the town and Bradley and Wright Lakes in the city of Troy.

Grafton

The town of Grafton expressed concern that several of the SFHA's shown on the effective FIRM overstates the actual risk, this was especially true with a number of lakes and ponds in the town. The towns request for reviews can be found in Appendix Y.

Hartford

The town reported that the dam at Lily Pond was in poor condition and that the town was actively seeking funds for its repair. Lily Pond is outside of the Hudson-Hoosic watershed.

Hudson Falls

US Route 4 is currently undergoing a major reconstruction within the village that includes infrastructure, sidewalks, and paving. In addition, a senior living facility is being constructed in the village. The addition of a large number of elderly in the jurisdiction may have an impact on evacuation and other emergency services.

Rensselaer County

The county noted that the Buskirk Fire Station in the town of Hoosick had to be evacuated during recent flooding. In addition, the county was one of several jurisdictions to note that the Hoosic River is particularly susceptible to ice jams.

The county expressed a belief that, should flood insurance rates continue to rise (as is expected with the passage of the Biggert-Waters Flood Insurance Reform Act of 2012), more communities may be interested in joining the CRS program.

Salem (Town and Village)

The village of Salem, in conjunction with the town of Salem, provided detailed descriptions of areas of overflow flooding caused by Tropical Storms Irene and Lee in the White Creek valley. This information, shown as Attachment 14: *Identification of Out-of-Stream-Overflow Waters in the White Creek Watershed*, provides a narrative and maps that illustrate several areas throughout the town and village inundated by flooding in 2011, but that are either not shown on or are understated on the current effective FIRM for the two communities. The review is especially concerned with the flooding effects that may be caused by the presence of embankments used by the Delaware and Hudson Railway that follow the course of White Creek through the town and village and eastward into Vermont.

The village feels that the repeated risk of flooding in the village is a detriment to additional economic growth in the village.

The village also thinks that a more specific regression equation should be used to calculate flood flows emanating from the Northern Taconic Range of mountains in the White Creek watershed.

The village also noted that the NGO Trout Unlimited, participates in monitoring a gage station in the village of Salem.

Schaghticoke (Town)

The town of Schaghticoke reviewed the numerous culverts that have been replaced within the community during 2011. These changes may have an impact on the SFHA in those areas.

Schaghticoke (Village)

Schaghticoke responded to the questions presented during the meeting by affirming most of the conclusions reached during the pre-Discovery meeting. The village also stated that several homes have been completed on Powerhouse Road near the Hoosic River and that Fisherman's Lane, which runs over the pooled portion of the Hoosic River south of the village, may be susceptible to flooding.

Trout Unlimited

Trout Unlimited provided limited information at certain locations on the Batten Kill and White Creek in Washington County. This information is shown in Attachment 17: *Trout Unlimited Data for Batten Kill and White Creek.*

Washington County

The county noted that several berms and farmers levees have been built in various locations within the county. It is unknown what impact, if any, these structures may have on the SFHA.

White Creek

The town explained that wing dams have been placed in the Hoosic River in the Buskirk area to help keep the main channel of the river in its current location.

SECTION SEVEN CONCLUSIONS FROM MEETINGS AND DATA

Based on the data, it would appear that special outreach effort should be made for those communities at or near the confluence of the Mohawk and Hudson Rivers: Troy, Cohoes, Green Island, and the town and village of Waterford. These older communities constitute a large number of the flood insurance policies in force within the watershed due to their historical development adjacent to the rivers and are often in the floodplain. These communities also have some of the watershed's largest population of non-English speakers and economically distressed residents.

A particular emphasis on joining the NFIP's CRS program would be of benefit to these and all watershed communities. There seems to be a great deal of misinformation and lack of communication as to what the CRS is; if a community is eligible for membership; and what level of effort is required to make the CRS beneficial for a community. Local communities may wish to consider pooling resources/efforts or work on a countywide-basis to ease the effort of complying with the requirements of joining the CRS program.

As a result of consultation with the communities, historical data, and engineering judgment, the NYSDEC developed letter to FEMA prioritizing the mapping needs of the Hudson-Hoosic Watershed. A copy of this letter can be found as Appendix Y: *NYSDEC Letter: "Revised Hudson-Hoosic Watershed RiskMAP Recommended Scope March 2014"*.

As stated in the NYSDEC's memo to FEMA, the Hudson River is the number one priority for communities in the watershed and is noted nearly universally as a need by those communities impacted by its floodplain. Several other bodies of water, including Saratoga and Round Lakes and White and Kayaderosseras Creeks and others are also listed in the letter.

In addition, based on the number of flooding claims in Zones B, C, and X in the town of Stillwater, 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 in the town.

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

Due to the recession that began in 2008 and as noted in the Demographic portion of this report, growth in the watershed remains subdued. However, construction of new homes and commercial properties does continue at a slow pace with many of the largest developments occurring in the Saratoga County towns of Halfmoon, Clifton Park and Malta. While larger development may have a greater impact on the watershed, they are often the most heavily scrutinized before and during construction, and therefore are usually the most likely to be compliant with NFIP regulations.

In the Hudson-Hoosic watershed, it may be two other types of construction that, in the long term, cause greater impact on the watershed's vulnerability to flooding: the incremental conversion of summer cottages to year-round residences and piecemeal, limited-scale housing developments.

The first, the gradual "winterization" of formerly simple vacation cottages for year-round use has been recognized in the Saratoga Lake area, but is undoubtedly occurring on many of watershed's lakes and streams, such as along the Hudson River, Galway Lake, Batten Kill, and others. It is important that, when issuing building permits for upgrades to these (and all) homes located in the SFHA, that local building and code officers know the requirements of the NFIP's rules concerning the "substantial improvement" clause of the NFIP. "Substantial improvement" means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50-percent of the market value of the structure before the "start of construction" of the improvement. Comprehensive guidance on building or rebuilding in an SFHA can be found in FEMA's *Substantial Improvement/ Substantial Damage Desk Reference*. A digital copy of this guidance can be found as Attachment 15 of this report.

In addition, the prevalence of smaller developments, (often as limited as two building sites), planned across the watershed may be a challenge to effective floodplain management, as these micro-developments can easily slip through regulatory cracks. Local officials need to be aware that the NFIP requires that minimum building standards be met for all construction in the SFHA. The NFIP also has additional reporting (BFE) regulations for those projects as limited as five lots or 50 acres, whichever is smaller (44 CFR 60.3(b)(3)). Information on the NFIP's building requirements in the SFHA can be found in the NYSDEC's *Floodplain Construction Requirements in New York State*. A copy of this brochure can be found online or in the digital version of this report as Attachment 16.

Long term, as noted in the Demographics Section of this Report, the watershed's slow, but steady, population growth offers local jurisdictions the opportunity for thoughtful floodplain mitigation and management.

Continued vigilance will need to be maintained so that as the economy improves, good building practices continue for communities within the watershed.