Discovery Report

Mid-Hudson Watershed

HUC 02020006

Albany, Columbia, Dutchess, Greene, Rensselaer, Schenectady, Schoharie, and Ulster Counties, New York*

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

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FEMA

Federal Emergency Management Agency
Department of Homeland Security
26 Federal Plaza
New York, NY

Project Area Community List

This list includes all communities located fully or partially within the Mid-Hudson Watershed. While all communities may be under consideration for a revised Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM), not all communities will receive new/updated FEMA FISs or FIRMs as a result of this watershed Discovery project.

Albany County
- Albany, City of*
- Altamont, Village of
- Berne, Town of*
- Bethlehem, Town of
- Coeymans, Town of
- Colonie, Town of*
- Colonie, Village of*
- *Green Island, Village of****
- Guilderland, Town of*
- Knox, Town of*
- Menands, Village of
- New Scotland, Town of
- Ravena, Village of
- Rensselaerville, Town of*
- Voorheesville, Village of
- Watervliet, City of*
- Westerlo, Town of*

Columbia County
- Ancram, Town of*
- Austerlitz, Town of*
- Canaan, Town of*
- Chatham, Town of
- Chatham, Village of
- Claverack, Town of
- Clermont, Town of
- Copake, Town of*
- Gallatin, Town of
- Germantown, Town of
- Ghent, Town of
- Greenport, Town of
- Hillsdale, Town of*
- Hudson, City of
- Kinderhook, Town of
- Kinderhook, Village of
- Livingston, Town of
- New Lebanon, Town of
- Philmont, Village of
- Stockport, Town of
- Stuyvesant, Town of
- Taghkanic, Town of
- Valatie, Village of

Delaware County
- *Middletown, Town of***

Dutchess County
- *Amenia, Town of***
- Milan, Town of*
- Northeast, Town of*
- Pine Plains, Town of*
- Red Hook, Town of*
- Red Hook, Village of*
- Rhinebeck, Town of*
- Stanford, Town of*
- Tivoli, Village of

Greene County
- Athens, Town of
- Athens, Village of
- Cairo, Town of*
- Catskill, Town of
- Catskill, Village of
- Coxsackie, Town of
- Coxsackie, Village of
- Durham, Town of*
- Greenville, Town of
- *Hunter, Town of***
- *Jewett, Town of***
- *Lexington, Town of***
- New Baltimore, Town of
- *Windham, Town of***

Rensselaer County
- Berlin, Town of*
- Brunswick, Town of*

Rensselaer County (cont.)

Castleton-on-Hudson, Village of
East Greenbush, Town of
East Nassau, Village of
Grafton, Town of*
Nassau, Town of
Nassau, Village of
North Greenbush, Town of
Poestenkill, Town of
Rensselaer, City of
Sand Lake, Town of
Schodack, Town of
Stephentown, Town of*
Troy, City of*

Schenectady County

Delanson, Village of
Duanesburg, Town of*
Princetown, Town of*
Rotterdam, Town of*

Schoharie County

Broome, Town of*
*Conesville, Town of***
*Fulton, Town of***
*Middleburgh, Town of***
*Wright, Town of***

Ulster County

*Denning, Town of***
*Hardenburgh, Town of***
Hurley, Town of*
Kingston, City of*
Kingston, Town of
Marbletown, Town of*
*Olive, Town of***
*Rosendale, Town of***
Saugerties, Town of
Saugerties, Village of
*Shandaken, Town of***
Ulster, Town of*
Woodstock, Town of

*Partially within the Mid-Hudson Watershed

**Partially within the Mid-Hudson Watershed, but not included in this Discovery Report due to inclusion within other Discovery processes, lack of flooding sources, and/or unpopulated area or development.*

****Outside of the Mid-Hudson Watershed but included in this Discovery project due to proximity and study needs.*

Study Date

The information and data presented in this report are static and were current as of August 2017. The Discovery process for the Mid-Hudson Watershed began in early 2016. Data collection was completed between March 2016 and February 2017. The in-person Discovery Meetings were held in October 2016. Additional details on meetings and stakeholder involvement can be found in Sections IV and V of this report. Where applicable, the dates of data creation are noted throughout the report.

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Acronyms and Abbreviations

AAL	Average Annualized Loss
BFE	Base Flood Elevation
CAC	Community Assistance Contact
CAV	Community Assistance Visit
CFR	Code of Federal Regulations
CID	Community Identification Number
CIS	Community Information System
CNMS	Coordinated Needs Management Strategy
CRS	Community Rating System
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FIPS	Federal Information Processing Standard
FMA	Flood Mitigation Assistance
GIS	Geographic Information System
Hazus-MH	Multi-Hazard Risk Assessment and Loss Estimation Software Program
HAZNY	Hazards- New York
HIRA-NY	Hazard Identification and Risk Assessment New York
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HWM	High Water Mark
HUC	Hydrologic Unit Code
LiDAR	Light Detection and Ranging
LOMA	Letter of Map Amendment
LOMC	Letter of Map Change
LOMR	Letter of Map Revision
LOMR-F	Letter of Map Revision based on Fill
MS4	Municipal Separate Storm Sewer System
NFIP	National Flood Insurance Program
NIBS	National Institute of Building Sciences
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWS	National Weather Service

NYSDEC	New York State Department of Environmental Conservation
NYSDHSES	New York State Division of Homeland Security and Emergency Services
PDM	Pre-Disaster Mitigation
Risk MAP	Risk Mapping, Assessment, and Planning
RL	Repetitive Loss
SFHA	Special Flood Hazard Area
SPDES	State Pollutant Discharge Elimination System
SRL	Severe Repetitive Loss
SWCD	Soil and Water Conservation District
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USGS	United States Geological Survey

Glossary of Terms

1-Percent-Annual-Chance Flood: The flood having a 1-percent chance of being equaled or exceeded in any given year. This is the regulatory standard also referred to as the "100-year flood" or "base 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). (Federal Emergency Management Agency (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)

Approximate Study: Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no BFEs or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply. An approximate study is represented on a FIRM as Zone A. (FEMA)

Average Annualized Loss (AAL): AAL is the estimated long-term value of losses to the general building stock averaged on an annual basis for a specific hazard type. Annualized loss considers all future losses for a specific hazard type resulting from possible hazard events with different magnitudes and return periods averaged on a "per year" basis. Like other loss estimates, AAL is an estimate based on available data and models. Therefore, the actual loss in any given year can be substantially higher or lower than the estimated annualized loss. (FEMA)

Base Flood Elevation (BFE): The computed elevation to which floodwater is anticipated to rise during the base flood. BFEs are shown on FIRMs and on the flood profiles. The BFE is a regulatory requirement for the elevation or flood proofing of structures. The relationship between the BFE and a structure's elevation determines the flood insurance premium. (FEMA)

Coordinated Needs Management Strategy (CNMS): A FEMA Geographic Information System (GIS) tool that identifies and tracks the lifecycle of mapping requests and needs for the flood hazard mapping program. (FEMA)

Dam: An artificial barrier that has the ability to impound water, wastewater, or any liquid-borne material, for the purpose of storage or control of water. (FERC)

Declared Disaster: Local and State governments share the responsibility for protecting their citizens and for helping them recover after a disaster strikes. In some cases, disasters are beyond the capabilities of local, State, and tribal government. In 1988, the Stafford Act was enacted to support local, State, and tribal governments and their citizens when disasters overwhelm and exhaust their resources. This law, as amended, established the process for requesting and obtaining a Presidential Emergency or Disaster Declaration, defined the type and scope of assistance available from the Federal Government, and set the conditions for obtaining assistance. Steps for a Disaster Declaration include: (1) Local government responds, supplemented by

neighboring communities and volunteer agencies. (2) If the local government is overwhelmed, the State responds, (3) Damage assessments are completed to determine total losses and recovery needs, (4) Disaster Declaration is requested by the governor of the state or by a tribal Chief Executive Officer (CEO), (5) Based on damage assessments, FEMA evaluates the request, and then (6) the President approves or denies the request. (FEMA)

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

Flood Insurance Rate Map (FIRM): The official map of a community on which FEMA has delineated both the special hazard areas and the risk premium zones applicable to the community. (FEMA)

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)

Flood Mitigation Assistance (FMA): The FMA program provides funds for projects to reduce or eliminate risk of flood damage to buildings that are insured under the NFIP on an annual basis. There are three types of FMA grants available and include (1) planning grants, (2) project grants, and (3) management cost grants. (FEMA)

Multi-Hazard Risk Assessment and Loss Estimation Program (Hazus-MH): Hazus-MH is a nationally applicable standardized methodology that estimates potential losses from earthquakes, hurricane winds and floods. FEMA developed Hazus-MH under contract with the National Institute of Building Sciences (NIBS). Hazus-MH uses state-of-the-art GIS software to map and display hazard data and the results of damage and economic loss estimates for buildings and infrastructure. It also allows users to estimate the impacts of earthquakes, hurricane winds and floods on populations. (FEMA)

Hazard Mitigation Assistance (HMA): FEMA's HMA grant programs provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages including the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA). (FEMA)

Hazard Mitigation Grant Program (HMGP): The HMGP provides grants to States or Tribes and local governments (as sub-grantees) to implement long-term hazard mitigation measures after a major disaster declaration. Each State or Tribe (if applicable) administers the HMGP in its jurisdiction. 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. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Individual homeowners and businesses may not apply

directly to the program; however, an eligible applicant or sub-applicant may apply on their behalf. (FEMA)

HUC (Hydrologic Unit Code): The United States Geological Survey (USGS) divides and sub-divides the area of the United States into successively smaller hydrologic units which are classified into four levels: regions, sub-regions, accounting units, and cataloging units. The hydrologic units are arranged or nested within each other, from the largest geographic area (regions) to the smallest geographic area (cataloging units). 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. (USGS)

Hydraulics: The science that deals with fluids in motion, is used to determine how a quantity of water will flow through a channel or floodplain. For purposes of floodplain analysis, hydraulics is the study of floodwaters moving through the stream and the floodplain. (FEMA)

Hydrology: The science that encompasses the occurrence, distribution, movement, and properties of the waters of the earth and their relationship to 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**):** is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth. These light pulses— combined with other data recorded by the airborne system— generate precise, three-dimensional information about the shape of the Earth and its surface characteristics. LIDAR systems allow scientists and mapping professionals to examine both natural and manmade environments with accuracy, precision, and flexibility. (NOAA)

Letter of Map Amendment (LOMA): A LOMA is an official amendment, by letter, to an effective NFIP map. A LOMA establishes a property's location in relation to the Special Flood Hazard Area (SFHA). LOMAs are usually issued because a property has been inadvertently identified as being in the floodplain, but is actually on natural high ground above the BFE or out of the floodplain as shown on the FIRM. Because a LOMA officially amends the effective NFIP map, it is a public record that the community must maintain. Any LOMA should be noted on the community's master flood map and filed by panel number in an accessible location. (FEMA)

Letter of Map Change (LOMC): LOMC is a general term used to refer to the several types of revisions and amendments to FEMA maps that can be accomplished by letter. They include LOMAs, Letters of Map Revision (LOMRs), and Letters of Map Revision based on Fill (LOMR-Fs). (FEMA)

Letter of Map Revision (LOMR): FEMA's modification to an effective FIRM. LOMRs are generally based on the implementation of physical measures that affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing

regulatory floodway, the effective BFEs, and/or the SFHA. The LOMR officially revises the FIRM and sometimes the FIS report. (FEMA)

Letter of Map Revision Based on Fill (LOMR-F): A LOMR-F is FEMA's modification of the SFHA shown on the FIRM based on the placement of fill outside the existing regulatory floodway. (FEMA)

Levee/Floodwall: A man-made structure designed to contain or control the flow of water. Levees and floodwalls are constructed from earth, compacted soil, or artificial materials, such as concrete or steel. To protect against erosion and scouring, earthen levees can be covered with grass and gravel or hard surfaces like stone, asphalt, or concrete. (FEMA)

Map Modernization: A multi-year Presidential initiative funded by Congress from fiscal year (FY) 2003 to FY 2008 that improved and updated the nation's flood maps and provided 92 percent of the nation's population with digital FIRMs. (FEMA)

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

Pre-Disaster Mitigation (PDM): The PDM grant program provides funds for hazard mitigation planning and projects on an annual basis. The PDM program was put in place to reduce overall risk to people and structures, while at the same time reducing reliance on Federal funding if an actual disaster were to occur. (FEMA)

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

Risk Mapping, Assessment, and Planning (Risk MAP) program: The FEMA program that provides communities with flood risk information and tools to support mitigation planning and risk reduction actions. (FEMA)

Severe Repetitive Loss (SRL) property: A SRL property is a single family property (consisting of 1 to 4 residences) covered by flood insurance underwritten by the NFIP that has incurred flood-related damage for which four or more separate claim payments have been paid with the amount of each claim payment exceeding $5,000 and with the cumulative amount of such claim payments exceeding $20,000; or for which at least two separate claim payments have been made with the cumulative amount of such claims exceeding the market value of the property. (FEMA)

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

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

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, aquifers, creeks, and streams, making its way to larger rivers and eventually the sea. (Watershed Atlas)

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 and which includes 9 of the 12 months. Thus, the year ending September 30, 2013, is called the "2013" water year. (USGS)

Executive Summary

The Federal Emergency Management Agency (FEMA) Mid-Hudson Watershed Discovery Report provides users with a comprehensive understanding of historical flood risk, existing flood-related data, and local needs concerning FEMA Flood Insurance Studies (FISs) and Flood Insurance Rate Maps (FIRMs) and current flood mitigation activities within the Mid-Hudson Watershed in New York.

In 2016, FEMA, in coordination with the New York State Department of Environmental Conservation (NYSDEC), implemented a Risk Mapping Assessment and Planning (Risk MAP) Discovery Project for the Mid-Hudson Watershed. The Discovery process involved significant watershed-wide data collection and outreach efforts with local stakeholders using several methods, including individual phone calls, webinars, and in-person meetings. During the outreach process, the emphasis was placed on opportunities for stakeholders to provide their comments and concerns and provide input for future mapping projects. Conversations during the meetings were focused on the types of existing data sources that could be used as part of a Risk MAP project, community mapping needs, locations of development pressure, and mitigation assistance requirements. Data collected from stakeholders within the Mid-Hudson Watershed during this Discovery process can be found in *Section III: Summary of Watershed-Wide Data*.

In addition to collecting information about mapping needs and existing data sources, the Discovery project also identified mitigation activities within the watershed. Local Hazard Mitigation Plans (HMPs) were reviewed to better understand existing flood risks within communities in the watershed. These plans are developed as part of the local planning process and are primarily multi-jurisdictional. Stakeholders provided additional information about ongoing mitigation activities in the watershed, and a number of communities requested specific training focused on hazard mitigation planning and future projects. More information on flood hazard mitigation projects and actions identified during the Discovery process can be found in *Section III: Summary of Watershed-Wide Data* in this report.

Using community mapping needs and information about existing data collected through the stakeholder engagement process, a recommended scope of work for the Mid-Hudson Watershed Discovery project was developed. The project area consists of eight counties and 86 communities. Communities in the Mid-Hudson Watershed have a mix of updated digital countywide FIRMs and older community based, paper FIRMs developed between 1979 and 2000.

While communities in Albany, Dutchess, Greene, Schenectady, Schoharie, and Ulster Counties have updated countywide FIRMs, communities in Columbia and Rensselaer Counties would benefit from a modernized countywide FIRM in a digital format. Many community officials find the existing maps difficult to work with and the floodplains shown inaccurate. Existing LiDAR data available for the entire watershed will make upgrading these portions of the watershed to a digital product feasible and significantly reduce the cost of developing model-based approximate A-zone studies.

The highest stream study priority in the recommended scope of work is an updated detailed study of the Hudson River for its entire length in the Mid-Hudson Watershed. The Hudson River borders six counties within the study area and was a high priority for both the counties and the communities on its waterfront. Several components required to update the Hudson River study have already been completed though other projects. The NYSDEC Hudson River Estuary program has detailed bathymetric data available for the entire estuarine reach from New York City to the Troy Lock and Dam. FEMA has already completed a storm surge analysis for the estuarine portion of the Hudson River as part of the North Atlantic coastline floodplain mapping project for New York City and Westchester County. As mentioned previously, detailed topographic information is available for the entire watershed through past LiDAR collections. By leveraging this existing information the cost to update the existing 1977 model should be significantly reduced.

In total, 18 high priority new or revised detailed riverine segments and lake studies, 17 medium priority detailed riverine studies, and eight lower priority detailed studies were identified as desirable for inclusion in a future Risk MAP project scope. There were also a number of lower priority streams that were targeted for new or revised approximate studies.

More specific information on stream study requests and other community needs collected through the Discovery process can be found in *Section VI: Discovery Findings* of this report and in *Appendix H: Discovery Meeting Summary Memorandum*. The recommended scope of work is also discussed in more detail in *Section VI: Discovery Findings* and is available in its entirety in *Appendix M: Mid-Hudson Watershed Recommended Scope of Work Memorandum*.

I. Discovery Overview

The Federal Emergency Management Agency's (FEMA's) Risk Mapping, Assessment, and Planning (Risk MAP) program helps communities identify, assess, and reduce their flood risk. Through Risk MAP, FEMA provides information to enhance local hazard mitigation plans, improve community outreach, and increase local resilience to floods.

The Mid-Hudson Watershed Discovery project is an interactive process that gathers existing data useful in updating Flood Insurance Studies (FISs), and results in a watershed-wide assessment of existing flood hazard mapping needs, and ultimately, recommendations for the development of updated Risk MAP products, such as revised Flood Insurance Rate Maps (FIRMs).

Discovery occurs after FEMA's planning and budgeting cycle, when watersheds of interest have been selected for further examination in coordination with Federal and State-level stakeholders. Watersheds are selected based on risk, need, available topographic data, and other factors. The data that FEMA has readily available is gathered and prepared at the national and regional level and augmented by community-supplied flood risk information and data collected during the Discovery process. Community participation is necessary to ensure that FEMA has the most up-to-date understanding of a community's flood risk.

The Discovery process does not necessarily mean that a new Risk MAP project will take place – instead, it is the process through which FEMA and NYSDEC learn about local flooding issues and prioritize the need for new studies or other support that may be provided under the Risk MAP program. Additional support may include the development of new training programs or providing assistance to selected communities to advance mitigation actions or join the Community Rating System (CRS).

During Discovery, FEMA, NYSDEC, and partners:

- Gather information about local flood risk and flood hazards;
- Review mitigation plans to understand local mitigation capabilities, hazard risk assessments, and current or future mitigation activities;
- Support communities within the watershed to develop a vision for the watershed's future;
- Collect information from communities about their flooding history, effective FIRM usability, development plans, daily operations, and stormwater and floodplain management activities;
- Use all information gathered to identify and prioritize areas of the watershed that require revised mapping, risk assessment, or mitigation planning assistance through a Risk MAP project; and
- Develop a Discovery Report and Maps that summarize and display the Discovery findings.

II. Mid-Hudson Watershed Overview

Watershed Characteristics and Geography

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

The HUC-8 code for the Mid-Hudson Watershed is 02020006. The first two digits of the 8-digit HUC denote the Regional Boundary (e.g., 02, for the Mid-Atlantic Region). The next two digits of the HUC denote the Sub-regional Boundary (e.g., 02, Upper Hudson). The following two digits are the code for the basin (e.g., 00, Upper Hudson, New York.). The last two digits of the HUC are the sub-basin (e.g., 06, Middle Hudson, New York). Figure 1: Mid-Hudson Watershed shows the boundaries of the watershed. Note that the official name of the HUC-8 hydrologic unit 02020006 is "Middle Hudson." For the purposes of this Discovery project, the term "Mid-Hudson Watershed" is used.

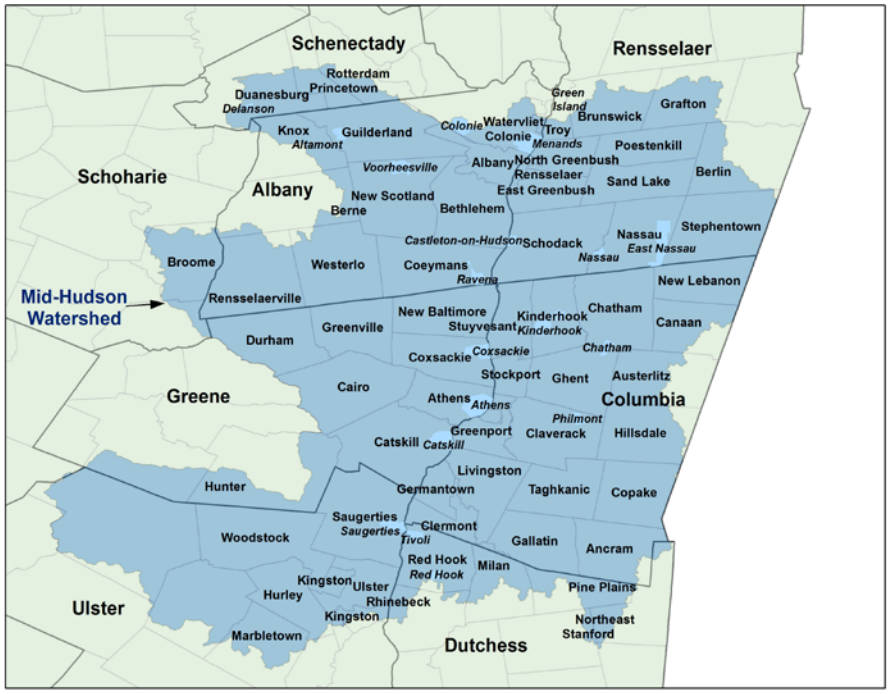

Figure 1: Mid-Hudson Watershed

The Mid-Hudson Watershed occupies 1,553,779 acres of southeastern New York State (NYS) and contains portions of Albany, Columbia, Dutchess, Greene, Rensselaer, Schenectady, Schoharie, and Ulster Counties. Urban areas make up 8% of the watershed and include the Cities of Albany, Kingston, Hudson, Rensselaer, Troy, and Watervliet along with their surrounding suburbs. There are approximately 1,700 farms in the watershed, the majority of which are medium sized.[2] Horse, beef cow, and poultry farms are the top farm operations. Land cropped for hay, corn for grain, and corn for silage dominate the cropland.

[1] *Hydrologic Unit Maps, U.S. Geological Survey. usgs.gov. http://water.usgs.gov/GIS/huc.html*
[2] *Mid-Hudson Watershed Rapid Assessment Profile, Natural Resources Conservation Service*

The watershed contains 30 different bodies of water including but not limited to:

- Hudson River
- Catskill Creek
- Normans Kill
- Roeliff Jansen Kill

Demographics

Population

The Mid-Hudson Watershed project area covers all or part of 86 towns, cities, and villages and has a population of 535,843. Albany, Rensselaer, Schenectady, and Schoharie Counties fall into the Albany-Schenectady-Troy Metropolitan Statistical Area (MSA). Communities in the watershed are generally small; the largest jurisdictions within the watersheds are the Cities of Albany, Kingston, Hudson, and the Town of Red Hook.[3] The distribution of population in the watershed is shown in *Table 1: Approximate 2010 Population in the Mid-Hudson Watershed*.

Table 1: Approximate 2010 Population in the Mid-Hudson Watershed

County	Total County Population (2010 data)	Percent of County Population in Mid-Hudson Watershed	2010 Estimated Population in the Mid-Hudson Watershed (Based on % in Watershed * Total Population)	Square Miles in Mid-Hudson Watershed
Albany	304,204	78%	237,279	407
Columbia	63,096	94%	59,310	597
Dutchess	297,488	12%	35,699	96
Greene	49,221	60%	39,532	388
Rensselaer	159,429	55%	87,686	359
Schenectady	154,727	25%	38,861	51
Schoharie	32,749	7%	2,292	44
Ulster	182,493	35%	63,873	393

Source: U.S. 2010 Census, New York Rapid Watershed Assessment Profile: Middle Hudson Watershed

Government/Representatives

The NYS Municipal Home Rule law grants significant authority to local government, including lawmaking and administrative powers. *Table 2: County Government Organization* outlines each county's administrative and legislative officials. Albany, Dutchess, Greene, Rensselaer, Schenectady, and Ulster Counties have adopted specific County Charters, which divide executive and legislative duties between the County Executive/Manager/Administrator and the County

[3] *Mid-Hudson Watershed Rapid Assessment Profile, Natural Resources Conservation Service*

Legislature. In the non-charter counties in the watershed, (Columbia and Schoharie), legislative and executive powers are joined under the Board of Supervisors.[4]

Table 2: County Government Organizations

County	Chief Administrative Official	Legislative Body
Albany	County Executive	Legislature (39 members)[5]
Columbia	Chairman of Board of Supervisors	Supervisors (19 members)[6]
Dutchess	County Executive	Legislature (25 members)[7]
Greene	County Administrator	Legislature (9 districts, 14 members)[8]
Rensselaer	County Executive	Legislature (6 districts, 19 members)[9]
Schenectady	County Manager	Legislature (15 members)[10]
Schoharie	Chairman of Board of Supervisors	Supervisors (16 members)[11]
Ulster	County Executive	Legislature (23 members)[12]

Property Ownership

Land ownership in the watershed is diverse. Agriculture is scattered throughout the watershed and is most prevalent in Columbia and Albany Counties.[13] Farm operations are dominated by livestock, and the predominant crops are dry hay, haylage, corn, and grain.

[4] https://www.dos.ny.gov/lg/publications/Local_Government_Handbook.pdf, page 40
[5] http://www.albanycounty.com/legislature.aspx
[6] https://sites.google.com/a/columbiacountyny.com/columbia-county-board-of-supervisors/
[7] http://www.co.dutchess.ny.us/CountyGov/Departments/Legislature/CLindex.htm
[8] http://greenegovernment.com/greene-government/county-legislature
[9] http://www.rensselaercounty.org/Districts.htm
[10] http://www.schenectadycounty.com/legislature
[11] http://www.schohariecounty-ny.gov/CountyWebSite/BoardOfSupervisors/boardofsupervisorshome.html
[12] http://ulstercountyny.gov/executive/about-executive
[13] U.S. Agricultural Census 2012

Albany County

Albany County is located in northwest New York in the state's Capital District Region, which includes Albany, Schenectady, Rensselaer, and Saratoga Counties.[14] The county seat is the City of Albany. The county covers an area of 522 square miles and has a population of 304,204 with an average of 581 people per square mile.[15] The City of Albany is the largest population center, with a population of 97,856 in 2010.[16]

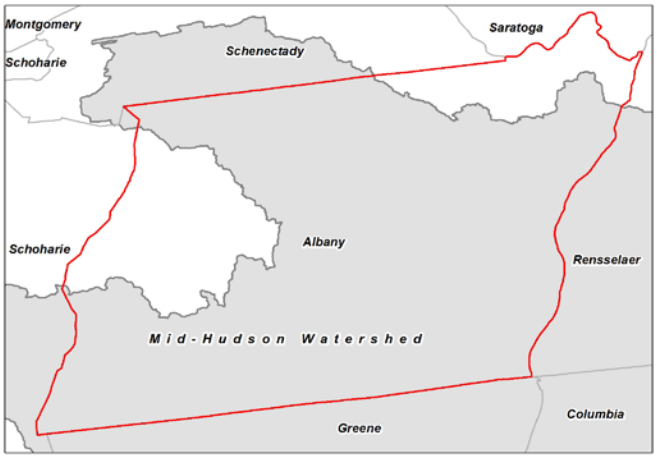

Figure 2: Albany County

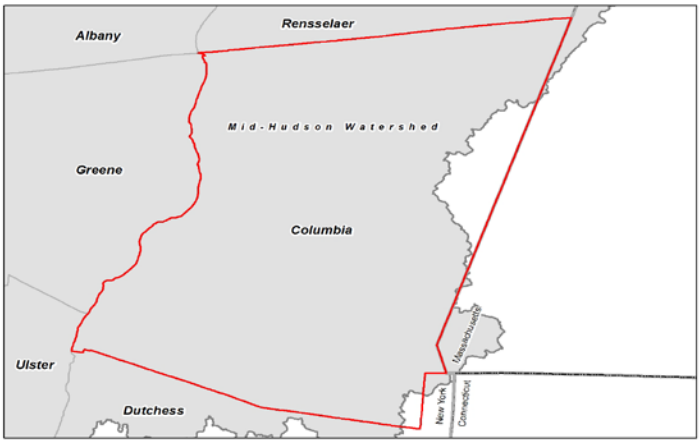

Figure 3: Columbia County

Columbia County

Columbia County covers 634 square miles[17] in the Hudson Valley region of eastern New York.[18] The Hudson River runs approximately 30 miles along the county's western border.[19] The county seat is the City of Hudson. The agricultural economy is a large part of the county, with farmland comprising 29% of the total land area. The Town of Kinderhook has the largest population with 8,498 people,[20] followed by the City of Hudson with 6,713 people.[21]

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[14] *Capital District Regional Planning Commission*
[15] *http://www.census.gov/quickfacts/table/LND110210/36001*
[16] *http://www.census.gov/quickfacts/table/LND110210/3601000*
[17] *http://www.census.gov/quickfacts/table/LND110210/36021*
[18] *Columbia County Hazard Mitigation Plan, page 26*
[19] *ibid*
[20] *http://www.census.gov/quickfacts/table/LND110210/3602139573*
[21] *http://www.census.gov/quickfacts/table/LND110210/3635969*

Dutchess County

Dutchess County is located in southeastern New York in the Hudson Valley. The county seat is the City of Poughkeepsie. The county is bordered to the west by the Hudson River, to the east by Connecticut, to the north by Columbia County, and to the south by Putnam County. Dutchess County covers an area of 795 square miles and has a population of 297,488 with an average of 373 people per square mile.[22] The Town of Poughkeepsie, with a population of 43,341 is the most populated municipality in the county.[23]

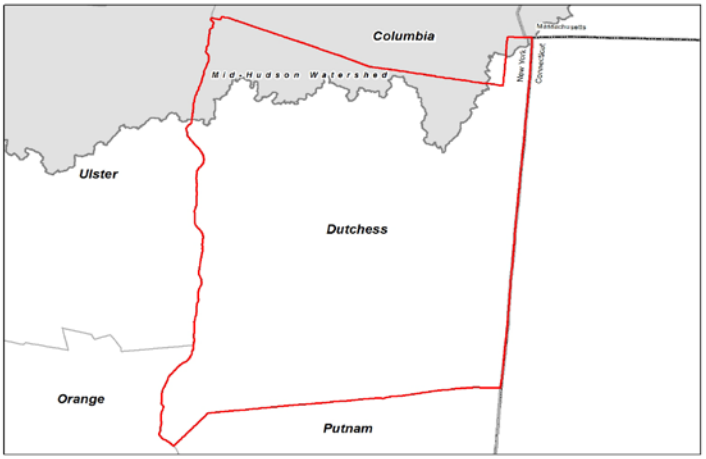

Figure 4: Dutchess County

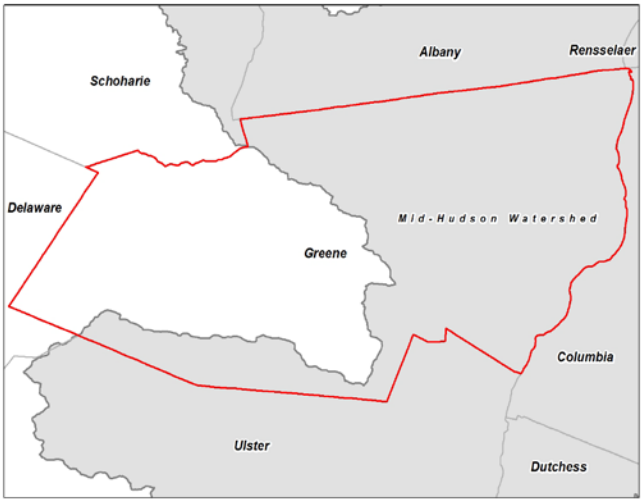

Figure 5: Greene County

Greene County

Greene County is located in southeastern New York, west of the Hudson River and south of Albany. The county seat is the Village of Catskill. Greene County is located in the Catskill Mountains region, with an area of 647 square miles, population of 49,221, and average of 76 people per square mile.[24] Tourism is vital to the county economy, accounting for 15% of employment in the Catskills region.[25]

[22] http://www.census.gov/quickfacts/table/LND110210/36027
[23] http://www.census.gov/quickfacts/table/LND110210/3602759652
[24] http://www.census.gov/quickfacts/table/LND110210/36039
[25] Greene County 2016 Hazard Mitigation Plan, page 28

Rensselaer County

Rensselaer County is located in eastern New York. The county seat is the City of Troy. The county is bordered to the north by Washington County, to the east by the States of Vermont and Massachusetts, to the west by Saratoga and Albany Counties, and to the south by Columbia County. Rensselaer County has a population of 159,429, a population density of 244 people per square mile, and a total area of 652 square miles.[26] The county is located in the State's Capital District Region, a region that includes Albany, Schenectady, Rensselaer, and Saratoga Counties.[27]

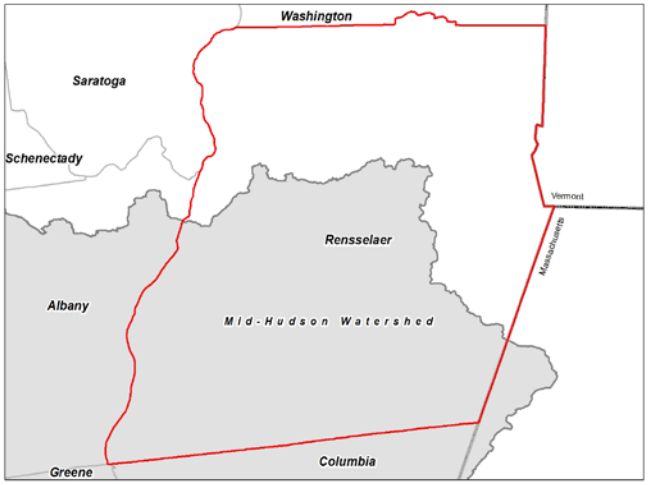

Figure 6: Rensselaer County

Figure 7: Schenectady County

Schenectady County

Schenectady County is the second smallest of the upstate counties, occupying approximately 204 square miles in east central New York. The county seat is the City of Schenectady. The county has a population of 154,727 with an average of 756 people per square mile.[28] The county is considered an industrial and research center, with a large concentration of manufacturing and research performed by GE Power and Water, Knolls Atomic Power Laboratory, and Schenectady International (S.I. Group). The densest residential, commercial, and industrial development is in the City of Schenectady and surrounding suburban areas of Rotterdam, Scotia, Glenville, and Niskayuna.[29] The county is located in the state's Capital District Region.[30]

[26] http://www.census.gov/quickfacts/table/LND110210/36083
[27] Capital District Regional Planning Commission
[28] http://www.census.gov/quickfacts/table/LND110210/36093
[29] Schenectady County Hazard Mitigation Plan, *page 24*
[30] Capital District Regional Planning Commission

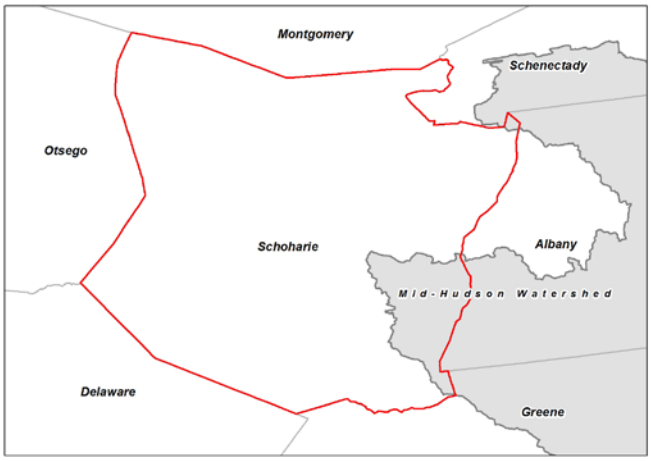

Figure 8: Schoharie County

Schoharie County

Schoharie County is located in east-central New York, and is part of the Albany-Schenectady-Troy MSA. The county seat is located in the Village of Schoharie. Schoharie County is the least populated county in the region, with a population of 32,749 and population density of 52 people per square mile.[31]

Ulster County

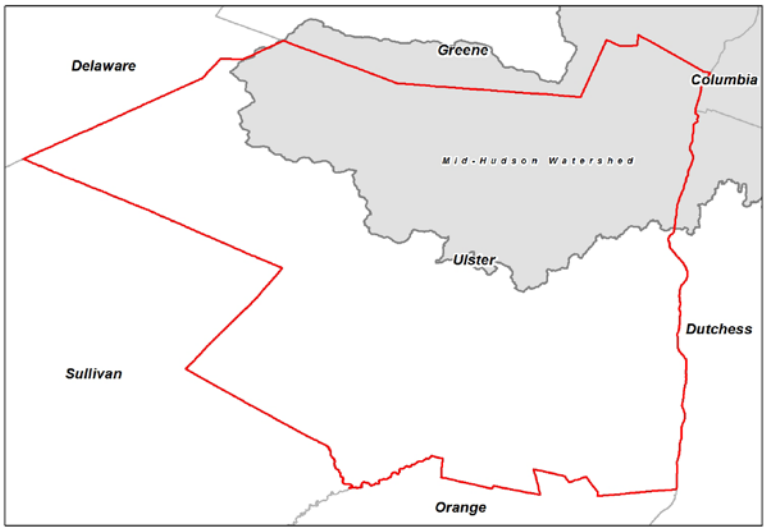

Figure 9: Ulster County

Ulster County is located in southeastern New York in the Mid-Hudson region of the Hudson Valley. It is the northernmost county and largest county by land area in the New York Metropolitan Area. The county has a population of 182,493 people, population density of 162 people per square mile, and an area of 1,124 square miles, comparable in size to the State of Rhode Island.[32] The county seat and only city is the City of Kingston.[33] Most land in the county is preserved open space, low-density development, or agricultural. Some recent development trends in the county include upcoming construction of the Nevele Resort, Casino, and Spa in the Village of Ellenville,[34] and expansion of the State University of New York (SUNY) New Paltz campus.[35]

More information on property ownership can be found on each County's Real Property webpage as noted in *Table 3: Links to Real Property Webpages.*

[31] http://www.census.gov/quickfacts/table/LND110210/36095
[32] http://www.census.gov/quickfacts/table/LND110210/36111
[33] Ulster County Hazard Mitigation Plan, page 23
[34] Ulster County Hazard Mitigation Plan, page 203
[35] Ulster County Hazard Mitigation Plan, page 204

Table 3: Links to Real Property Webpages

County	Hyperlink to Real Property Webpage
Albany	http://www.albanycounty.com/Government/Departments/DepartmentofManagementandBudget/RealPropertyTaxServiceAgency.aspx
Columbia	https://sites.google.com/a/columbiacountyny.com/columbia-county-real-property-tax/
Dutchess	http://www.co.dutchess.ny.us/countygov/departments/realpropertytax/rpindex.htm
Greene	http://greenegovernment.com/departments/rpts
Rensselaer	http://www.rensco.com/departments/bureau-of-tax-services/county-assessment-rolls/
Schenectady	http://www.schenectadycounty.com/taxmaps
Schoharie	http://www.schohariecounty-ny.gov/CountyWebSite/RealProperty/realpropertyhome.html
Ulster	http://ulstercountyny.gov/real-property

Land Use

A comprehensive plan is a land use document that provides framework and policy direction for land use decisions. Comprehensive plans usually include chapters detailing policy direction affecting land use, transportation, housing capital facilities, utilities, and rural areas. Comprehensive plans identify where and how growth needs will be met. For floodplain management and hazard mitigation, a land-use management plan can be a powerful tool to guide the community on how to achieve increased resilience. If a community has a comprehensive plan, it needs to be in compliance with both the local flood damage prevention ordinance and local HMP.

The 2001 National Land Cover Database divides land cover in the United States into 16 classes. In the Mid-Hudson Watershed, forest accounts for 59% of the land cover, followed by grassland (13.9%), developed land/low intensity (8.9%), wetland (7.4%), cultivated crops (4.9%), open water (2.4%), shrub/scrub (2.1%), developed land medium/high intensity (1.8%), and barren land (0.02%).[36]

Land use regulations in NYS are primarily controlled at the municipal level. Individual communities have the ability to adopt zoning, subdivision regulations, and environmental regulations, often guided by a comprehensive planning process that sets priorities for land use. Specific land use trends and challenges are discussed below for each county.

Albany County

Albany County includes 63,394 acres of farmland clustered in the rural towns of Berne, Knox, Westerlo, and Rensselaerville.[37] Policies for the protection of agricultural land are outlined in the county's *Agricultural and Farmland Protection Plan.* Parkland and preserves include the Delmar State Game Farm, the Partridge Run Game Management Area, the Pine Bush State Unique Area,

[36] *Mid-Hudson Watershed Rapid Assessment Profile, Natural Resources Conservation Service*
[37] *USDA Census of Agriculture 2012*

and Thatcher State Park.[38] The Albany County HMP predicts that over 95% of the projected growth will take place in the Towns of Colonie, Guilderland, and Bethlehem, adjacent to the City of Albany.[39]

Columbia County

Land use development trends are not discussed in detail in Columbia County's HMP, though the plan does note that the county is consistently losing green space to development, with most towns noting forested area turning into residential areas.[40] Almost 50% of the county's land is used for agriculture with 95,378 acres used for farming according to the 2012 Agricultural Census.[41] Nonprofit organizations such as Scenic Hudson and the Columbia Land Conservancy work to conserve prime farmland through conservation easements.[42] In May 2015, Scenic Hudson acquired a 590-acre parcel in the Town of Stockport, at that time the largest privately owned, undeveloped land in the county.[43]

Dutchess County

Suburban development has been the fastest growing type of development in Dutchess County over the last 40 years.[44] There are 74,820 acres of protected land in the county; 31,106 acres are preserved farmland. Recent land use trends have been centered on the expansion of developed areas of housing, commercial and transportation activities. There has also been a significant trend in the increase of residential development of larger parcels and larger homes. Since the beginning of the 21st century, approximately one-third of new houses in the county have been constructed on two acres or larger, leading to a loss of forested land.[45] A 2010 report from the Dutchess County Transportation Council notes that most development is occurring in the southern and central parts of the county, with over 1,000 proposed housing units, accounting for over 77% of all proposed units countywide.[46] The southern and eastern portions of Dutchess County also saw the most non-residential development proposals. Dutchess County is a member of the Hudson River Valley Greenway, a state sponsored cooperation of six counties authorized by the Hudson River Valley Greenway Act of 1991. The Greenway Program facilitates regional approaches to land use, transportation, and planning through development of Greenway Compacts. Dutchess County developed the first Greenway Compact in 2000, serving as a statewide model.[47]

Greene County

Greene County is predominantly rural with a small number of urban centers. The county is located in the Catskill Mountains Region and includes the Catskill Park, a 700,000-acre forest preserve protected from many forms of development. Greene County also has a large farming and forestry-based industry; 80% of the county is forested and 60% of that land is privately owned.[48]

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[38] *Albany County Hazard Mitigation Plan, page 18*
[39] *Albany County Hazard Mitigation Plan, page 20*
[40] *Columbia County Hazard Mitigation Plan, page 32*
[41] *https://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/New_York/st36_2_001_001.pdf*
[42] *http://imby.com/hudson/article/important-farmland-preserved-by-scenic-hudson-columbia-land-conservancy/*
[43] *Daily Freeman News, April 15, 2015*
[44] *Dutchess County Hazard Mitigation Plan, page 10*
[45] *Dutchess County Hazard Mitigation Plan, page 22*
[46] *Dutchess County Hazard Mitigation Plan, page 24*
[47] *http://www.hudsongreenway.ny.gov/Planning/Greenway_Compact.aspx*
[48] *http://greenegovernment.com/wp-content/uploads/2013/10/ChapterEight_LandUsePlanningAnalysis.pdf*

Rensselaer County

Rensselaer County is largely rural and agricultural. Land use is divided into the following categories:

- Agriculture: 16.4%
- Residential: 39.6%
- Vacant: 29.6%
- Parks and Open Space: 8.9%
- Office, Business, Commercial: 1.6%
- Community Services/Industrial/Utilities/Transportation/Open Water: 3.9%

The county's HMP indicates that future development trends are likely going to be characterized by infill development in the western portion of the county, more development of low-density housing in the woodlands of the central-eastern section, and proposed higher density development in regions around the cities with some loss of existing farmland.[49]

Schenectady County

Redevelopment of vacant or brownfield sites is a key component of Schenectady County's economic development strategy. According to its HMP, the county's land use can be divided into six major categories:

- Residential: 54%
- Vacant: 23%
- Commercial and industrial: 8%
- Agricultural: 6%
- Community and public service: 6%
- Parks, conservation areas, and forest: 3%

The only land use category that has changed significantly is the increase in residential development, due largely to major subdivisions that have been built in the Towns of Glenville, Niskayuna, and Rotterdam.[50]

Schoharie County

Agriculture has been the traditional leader of Schoharie County's economy. The county's agricultural background and rural character means there are large amounts of open space and farmland.[51] Most of the larger employers in the county are located in the Village of Cobleskill, considered the economic center of the county.[52] The county is outside of the core Albany-Capital District Region and growth is not expected to increase dramatically. The greatest potential for development exists in the highway and rail transportation corridor crossing the county through Esperance, Schoharie, Cobleskill, and Richmondville. [53]

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[49] *Rensselaer County Hazard Mitigation Plan, page 3d-8*
[50] *Schenectady County Hazard Mitigation Plan, page 28*
[51] *Schoharie County Hazard Mitigation Plan, page 9*
[52] *http://stormrecovery.ny.gov/sites/default/files/crp/community/documents/esperance-schoharie-middleburgh_nyrcr_plan.pdf*
[53] *Schoharie County Hazard Mitigation Plan, page 8*

Ulster County

Ulster County land use planning is divided into several components through the adoption of individual Housing, Transportation, and Open Space Plans. Ulster County is a member of the Hudson Valley Greenway Program. The county's Greenway Compact (currently in development) will unify these documents into a regional planning approach.[54] The county has a long history of open space protection. Catskill Forest Preserve and Mohonk Preserve are some of the largest areas of open space, encompassing 160,000 acres and 6,500 acres respectively.[55] The county's HMP indicates that agriculture and natural resources are expected to remain a focus for the county economy, and most new development is expected to continue to occur in the Hudson River Valley, especially along the Interstate 87 Corridor.

Table 4: U.S. Census 2010 and USDA Census of Agriculture 2011: summarizes the total population and land area in the watershed from the 2010 U.S. Census and the number of farms and acres of farmland from the USDA 2012 Census of Agriculture.

Table 4: U.S. Census 2010 and USDA Census of Agriculture 2011

County	Land Area (Square Miles)	Farm Land (Acres)	Farm Land (Acres) Within Watershed	Total Farms Within Watershed
Albany	522	63,394	49,447	385
Columbia	635	95,378	89,665	464
Dutchess	796	112,482	13,498	81
Greene	647	42,986	25,792	164
Rensselaer	652	88,763	48,820	272
Schenectady	204	19,868	4,967	42
Schoharie	622	98,369	6,885	37
Ulster	1,124	71,222	24,928	170

Sources: U.S. Census Bureau 2010 and USDA Census of Agriculture 2011

Media

The Albany-Schenectady-Troy media market serves the Mid-Hudson Watershed. The area has eight primary television stations, 30 full power FM and 16 AM radio stations. The primary newspaper in the watershed is the Times-Union, which covers the entire region.[56] Other prominent local newspapers are noted below.

[54] *Ulster County Hazard Mitigation Plan, page 196*
[55] *Ulster County Hazard Mitigation Plan, page 190*
[56] *Hudson-Hoosic Watershed Risk MAP Discovery Report*

Albany County newspapers and media include:[57]

- *The Altamont Enterprise and Albany County Post*
- *The Business Review*
- *The Evangelist*
- *The News-Herald*
- *The Spotlight*

Columbia County newspapers include:[58]

- *The Columbia Paper*
- *Register-Star*

Dutchess County newspapers include:[59]

- *Beacon Free Press*
- *Northern Dutchess Review*
- *Poughkeepsie Journal*
- *Redhook Observer*
- *River Chronicle*

Greene County newspapers include:[60]

- *The Daily Mail*
- *Windham Journal*

Rensselaer County newspapers include:[61]

- *The Troy Record*
- *Rensselaer County North Advertiser*
- *Rensselaer County South Advertiser*

Schenectady County and Schoharie County newspapers and media include:[62]

- *The Daily Gazette*
- *Cobleskill Times-Journal*
- *The Mountain Eagle and The Schoharie News*

Ulster County newspapers and media include:[63]

- *The Daily Freeman*
- *New Paltz Times*
- *Shawangunk Journal*
- *Woodstock Times*

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[57] http://nynewspapers.com/newspapers-by-county/#A
[58] http://nynewspapers.com/newspapers-by-county/#C
[59] http://nynewspapers.com/newspapers-by-county/#D
[60] http://nynewspapers.com/newspapers-by-county/#G
[61] http://nynewspapers.com/newspapers-by-county/#R
[62] http://nynewspapers.com/newspapers-by-county/#S
[63] http://nynewspapers.com/newspapers-by-county/#U

Historic Flooding Problems

Overview

Throughout the recorded history of the Mid-Hudson Watershed, flooding has been a constant threat. Floods in the early summer months and extending through the fall months are often associated with tropical systems moving north along the Atlantic coast. During the winter, flooding is a threat when ice jams impede the free flow of rivers in the watershed. Flooding usually occurs in the late winter and early spring when the ground is still frozen and snowmelt adds to heavy rainfall to produce increased runoff. Historic flooding problems associated with each county in the watershed are summarized below. County HMPs include vulnerability assessments for hazards, based on models including Hazards New York (HAZNY) and Hazard Identification and Risk Assessment New York (HIRA-NY). HAZNY is an automated interactive risk assessment tool that enables the quantitative assessment of risks. HIRA-NY evaluates five factors related to the hazard analysis process to rank hazards. Both models assign rankings of 44-160 (low), 161-240 (moderately low), 241-320 (moderately high) and 321- 400 (high). Specific scores are noted for each county when available. [64]

Albany County

Floods are the highest risk natural hazard in Albany County. In the county's 2007 HMP, floods have a ranking of 270 on the HIRA-NY model, a ranking of moderately high.

Columbia County

Floods have a ranking of 232 on the HIRA-NY scale, ranking them a moderately low hazard in Columbia County. However, this score is close to 241, the minimum score for a "moderately high" hazard. Since 1953, there have been seven Federal Disasters for flood events. Streams including Roeliff-Jansen Kill, Claverack Creek, and Kinderhook Creek contribute to flooding during storm events; there is also a risk of flooding due to rainfall from coastal storms, and thunderstorms and downpours in low-lying areas. The county HMP also notes that there is a significant amount of construction occurring throughout the county that could lead to an increase of flooding potential in all areas of the county.

Dutchess County

Flooding is a significant concern for Dutchess County. The county's HMP states that approximately 7.5% of the county is prone to flooding, triggered by coastal storms, hurricanes/tropical storms, and Nor'easters. Between 1960 and 2012, the county had 56 flooding events that resulted in two fatalities and over $58 million in property damage.

Greene County

Flooding is the highest risk natural hazard in the county. Since the last approved hazard mitigation plan update in 2009, nine flooding events have occurred in the county. Hurricane Irene (2011) and Hurricane Sandy (2012) caused extensive flooding and damage throughout the county. Between 1953 and 2015, Greene County had 95 flooding events leading to $15 million in property damage.[65]

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[64] *http://www.dhses.ny.gov/recovery/mitigation/documents/2014-shmp/Section-3-9-Flood.pdf*
[65] *Greene County Hazard Mitigation Plan, Section 4.0, page 49*

Rensselaer County

The majority of flooding in Rensselaer County is riverine flooding that occurs in low-lying areas. Since 1978, National Flood Insurance Program (NFIP) losses have totaled $1.5 million. The Rensselaer County HAZNY analysis ranks flooding as the most significant natural hazard in the County.[66] Half of all Federal Disaster declarations in the county between 1953 and 2010 have involved flooding.[67]

Schenectady County

Schenectady County's HMP ranks flooding as a high risk hazard based on HAZNY. The county has experienced four significant floods recently (January 1996, June 2006, and two floods in August and September 2011). The Hamlet of Rotterdam Junction in the Town of Rotterdam was severely impacted by the flooding in August 2011 (see Figure 10: Flooding in Rotterdam Junction, 2011).

Figure 10: Flooding in Rotterdam Junction, 2011

Schoharie County

Schoharie County's HMP ranks flooding as a moderately high hazard with a score of 304 on the HAZNY scale. Hurricane Irene dumped 16 inches of rain in the Catskill Region at the headwaters of Schoharie Creek. Ten days later, Tropical Storm Lee caused flash flooding, resulting in an 8-foot tidal wave washing away businesses and homes in the valley of the county. Repair and reconstruction is ongoing and costs for residential structures in the county are expected to reach $90 million.[68]

Ulster County

Ulster County's HMP classifies flooding as a high-risk hazard. The county is affected by riverine and coastal flooding.[69] Ulster has experienced 81 recorded flood events since 1996, resulting in more than $24 million in property damage.[70] About 85% of all Federal Disaster declarations covering the county have involved flooding. Severe flooding in 2005, 2006, and 2007 damaged approximately 150 residential structures. Hurricane Irene (2011) and Hurricane Sandy (2012) also led to significant damage throughout the community including overtopped and eroded stream banks, dozens of flooded homes, and substantial infrastructure damage to water mains, sewage treatment facilities, and water delivery systems.[71] The City of Kingston, located along the Hudson River, is extremely vulnerable to flooding.

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[66] *Rensselaer County Hazard Mitigation Plan, page 2-12*
[67] *Rensselaer County Hazard Mitigation Plan, page 2-11*
[68] *http://www.watershedpost.com/2016/unfinished-business-recovery-schoharie-valley-five-years-after-irene*
[69] *Ulster County Hazard Mitigation Plan*
[70] *ibid*
[71] *http://stormrecovery.ny.gov/sites/default/files/crp/community/documents/ulstercounty_nyrcr_plan.pdf*

Significant flood events from the HMPs are summarized in *Table 5: Hazard Mitigation Plan Significant Flood Events*. See Hazard Mitigation Planning and Activities for additional information on HMPs.

Table 5: Hazard Mitigation Plan Significant Flood Events

County	Community	Flood Events of Significance
Albany	City of Albany	July 2014: 2.9 inches of rain in less than an hour led to severe flooding in many areas of the city, damaging four sewer districts and flooding intersections.
Columbia	Town of Canaan	August 2004: Flooding caused $280,000 in property damage.
	Countywide	January 1996: Flooding caused $4 million in damages.
Dutchess	Towns and Villages of Red Hook and Rhinebeck	December 2008: Severe Winter Storm (EM-3299): Total precipitation of 1 to 4 inches caused flooding of small streams and creeks. Roads were also flooded.
	Countywide	August 2011: Flash flooding reported in several areas, numerous roads and bridges closed or damaged. Record flooding recorded on the Hudson River at Poughkeepsie, and major flooding on the Hoosic River at Eagle Bridge and Hudson River at Troy.
	Countywide	October 2012: Hurricane Sandy caused record tidal flooding along the Hudson River throughout the county.
Greene	Eastern Greene County	July 2013: Heavy rainfall resulted in 4 to 7 inches of flash flooding across the eastern part of the county. Roadways were closed.
	Countywide	August 2011: Hurricane Irene led to record flooding on Schoharie Creek, one death, and numerous downed trees, power lines, and prolonged power outages for 18,000 people.
	Route 23, Route 145	December 2010: 1 to 3 inches of flooding fell across the county, resulting in flooding and closures of segments of Route 145 and Route 23.
	Countywide	FEMA DR-1589, April 2005: Heavy rainfall combined with high flow rates from previous rainstorms and snowmelt led to severe damage throughout the county. Many county roads were closed. State Routes 23A and 23B, and Route 32 were underwater. The county experienced approximately $1.3 million in damages.
Rensselaer	Town of Berlin	Localized flash flooding washed out a segment of Route 41 and caused $5,000 in damages.
	City of Rensselaer, Town of East Greenbush	2008: Very heavy rainfall led to significant flash flooding especially along the banks of Quackenderry Creek and Mill Creek. A State of Emergency was declared, and more than 6 feet of standing water was reported in the City of Rensselaer. $4,000,000 in damages.
	Towns of Nassau, Schodack, Stephentown, and Sand Lake	2009: Flash flooding caused Kinderhook Creek to overflow its banks and washed out numerous roadways and bridges.
Schenectady	Town of Princetown	May 2013: Localized flooding and high volume of water led to overflow of small streams and storm sewers with $100,000 in county road damages.

Table 5: Hazard Mitigation Plan Significant Flood Events

County	Community	Flood Events of Significance
Schenectady (cont.)	Countywide: Mohawk River, Schoharie Creek, Normanskill River	August-September 2011: Hurricane Irene caused severe damage throughout the county- major damage in Rotterdam Junction and Duanesburg. Over $6 million in NFIP payouts.
	Towns of Princetown, Duanesburg	2008: Localized flooding led to washouts of roads and culverts and over $1 million in damages.
Schoharie	Town and Village of Esperance, Town and Village of Schoharie, Town and Village of Middleburgh	2011: Hurricane Irene dumped 16 inches of rain, causing Schoharie Creek to rise to 17 feet in 12 hours. 57 homes were destroyed, 367 suffered severe damage (representing 20% of the total housing stock in these towns), and 3,370 residents in the county lost power.
	Towns of Seward, Richmondville, Cobleskill, Summit, and Gilboa	June 2006: Heavy rain and flooding in areas west of Schoharie Creek. Up to 6 inches of rain fell in some areas. Approximately 43% of the farmland in the county was damaged and extensive structural damage to farm properties was reported. Up to $160,000 in damages to municipal roads, bridges, and other infrastructure.
Ulster	Town of Saugerties, Hamlet of High Falls, Hamlet of Kerhonkson	March-April 2005: Flooding throughout the county led to more than $2.2 million in property damages.
	Town of Ulster	2005, 2006, and 2007: Significant flooding events damaged 150 residential structures and caused several significant sewer breaks. The Town received more than $850,000 in Public Assistance funds from FEMA.
	Countywide	August 2011: Hurricane Irene brought 4 to 8 inches of rain, with isolated amounts of up to 18 inches reported. Extensive damage to roads, bridges, and electrical infrastructure. Record flooding at Esopus Creek, Rondout Creek at Rosendale, and Hudson River. Several creeks exceeded major flood stage (Esopus Creek, Rondout Creek, and Twaalfskill Creek). Segments of NY State Thruway and Route 42 were closed due to numerous reports of flooding.
	Countywide	September 2011: Tropical Storm Lee. Heavy rainfall led to widespread minor (Esopus Creek) to moderate flooding (Esopus Creek downstream from Ashokan Reservoir). Numerous roads flooded and small streams overflowed their banks.
	Countywide	October 2012: Hurricane Sandy caused a storm surge of water that moved up the Hudson River, causing record flooding on the Hudson River and damage to homes along the river in Ulster, Albany, and Dutchess Counties. Tidal flooding along Rondout Creek and Esopus Creek damaged several homes. 63,000 customers lost power in Ulster County.

Sources: Albany County Hazard Mitigation Plan, Columbia County Hazard Mitigation Plan, Dutchess County Hazard Mitigation Plan, Greene County Hazard Mitigation Plan, Rensselaer County Hazard Mitigation Plan, Schenectady County Hazard Mitigation Plan, Schoharie County Hazard Mitigation Plan, Ulster County Hazard Mitigation Plan

New York Rising Community Reconstruction Program (NYRCRP)

The NYRCRP is a planning and implementation process established by the State of New York to provide rebuilding and resiliency assistance to communities severely damaged by Hurricane Irene, Tropical Storm Lee, and Hurricane Sandy. Communities in Ulster, Schenectady, and Schoharie Counties are all part of the NYRCRP. Critical issues as well as programs, policies, and initiatives developed by each community are noted below in *Table 6: NYRCRP Communities*.

Table 6: NYRCRP Communities

County	Critical Issues	Programs, Policies, and Initiatives
Schenectady	• Increase stockpile of supplies and plan sharing for emergency management facilities • Increase protection for wastewater systems • Protect water quality of Mohawk River by mitigating overflows associated with flooding	• Install generator back up at Rotterdam wellhead • Complete a Canal Way study for drainage management • Provide flood protection for the National Grid substation
Schoharie	• Schoharie Creek flooding • Lack of flood warning and response system • Lack of comprehensive open space and stormwater plans	• Schoharie Creek Flood Study • Install sewer to prevent future health risks in the Village of Esperance • Land use study for floodplain management
Ulster	• Widespread flooding of Rondout, Wallkill, and Esopus Creeks • Stream bank erosion • Lack of emergency preparedness, regional command centers, and effective inter-municipal communication among emergency service providers	• Village of Ellenville: Stream bank restoration • Town and Village of New Paltz: consolidated municipal and emergency operations center • Town of Olive: Relocate Boiceville Firehouse

Sources: Schenectady/Rotterdam New York Rising Community Reconstruction Plan, Esperance/Schoharie/ Middleburgh NYRCR Plan, Ulster County New York Rising Community Reconstruction Plan

High Water Marks

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

HWMs identified by watershed stakeholders during this Discovery project are summarized in *Appendix H: Discovery Meeting Summary Memorandum*.

Disaster Declarations

Like much of the eastern United States, one of the most frequent, widespread, 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 (2011) and Hurricane Sandy (2012).

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. The major flood-related disaster declarations for the study area are listed below in *Table 7: Disaster Declarations*. Since 1972, there have been 21 flood-related declared disasters within the study area. FEMA's disaster and emergency declarations history can be viewed at FEMA's website.[72]

Table 7: Disaster Declarations

Incident Period	Title of Event	Number of Counties Declared Within Study Area
June 1972	DR 338: New York Tropical Storm Agnes	2
March 1973	DR 367: High Winds, Wave Action & Flooding	1
July 1973	DR 401: Severe Storms & Flooding	4
April 1984	DR 702: Flooding, Southeastern NY	1
May 1987	DR 792: Flooding, East Central NY	3
January 1996	DR 1095: Severe Storm & Flooding	8
December 1996	DR 1148: Severe Flooding	1
September 1999	DR 1296: Hurricane Floyd	8
July 2000	DR 1335: Severe Storms, Tornadoes, & Flooding	8
August 2003	DR 1486: Severe Storms, Tornadoes, & Flooding	3
August-September 2004	DR 1534: Severe Storms & Flooding	2
October 2004	DR 1564: Severe Storms & Flooding	2
October 2004	DR 1565: Tropical Depression Ivan	2
April 2005	DR 1589: Severe Storms & Flooding	6
July 2006	DR 1650: Severe Storms & Flooding	5
April and May 2011	DR 1993: Severe Storms, Flooding, Tornadoes, and Straight Line Winds	1
August 2011	DR 4020: Hurricane Irene	8
September 2011	DR 4031: Tropical Storm Lee	3
October 2012	DR 4085: Hurricane Sandy	1
July 2014	DR 4180: Severe Storms & Flooding	1

Source: FEMA

Ice Jams

As explained by the National Weather Service (NWS), "ice jams cause localized flooding and can quickly cause serious problems. 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".[73]

[72] https://www.fema.gov/disasters
[73] http://www.weather.gov/media/aly/Hydrology/IceJamInfo.pdf

There are two types of ice jams: freeze up and break up. Freeze up jams usually occur in early to mid-winter during extremely cold weather. Break up jams usually occur in mid to late winter with thaws. NWS notes the conditions of both below:[74]

Freeze Up Jam Criteria:

Three consecutive days with daily average temperatures of less than 0°F. Early to mid-winter formation, fairly steady discharge, frazil and broken border ice, unlikely to release suddenly, smooth to moderate surface roughness.

Break Up Jam Criteria:

Ice around one foot thick or more (presumed) and daily average temperature forecast to be greater than 42°F or more. Direct sunlight plays a large role as open water areas absorb sunlight. A break up jam can occur at any time after ice cover formation, but generally takes place in mid to late winter. Break up jams are highly unstable with sudden failures.

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.

Flooding caused by ice jams is not calculated nor shown on FEMA's FIRMs. Furthermore, NWS's statement on ice jams also explains that river forecasts found on its website do not take into account the effect of ice on river levels. The complete list with fuller descriptions of the circumstances of jamming at each location can be found on the U.S. Army Corps of Engineers (USACE) website: http://icejams.crrel.usace.army.mil/.

Albany County

Albany County's HMP ranks ice jams as a moderately low hazard, noting that they normally occur along the Hudson River and Normans Kill within the Mid-Hudson Watershed. There are three ice jam events listed for the City of Albany and ten for the City of Troy in the USACE Cold Regions Research and Engineering Laboratory (CRREL) Ice Jam Database.[75]

Columbia County

Ice jams are ranked as a hazard of medium concern according to the county's HMP. There is no section in the HMP discussing specific ice jam events in the county. The CRREL database lists four ice jam incidents originating in Kinderhook Creek.[76]

Dutchess County

Ice jams are ranked as a hazard of medium concern in the county according to the county's HMP. The CRREL database shows nine ice jam events between 1780 and 2015. Ice jams typically form along Fall Kill within the Mid-Hudson Watershed.[77]

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[74] *http://www.weather.gov/media/aly/Hydrology/IceJamInfo.pdf*
[75] *http://rsgisias.crrel.usace.army.mil/apex/f?p=524:1:*
[76] *ibid*
[77] *ibid*

Greene County
The Greene County HMP does not note any streams prone to ice jams that are located in the Mid-Hudson Watershed. The CRREL database lists two ice jam incidents from the Hudson River.[78]

Rensselaer County
Ice jams are mentioned as a significant cause of flooding in the county HMP. From 1996 to the present, there are 38 recorded ice jams in the CRREL database for the county. Most of these events occurred on the Poesten Kill and Moordener Kill within the Mid-Hudson Watershed.[79]

Schenectady County
According to the county's HMP, the majority of all flooding events in the county involve break-up, ice jams, and ice dams. Ice jams occur during break-up events, both in the winter and in the spring. Of all of these events, ice jams have contributed to 90% of all major winter and spring floods. The county's HMP notes that Route 5 at Mohawk Valley Airport and Route 5S west of Crawford Road are susceptible to flooding due to their low elevation relative to the river bank at these locations. Other areas susceptible to flooding are the Stockade and the Niskayuna neighborhood east of the Rexford Bridge.

Schoharie County
Ice jams are ranked as a hazard of medium concern in the county according to the county's HMP. There is no section in the HMP discussing specific ice jam events in the county. The CRREL database lists an ice jam incident at Lake Creek in Livingstonville in 2010.[80]

Ulster County
Ice jams are ranked as a moderately low hazard in the county HMP. The CRREL database indicates 12 ice jam incidents in the county from 1875 and 2010.[81]

[78] *http://rsgisias.crrel.usace.army.mil/apex/f?p=524:1:*
[79] *Rensselaer County Hazard Mitigation Plan, page 2-12*
[80] *http://rsgisias.crrel.usace.army.mil/apex/f?p=524:1:*
[81] *Ulster County Hazard Mitigation Plan*, page 120

Dams

According to the NYSDEC Dam Safety Section's dam inventory, the Mid-Hudson Watershed contains 416 dam structures. NYSDEC uses a classification scale of A to D to assign hazard potential to each of the dam structures contained within the inventory.

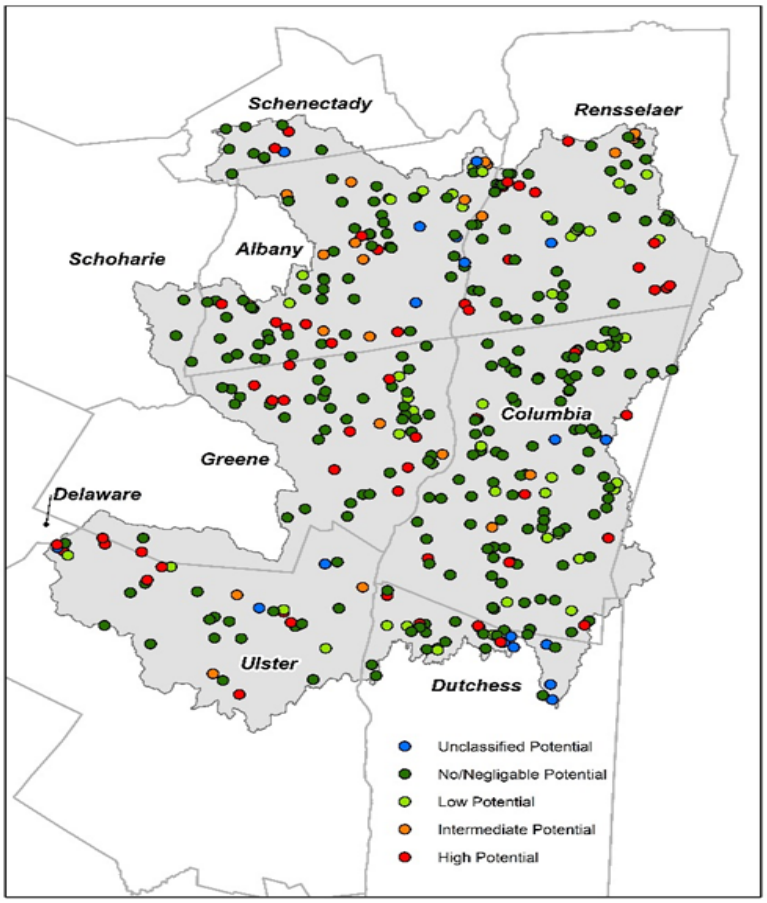

Figure 11: Dams in the Mid-Hudson Watershed

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; loss of human life and substantial economic loss is expected.

Class D-Negligible or No Hazard Potential: Dam has been breached, removed, or otherwise has failed or 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 no hazard.

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

The 416 dam structures classified by the NYSDEC Dam Safety Section are noted below in *Table 8: Dams in the Mid-Hudson Watershed*.

Table 8: Dams in the Mid-Hudson Watershed

County	Class A	Class B	Class C	Class D	Unclassified	Total
Albany	53	11	11	10	5	90
Columbia	90	15	2	9	2	118
Dutchess	18	4	0	5	6	33
Greene	40	4	2	12	0	58
Rensselaer	36	10	5	14	1	66
Schenectady	8	0	0	2	1	11
Schoharie	2	0	0	0	0	2
Ulster	19	4	3	9	3	38
Total	**266**	**48**	**23**	**61**	**18**	**416**

Source: NYSDEC

Recent Media Coverage of Natural Hazards

A summary of recent media coverage of natural hazards in the Mid-Hudson Watershed is provided below.

- 2011: Significant media coverage of Hurricane Irene and Tropical Storm Lee throughout the watershed.
- 2012: Significant media coverage of Hurricane Sandy throughout the watershed.
- 2014: Significant media coverage in the City of Albany during flash flooding event (2 inches of rain in under an hour).

III. Summary of Watershed-Wide Data

National Flood Insurance Program (NFIP) Data

Effective Regulatory Flood Insurance Rate Maps (FIRMs)

As noted in earlier sections of this report, the Mid-Hudson Watershed covers portions of eight counties in the state. The mapping in place is a mix of recently revised and older FIRMs. Albany, Dutchess, Greene, Schenectady, Schoharie, and Ulster Counties currently have effective countywide FIRMs, with effective dates ranging from 2009 to 2016. Columbia and Rensselaer County communities do not have a countywide FIRM. All communities in Columbia County have community-based FIRMs, with map dates ranging from 1979 to 1993. All watershed

communities in Rensselaer County have community-based FIRMs, with map dates ranging from 1979 to 2000.

To date, the Village of Philmont, in Columbia County, is the only municipality in the watershed not participating in the NFIP. As a result, the economic consequences of Sections 201(d) and 202 of the Flood Disaster Protection Act of 1973 (Public Law 93-234)[82] may apply. Flood insurance is not available in communities that do not participate in the NFIP.

The effective FIRM dates for each of the participating communities is shown in *Table 9: FIRM Effective Dates*.

Table 9: FIRM Effective Dates

County	Community	FIRM Effective Date
Albany (Countywide FIRM)	Albany, City of	3/16/2015
	Altamont, Village of	3/16/2015
	Berne, Town of	3/16/2015
	Bethlehem, Town of	3/16/2015
	Coeymans, Town of	3/16/2015
	Colonie, Town of	3/16/2015
	Colonie, Village of	3/16/2015
	Green Island, Village of	3/16/2015
	Guilderland, Town of	3/16/2015
	Knox, Town of	3/16/2015
	Menands, Village of	3/16/2015
	New Scotland, Town of	3/16/2015
	Ravena, Village of	3/16/2015
	Rensselaerville, Town of	3/16/2015
	Voorheesville, Village of	3/16/2015
	Watervliet, City of	3/16/2015
	Westerlo, Town of	3/16/2015
Columbia	Ancram, Town of	6/5/1985
	Austerlitz, Town of	6/5/1985
	Canaan, Town of	7/3/1985
	Chatham, Village of	12/15/1982
	Chatham, Town of	9/15/1993
	Claverack, Town of	9/6/1989
	Clermont, Town of	9/5/1984
	Copake, Town of	6/19/1985
	Gallatin, Town of	10/16/1984
	Germantown, Town of	5/11/1979
	Ghent, Town of	1/1/1988

[82] https://www.gpo.gov/fdsys/pkg/STATUTE-87/pdf/STATUTE-87-Pg975.pdf

Table 9: FIRM Effective Dates

County	Community	FIRM Effective Date
Columbia (cont.)	Greenport, Town of	11/15/1989
	Hillsdale, Town of	5/15/1985
	Hudson, City of	9/29/1989
	Kinderhook, Town of	12/1/1982
	Kinderhook, Village of	12/1/1982
	Livingston, Town of	5/11/1979
	New Lebanon, Town of	6/5/1985
	Philmont, Village of	Not participating in NFIP
	Stockport, Town of	1/19/1983
	Stuyvesant, Town of	9/14/1979
	Taghkanic, Town of	1/3/1986
	Valatie, Village of	12/1/1982
Dutchess (Countywide FIRM)	Milan, Town of	5/2/2012
	Northeast, Town of	5/2/2012
	Pine Plains, Town of	5/2/2012
	Red Hook, Town of	5/2/2012
	Red Hook, Village of	5/2/2012
	Rhinebeck, Town of	5/2/2012
	Stanford, Town of	5/2/2012
	Tivoli, Village of	5/2/2012
Greene (Countywide FIRM)	Athens, Town of	6/2/2015
	Athens, Village of	6/2/2015
	Cairo, Town of	6/2/2015
	Catskill, Town of	6/2/2015
	Catskill, Village of	6/2/2015
	Coxsackie, Town of	6/2/2015
	Coxsackie, Village of	6/2/2015
	Durham, Town of	6/2/2015
	Greenville, Town of	6/2/2015
	New Baltimore, Town of	6/2/2015
Rensselaer	Berlin, Town of	8/17/1979
	Brunswick, Town of	12/6/2000
	Castleton-on-Hudson, Village of	11/15/1984
	East Greenbush, Town of	3/18/1980
	East Nassau, Village of	9/5/1984
	Grafton, Town of	10/13/1978
	Nassau, Village of	5/18/1979
	Nassau, Town of	10/5/1984
	North Greenbush, Town of	6/18/1980

Table 9: FIRM Effective Dates

County	Community	FIRM Effective Date
Rensselaer (cont.)	Poestenkill, Town of	9/2/1981
	Rensselaer, City of	3/18/1980
	Sand Lake, Town of	5/15/1980
	Schodack, Town of	8/15/1984
	Stephentown, Town of	8/3/1981
	Troy, City of	3/18/1980
Schenectady (Countywide FIRM)	Delanson, Village of	1/8/2014
	Duanesburg, Town of	1/8/2014
	Princetown, Town of	1/8/2014
	Rotterdam, Town of	1/8/2014
Schoharie (Countywide FIRM)	Broome, Town of	2/16/2012
Ulster (Countywide FIRM)	Hurley, Town of	11/18/2016
	Kingston, City of	11/18/2016
	Kingston, Town of	11/18/2016
	Marbletown, Town of	11/18/2016
	Saugerties, Town of	11/18/2016
	Saugerties, Village of	11/18/2016
	Ulster, Town of	11/18/2016
	Woodstock, Town of	11/18/2016

Source: FEMA

Letters of Map Change (LOMCs)

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 inadvertently included in a Special Flood Hazard Area (SFHA). When property owners feel that this has occurred, they may request a Letter of Map Change (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) process, for properties on natural high ground, and the Letter of Map Revision based on Fill (LOMR-F) process, for properties elevated by the placement of fill, are the most common ways used to amend the FIRM. These methods do not physically change the FIRM for a community; rather they amend, by letter, the FIRM without the cost of publishing a revised FIRM panel. By comparison, a Letter of Map Revision (LOMR) is commonly used by community officials to request FIRM changes stemming from completed development (e.g. the construction of a bridge), flood-control projects (e.g., the construction of a levee), or other larger-scale changes in the floodplain (e.g., the paving of the channel of a stream).

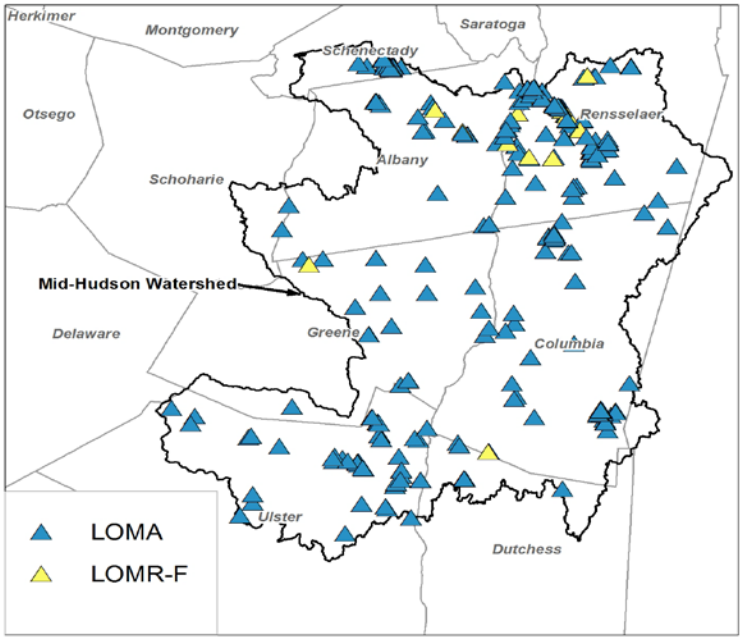

Figure 12: Location of LOMAs and LOMR-Fs in the Mid-Hudson Watershed

Table 10: LOMCs in the Mid-Hudson Watershed includes the communities within the Mid-Hudson Watershed that have LOMCs as of March 2016. The Town of Rotterdam in Schenectady County, the Town of Copake in Columbia County, and the Town of Sand Lake and City of Troy in Rensselaer County are the communities with the largest numbers of LOMCs in the watershed.

More information on the LOMA and LOMR-F processes can be found on FEMA's LOMC website.

Table 10: LOMCs in the Mid-Hudson Watershed

County	Community	Number of LOMA/ LOMR-Fs	Number of LOMRs	FIRM Effective Date
Albany	Albany, City of	14	0	3/16/2015
	Altamont, Village of	12	0	3/16/2015
	Berne, Town of	0	0	3/16/2015
	Bethlehem, Town of	1	0	3/16/2015
	Coeymans, Town of	3	0	3/16/2015
	Colonie, Town of	2	0	3/16/2015
	Colonie, Village of	0	0	3/16/2015

Table 10: LOMCs in the Mid-Hudson Watershed

County	Community	Number of LOMA/ LOMR-Fs	Number of LOMRs	FIRM Effective Date
Albany (cont.)	Green Island, Village of	11	0	3/16/2015
	Guilderland, Town of	5	0	3/16/2015
	Knox, Town of	0	0	3/16/2015
	Menands, Village of	2	0	3/16/2015
	New Scotland, Town of	0	0	3/16/2015
	Ravena, Village of	1	0	3/16/2015
	Rensselaerville, Town of	1	0	3/16/2015
	Voorheesville, Village of	2	0	3/16/2015
	Watervliet, City of	6	0	3/16/2015
	Westerlo, Town of	0	0	3/16/2015
Columbia	Ancram, Town of	0	0	6/5/1985
	Austerlitz, Town of	0	0	6/5/1985
	Canaan, Town of	0	0	7/3/1985
	Chatham, Village of	0	0	12/15/1982
	Chatham, Town of	14	0	9/15/1993
	Claverack, Town of	2	0	9/6/1989
	Clermont, Town of	0	0	9/5/1984
	Copake, Town of	27	0	6/19/1985
	Gallatin, Town of	0	0	10/16/1984
	Germantown, Town of	0	0	5/11/1979
	Ghent, Town of	0	0	1/1/1988
	Greenport, Town of	1	0	11/15/1989
	Hillsdale, Town of	0	0	5/15/1985
	Hudson, City of	0	0	9/29/1989
	Kinderhook, Town of	4	0	12/1/1982
	Kinderhook, Village of	0	0	12/1/1982
	Livingston, Town of	3	0	5/11/1979
	New Lebanon, Town of	1	0	6/5/1985
	Philmont, Village of	0	0	N/A
	Stockport, Town of	3	0	1/19/1983
	Stuyvesant, Town of	0	0	9/14/1979
	Taghkanic, Town of	1	0	1/3/1986
	Valatie, Village of	0	0	12/1/1982

Table 10: LOMCs in the Mid-Hudson Watershed

County	Community	Number of LOMA/ LOMR-Fs	Number of LOMRs	FIRM Effective Date
Dutchess	Milan, Town of	0	0	5/2/2012
	Northeast, Town of	0	0	5/2/2012
	Pine Plains, Town of	1	0	5/2/2012
	Red Hook, Town of	4	0	5/2/2012
	Red Hook, Village of	0	0	5/2/2012
	Rhinebeck, Town of	0	0	5/2/2012
	Stanford, Town of	0	0	5/2/2012
	Tivoli, Village of	0	0	5/2/2012
Greene	Athens, Town of	0	0	6/2/2015
	Athens, Village of	2	0	6/2/2015
	Cairo, Town of	5	0	6/2/2015
	Catskill, Town of	2	0	6/2/2015
	Catskill, Village of	0	0	6/2/2015
	Coxsackie, Town of	2	0	6/2/2015
	Coxsackie, Village of	1	0	6/2/2015
	Durham, Town of	2	0	6/2/2015
	Greenville, Town of	2	0	6/2/2015
	New Baltimore, Town of	1	0	6/2/2015
Rensselaer	Berlin, Town of	0	0	8/17/1979
	Brunswick, Town of	6	0	12/6/2000
	Castleton-on-Hudson, Village of	0	0	11/15/1984
	East Greenbush, Town of	9	0	3/18/1980
	East Nassau, Village of	0	0	9/5/1984
	Grafton, Town of	4	0	10/13/1978
	Nassau, Village of	1	0	5/18/1979
	Nassau, Town of	4	0	10/5/1984
	North Greenbush, Town of	0	0	6/18/1980
	Poestenkill, Town of	3	0	9/2/1981
	Rensselaer, City of	1	0	3/18/1980
	Sand Lake, Town of	27	0	5/15/1980
	Schodack, Town of	7	0	8/15/1984
	Stephentown, Town of	1	0	8/3/1981
	Troy, City of	30	0	3/18/1980

Table 10: LOMCs in the Mid-Hudson Watershed

County	Community	Number of LOMA/ LOMR-Fs	Number of LOMRs	FIRM Effective Date
Schenectady	Delanson, Village of	0	0	1/8/2014
	Duanesburg, Town of	0	0	1/8/2014
	Princetown, Town of	2	0	1/8/2014
	Rotterdam, Town of	46	0	1/8/2014
Schoharie	Broome, Town of	0	0	2/16/2012
Ulster	Hurley, Town of	1	0	11/18/2016
	Kingston, City of	1	0	11/18/2016
	Kingston, Town of	0	0	11/18/2016
	Marbletown, Town of	1	0	11/18/2016
	Saugerties, Town of	12	0	11/18/2016
	Saugerties, Village of	2	0	11/18/2016
	Ulster, Town of	14	0	11/18/2016
	Woodstock, Town of	12	0	11/18/2016

Source: FEMA

Coordinated Needs Management Strategy (CNMS) and NFIP Mapping Needs

The Coordinated Needs Management Strategy (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 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 (i.e., those with new hydrologic and hydraulic models) performed during FEMA's Map Modernization program were automatically determined to be "Valid" and the remaining studies went through a 17 element validation process with seven critical and ten secondary elements. Validation elements apply physical, climatological, and environmental factors to stream studies to determine validity. A stream study has to pass all of the critical elements and at least seven secondary elements in order to be classified as "Valid." The remainder of the streams are classified as "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 the effective analysis?
- Change in Discharge: Do the updated and effective peak discharges differ significantly based on confidence limit criteria in *FEMA's Guidelines and Specifications* (G&S)?

- Model Methodology: Is the model methodology no longer appropriate based on FEMA's G&S?
- Hydraulic Change: Has a major flood-control structure (dam/levee/floodwall/other change) been added or removed from the reach?
- Channel Reconfiguration: Is the current channel reconfiguration outside the effective SFHA? (i.e. has the stream moved?)
- Other Hydraulic Changes: Have more than five hydraulic structures (bridges/culverts) been added or removed that impact Base Flood Elevations (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 the flood hazard information must be recorded as "Invalid."

- Regression Equation: Has a rural regression equation been used in a 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 equal to or greater than 50 percent?
- Hydraulic Structure: Have more than one, but less than five, hydraulic structures (bridges/culverts) 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: Have significant changes to vegetation or land use have occurred in the area?
- Coastal Dune: Is there a failure to identify primary frontal dune in coastal areas?
- High Water Mark: Have significant storms occurred with recorded 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 provide an opportunity for the gathering and prioritization of CNMS community requests. *Table 11: Current Status of CNMS* shows the status of the portions of each county in this project area within the Mid-Hudson Watershed ***prior*** to the Discovery process in March 2016.

Table 11: Current Status of CNMS

County	FIPS	Stream Mileage Within Mid-Hudson Watershed			
		Valid	Unverified	Unknown	Total
Albany County	36001C	221	36	37	294
Columbia County	36021C	50	15	183	248
Dutchess County	36027C	23	0	2	25
Greene County	36039C	97	0	142	239
Rensselaer County	36083C	39	28	128	196

Table 11: Current Status of CNMS

County	FIPS	Stream Mileage Within Mid-Hudson Watershed			
		Valid	Unverified	Unknown	Total
Schenectady County	36093C	19	0	1	20
Schoharie County	36095C	0	0	7	7
Ulster County	36111C	70	0	71	142

Source: FEMA

The CNMS Data Viewer can be accessed online at https://msc.fema.gov/cnms/. More information about CNMS can also be found on FEMA's CNMS webpage at http://www.fema.gov/media-library/assets/documents/21436?id=4628.

Flood Insurance Policies and Claims

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 risk reduction element in making federally backed flood insurance available to home and business owners.

As part of this Discovery project, data regarding the NFIP flood insurance policies in the watershed were collected. As of March 2016, 3,104 policies were in-force, accounting for $672,576,800 in insurance coverage within the communities in the Mid-Hudson Watershed. The number of policies and total coverage cost as of March 2016 are listed in *Table 12: Flood Insurance Policies and Claims Data*.

Rensselaer County represents the largest number of flood insurance policies and coverage in the Mid-Hudson Watershed, with 33 percent of the insurance policies (1,014) and 27 percent of the insurance coverage ($178 million). In Rensselaer County, the City of Troy has 620 policies and over $106 million in coverage. This community has the most policies of any in the watershed.

The communities within the watershed in Albany County have 905 flood insurance policies with $201 million in insurance coverage. In Ulster County, there are 593 policies with the communities in the watershed with $140 million in insurance coverage. In Columbia County, there are 275 insurance policies with $66.4 million in coverage. In Greene County, there are 245 insurance policies with $47 million in coverage. In Dutchess County, there are 128 insurance policies with $33 million in coverage. In Schenectady County, there are 113 insurance policies with $31 million in coverage. In Schoharie County, there are 10 insurance policies with $1.8 million in coverage.

Table 12: Flood Insurance Policies and Claims Data

County	Community	Number of Policies	Total Amount of Coverage	Number of Claims	Total Claims Paid
Albany	Albany, City of	181	$50,432,600	52	$726,130
	Altamont, Village of	36	$7,895,200	13	$32,586
	Berne, Town of	10	$2,514,500	3	$26,910

Table 12: Flood Insurance Policies and Claims Data

County	Community	Number of Policies	Total Amount of Coverage	Number of Claims	Total Claims Paid
Albany (cont.)	Bethlehem, Town of	54	$13,899,600	27	$251,266
	Coeymans, Town of	46	$9,104,000	20	$567,611
	Colonie, Town of	116	$30,093,500	94	$1,315,607
	Colonie, Village of	1	$210,000	0	$0
	Green Island, Village of	169	$24,525,200	7	$34,790
	Guilderland, Town of	45	$13,111,700	17	$342,390
	Knox, Town of	6	$1,113,600	2	$0
	Menands, Village of	52	$15,119,100	7	$37,499
	New Scotland, Town of	19	$5,726,100	15	$200,069
	Ravena, Village of	5	$611,000	4	$1,039
	Rensselaerville, Town of	12	$2,459,800	8	$199,436
	Voorheesville, Village of	22	$4,214,400	11	$67,231
	Watervliet, City of	130	$19,875,400	16	$67,666
	Westerlo, Town of	1	$42,000	5	$48,361
Columbia	Ancram, Town of	7	$2,608,000	5	$79,684
	Austerlitz, Town of	12	$2,530,200	6	$38,343
	Canaan, Town of	11	$3,057,100	3	$33,767
	Chatham, Village of	25	$6,203,600	8	$118,461
	Chatham, Town of	1	$250,000	2	$683
	Claverack, Town of	23	$6,729,400	6	$10,604
	Clermont, Town of	6	$1,397,000	1	$93,201
	Copake, Town of	43	$9,943,200	20	$235,556
	Gallatin, Town of	9	$2,047,600	13	$50,531
	Germantown, Town of	3	$1,230,500	0	$0
	Ghent, Town of	10	$2,018,000	3	$44,866
	Greenport, Town of	5	$1,080,200	7	$12,635
	Hillsdale, Town of	12	$3,211,100	7	$30,305
	Hudson, City of	7	$1,715,000	3	$2,915
	Kinderhook, Town of	23	$5,191,600	7	$58,651
	Kinderhook, Village of	5	$1,505,200	5	$375,559
	Livingston, Town of	17	$4,457,600	19	$85,401
	New Lebanon, Town of	21	$3,209,000	71	$918,072
	Philmont, Village of	N/A	N/A	N/A	N/A
	Stockport, Town of	19	$4,258,000	28	$218,060
	Stuyvesant, Town of	6	$988,100	12	$540,560

Table 12: Flood Insurance Policies and Claims Data

County	Community	Number of Policies	Total Amount of Coverage	Number of Claims	Total Claims Paid
Columbia (cont.)	Taghkanic, Town of	4	$1,070,100	4	$14,911
	Valatie, Village of	6	$1,706,000	4	$16,402
Dutchess	Milan, Town of	12	$3,499,500	6	$15,889
	Northeast, Town of	14	$3,977,000	3	$21,266
	Pine Plains, Town of	14	$2,892,800	1	$2,170
	Red Hook, Town of	36	$8,729,100	20	$384,452
	Red Hook, Village of	1	$210,000	0	$0
	Rhinebeck, Town of	31	$9,185,100	3	$28,632
	Stanford, Town of	18	$4,219,400	8	$44,102
	Tivoli, Village of	2	$462,000	2	$16,562
Greene	Athens, Town of	6	$1,596,600	6	$168,640
	Athens, Village of	16	$3,404,900	21	$547,484
	Cairo, Town of	43	$5,955,400	43	$560,905
	Catskill, Town of	58	$12,775,400	128	$4,717,864
	Catskill, Village of	58	$11,685,700	38	$2,370,030
	Coxsackie, Town of	6	$1,890,000	3	$11,390
	Coxsackie, Village of	16	$2,564,700	15	$251,483
	Durham, Town of	15	$1,909,000	13	$222,437
	Greenville, Town of	15	$2,664,700	2	$67,611
	New Baltimore, Town of	12	$2,572,100	5	$28,623
Rensselaer	Berlin, Town of	8	$1,460,500	1	$0
	Brunswick, Town of	22	$4,248,700	9	$112,702
	Castleton-on-Hudson, Village of	20	$2,377,600	18	$37,166
	East Greenbush, Town of	13	$4,144,200	4	$5,455
	East Nassau, Village of	0	0	0	0
	Grafton, Town of	6	$805,100	0	$0
	Nassau, Village of	39	$8,098,800	97	$2,908,565
	Nassau, Town of	7	$2,044,100	24	$755,562
	North Greenbush, Town of	52	$8,295,600	16	$112,565
	Poestenkill, Town of	20	$3,609,900	14	$320,694
	Rensselaer, City of	136	$22,016,500	64	$382,189
	Sand Lake, Town of	31	$7,570,100	11	$63,141
	Schodack, Town of	27	$4,717,800	8	$65,479
	Stephentown, Town of	13	$2,779,300	1	$0
	Troy, City of	620	$106,111,100	189	$2,188,528

Table 12: Flood Insurance Policies and Claims Data

County	Community	Number of Policies	Total Amount of Coverage	Number of Claims	Total Claims Paid
Schenectady	Delanson, Village of	5	$1,175,000	2	$11,780
	Duanesburg, Town of	13	$3,570,000	8	$497,929
	Princetown, Town of	11	$2,680,000	0	$0
	Rotterdam, Town of	84	$23,805,800	44	$2,006,492
Schoharie	Broome, Town of	10	$1,846,200	13	$216,154
Ulster	Hurley, Town of	38	$7,596,400	34	$1,010,671
	Kingston, City of	76	$19,945,000	89	$1,477,682
	Kingston, Town of	34	$5,637,800	24	$598,993
	Marbletown, Town of	32	$9,718,100	18	$343,448
	Saugerties, Town of	102	$21,677,900	51	$1,265,381
	Saugerties, Village of	33	$6,860,500	48	$1,564,432
	Ulster, Town of	125	$29,998,500	219	$4,961,804
	Woodstock, Town of	153	$38,610,100	73	$406,452

Source: FEMA

Repetitive Loss/Severe Repetitive Loss Properties

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 ten-year period. In the Mid-Hudson Watershed, there were 205 repetitive losses for communities within the study area accounting for $19,955,896.04 in claims paid as of March 2016. The data are shown in *Table 13: Repetitive Losses in Study Area*.

A Severe Repetitive Loss (SRL) property is defined as a residential property that is covered under an NFIP flood insurance policy and (a) has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; and (b) for which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building. For both (a) and (b), at least two of the referenced claims must have occurred within any ten-year period, and must be greater than ten days apart.

There are ten SRL properties in the Mid-Hudson Watershed. Six of these properties are located in the Town of Ulster in Ulster County and have a total paid claim amount of over $1.1 million. In the Town of Colonie in Albany County there are three SRL properties that have a total paid claim amount of $641,823.92. The last SRL property is located in the Town of Red Hook in Dutchess County and has a total paid claim amount of $237,916.53.

Table 13: Repetitive Losses in Study Area

County	Community	Number of Repetitive Loss Properties	Total Claims Paid
Albany	Albany, City of	6	$275,391.23
	Altamont, Village of	1	$7,251.33
	Berne, Town of	0	$0.00
	Bethlehem, Town of	4	$118,659.46
	Coeymans, Town of	1	$17,467.53
	Colonie, Town of*	14	$1,031,336.94
	Colonie, Village of	0	$0.00
	Green Island, Village of	0	$0.00
	Guilderland, Town of	1	$109,226.23
	Knox, Town of	0	$0.00
	Menands, Village of	1	$37,499.46
	New Scotland, Town of	1	$143,405.63
	Ravena, Village of	0	$0.00
	Rensselaerville, Town of	1	$17,008.37
	Voorheesville, Village of	1	$45,361.65
	Watervliet, City of	0	$0.00
	Westerlo, Town of	0	$0.00
Columbia	Ancram, Town of	1	$4,056.85
	Austerlitz, Town of	0	$0.00
	Canaan, Town of	0	$0.00
	Chatham, Village of	0	$0.00
	Chatham, Town of	0	$0.00
	Claverack, Town of	0	$0.00
	Clermont, Town of	0	$0.00
	Copake, Town of	3	$70,878.77
	Gallatin, Town of	0	$0.00
	Germantown, Town of	0	$0.00
	Ghent, Town of	0	$0.00
	Greenport, Town of	0	$0.00
	Hillsdale, Town of	1	$17,259.08
	Hudson, City of	0	$0.00
	Kinderhook, Town of	1	$22,452.27
	Kinderhook, Village of	2	$368,286.07
	Livingston, Town of	2	$52,385.68
	New Lebanon, Town of	5	$888,937.30
	Philmont, Village of	0	$0.00

Table 13: Repetitive Losses in Study Area

County	Community	Number of Repetitive Loss Properties	Total Claims Paid
Columbia (cont.)	Stockport, Town of	5	$177,878.75
	Stuyvesant, Town of	4	$395,986.39
	Taghkanic, Town of	0	$0.00
	Valatie, Village of	1	$12,825.03
Dutchess	Milan, Town of	1	$9,411.11
	Northeast, Town of	0	$0.00
	Pine Plains, Town of	0	$0.00
	Red Hook, Town of**	3	$334,192.09
	Red Hook, Village of	0	$0.00
	Rhinebeck, Town of	1	$13,128.28
	Stanford, Town of	1	$24,432.30
	Tivoli, Village of	0	$0.00
Greene	Athens, Town of	1	$91,948.45
	Athens, Village of	2	$170,645.04
	Cairo, Town of	1	$9,337.06
	Catskill, Town of	10	$3,046,874.27
	Catskill, Village of	5	$1,265,346.82
	Coxsackie, Town of	0	$0.00
	Coxsackie, Village of	3	$215,687.31
	Durham, Town of	0	$0.00
	Greenville, Town of	0	$0.00
	New Baltimore, Town of	0	$0.00
Rensselaer	Berlin, Town of	0	$0.00
	Brunswick, Town of	1	$24,378.65
	Castleton-on-Hudson, Village of	0	$0.00
	East Greenbush, Town of	0	$0.00
	East Nassau, Village of	0	$0.00
	Grafton, Town of	0	$0.00
	Nassau, Village of	1	$278,059.61
	Nassau, Town of	8	$1,262,661.21
	North Greenbush, Town of	0	$0.00
	Poestenkill, Town of	1	$86,034.16
	Rensselaer, City of	6	$162,002.07
	Sand Lake, Town of	2	$19,542.97
	Schodack, Town of	0	$0.00
	Stephentown, Town of	0	$0.00

Table 13: Repetitive Losses in Study Area

County	Community	Number of Repetitive Loss Properties	Total Claims Paid
Rensselaer (cont.)	Troy, City of	5	$698,922.23
Schenectady	Delanson, Village of	0	$0.00
	Duanesburg, Town of	2	$432,943.44
	Princetown, Town of	0	$0.00
	Rotterdam, Town of	6	$680,961.28
Schoharie	Broome, Town of	0	$0.00
Ulster	Hurley, Town of	4	$389,749.37
	Kingston, City of	18	$932,175.19
	Kingston, Town of	0	$0.00
	Marbletown, Town of	1	$9,207.70
	Saugerties, Town of	10	$1,031,261.51
	Saugerties, Village of	14	$1,285,280.26
	Ulster, Town of***	38	$3,611,330.18
	Woodstock, Town of	4	$56,829.46

*Includes 3 severe repetitive loss properties

**Includes 1 severe repetitive loss property

***Includes 6 severe repetitive loss properties

Source: FEMA

Structures that flood frequently strain the NFIP Fund. In fact, RL properties are the biggest draw on the fund. 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, but also drain funds needed to prepare for future catastrophic events.

Clusters of RL properties and previous NFIP assistance are used to identify "hot spot" areas within communities. This information can be used to identify areas of mitigation interest and updated mapping needs and products for individual communities.

Community Assistance Visits (CAVs)

Statewide Community Assistance Visits (CAVs) are part of the evaluation and review process used by FEMA, NYSDEC Floodplain Management staff, and local officials to ensure that each community adequately enforces local floodplain management regulations to remain in compliance with NFIP requirements. Generally, a CAV consists of a tour of the floodplain, an inspection of community permit files, and meetings with local appointed and elected officials. During a CAV, observations and investigations focus on identifying issues in various areas, such as community floodplain management regulations/ordinances, community administration and enforcement procedures, engineering or other issues related to FIRMs, and other problems related to community floodplain management.

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

CAVs are also a way to provide technical assistance to communities. If administrative problems or potential violations are identified, the community will be notified and given the opportunity to correct those administrative procedures and remedy the violations to the maximum extent possible within established deadlines. FEMA or the State will work with the community to help bring the program into compliance with NFIP requirements. In extreme cases where the community does not take action to bring itself into compliance, FEMA may initiate an enforcement action against the community. A program deficiency is a defect in a community's floodplain management regulations or administrative procedures that impacts effective implementation of floodplain management regulations of the standards in 44 CFR Sections 60.3, 60.4, or 60.6. "Open" CAVs can be indicative of unresolved violations.

Community Assistance Contacts (CACs)

Community Assistance Contacts (CACs) are a tool employed by the State of New York and FEMA to periodically contact a community to see if they are having any difficulties in administering the local floodplain management ordinance or program. A CAC is an additional way of determining if a CAV should be scheduled. CACs are also a means of encouraging Code Enforcement Officers to attend annual floodplain management workshops. CACs can serve to support local officials when they need help to effectively administer the NFIP in their community. CACs in the watershed have been more sporadic during the last 20 years.

Table 14: CAVs and CACs Performed within the Project Area lists the most recent CAVs and CACs performed for communities located within the project area.

Table 14: CAVs and CACs Performed within the Project Area

County	Community	Most Recent CAV Date	Most Recent CAC Date
Albany	Albany, City of	9/25/2014	N/A
	Altamont, Village of	9/23/2014	N/A
	Berne, Town of	N/A	N/A
	Bethlehem, Town of	6/29/1990	N/A
	Coeymans, Town of	9/4/2014	7/20/2015
	Colonie, Town of	8/19/1992	N/A
	Colonie, Village of	N/A	N/A
	Green Island, Village of	6/17/1999	11/14/2005
	Guilderland, Town of	7/8/2015	12/15/1993
	Knox, Town of	N/A	N/A
	Menands, Village of	12/4/2014	N/A
	New Scotland, Town of	7/8/2015	1/25/2007

Table 14: CAVs and CACs Performed within the Project Area

County	Community	Most Recent CAV Date	Most Recent CAC Date
Albany (cont.)	Ravena, Village of	9/19/2014	7/27/2006
	Rensselaerville, Town of	N/A	6/11/1992
	Voorheesville, Village of	N/A	4/24/2014
	Watervliet, City of	12/4/2014	N/A
	Westerlo, Town of	N/A	N/A
Columbia	Ancram, Town of	N/A	41011
	Austerlitz, Town of	8/17/2009	4/03/2007
	Canaan, Town of	N/A	N/A
	Chatham, Village of	8/12/2009	N/A
	Chatham, Town of	8/10/2009	6/06/1995
	Claverack, Town of	8/12/2009	N/A
	Clermont, Town of	N/A	N/A
	Copake, Town of	N/A	6/16/2015
	Gallatin, Town of	N/A	8/26/2014
	Germantown, Town of	N/A	N/A
	Ghent, Town of	8/10/2009	3/22/2007
	Greenport, Town of	N/A	N/A
	Hillsdale, Town of	8/10/2009	N/A
	Hudson, City of	9/18/2008	N/A
	Kinderhook, Town of	8/13/2009	N/A
	Kinderhook, Village of	8/10/2009	N/A
	Livingston, Town of	N/A	7/15/2004
	New Lebanon, Town of	9/10/2009	N/A
	Philmont, Village of	8/12/2009	N/A
	Stockport, Town of	N/A	N/A
	Stuyvesant, Town of	N/A	N/A
	Taghkanic, Town of	4/24/2009	N/A
	Valatie, Village of	N/A	N/A
Dutchess	Milan, Town of	N/A	N/A
	Northeast, Town of	9/14/1993	N/A
	Pine Plains, Town of	N/A	N/A
	Red Hook, Town of	3/8/2001	4/17/2014
	Red Hook, Village of	N/A	8/30/1994
	Rhinebeck, Town of	4/16/2010	N/A
	Stanford, Town of	N/A	N/A
	Tivoli, Village of	4/16/1990	4/17/2014

Table 14: CAVs and CACs Performed within the Project Area

County	Community	Most Recent CAV Date	Most Recent CAC Date
Greene	Athens, Town of	8/09/1992	7/07/2014
	Athens, Village of	9/20/2013	4/05/2006
	Cairo, Town of	8/05/2013	N/A
	Catskill, Town of	9/20/2013	N/A
	Catskill, Village of	9/20/2013	N/A
	Coxsackie, Town of	7/30/1993	N/A
	Coxsackie, Village of	9/20/2013	3/20/1996
	Durham, Town of	9/24/2014	N/A
	Greenville, Town of	8/10/2009	3/18/1996
	New Baltimore, Town of	9/04/2014	7/07/1992
Rensselaer	Berlin, Town of	2/09/2001	N/A
	Brunswick, Town of	9/21/2015	N/A
	Castleton-on-Hudson, Village of	4/2/1996	N/A
	East Greenbush, Town of	N/A	N/A
	East Nassau, Village of	N/A	N/A
	Grafton, Town of	N/A	6/24/2015
	Nassau, Village of	N/A	9/03/2015
	Nassau, Town of	N/A	12/02/2004
	North Greenbush, Town of	6/11/1992	N/A
	Poestenkill, Town of	9/16/2015	N/A
	Rensselaer, City of	9/30/2004	N/A
	Sand Lake, Town of	9/16/2015	N/A
	Schodack, Town of	N/A	4/17/2007
	Stephentown, Town of	N/A	N/A
	Troy, City of	8/1/2012	8/05/1994
Schenectady	Delanson, Village of	9/24/2014	N/A
	Duanesburg, Town of	9/24/2014	N/A
	Princetown, Town of	12/12/2006	N/A
	Rotterdam, Town of	7/29/2004	1/24/2003
Schoharie	Broome, Town of	N/A	10/13/2015
Ulster	Hurley, Town of	1/11/2011	6/29/2006
	Kingston, City of	6/14/2000	N/A
	Kingston, Town of	N/A	N/A
	Marbletown, Town of	N/A	6/02/1994
	Saugerties, Town of	4/20/2009	3/19/1996
	Saugerties, Village of	9/15/2009	N/A

Table 14: CAVs and CACs Performed within the Project Area

County	Community	Most Recent CAV Date	Most Recent CAC Date
Ulster (cont.)	Ulster, Town of	7/22/2015	10/15/2008
	Woodstock, Town of	4/22/2009	8/11/2005

N/A - Date not available

Source: FEMA

Ordinances

The project area's local jurisdictions have a patchwork of regulations regarding development within known SFHAs. The regulations range from ordinances with minimum NFIP requirements to strong, pro-active ordinances that not only regulate and protect new and improved development in existing SFHAs, but seek to mitigate the growth of SFHAs caused by increased runoff from developed areas and the degradation of natural flood control areas, such as wetlands and forests.

While the NFIP uses six different ordinance levels (60.3 land-use classification levels), NYS uses their own system that includes three ordinance levels, as described below.

1. The "A" type is used when 1-percent-annual-chance floodplains have not yet been identified.

2. The "D" type is used when 1-percent-annual-chance floodplains without BFEs have been identified; 1-percent-annual-chance floodplains with BFEs, but without floodways have been identified; and 1-percent-annual-chance floodplains with BFEs and a floodway have been identified. If the community also has coastal flooding, but does not have coastal high-hazard areas (V Zones), it is a "D" type.

3. The "E" type is used when coastal high-hazard areas (V Zones) have been identified.

The NFIP-participating communities within the watershed have floodplain management regulations in place and have a mechanism for updating their ordinances. *Table 15: Program Status and Ordinance Level* lists the program status and ordinance level for each community in the Mid-Hudson Watershed Discovery project area.

Table 15: Program Status and Ordinance Level

County	Community	Program Status	Ordinance Level	Ordinance Effective Date
Albany	Albany, City of	Regular	D	3/3/2015
	Altamont, Village of	Regular	D	3/15/2015
	Berne, Town of	Regular	D	3/16/2015
	Bethlehem, Town of	Regular	D	3/16/2015
	Coeymans, Town of	Regular	D	3/16/2015
	Colonie, Town of	Regular	D	3/16/2015
	Colonie, Village of	Regular	A	3/27/2015
	Green Island, Village of	Regular	D	3/16/2015
	Guilderland, Town of	Regular	D	1/20/2015

Table 15: Program Status and Ordinance Level

County	Community	Program Status	Ordinance Level	Ordinance Effective Date
Albany (cont.)	Knox, Town of	Regular	D	3/16/2015
	Menands, Village of	Regular	D	2/17/2015
	New Scotland, Town of	Regular	D	2/11/2015
	Ravena, Village of	Regular	D	1/23/2015
	Rensselaerville, Town of	Regular	D	2/12/2015
	Voorheesville, Village of	Regular	D	1/28/2015
	Watervliet, City of	Regular	D	2/5/2015
	Westerlo, Town of	Regular	D	1/6/2015
Columbia	Ancram, Town of	Regular	D	9/30/1987
	Austerlitz, Town of	Regular	D	6/5/1987
	Canaan, Town of	Regular	D	4/16/1997
	Chatham, Village of	Regular	D	5/12/1989
	Chatham, Town of	Regular	D	5/6/1993
	Claverack, Town of	Regular	D	7/12/1989
	Clermont, Town of	Regular	D	5/6/1988
	Copake, Town of	Regular	D	3/30/1987
	Gallatin, Town of	Regular	D	12/2/1988
	Germantown, Town of	Regular	D	9/11/1989
	Ghent, Town of	Regular	D	1/21/1988
	Greenport, Town of	Regular	D	8/2/1989
	Hillsdale, Town of	Regular	D	3/30/1987
	Hudson, City of	Regular	D	12/12/1989
	Kinderhook, Town of	Regular	D	4/13/1987
	Kinderhook, Village of	Regular	D	6/29/1989
	Livingston, Town of	Regular	D	11/14/1989
	New Lebanon, Town of	Regular	D	3/14/1988
	Philmont, Village of	Not Participating	N/A	N/A
	Stockport, Town of	Regular	D	8/2/1989
	Stuyvesant, Town of	Regular	D	4/1/1987
	Taghkanic, Town of	Regular	D	5/2/1988
	Valatie, Village of	Regular	D	8/11/1987
Dutchess	Milan, Town of	Regular	D	4/18/2012
	Northeast, Town of	Regular	D	3/8/2012
	Pine Plains, Town of	Regular	D	3/15/2012
	Red Hook, Town of	Regular	D	3/13/2012
	Red Hook, Village of	Regular	D	4/9/2012
	Rhinebeck, Town of	Regular	D	3/12/2012
	Stanford, Town of	Regular	D	4/12/2012
	Tivoli, Village of	Regular	D	3/21/2012
Greene	Athens, Town of	Regular	D	2/8/2008
	Athens, Village of	Regular	D	4/24/2008
	Cairo, Town of	Regular	D	4/23/2008

Table 15: Program Status and Ordinance Level

County	Community	Program Status	Ordinance Level	Ordinance Effective Date
Greene (cont.)	Catskill, Town of	Regular	D	4/2/2008
	Catskill, Village of	Regular	D	5/14/2008
	Coxsackie, Town of	Regular	D	4/21/2008
	Coxsackie, Village of	Regular	D	4/25/2008
	Durham, Town of	Regular	D	3/18/2008
	Greenville, Town of	Regular	D	4/21/2008
	New Baltimore, Town of	Regular	D	4/18/2008
Rensselaer	Berlin, Town of	Regular	D	3/16/1989
	Brunswick, Town of	Regular	D	11/30/2000
	Castleton-on-Hudson, Village of	Regular	D	3/13/1989
	East Greenbush, Town of	Regular	D	4/15/1991
	East Nassau, Village of	Regular	D	5/15/2007
	Grafton, Town of	Regular	D	N/A
	Nassau, Village of	Regular	D	11/4/1992
	Nassau, Town of	Regular	D	2/13/1990
	North Greenbush, Town of	Regular	D	3/31/1987
	Poestenkill, Town of	Regular	D	3/19/1987
	Rensselaer, City of	Regular	D	6/30/1987
	Sand Lake, Town of	Regular	D	2/8/1989
	Schodack, Town of	Regular	D	N/A
	Stephentown, Town of	Regular	D	5/18/1987
	Troy, City of	Regular	D	10/16/1987
Schenectady	Delanson, Village of	Regular	D	12/9/2013
	Duanesburg, Town of	Regular	D	12/5/2013
	Princetown, Town of	Regular	D	11/26/2013
	Rotterdam, Town of	Regular	D	12/11/2013
Schoharie	Broome, Town of	Regular	D	4/2/2004
Ulster	Hurley, Town of	Regular	D	11/15/2016
	Kingston, City of	Regular	D	8/13/2009
	Kingston, Town of	Regular	D	8/12/2009
	Marbletown, Town of	Regular	D	8/19/2009
	Saugerties, Town of	Regular	D	9/2/2009
	Saugerties, Village of	Regular	D	5/4/2009
	Ulster, Town of	Regular	D	8/6/2009
	Woodstock, Town of	Regular	D	11/18/2016

Source: FEMA, NYS

Community Rating System (CRS)

CRS is a voluntary incentive program that provides flood insurance premium discounts to NFIP-participating communities that take extra measures to manage floodplains above the minimum NFIP requirements. A point system is used to determine a CRS rating. The more measures a community takes to minimize or eliminate exposure to floods, the more CRS points are awarded

and the higher the discount on flood insurance premiums. As a result, flood insurance premium rates are discounted from 5 to 45 percent to reflect the reduced flood risk resulting from a community's actions to successfully meet the three CRS goals:

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.

Currently there are no communities within the Mid-Hudson Watershed that participate in CRS.

Additional information on the CRS program would be of benefit to all watershed communities to ensure they are fully aware of what CRS is, if a community is eligible to apply, and what level of effort is required to make CRS participation beneficial for a community. Local communities may wish to consider pooling resources and efforts or work on a countywide basis to ease the level of effort to comply with the requirements of joining the CRS program.

Other Data Useful for Flood Risk Assessment and Mitigation

Topographic Data

Topography is the description of surface shapes and features of the land. Today topographic data is commonly captured using Light Detection and Ranging (LiDAR) techniques. LiDAR is a state-of-the-art method for collecting accurate topographic elevation information using an instrument that measures distance to a reflecting object by emitting timed pulses of laser light and measuring the time between emission and reception of reflected pulses. More information on LiDAR is available on NOAA's website. LiDAR elevation data are only available for some portions of the Mid-Hudson Watershed at this time. However, collection of LiDAR for the portions of the watershed where data are unavailable is currently underway. Information about the coverage of LiDAR data in NYS is available at the NYSGIS Clearinghouse.

Dams

Please refer to the *Historic Flooding Problems* subsection of this report for information about dams in the Mid-Hudson Watershed.

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".

During the Discovery Meetings with the watershed communities, several comments were made by local officials about levees within the watershed. These comments are summarized in *Table 16: Mid-Hudson Watershed Levees*.

Table 16: Mid-Hudson Watershed Levees

County	Community	Comment
Schenectady	Rotterdam, Town of	There is a small private levee / berm for the shopping center located on Campbell Road. The berm has gates that can be closed during a storm to prevent the water from coming onto the property. This system is maintained by the owners of the shopping center.
Ulster	Hurley, Town of	There are issues related to erosion and high velocities, and agricultural levees along Esopus Creek, which has jumped its banks in multiple areas within the town.
	Kingston, City of	County officials requested assistance with the FEMA Levee Analysis and Mapping Procedure (LAMP) for the un-accredited levees in the City of Kingston.

Stream Gages and Flows

According to the U.S. Geological Survey (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.

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 push a gas bubble through a tube (related to the depth of water), or with radar. Figure 13: Typical Modern USGS Stream Gage illustrates the design of a river gaging station.

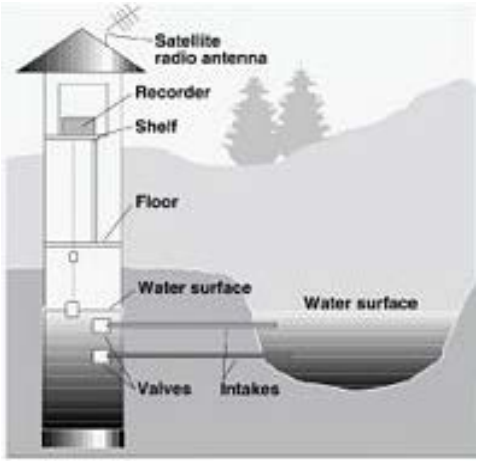

Figure 13: Typical Modern USGS Stream Gage

At most USGS stream gages, the stage is measured every 15 minutes and the data are stored in an electronic data recorder. At set intervals, usually between every one to four hours, the data are transmitted to the USGS using satellite, phone, or radio. At the USGS offices, the curves relating stage to stream flow are applied to determine stream flow estimates 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.

There are twelve known current and past gages in the watershed. *Table 17: USGS Gages in the Mid-Hudson Watershed* shows the gage identification number, location, drainage area, status, and

county for all USGS gages identified in the watershed. Additional information on gages in the watershed may be found by visiting the USGS's website.

Table 17: USGS Gages in the Mid-Hudson Watershed

County	Gage ID	Gage Location	Drainage Area (sq. miles)	Gage Status
Greene	01361500	Catskill Creek at Oak Hill, NY	97.585	Inactive
Rensselaer	01359750	Moordener Kill At Castleton-On-Hudson, NY	31.854	Inactive
	01360640	Valatie Kill Near Nassau, NY	9.623	Active
Ulster	013621955	Birch Creek at Big Indian, NY	12.627	Active
	01362198	Esopus Creek at Shandaken, NY	59.513	Inactive
	01362200	Esopus Creek at Allaben, NY	65.325	Active
	0136230002	Woodland Creek above mouth at Phoenicia, NY	20.535	Active
	01362370	Stony Clove Creek below Ox Clove at Chichester, NY	30.984	Active
	01362497	Little Beaver Kill at Beechford near Mt Tremper, NY	16.664	Active
	01362500	Esopus Creek at Coldbrook, NY	190.411	Active
	01363382	Bush Kill below Maltby Hollow Bk at West Shokan, NY	17.099	Active
	01364500	Esopus Creek at Mount Marion, NY	418.697	Active

Source: USGS

Rain Gages

The National Oceanic and Atmospheric Administration's (NOAA) Cooperative Observer Program 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. When appropriate, FEMA utilizes the NOAA information from these gages in developing meteorological models for the watershed that employ rainfall runoff models and calibration.

Additional information on rainfall in New York can be found in NOAA's Technical Paper No. 49 and in the Technical Memorandum NWS HYDRO-35, both on NOAA's website. It should be noted that data has been updated through a joint collaboration between the Natural Resources Conservation Service (NRCS) and the Northeast Regional Climate Center (NRCC) and is available at the Extreme Precipitation in New York and New England webpage.

Average Annualized Loss (AAL) Data

The Average Annualized Loss (AAL) data provide a general understanding of the dollar losses associated with a certain flood event frequency within a county and are used to get a relative

comparison of flood risk. It is determined by using FEMA's Multi-Hazard Risk Assessment and Loss Estimation Program, otherwise known as Hazus-MH.

The Hazus Flood Model analyzes both riverine and coastal flood hazards. Flood hazard is defined by a relationship between depth of flooding and the annual chance of inundation to that depth. Probabilistic events are modeled by looking at the damage caused by an event that is likely to occur over a given period of time, known as a return period or recurrence interval (10-, 25-, 50-, 100-, and 500-year). Annualized losses are the summation of losses over all return periods multiplied by the probability of occurrence. Loss estimation for this Hazus model is based on specific input data. The first type of data includes square footage of buildings for specified types or population. The second type of data includes information on the local economy that is used in estimating losses.

AAL data summarized at the census block level are shown on the Discovery Maps and provided in tabular form in *Appendix J: FEMA Hazus-MH AAL Data*. Total losses for the communities included in the Mid-Hudson Watershed are estimated at over $78 million.

Municipal Separate Storm Sewer Systems (MS4s)

As noted on the NYSDEC's website, Federal Stormwater Phase II regulations require permits for stormwater discharges from MS4s in urban areas and for construction activities that disturb one or more acres of land. To implement the law, 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. Detailed maps that depict where the regulated MS4 boundaries lie can be also found on the NYSDEC's website.

Transportation

Transportation is the movement of people and goods from location to location. These features include roads, rail, and air. Planning for these features allows for utilization and function within communities and interaction with other communities. These features are critical for community planning related to risk assessments for evacuation routes and potential flooding issues that could occur. Transportation features used for this Discovery project were obtained from the New York State GIS Clearinghouse.

Jurisdictional Boundaries

Jurisdictional boundaries used for this Discovery project, including boundaries for cities, towns, villages, and counties, were also obtained from the New York State GIS Clearinghouse.

Hazard Mitigation Planning and Activities

Summary of Hazard Mitigation Plans (HMPs)

A local HMP is a long-term strategic/guidance document used by an entity to reduce future risk to life, property, and the economy in a community. The purpose of the HMP is to:

- Identify vulnerabilities to natural hazards and provide for potential projects to reduce those vulnerabilities in the future;
- Protect life, safety, and property by reducing the potential for future damages and economic losses that result from natural hazards;
- Qualify for additional grant funding, in both the pre-disaster and post-disaster environment;
- Speed recovery and redevelopment following future disaster events;
- Demonstrate a firm local commitment to hazard mitigation principles; and
- Comply with both State and Federal legislative requirements for local HMPs.

As of February 2017, 28 communities within the watershed had current approved HMPs with updated plans in progress for the remainder of the communities. The New York State Division of Homeland Security and Emergency Services (NYSDHES) reviews the local HMPs prior to FEMA review and approval. These plans identify potential hazards and threats that face each community. Subsequent to approval and adoption of the HMPs, the communities are eligible to receive grants for future mitigation projects through the Hazard Mitigation Grant Program. There are numerous advantages to mitigation. The creation of a mitigation plan helps local officials identify potential future hazards. Once the threats are identified, the communities can identify mitigation activities, projects, and strategies to eliminate or minimize the impact a potential hazard would cause. Preventative measures are also cost effective; preventing the impact of a hazard will cost less than cleaning up after a disaster occurs. Mitigation can prevent the loss of lives as well as property damage. These plans focus on the exposure of critical facilities and community-owned assets to potential hazards and address ways to reduce the vulnerability to these threats. Some of these actions, projects, and strategies may take little time to employ while others may take years to implement.

HMPs are often completed at the county or regional level. At the local level, each municipal government also adopts the HMP as an individual plan or regional plan. Each municipality that adopts the HMP must develop specific mitigation actions to address vulnerabilities. Each municipal HMP was reviewed for initiatives, critical facilities, and mitigation actions. The status of each countywide HMP is shown in *Table 18: Status of Hazard Mitigation Plans*. Communities without a current HMP, such as those in Albany, Columbia, Greene, and Ulster Counties, are in the process of updating their plans.

Table 18: Status of Hazard Mitigation Plans

County	Community	Approval Date	Plan Expiration
Albany	Countywide	2/3/2010	Expired, new plan in progress
Columbia	Countywide	9/16/2008	Expired, new plan in progress
Dutchess	Countywide	10/7/2016	10/7/2021
Greene	Countywide	2/24/2011	Expired, new plan in progress
Rensselaer	Countywide	9/12/2012	9/12/2017
Schenectady	Countywide	2/17/2016	2/17/2021
Schoharie	Countywide	10/25/2013	10/25/2018
Ulster	Countywide	6/23/2009	Expired, new plan in progress

Source: FEMA

Critical Facilities and Other Important Properties in the SFHA

Table 19: Critical Facilities and Infrastructure Noted in HMPs as at Risk of Flooding shows critical facilities identified in the watershed. Critical facilities are those entities essential to the community's health and welfare. Critical facilities included in the HMPs vary based on how the locality defines a critical facility/infrastructure and the types of data available. Typically, critical facilities are defined as community assets whose presence is vital to that jurisdiction's continued ability to operate. Critical facilities often include 911 and emergency services facilities, airports, colleges and universities, schools, fire departments, police departments, sewage treatment plants, hospitals and nursing homes.

Table 19: Critical Facilities and Infrastructure Noted in HMPs as at Risk of Flooding

County	Facilities Located within SFHA
Albany	Four hospitals. Comprehensive information on critical facilities unavailable in county HMP.
Columbia	Fire stations, hospital, school, police station, senior center. Comprehensive information on critical facilities unavailable in county HMP.
Dutchess	5 Departments of Public Works, 9 Fire Stations/Emergency Management facilities, 4 Police Enforcement facilities, 1 school, 1 town hall, 4 wastewater treatment facilities.
Greene	10 wastewater treatment plants, two EMS facilities, four fire stations, two schools.
Rensselaer	Buskirk Fire Company Fire Station, Pleasantdale Fire Company Fire Station, Hoosick Area Senior Service Center, Bennington Battlefield, NYS Route 67.
Schenectady	One airport, four ambulances, 27 fire stations, 10 Government Buildings, four hospitals, 14 nursing homes, four Mohawk River Locks, seven Phone Companies, eight Police Stations, 65 Public Utilities, eight Public Work facilities, 56 schools, 17 substations.

County	Facilities Located within SFHA
Schoharie	16 fire stations, five police stations, 16 EMS/Ambulance stations, five Hospital/Adult Care facilities, 17 Emergency Communication facilities.
Ulster	33 Potable Water Treatment Facilities, 23 Wastewater Treatment Facilities, 33 Public Work facilities, five Airports, three Waste Transfer stations.

Sources: *Columbia County Hazard Mitigation Plan, Dutchess County Hazard Mitigation Plan, Greene County Hazard Mitigation Plan, Rensselaer County Hazard Mitigation Plan, Schenectady County Hazard Mitigation Plan, Schoharie County Hazard Mitigation Plan, and Ulster County Hazard Mitigation Plan*

Hazard Mitigation Grants

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

The PDM program provides funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event to states, territories, and Tribal governments (and through them, local communities). Funding these plans and projects reduces overall risks to residents and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

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

Lastly, the FMA provides funds for projects to reduce or eliminate risk of flood damage to buildings that are insured under the NFIP on an annual basis through three types of grants: Planning Grants to prepare flood mitigation plans; Project Grants to implement measures to reduce flood losses, such as elevation, acquisition or relocation of NFIP-insured structures; and Management Cost Grants so that the grantee may administer the FMA program and activities. FMA grants are only available to state (and state-equivalent) and Tribal governments; however, local governments may be named as sub-applicants.

Mitigation Projects Completed or Underway

The County HMPs identified mitigation projects, actions, and strategies to reduce long-term vulnerability to hazards. Each county listed several mitigation projects related to reducing flood risk. The general mitigation planning approach used is based on the FEMA Publication *"Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies."* The FEMA document contains four steps used to support mitigation planning:

- Develop mitigation goals and objectives
- Identify and prioritize mitigation actions
- Prepare an implementation strategy

- Document the mitigation planning process

Albany County

Albany County's HMP mitigation strategies include:[83]

- Implementation of NYS Building Code
- Encourage retrofitting of new homes
- Install tidal check valves along the Hudson River
- Consider moving, raising, or purchasing of homes in flood prone areas

Columbia County

Columbia County's HMP does not include overall mitigation strategies. Though the plan is currently expired, specific mitigation measures include:[84]

- Property buyouts of repetitive flood structures
- GIS mapping of flood hazard areas of high hazard dams
- Countywide stream maintenance program
- County Highway Department Infrastructure Inventory and mapping, and local zoning restriction on 100-year floodplain construction

Dutchess County

Dutchess County's HMP focuses on several strategies, including:[85]

- Protect property, including public and private property, critical facilities, and infrastructure
- Build regional, county, and local mitigation and related emergency management capabilities.
- Support comprehensive county and local mitigation through the integration of hazard mitigation planning into related county and local plans and programs

Greene County

Greene County's mitigation strategies include:[86]

- Prevent loss of life from natural hazards
- Protect and enhance community buildings, critical facilities, and infrastructure

Municipal mitigation actions and projects to implement the above strategies include:

- Retrofitting against flooding
- Property acquisition and structure demolition
- Mitigation reconstruction
- Localized flood risk reduction projects

Some key accomplishments since 2008 include:

- Community emergency notification system
- Batavia Kill watershed dam reconstruction and repairs

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[83] *Hudson-Hoosic Watershed Risk MAP Discovery Report*
[84] *Columbia County Hazard Mitigation Plan*
[85] *Dutchess County Hazard Mitigation Plan*
[86] *Greene County Hazard Mitigation Plan*

Rensselaer County

Rensselaer County and participating municipalities developed several mitigation goals and objectives. These include:[87]

- Review of each jurisdiction's HMP by county officers
- Regular workshops for municipal zoning and code officers
- Expand and disseminate GIS and other hazard information to communities and on the Internet

Schenectady County

Schenectady County and participating municipalities developed several mitigation goals and strategies. These include:[88]

- Provide information to county residents and businesses on the prevention of damage to people and property from hazard events
- Identify critical facilities and infrastructure for flood proofing and/or flood resilience
- Develop evacuation and sheltering plans for areas that are vulnerable to floods or other hazards

Municipal mitigation actions and projects to implement the above strategies include:

- Village of Delanson: Elevate heating system in Village Hall above the floodplain
- Town of Duanesburg: Culvert improvements
- Stabilization of Broadway Hill - three homes purchased, buildings demolished, and slope stabilized
- Establishment of County Voluntary Evacuation Registry

Schoharie County

Schoharie County and participating municipalities developed several mitigation goals and strategies. These include:[89]

- Stormwater management projects: Prevent or reduce flooding by improving stormwater management infrastructure on local roads or culverts
- Avoid measures and actions that could promote or contribute to high density development in protected and hazard sensitive areas
- Improved land use management: use regulations to limit development in the floodplain

Municipal mitigation actions and projects to implement the above strategies include:

- Countywide: Develop a Stream Corridor Management Program for Schoharie Creek, other drainage areas, and major tributaries
- Replace/install stream gages

Ulster County

Ulster County and participating municipalities developed several mitigation goals and strategies. These goals are aligned with the Ulster NYRCRP, and include:[90]

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[87] *Rensselaer County Hazard Mitigation Plan, page D-2*
[88] *Schenectady County Hazard Mitigation Plan*
[89] *Schoharie County Hazard Mitigation Plan*
[90] *Ulster County Hazard Mitigation Plan*

- Promote disaster resistant development
- Build and support local capacity to enable the public to prepare for, respond to, and recover from disasters
- Reduce the possibility of damage and losses due to flooding caused by floods, hurricanes, and nor'easters.
- Seek mitigation projects that provide the highest degree of natural hazards protection at the least cost.
- Seek risk reduction projects that minimize or mitigate their impacts on the environment.

Specific mitigation strategies include:

- Ulster County: Plank Road Embankment Protection and Preemptive Stormwater Mitigation (evaluate culverts and replace as needed, repair eroded embankments using geo-stabilization)
- Mitigate Repetitively Flooded Properties: explore mitigation measures for these properties and if necessary, carry out acquisition, relocation, elevation, and flood-proofing measures to protect the properties.

IV. Discovery Outreach and Engagement Strategy

Prior Engagement Efforts

Prior outreach and engagement efforts related to flood risk (separate from this Discovery project) have been performed by NYSDEC and FEMA for certain communities within the Mid-Hudson Watershed recently. These projects and activities are summarized in the *Table 20: Prior Engagement Efforts in Project Area*. Other significant outreach and engagement activities were also performed for communities in the West of Hudson watersheds in addition to those listed below. However, those areas are not included in this Discovery project.

Table 20: Prior Engagement Efforts in Project Area

County	Date	Project Outreach and Engagement Efforts
Albany	3/19-20/2007	FIRM Pre-Scoping Meetings
	3/26/2012	Preliminary FIRM Release Webinar
	4/24-25/2012	FIRM CCO Meetings
	6/19-20/2012	FIRM Public Open Houses
	4/29/2013	Albany County Risk MAP Meeting
Dutchess	8/18/2006	FIRM Pre-Scoping Meetings
	10/6-7/2008	FIRM CCO Meetings
	10/23/2008	FIRM Public Open House
Greene	11/13/2006	FIRM Consultation Coordination Officer (CCO) Meeting
	1/10/2007	FIRM Public Open House
Schenectady	6/14/2007	FIRM Pre-Scoping Meeting
	11/12/2009	FIRM CCO Meeting
	12/3/2009	FIRM Public Open House
	9/14/2012	FIRM Update Meeting for local officials
Schoharie	2/11/2010	FIRM Public Open House
	7/29/2010	Meeting regarding FIRM comments
Ulster	4/28-29/2004	FIRM Pre-Scoping Meetings (for areas outside New York City watershed)
	10/23-24/2007	FIRM CCO Meetings and Public Open House
	1/14/2008	Meeting with the City of Kingston regarding levee issues
	9/25/2008	Meetings with the City of Kingston regarding levee de-certification
	7/11/2013	Meeting with City of Kingston to discuss levee and FIRM issues (FEMA and the DEC)
	3/21/2016	Meeting with City of Kingston to discuss levee and FIRM issues (DEC)
	6/23/2016	Meeting with City of Kingston to discuss levee and FIRM issues (DEC)
	2/12/2017	City of Kingston Levee Analysis and Mapping Procedures (LAMP) Meeting

Stakeholder Identification

As part of this Discovery process for the Mid-Hudson Watershed, the NYSDEC Floodplain Management Section compiled an extensive list of contact information for community officials and other stakeholders within the watershed. In an effort to gather as much local feedback as possible, over 450 watershed stakeholders including local officials from individual communities and counties, representatives from Federal and State agencies, non-governmental organizations, and other local groups were invited to participate in the Discovery process.

Key Stakeholder Groups and Influencers

In addition to municipal officials, planning and emergency agencies, and local residents, there are other stakeholders with an interest in floodplain mapping and management. Other Federal and State agencies, major landowners, large employers, academic institutions, and environmental organizations all have a role to play, and sometimes valuable information to provide, when developing both pre-mapping data and final mapping products. Examples of such organizations in the Mid-Hudson Watershed include:

- Nature Conservancy
- United States Army Corps of Engineers (USACE) New York District
- USGS New York Water Science Center
- Farm Bureau of New York
- Cornell Cooperative Extensions: Columbia-Greene, Dutchess, Albany, Schoharie/Otsego, Schenectady, Ulster

Pre-Meeting Engagement and Information Exchange

Exchanging information with key stakeholders is a critical part of the Mid-Hudson Watershed Discovery project. There were two primary goals of the initial outreach and engagement activities associated with this project: 1) to communicate the purpose of the Discovery project and the role of local stakeholder input in the process and 2) to obtain key information upfront related to existing flood risk in the watershed, flood hazard mapping needs, mitigation activities, and other existing information useful in updating the FIRMs.

Pre-Discovery Webinars

The project team conducted two Pre-Discovery webinar sessions on May 10 and 11, 2016 via WebEx/conference call for the Mid-Hudson Watershed. The purpose of the sessions was to introduce the planning team, explain the Discovery process and how it can benefit the communities in the watershed, and how stakeholders can participate in the process. The sessions were also used to obtain input on best locations for in-person Discovery Meetings, who should be included in the process, and ideas for encouraging participation in the meetings. The presentation and webinar summaries are provided in *Appendices B and C* of this report, respectively.

Correspondence/Survey Form

Prior to the webinars, a Risk MAP Discovery Project Stakeholder Survey was sent to all stakeholders invited to the webinars. The survey was available online via Survey Monkey. Digital PDF copies of the survey were also provided. Stakeholders were asked to submit the survey prior to upcoming in-person Discovery meetings in order for the Discovery team to gather and develop preliminary materials ahead of the meetings.

The survey gathered information from stakeholders on:

- Flood mapping needs, FIRM inaccuracies, and historical flood problems
- High water marks within the community
- Community planning, ongoing projects, and recent residential, commercial, or industrial development

- Flood mitigation activities
- Training needs
- NFIP and floodplain management information
- GIS data: base map data, engineering data, and risk assessment data
- Other community officials or groups to include in the Discovery project

The list of identified stakeholders used for pre-meeting engagement communications is provided in *Appendix A: Pre-Discovery Meeting Mailing List & Invitation Letter* of this report.

V. Discovery Meetings

The purpose of the in-person Discovery meetings is to review any information previously provided by communities, State and regional agencies, and local stakeholders; discuss each community's floodplain mapping needs and floodplain management activities, mitigation plans and projects, and flood risk concerns; and gather additional feedback for FEMA to consider when developing Risk MAP products, including the development of new FIRMs where needed.

Appendices to this report include the Discovery meeting preparation and meeting materials:

- Meeting Invitation
- Meeting Invitation Mailing List
- Meeting Agenda
- Meeting Sign-In sheets
- Meeting Presentations
- Meeting Summary Memorandum

Invitees to the in-person Discovery meetings included not only those stakeholders initially identified to participate in the Pre-Discovery webinars, but also other stakeholders identified by participants during the Pre-Discovery webinars and in the completed Discovery Stakeholder Survey forms received prior to the meetings. Invitations were sent by e-mail and hard copy. Additionally, phone calls to communities who had not RSVP'd for the meetings were made the week prior to the meetings to encourage attendance.

A series of five in-person meetings in the Mid-Hudson Watershed were held on the dates and times listed below in *Table 21: Mid-Hudson Watershed Discovery Meetings*.

Table 21: Mid-Hudson Watershed Discovery Meetings

Date	Time	Location
10/18/2016	9:00 AM - 11:30 AM	Greene County Emergency Training Facility 25 Volunteer Drive, Cairo, NY 12413
10/18/2016	1:30 PM - 4:00 PM	Kingston Library 55 Franklin Street, Kingston, NY 12401
10/19/2016	1:30 PM - 4:00 PM	Albany County Cooperative Extension 24 Martin Road, Voorheesville, NY 12186
10/20/2016	9:00 AM - 11:30 AM	Schodack Town Hall 265 Schuurman Road, Castleton, NY 12033
10/20/2016	1:30 PM - 4:00 PM	Columbia County Soil & Water Conservation District 1024 NY 66, Ghent, NY 12075

Community officials and other stakeholders who attended the Discovery meetings were interviewed by project team members on a variety of flood and mitigation-related topics. Of particular importance to the project was the identification of mapping, training, and mitigation needs in the watershed. This information was captured in copies of the Discovery Stakeholder Survey form by project team members and on scoping maps created by NYSDEC for each community and county. The maps allowed stakeholders to pinpoint flooding hot spot areas, locations of past, ongoing, or desired mitigation projects, and areas with mapping needs.

Post-Meeting Follow Up Activities

Additional outreach to communities in the Mid-Hudson Watershed was performed after the meetings. Follow up letters were sent to communities that had not participated in the Discovery process to date (i.e., did not submit a Stakeholder Survey Form or attend one of the Discovery meetings) that again requested their input in the process. For communities that did participate in the process, letters summarizing the mapping needs identified by their communities were sent to the relevant community officials to ensure their needs were correctly summarized. The letters requested that community officials review the summarized needs and either return a signed copy of the letter to NYSDEC if the needs were summarized correctly or contact NYSDEC if changes were needed. Copies of the follow up letters are provided in *Appendix I: Community Acknowledgment Letters*.

VI. Discovery Findings

Summary of Stakeholder Comments and Needs

Following the completion of the Discovery meetings, the information gathered during the face-to-face consultations with community officials and other watershed stakeholders was combined with additional information provided by stakeholders through the Discovery Stakeholder Survey forms completed in hard copy or online outside of the meetings. A summary of identified needs related to flood mapping, mitigation, and training are provided in the sections below based on the information provided by stakeholders during the Discovery process.

Additionally, detailed summaries of the data provided by stakeholders during the project are available in the following appendices to this report:

- *Appendix H: Discovery Meeting Summary Memorandum*
- *Appendix M: Mid-Hudson Watershed Recommended Scope of Work Memorandum*

Flood Mapping Needs

Communities in the Mid-Hudson Watershed have a mix of updated digital countywide FIRMs and older community based, paper FIRMs developed between 1979 and 2000. While communities in Albany, Dutchess, Greene, Schenectady, Schoharie, and Ulster Counties have updated countywide FIRMs, communities in Columbia and Rensselaer Counties would benefit from a modernized countywide FIRM in a digital format. Many community officials find the existing maps difficult to work with and some of the floodplains shown inaccurate.

Beyond the upgrade of mapping for Columbia and Rensselaer County to a digital format, specific stream restudy priorities were also identified based on the data gathered and stakeholder input provided during this Discovery project. A total of 61 separate riverine/lake study mapping needs within the watershed were identified by stakeholders. An additional 13 riverine/lake study mapping needs located outside the watershed were also identified. Notably, the Hudson River which borders six counties within the study, area was identified as a high priority mapping update for both the counties and the communities on its waterfront. *Table 22: Summary of Identified Mapping Needs* summarizes all of the mapping needs identified by communities and other stakeholders during the project. The Discovery Maps prepared for the Mid-Hudson Watershed

show the locations of the identified mapping needs. A detailed summary of community requests and floodplain mapping priorities is also provided in *Appendix H: Discovery Meeting Summary Memorandum*.

Table 22: Summary of Identified Mapping Needs

County	Community	Mapping Needs Identified by Municipality/County
Albany	Albany, City of	1. The current FEMA modeling for Patroon Creek from Everett Road to the confluence with the Hudson River reflected on the Flood Insurance Rate Map is outdated and a revised detailed study is needed. There is currently dam break modeling being performed for this stream using HEC-RAS 2D. 2. The City is concerned about the accuracy of the current mapping for Normans Kill due to a recent landslide and reconstruction efforts. Changes to the stream channel need to be reflected in an updated detailed study for the stream. 3. The upsizing of a culvert along Krum Kill needs to be reflected on the Flood Insurance Rate Map.
	Altamont, Village of	1. Tributary to the Bozen Kill (south of Main Street) needs an updated detailed study to reflect a culvert upgrade project along Brandle Road and another at Park Street. 2. The Bozen Kill needs an updated approximate study. 3. Fly Creek needs an updated detailed study. During large rain events, the stream jumps its banks and floods large portions of nearby neighborhoods.
	Berne, Town of	1. The Foxen Kill is in need of a new detailed study. There is significant development along the stream and the current floodplain is not accurate. This stream is located outside of the Mid-Hudson Watershed. 2. The Tributary to Warners Lake is in need of a revised approximate study. The area currently has no flood hazards mapped and there have been flooding problems in this area. This stream is located outside of the Mid-Hudson Watershed. 3. Helderberg Lake is in new of a new approximate study. The lake currently has no flood hazards mapped. 4. Thompsons Lake is in need of a revised approximate study. The current floodplain is not accurate. 5. The Switz Kill is in need of a new detailed study. This is a significant flooding source in the community. This stream is located outside of the Mid-Hudson Watershed.

Table 22: Summary of Identified Mapping Needs

County	Community	Mapping Needs Identified by Municipality/County
Albany (cont.)	Berne, Town of (cont.)	6. The Tributary to Thompsons Lake is in need of an updated approximate study. 7. Woodstock Lake is in need of a new approximate study. There are seasonal homes present and the area currently has no flood hazard mapping. The lake is located outside of the Mid-Hudson Watershed.
	Bethlehem, Town of	1. A segment of the Normans Kill is in need of an updated detailed study in the vicinity of the Normanside Country Club. This area was subject to a landslide due to the illegal placement of fill that blocked the entire channel. Reconstruction efforts have changed the course of the stream.
	Coeymans, Town of	1. An updated detailed study of Hannacroix Creek is needed. Flooding frequently occurs and many properties are located in the current floodplain. Several Letters of Map Amendment have also been issued along the stream. 2. An updated detailed study of Coeymans Creek is needed. Miller Road frequently washes out. 3. An updated detailed study of the Hudson River is needed.
	Colonie, Town of	No needs identified.
	Colonie, Village of	No needs identified.
	Green Island, Village of	1. The effect of the upper Hudson and Mohawk Rivers on the village needs to be studied. The current effective study is outdated (Dec. 1979) and inaccurate. Many changes have occurred since then that could have a positive effect on the community's ability to sustain high water. The Mohawk River is located outside of the Mid-Hudson Watershed.
	Guilderland, Town of	1. The Krum Kill is in need of an updated detailed study. The stream has repeated flooding problems due to undersized culverts that frequently affect a large commercial development 2. Mill Pond is in need of a new detailed study. There is currently no Special Flood Hazard Area shown in this location but the area floods due to an undersized culvert. 3. Black Creek is in need of a new detailed study. There is new development occurring in close proximity to the existing Special Flood Hazard Area.
	Knox, Town of	No needs identified.
	Menands, Village of	No needs identified.
	New Scotland, Town of	No needs identified.

Table 22: Summary of Identified Mapping Needs

County	Community	Mapping Needs Identified by Municipality/County
Albany (cont.)	Ravena, Village of	1. A new/revised detailed study is needed for the Tributary 1 to Hannacroix Creek to accurately reflect flooding problems caused by old, outdated culverts for the NYS Thruway and CSX Railroad. The portion of the stream west of the Thruway currently has an approximate study.
	Rensselaerville, Town of	No needs identified.
	Voorheesville, Village of	No needs identified.
	Watervliet, City of	No needs identified.
	Westerlo, Town of	No needs identified.
	Albany County	1. The Hudson River is in need of a new/revised detailed study for the entire reach within the county. There has been development in certain communities along the river, including in the Town of Bethlehem. 2. Vly Creek is in need of a revised detailed study from Normans Kill through the Village of Voorheesville. This is a densely settled area with development pressures. 3. Vloman Kill is in need of a new detailed study from Route 32 to Route 85. There is new development along the stream. 4. Basic Creek is in need of an updated detailed study from Basic Creek Reservoir through the Hamlet of Westerlo. 5. Catskill Creek is in need of a revised approximate study for the entirety of the stream within the county. There are flash flooding issues along the stream. 6. Fox Creek from the county line past County Route 357 is in need of a new approximate study. There are issues with the bridge over the county road but few buildings in the area.
Columbia	Ancram, Town of	1. Roeliff Jansen Kill, Punch Brook, and Drowned Lands Swamp are in need of a new detailed studies. These three flooding sources comprise one distinct area that frequently floods and results in road closures.
	Austerlitz, Town of	No needs identified.
	Canaan, Town of	No needs identified.
	Chatham, Village of	No needs identified.
	Chatham, Town of	No needs identified.
	Claverack, Town of	No needs identified.
	Clermont, Town of	No needs identified.
	Copake, Town of	No needs identified.
	Gallatin, Town of	No needs identified.
	Germantown, Town of	No needs identified.
	Ghent, Town of	No needs identified.
	Greenport, Town of	No needs identified.

Table 22: Summary of Identified Mapping Needs

County	Community	Mapping Needs Identified by Municipality/County
Columbia (cont.)	Hillsdale, Town of	No needs identified.
	Hudson, City of	1. An updated detailed study of the Hudson River is needed due to the presence of several at-risk structures. 2. A new detailed study of the tributary to the Hudson River at the southeastern corporate limit is needed due to the presence of several at-risk structures.
	Kinderhook, Town of	No needs identified.
	Kinderhook, Village of	No needs identified.
	Livingston, Town of	No needs identified.
	New Lebanon, Town of	1. A new detailed study is needed for both Kinderhook and Wyomanock Creeks. There is development along both streams and significant flooding problems. Both streams are currently mapped as Zone A.
	Philmont, Village of	No needs identified.
	Stockport, Town of	No needs identified.
	Stuyvesant, Town of	No needs identified.
	Taghkanic, Town of	No needs identified.
	Valatie, Village of	1. Kinderhook Creek for its entire distance within the village, is in need of an updated detailed study. This area, including the village water/sewer treatment plant, flooded during Hurricane Irene.
	Columbia County	<u>Patrice Perry</u> 1. Kinderhook Creek is in need of a revised detailed study, from just north of the Village of Valatie to just south of the Village of Kinderhook. This is one of the few developed areas within the county, and there is some development pressure in this area. 2. Kinderhook Creek and Wyomanock Creek are in need of new detailed studies from the county line to the Hamlet of New Lebanon. This area has a high repetitive loss rate. There is also recent development in this area, along with a school. 3. Bashbish Brook and the Roeliff Jansen Kill are in need of a new detailed studies, from the confluence of the Bashbish and the Roeliff Jansen Kill to the Hamlet of Copake Falls. This area has repeated flood losses and infrastructure damage. 4. There are a number of small lakes in the county that have development on them or have some development pressure. The county would like Base Flood Elevations established for the following lakes: Copake Lake, Upper Rhoda Pond,

Table 22: Summary of Identified Mapping Needs

County	Community	Mapping Needs Identified by Municipality/County
Columbia (cont.)	Columbia County (cont.)	Lower Rhoda Pond, Chrysler Pond, Kinderhook Lake, and Twin Lakes. <u>Dean Knox</u> 1. The Roeliff Jansen Kill is in need of an updated detailed study from Robinson Pond Dam to Hudson River (Towns of Germantown, Livingston, Copake, Clermont, Milan, Gallatin, Pine Plains, and Ancram). 2. Claverack Creek is in need of an updated detailed study for its entire length within the county (Towns of Stockport and Claverack). 3. Hollowville Creek is in need of a new detailed study for its entire length within the county (Town of Claverack). 4. Indian Creek should be studied by approximate methods for its entire length within the county (Towns of Canaan, Chatham, and Austerlitz). 5. Taghkanic Creek should be studied by approximate methods for its entire length within the county (Towns of Claverack, Greenport, Taghkanic, Copake, and Hillsdale). 6. Wyomanock Creek should be studied by detailed methods for its entire length within the county (Town of New Lebanon). 7. Green River should be studied by approximate methods for its entire length within the county (Towns of Austerlitz and Hillsdale). This stream is located outside of the Mid-Hudson Watershed. <u>Steve Nack</u> 1. Bashbish Brook should be studied using detailed methods in the Town of Copake
Dutchess	Milan, Town of	No needs identified.
	Northeast, Town of	1. The unnamed tributary to Webutuck Creek east of State Route 22 is in need of a new approximate study from Downey Road to Lower Mill Road. This stream is located outside of the Mid-Hudson Watershed. 2. Webutuck Creek is in need of a revised detailed study from Beilke Road to Indian Lake Road. This stream is located outside of the Mid-Hudson Watershed. 3. Kelsey Brook is in need of a revised detailed study from the county boundary to the confluence with Webutuck Creek. This stream is located outside of the Mid-Hudson Watershed.
	Pine Plains, Town of	No needs identified.

Table 22: Summary of Identified Mapping Needs

County	Community	Mapping Needs Identified by Municipality/County
Dutchess (cont.)	Red Hook, Town of	No needs identified.
	Red Hook, Village of	1. An unnamed pond on private land southeast of the intersection of East Market Street and North Broadway should be studied. It overtops its banks during major storms.
	Rhinebeck, Town of	No needs identified.
	Stanford, Town of	1. Wappinger Creek Reach 1 (from Salt Point Turnpike to 250 feet upstream of Creamery Road) is in need of a revised detailed study. There is a bridge replacement planned along this stream on Bulls Head road. This area is also a developed area. This stream is located outside of the Mid-Hudson Watershed. 2. Wappinger Creek Reach 3 (from 250 feet upstream of Creamery Road to the northern corporate limits) is in need of a new detailed study. There is a new business district being designated from Reach 1 to Cold Spring to approximately the intersection of NY Route 82 and County Route 53 (just north of intersection of Wappinger Creek and Cold Spring Creek). This stream is located outside of the Mid-Hudson Watershed.
	Tivoli, Village of	No needs identified.
	Dutchess County	1. Sawkill Creek in the Town and Village of Red Hook is in need of a revised detailed study. This stream is prone to flooding.
Greene	Athens, Town of	No needs identified.
	Athens, Village of	No needs identified.
	Cairo, Town of	1. Catskill Creek is in need of a revised detailed study. The area in the vicinity of Morehouse Road frequently floods and a mitigation project is being proposed in the area. 2. The Tributary 1 to Catskill Creek near Lincoln Drive needs a new detailed study. This is an area that frequently floods. 3. Tributary 2 to Catskill Creek needs a new detailed study to incorporate the upsized culverts on Harold Myers Road and Sandy Plain Road.
	Catskill, Town of	No needs identified.
	Catskill, Village of	1. Catskill Creek is in need of an updated detailed study. This area is populated, has commercial development, and has experienced property damage from flooding. 2. Hudson River is in need of an updated detailed study. This area is populated and has experienced property damage from flooding.

Table 22: Summary of Identified Mapping Needs

County	Community	Mapping Needs Identified by Municipality/County
Greene (cont.)	Catskill, Village of (cont.)	3. Dubois Creek has the potential for backwater flooding from Catskill Creek but there is no floodplain shown on the Flood Insurance Rate Map. The map should be updated to reflect the hazard that is present in this area. 4. There is an isolated Zone X shown on the Flood Insurance Rate Map at the confluence of Catskill Creek with the Hudson River.
	Coxsackie, Town of	No needs identified.
	Coxsackie, Village of	No needs identified.
	Durham, Town of	No needs identified.
	Greenville, Town of	No needs identified.
	New Baltimore, Town of	1. The Hudson River need a new detailed study to incorporate the impacts of the waste water treatment plant pump station mitigation project at Mill Street.
	Greene County	1. Catskill Creek needs a new detailed study from the Hudson River to County Route 67 in the Town of Durham. The county believes the Special Flood Hazard Area is inaccurate. This stream reach experiences both repetitive flooding and significant erosion. 2. Kaaterskill Creek needs a new detailed study from Catskill Creek in the Town of Catskill to the Catskill Forest Preserve lands also in the Town of Catskill. There is repetitive flooding and the stream alignment has shifted. 3. The entire reach of Coxsackie Creek within the Town of Coxsackie needs an updated detailed study. This is a developed area. 4. Sickles Creek in the Town of New Baltimore needs a revised approximate study from the confluence with Coxsackie Creek to the NYS Thruway. There is tidal flooding in this area and the drainage is blocked at high tide. The county also expressed concern regarding the hydrologic analysis used to develop the FEMA floodplains. They believe the models differ significantly from the results of nearby USGS gages using standard evaluation software such as Peak FQ. The flows used in the models tend to be much higher than the flows returned by Peak FQ. Therefore, the county believes there is systematic inaccuracy in the models especially for the Batavia Kill.
Rensselaer	Berlin, Town of	No needs identified.
	Brunswick, Town of	1. The Quacken Kill Reach One is in need of an updated detailed study from the southern corporate limits to approximately 5,970 feet upstream, south of State Highway 2. The current map is not

Table 22: Summary of Identified Mapping Needs

County	Community	Mapping Needs Identified by Municipality/County
Rensselaer (cont.)	Brunswick, Town of (cont.)	accurate in this area and there are residential properties along the reach. 2. The Quacken Kill Reach Two is in need of a new detailed study from south of State Highway 2 to the eastern corporate limits. The current map is not accurate in this area. 3. The Poesten Kill Reach Two, from north of Rutledge Lane to the western corporate limits, is in need of a new detailed study. 4. An unnamed stream north of the Hamlet of Haynersville is in need of a new detailed study due to recent flooding issues. This stream is located outside of the Mid-Hudson Watershed. 5. Additionally, the town noted that more street names on the Flood Insurance Rate Maps would be helpful.
	Castleton-on-Hudson, Village of	No needs identified.
	East Greenbush, Town of	No needs identified.
	East Nassau, Village of	1. The entire reach of Kinderhook Creek within the village needs a revised detailed study due to more frequent flooding. 2. The entire reach of Black Brook within the village needs a revised detailed study. Flooding is occurring more frequently and the flood water is swifter moving and rises higher than in the past. 3. Tsatsawassa Creek is in need of a new detailed study in Hoag's Corners. There are capacity issues with older culverts along the Tsatsawassa Lake Road. 4. The unnamed tributary to Kinderhook Creek that crosses Hayes Road and NY State Route 66 often overtops a portion of Hayes Road. A new detailed study is needed to reflect the enlargement of culverts for these roads and to properly assess flood hazards. This is not a heavily developed area.
	Grafton, Town of	No needs identified.
	Nassau, Village of	No needs identified.
	Nassau, Town of	No needs identified.
	North Greenbush, Town of	No needs identified.
	Poestenkill, Town of	1. Poesten Kill Reach One is in need of a revised detailed study due to severe flooding that occurred in the vicinity during Hurricane Irene. 2. Poesten Kill Reach Two is in need of a new detailed study. This reach currently has an approximate study only. Severe flooding

Table 22: Summary of Identified Mapping Needs

County	Community	Mapping Needs Identified by Municipality/County
Rensselaer (cont.)	Poestenkill, Town of (cont.)	occurred during Hurricane Irene causing damage to portions of Plank Road in East Poestenkill. 3. The Tributary to the Poesten Kill, west of Fifty Six Road, is in need of a new detailed study due to severe flooding that occurred in the vicinity during Hurricane Irene that washed out roads and caused damage to a culvert. 4. Vosburg Pond is in need of a new detailed study due to severe flooding that occurred during Hurricane Irene.
	Rensselaer, City of	1. The Hudson River is in need of a revised detailed study for its entire length within the city. There is high development pressure along the waterfront, including plans for a mixed residential / commercial area, including apartment buildings. There are also plans to redevelop the area near the old high school, with some sports fields and recreation facilities in the near future. 2. Quackenderry Creek is in need of a revised detailed study. There is some development pressure along the northern portion of the creek, including possible development of a park and open space area near the East Greenbush line. There have been changes throughout the creek that may affect flooding, including construction of a small dam in 2008 just east of Catherine Street to help alleviate flooding issues. 3. Mill Creek is in need of a revised detailed study. This creek flows into the Hudson River and passes through an area that has development pressure and redevelopment plans.
	Sand Lake, Town of	1. The entirety of the Wynants Kill (Reaches One, Two and Three) needs a new/revised detailed study due to the age of the previous study, bridge replacements, the presence of residential properties in the area, and flooding during Hurricane Irene. Reach Two is currently an approximate study.
	Schodack, Town of	1. The entirety of Muitzes Kill Reach One needs an updated detailed study due to repeated flooding events, new flood control structures, fill activity, and flood risk to structures. 2. Moordener Kill needs an updated detailed study near a trailer park at the intersection of East Schodack Road and Poyneer Road. This area was inundated during Hurricane Irene and has continuing erosion problems. There is also a culvert that is undersized that contributes to flooding problems in this area.
	Stephentown, Town of	No specific needs identified. Digital FIRMs requested.
	Troy, City of	1. The Hudson River needs an updated detailed study within the corporate limits. The 1922 seawall has been recently repaired. (High priority)

Table 22: Summary of Identified Mapping Needs

County	Community	Mapping Needs Identified by Municipality/County
Rensselaer (cont.)	Troy, City of (cont.)	2. The Poesten Kill is in need of an updated detailed study due to development in the area and the presence of two dams. (High priority) 3. The Wynants Kill needs an updated approximate study from the confluence with the Hudson River to the confluence with Burden Pond. (Low priority) 4. An existing analysis for Burden Pond is available that needs to be incorporated into the Flood Insurance Rate Map. (Low priority) 5. Data from an existing dam break analysis is available to be incorporated into the Flood Insurance Rate Map for the Piscawen Kill. This stream is located outside of the Mid-Hudson Watershed. (Low priority) 6. The Paensic Kill is in need of an updated approximate study. There is a small amount of development in this area. This stream is located outside of the Mid-Hudson Watershed. (Low priority) 7. Data from an existing dam break analysis is available to be incorporated into the Flood Insurance Rate Map for Ida Lake. (Low priority)
	Rensselaer County	1. The Poesten Kill needs a revised detailed study for its entire reach within the county. This stream flooded during Hurricane Irene. 2. The Wynants Kill should be restudied using detailed methods for its entire length within the City of Troy. This stream frequently floods. 3. The Hudson River from Route 7 in the City of Troy south to Route 20 in the Town of East Greenbush is in need of a revised detailed study. 4. The Quacken Kill is in need of a new detailed study from Route 351 to the Brunswick/Grafton corporate limits due to recurrent flooding. 5. Quackenderry Creek should be restudied using detailed methods from the confluence with the Hudson River to Route 4, in the City of Rensselaer and Town of North Greenbush due to recurrent flooding caused by development.
Schenectady	Delanson, Village of	No needs identified.
	Duanesburg, Town of	No needs identified.
	Princetown, Town of	No needs identified.

Table 22: Summary of Identified Mapping Needs

County	Community	Mapping Needs Identified by Municipality/County
Schenectady (cont.)	Rotterdam, Town of	1. The Mohawk River is in need of an updated detailed study. There has been roadwork recently completed along the I-890 exit near Erie Boulevard which may have affected the accuracy of the Special Flood Hazard Area. There is also development pressure/possibility of redeveloping parts of an old industrial complex in the same area. This flooding source is located outside of the Mid-Hudson Watershed.
	Schenectady County	No needs identified.
Schoharie	Broome, Town of	No needs identified.
	Schoharie County	1. Lake Creek (also known as Hauverville Creek) in the Town of Broome should have a new detailed study from the county line to the confluence with Catskill Creek. This is a currently unmapped stream with some residential development and is likely to develop further. The area sustained significant flood damage including the complete destruction of three homes due to Hurricane Irene in 2011. 2. Catskill Creek in the Town of Broome is in need of a new detailed study. The establishment of Base Flood Elevations is needed since the area is a mix of rural residences and commercial uses.
Ulster	Hurley, Town of	No needs identified. However, there are several errors the community officials noticed on the new Ulster County countywide Flood Insurance Rate Map and Flood Insurance Study report that have not yet been addressed, including: • Floodway Data Table value errors for Esopus and Englishmans Creek • Stream names are not correct in some areas
	Kingston, City of	1. Esopus Creek is in need of an updated detailed study. The current study is outdated and there is development occurring along the stream within the town. 2. Rondout Creek is in need of an updated detailed study from the confluence with the Hudson River to the corporate limits. This stream is located outside of the Mid-Hudson Watershed. 3. Twaalfskill Brook is in need of an updated detailed study from the confluence with Rondout Creek to just upstream of Brook Street. This stream is located outside of the Mid-Hudson Watershed. 4. The Hudson River is in need an updated detailed study due to proposed development along the shoreline. 5. Tannery Brook is in need of a new approximate study from the confluence with Esopus Creek to the corporate limits. Heavy rain events cause flooding along the stream.

Table 22: Summary of Identified Mapping Needs

County	Community	Mapping Needs Identified by Municipality/County
Ulster (cont.)	Kingston, City of (cont.)	6. Main Street Brook is in need of a new approximate study from Lucas Avenue to the corporate limits. Flooding occurs at the Main Street bridge.
	Kingston, Town of	No needs identified.
	Marbletown, Town of	No needs identified.
	Saugerties, Town of	1. Esopus Creek is in need of an updated detailed study. The creek has caused repeated flooding losses in the past, leading to several property buyouts. There are currently a number of on-going mitigation projects along the creek, such as bulkhead replacements, that should be considered in the updated study. 2. Sawyer Kill needs a new detailed study due to compromised floodplains and to generate a more detailed Special Flood Hazard Area. 3. An updated detailed study is needed along the Kate Yaeger Kill, especially between cross sections E and G, through the residential area. 4. Kaaterskill Creek is in need of a new detailed study in a residential area located where the creek crosses the Greene County line in the west, heading downstream in an east/northeasterly direction where it crosses back into Greene County to the north. 5. Plattekill Creek near Carrelis Road is in need of a new detailed study to establish Base Flood Elevations. There is residential development in this area.
	Saugerties, Village of	1. Esopus Creek in in need of an updated detailed study. The creek has caused repeated flooding losses in the past, leading to several property buyouts. There are currently a number of ongoing mitigation projects along the creek, such as bulkhead replacements, that should be considered in the updated study. 2. The Hudson River, within the corporate limits, needs an updated detailed study. 3. Sawyer Kill needs a new detailed study due to compromised floodplains and to generate a more detailed Special Flood Hazard Area.
	Ulster, Town of	1. Commercial development activities along Esopus Creek, including the placement of fill in the floodplain along Washington Avenue between the City of Kingston corporate limit and the New York State Thruway traffic circle, need to be reflected in a revised detailed study for this stream to update the FIRM.

Table 22: Summary of Identified Mapping Needs

County	Community	Mapping Needs Identified by Municipality/County
Ulster (cont.)	Ulster, Town of (cont.)	2. Preymaker Brook is in need of a revised approximate study. This is an area affected by flooding due to plugged culverts as a result of beaver activity. This area has low density development and population.
	Woodstock, Town of	No needs identified.
	Ulster County	1. A revised detailed study for Lower Esopus Creek from the Ashokan Reservoir to Saugerties is needed, as are depth grids for the various (1, 5, 10, 25, 100, 500 year), return interval floods. There is significant flooding and development pressure along this stream. 2. A revised detailed study for Sawkill Creek from Shady Lane to Esopus Creek is needed, as are depth grids for the various (1, 5, 10, 25, 100, 500 year), return interval floods. There have been buyouts in the area and the stream has been dredged. 3. A new detailed study is needed for Little Beaver Kill from the area below Yankeetown Pond to Kenneth Wilson State Park and the low-lying areas along the tributary stream in the vicinity of Ulster County Route 45 (Wittenberg Road) where inundation problems to homes and the roadway occur. 4. A new detailed study is needed for the Plattekill Creek in the area around Mount Marion to Glenerie where inundation problems to homes and roadways occur. There is new housing in this area. 5. The Hudson River is in need of a revised study. There are some critical facilities located in the floodplain. 6. Butternut Creek within the Town of Olive needs a new detailed study. The stream runs through a residential area and regularly floods, even in small, 2+ year return interval storm events, resulting in a lot of ponding, debris blockages, and closed roads, including Bostock Lane, which is where the town meeting hall and police station are located. This stream is located outside of the Mid-Hudson Watershed. <u>The following issue was also noted a possible error on the soon-to-be effective countywide FIRM for the county:</u> The new (currently still preliminary) Base Flood Elevations along Beaver Kill in the vicinity of Willow (Sickler Road and Flats) may be incorrect (Town of Woodstock). The area is very flat, and two tributaries enter which can cause discrepancies in the HEC-RAS modeling, resulting in large “jumps” in Base Flood Elevations (Wagner Creek and Mink Hollow). The county also requested assistance with the FEMA Levee Analysis and Mapping Procedure (LAMP) for the un-accredited levees in the City of Kingston.

Mitigation and Risk Reduction Project Needs

Communities and other stakeholders provided their input on mitigation and risk reduction project needs as part of the Discovery project. The most common needs identified included the replacement/resizing of culverts and bridges, dam maintenance/remediation, and stream maintenance and erosion issues along flooding sources that exacerbate flooding problems. *Table 23: Summary of Mitigation and Risk Reduction Project Needs* provides a summary of such needs identified by communities and stakeholders during this Discovery project.

Table 23: Summary of Mitigation and Risk Reduction Project Needs

County	Community	Mitigation/Risk Reduction Project Need
Albany	Albany, City of	No needs identified.
	Altamont, Village of	• A grant application was submitted to update a bridge that the Town of Guilderland owns along the tributary to the Bozen Kill at Grand Street.
	Berne, Town of	No needs identified.
	Bethlehem, Town of	• There is an erosion problem south of the high school along an unnamed tributary that the town has already been in contact with the DEC about.
	Coeymans, Town of	• There is a proposed project to raise the grade of Miller Road along Coeymans Creek because it floods frequently. This project was proposed in the hazard mitigation plan.
	Colonie, Town of	No needs identified.
	Colonie, Village of	No needs identified.
	Green Island, Village of	• There is a potential mitigation site along the Hudson River at the southernmost corporate limit of the village at Lower Hudson Avenue.
	Guilderland, Town of	• The Krum Kill floods in any heavy rain event due to undersized culverts. A commercial area is affected. • There are plans for various mitigation activities but funding is an issue. The points of contact are the Planning and Zoning Boards.
	Knox, Town of	No needs identified.
	Menands, Village of	No needs identified.
	New Scotland, Town of	No needs identified.
	Ravena, Village of	No needs identified.
	Rensselaerville, Town of	No needs identified.
	Voorheesville, Village of	No needs identified.
	Watervliet, City of	No needs identified.
	Westerlo, Town of	• Beavers are increasing the flooding area at Troutner Lake. There is a concern that if the beaver dam breaks that it could cause flooding downstream.

Table 23: Summary of Mitigation and Risk Reduction Project Needs

County	Community	Mitigation/Risk Reduction Project Need
Albany (cont.)	Westerlo, Town of (cont.)	• County Route 143 has two 24 inch pipes which often clog with debris.
	Albany County	• Erosion is a serious problem along the Normans Kill. • There are problems with erosion and culvert blowouts along Fox Creek. • County sewer plants in Menands and the Port of Albany are at a low elevation near the Hudson River and many of the older storm drains run into the sewer system so that the facility can become overloaded. • Preston Hollow in Rensselaerville: Catskill Creek is a secondary tributary that is fed by many small streams. This area was devastated by Hurricane Irene, which resulted in the destruction of dozens of homes and infrastructure. No mitigation has occurred post-Irene. • Albany County Colonie Department of Public Works Substation: Most of the facility is located within the 100-year floodplain along Shaker Creek which is an urban stream prone to flash flooding. Property contains some chemicals as well as valuable equipment. A response plan for protecting assets during major storm events is needed to ensure continuity of critical services to county residents. • County Route 1 at Church Road in Berne/Westerlo: A series of undersized culvert crossings, including both County Route 1 (36" pipe) and Church Road (pair of 18" pipes, and a second 36" pipe) are causing the water to jump out of its channel and flow onto Church Road during heavy runoff events. • County Route 252 at 157A near Warner's Lake, Berne: One travel lane washed out completely during Hurricane Irene near this location (and on other occasions has flooded out), causing partial closure of the road for one week. An undersized circular CMP culvert became clogged during Irene, resulting in heavy bed load deposition in the stream and overtopping of the road south of the crossing. This causes severe inundation of the neighboring fields west of the road, which overflows east to west, and cuts off a connecting private road containing several homes (Strevell Lane) from all access to the highway. The problem is exacerbated by beaver activity on the same tributary upstream of the road, which contributes to clogging of the culvert as well as releases of water when the beaver dams fail. There is a dirt access road on the south side of the stream (east side of County Route 252) that retains the water in the channel

Table 23: Summary of Mitigation and Risk Reduction Project Needs

County	Community	Mitigation/Risk Reduction Project Need
Albany (cont.)	Albany County (cont.)	during moderate storms, keeping it from entering a stone lined ditch from which the overtopping occurs. • County Route 405 over Eightmile Creek, Westerlo: During Hurricane Irene, three circular culverts at this crossing were overwhelmed, causing overtopping and complete washout of the roadway. Repairs were made but the intersection remains vulnerable to future flood events due to the probability of snags at the upstream end of the culverts causing backup of water. • County Route 412 at Hannacroix Creek immediately south of Westerlo town line: Crossing contains one 36" Corrugated Metal Pipe (CMP) and a 24" High Density Polyethelyne (HDPE) "overflow" culvert which are insufficient to carry flow during high water. The road is frequently overtopped, and water travels into the drainage ditch adjacent to driveway.
Columbia	Ancram, Town of	No needs identified.
	Austerlitz, Town of	No needs identified.
	Canaan, Town of	No needs identified.
	Chatham, Village of	No needs identified.
	Chatham, Town of	No needs identified.
	Claverack, Town of	No needs identified.
	Clermont, Town of	No needs identified.
	Copake, Town of	No needs identified.
	Gallatin, Town of	No needs identified.
	Germantown, Town of	No needs identified.
	Ghent, Town of	• The double culvert at Angel Hill Road clogs on the east side.
	Greenport, Town of	No needs identified.
	Hillsdale, Town of	No needs identified.
	Hudson, City of	No needs identified.
	Kinderhook, Town of	No needs identified.
	Kinderhook, Village of	No needs identified.
	Livingston, Town of	No needs identified.
	New Lebanon, Town of	• There are significant flooding issues along Kinderhook and Wyomanock Creeks that are exacerbated by lack of maintenance. Downed trees and sediments are impacting the stream's ability to move water through the town during rainstorms or with snow melt. Both streams run the full length of the town and flood on a fairly regular basis (e.g. annually). The Town would like to clean out both creeks to increase their capacity. • North of the Wyomanock Creek and U.S. Route 20 crossing, the ground elevation was lowered during a NYSDEC funded

Table 23: Summary of Mitigation and Risk Reduction Project Needs

County	Community	Mitigation/Risk Reduction Project Need
Columbia (cont.)	New Lebanon, Town of (cont.)	remediation project where PCBs were removed. The town would like the land to be restored by the NYSDEC to its original ground elevation so it is less prone to flooding.
	Philmont, Village of	• The earthen dam at Philmont Reservoir off of Harder Road is a possible flooding source. The location is monitored by NYSDEC dam engineer, Syad Alam and a weakness in the dam was noted. • The sewage treatment plant near the corporate limits, located in the Town of Claverack, is located in a floodplain and floods from both North Creek and Agawamuck Creek. The Village would like to learn how it can be protected.
	Stockport, Town of	No needs identified.
	Stuyvesant, Town of	No needs identified.
	Taghkanic, Town of	No needs identified.
	Valatie, Village of	• A private dam in need of repairs is located just north of Main Street along the Valatie Kill.
	Columbia County	• The Route 29 bridge over Claverack Creek may be elevated to help mitigate some of the flooding issues at this crossing.
Dutchess	Milan, Town of	No needs identified.
	Northeast, Town of	• The Town Highway Garage is in need of being moved out of the floodplain to a more suitable location.
	Pine Plains, Town of	No needs identified.
	Red Hook, Town of	No needs identified.
	Red Hook, Village of	No needs identified.
	Rhinebeck, Town of	No needs identified.
	Stanford, Town of	No needs identified.
	Tivoli, Village of	No needs identified.
	Dutchess County	• Sawkill Creek in the Town of Red Hook floods due to trees and other riverine blockages obstructing flow.
Greene	Athens, Town of	No needs identified.
	Athens, Village of	No needs identified.
	Cairo, Town of	• An unnamed stream at Lincoln Drive floods during small storms due to an undersized culvert. • There is a proposed mitigation project to alleviate flooding on Morehouse Road from Catskill Creek.
	Catskill, Town of	No needs identified.
	Catskill, Village of	No needs identified.
	Coxsackie, Town of	No needs identified.
	Coxsackie, Village of	No needs identified.

Table 23: Summary of Mitigation and Risk Reduction Project Needs

County	Community	Mitigation/Risk Reduction Project Need
Greene (cont.)	Durham, Town of	No needs identified.
	Greenville, Town of	No needs identified.
	New Baltimore, Town of	• The Grapeville School on County Route 26 along the Hudson River floods due to an undersized culvert.
	Greene County	No needs identified.
Rensselaer	Berlin, Town of	No needs identified.
	Brunswick, Town of	No needs identified.
	Castleton-on-Hudson, Village of	No needs identified.
	East Greenbush, Town of	No needs identified.
	East Nassau, Village of	No needs identified.
	Grafton, Town of	No needs identified.
	Nassau, Village of	No needs identified.
	Nassau, Town of	No needs identified.
	North Greenbush, Town of	No needs identified.
	Poestenkill, Town of	• There are proposed plans to replace a culvert along Reichards Farm Road, north of the Poesten Kill. • Two culverts are proposed to be replaced along Dater Hill Road. • Bridge replacements on Dzembo Road over a tributary to the Poesten Kill are being proposed. • The town requested additional assistance from FEMA and NYSDEC to provide more boots on the ground post-storm to inform community officials what their options are for recovery, especially with regards to property buyouts.
	Rensselaer, City of	No needs identified.
	Sand Lake, Town of	• The Code Enforcement Officer feels that Johnny Cake Bridge over the Wynants Kill is undersized, creating a bottle neck that backs up water and affects several homes, including his own. The bridge is owned by the town. • A privately owned dam along the Wynants Kill, near Route 49, needs maintenance. However the owner does not have the funding to keep it up. NYSDEC has surveyed the dam (B class). Alon Dominitz is the NYSDEC point of contact for the dam.
	Schodack, Town of	• There is a privately owned broken dam along Muitzes Kill near Muitzeskill Road.
	Stephentown, Town of	No needs identified.

Table 23: Summary of Mitigation and Risk Reduction Project Needs

County	Community	Mitigation/Risk Reduction Project Need
Rensselaer (cont.)	Troy, City of	No needs identified.
	Rensselaer County	No needs identified.
Schenectady	Delanson, Village of	No needs identified.
	Duanesburg, Town of	No needs identified.
	Princetown, Town of	No needs identified.
	Rotterdam, Town of	No needs identified.
	Schenectady County	No needs identified.
Schoharie	Broome, Town of	No needs identified.
	Schoharie County	• There are erosion issues along a portion of Catskill Creek near Livingstonville.
Ulster	Hurley, Town of	• There are issues related to erosion and high velocities, and agricultural levees along Esopus Creek, which has jumped its banks in multiple areas within the town. There is one property owner who owns much of the Esopus Creek floodplain through the Towns of Marbletown, Hurley, and Ulster. The property is primarily farmland which may be beneficial for possible mitigation opportunities along the stream.
	Kingston, City of	No needs identified.
	Kingston, Town of	No needs identified.
	Marbletown, Town of	No needs identified.
	Saugerties, Town of	• Esopus Creek is a source of historic flooding problems. The east side of the creek experiences significant deposition and erosion that impacts the water quality, leading to algae blooms and decreased recreational use. Buyouts have occurred along the creek near Clay Finger Road, above Glenerie Falls. Together, development, agriculture, and the Ashokan Reservoir have significant impact on the Esopus Creek flooding and water quality. • There is a dam along the Plattekill Creek at Route 32 north of Mount Marion Park that needs to be restored to preserve the reservoir nearby. • The Town/Village of Saugerties would like to develop a better understanding of stormwater infrastructure and green infrastructure, and the potential to use in the town, village, and Barclay Heights.
	Saugerties, Village of	• The Village of Saugerties has a proposed project to expand the Ashokan Reservoir and add another filtration path.
	Ulster, Town of	• There is flooding along Preymaker Brook due to beaver activity and undersized culverts.
	Woodstock, Town of	No needs identified.
	Ulster County	No needs identified.

Training, Outreach, and Planning Support Needs

Hazard Mitigation and Grant Programs was the most commonly requested training topic by community officials. A large number of officials also indicated that training on Floodplain Management Administration and Building Code Requirements was needed. Effective Public Outreach was the least requested topic of the four. Several communities also requested training and support on CRS and several other topics. *Table 24: Summary of Training Needs* provides a summary of the training, outreach, and planning support needs identified by communities and stakeholders during this Discovery project.

Table 24: Summary of Training Needs

County	Community	Floodplain Management Administration	Building Code Requirements	Hazard Mitigation and Grant Programs	Effective Public Outreach	Other
Albany	Albany, City of	X	X	X	X	-
	Altamont, Village of	-	-	X	-	-
	Berne, Town of	X	X	X	X	-
	Bethlehem, Town of	-	-	-	-	-
	Coeymans, Town of	X	X	X	X	CRS (High priority)
	Colonie, Town of	-	-	-	-	-
	Colonie, Village of	-	-	-	-	-
	Green Island, Village of	X	X	X	X	-
	Guilderland, Town of	-	-	X	-	-
	Knox, Town of	-	-	-	-	-
	Menands, Village of	-	-	-	-	-
	New Scotland, Town of	-	-	-	-	-
	Ravena, Village of	-	-	X	-	-
	Rensselaerville, Town of	-	-	-	-	-
	Voorheesville, Village of	-	-	-	-	-
	Watervliet, City of	-	X	X	-	-
	Westerlo, Town of	-	-	-	-	-
	Albany County	-	-	X	-	CRS
Columbia	Ancram, Town of	X	X	X	-	-
	Austerlitz, Town of	-	-	-	-	-
	Canaan, Town of	-	-	-	-	-
	Chatham, Village of	-	-	-	-	-

Table 24: Summary of Training Needs

County	Community	Floodplain Management Administration	Building Code Requirements	Hazard Mitigation and Grant Programs	Effective Public Outreach	Other
Columbia (cont.)	Chatham, Town of	-	-	-	-	-
	Claverack, Town of	-	-	-	-	-
	Clermont, Town of	-	-	-	-	-
	Copake, Town of	-	-	-	-	-
	Gallatin, Town of	**X**	-	**X**	-	-
	Germantown, Town of	-	-	-	-	-
	Ghent, Town of	-	-	-	-	-
	Greenport, Town of	-	-	-	-	-
	Hillsdale, Town of	-	-	-	-	-
	Hudson, City of	-	-	-	-	-
	Kinderhook, Town of	-	-	-	-	-
	Kinderhook, Village of	-	-	-	-	-
	Livingston, Town of	-	-	-	-	-
	New Lebanon, Town of	**X**	**X**	**X**	**X**	-
	Philmont, Village of	**X**	**X**	**X**	**X**	-
	Stockport, Town of	-	-	-	-	-
	Stuyvesant, Town of	-	-	-	-	-
	Taghkanic, Town of	-	-	-	-	-
	Valatie, Village of	**X**	**X**	**X**	**X**	-
	Columbia County	**X**	**X**	**X**	**X**	Understanding role of local officials in post-disaster flood responses
Dutchess	Milan, Town of	-	-	-	-	-
	Northeast, Town of	-	-	-	-	-
	Pine Plains, Town of	**X**	**X**	**X**	-	-
	Red Hook, Town of	-	-	-	-	-
	Red Hook, Village of	-	-	**X**	-	-

Table 24: Summary of Training Needs

County	Community	Floodplain Management Administration	Building Code Requirements	Hazard Mitigation and Grant Programs	Effective Public Outreach	Other
Dutchess (cont.)	Rhinebeck, Town of	X	-	X	X	-
	Stanford, Town of	X	-	-	-	-
	Tivoli, Village of	-	-	-	-	-
	Dutchess County	X	X	X	X	-
Greene	Athens, Town of	-	-	-	-	-
	Athens, Village of	-	-	-	-	-
	Cairo, Town of	-	X	-	-	-
	Catskill, Town of	X	X	X	-	Methods for determining BFEs
	Catskill, Village of	X	X	X	X	-
	Coxsackie, Town of	-	-	-	-	-
	Coxsackie, Village of	-	-	-	-	-
	Durham, Town of	-	-	-	-	-
	Greenville, Town of	-	-	-	-	-
	New Baltimore, Town of	-	X	-	-	-
	Greene County	X	X	X	X	-
Rensselaer	Berlin, Town of	-	-	-	-	-
	Brunswick, Town of	X	X	-	X	-
	Castleton-on-Hudson, Village of	-	-	-	-	-
	East Greenbush, Town of	-	-	-	-	-
	East Nassau, Village of	-	-	-	-	-
	Grafton, Town of	-	-	-	-	-
	Nassau, Village of	-	-	-	-	-
	Nassau, Town of	-	-	-	-	-
	North Greenbush, Town of	-	-	-	-	-
	Poestenkill, Town of	X	X	X	X	-
	Rensselaer, City of	X	X	X	-	-
	Sand Lake, Town of	-	X	X	-	-

Table 24: Summary of Training Needs

County	Community	Floodplain Management Administration	Building Code Requirements	Hazard Mitigation and Grant Programs	Effective Public Outreach	Other
Rensselaer (cont.)	Schodack, Town of	X	X	X	X	-
	Stephentown, Town of	-	-	-	-	-
	Troy, City of	X	X	-	-	-
	Rensselaer County	-	X	-	-	CRS
Schenectady	Delanson, Village of	-	-	-	-	-
	Duanesburg, Town of	-	-	-	-	-
	Princetown, Town of	-	-	-	-	-
	Rotterdam, Town of	X	-	-	-	-
	Schenectady County	-	-	-	-	-
Schoharie	Broome, Town of	-	-	-	-	-
	Schoharie County	X	X	X	X	-
Ulster	Hurley, Town of	X	X	X	X	-
	Kingston, City of	X	-	-	-	Zoning in SFHAs
	Kingston, Town of	-	-	-	-	-
	Marbletown, Town of	-	-	-	-	-
	Saugerties, Town of	X	X	X	X	Training on agriculture best management practices related to wetlands and open space areas; additional support to improve stakeholder engagement for Esopus Creek watershed management plan
	Saugerties, Village of	X	X	X	X	-
	Ulster, Town of	-	-	X	-	-
	Woodstock, Town of	-	-	-	-	-
	Ulster County	-	-	X	X	-

Recommendations for Future Risk MAP Project Scope

Based on the stakeholder input and other data collected during this Discovery project, a recommended scope of work was developed for consideration for a future Risk MAP project that may be implemented by FEMA if available funding permits.

The highest priority in the scope of work is the development of digital countywide FIRMs for both Rensselaer and Columbia Counties. Rensselaer County would benefit greatly from the development of such a product. The northern three towns and the three associated villages were updated and modernized as part of the Hudson-Hoosic Watershed project; however the remaining 15 towns and villages within the county still utilize the older paper maps dating from the late 1970s and early 1980s. These maps are out of date and lack the details necessary for communities to effectively administer and enforce the NFIP requirements. The population of the county has increased by approximately 4% since 1990; however the number of housing units has increased by 20%.

Columbia County also would benefit greatly from the development of modernized countywide digital FIRMs. While the population of the county has held steady over the past 25 years, the number of new housing units has increased approximately 21%. Half of the 22 communities within Columbia County have the older flat style maps dating back to the late 1970s to early 1980s. Similar to Rensselaer County, these older maps are difficult to use for the administration and enforcement of the floodplain regulations and the communities would benefit from an updated and upgraded mapping product. In both counties, a wholesale restudy of the county may not be needed. Revised studies for a few key stream segments and new approximate A-zone studies in a digital format would assist both the communities and the counties in enforcing the floodplain regulations and management development.

Light Detection and Ranging (LiDAR) data was collected in 2015 by the NYS GIS Program Office (NYSGPO) for Columbia County and portions of Rensselaer County. The remaining portion of Rensselaer County had LiDAR collected by FEMA in 2012 as part of the Hudson-Hoosic and Deerfield Watershed projects. The available topographic data would make upgrading these portions of the watershed to a digital product feasible and significantly reduce the cost of developing model-based approximate A-zone studies.

Greene and Ulster Counties have effective digital FIRMs that were developed in the mid-2000s. In both counties the mapping updates focused primarily on the upland and New York City watershed areas with limited hydraulic studies completed in the valley communities. NYSDEC is recommending additional detailed studies be developed in those areas of high risk to provide more recent and accurate floodplain delineations. LiDAR was collected in 2014 by the USGS for all of Ulster County and in 2010 for the eastern portions of Greene County. Again this elevation data could be leveraged by FEMA to reduce the cost of developing both model-based approximate A zone studies and the recommended detailed hydraulic studies.

The highest stream study priority is an updated detailed study of the Hudson River for its entire length in the Mid-Hudson Watershed. The Hudson River borders six counties within the study area and was a high priority for both the counties and the communities on its waterfront. Several components required to update the Hudson River study have been completed though other projects. The NYSDEC Hudson River Estuary program has detailed bathymetric data available for the entire estuarine reach from New York City to the Troy Lock and Dam. FEMA has already completed a storm surge analysis for the estuarine portion of the Hudson River as part of the North Atlantic coastline floodplain mapping project for New York City and Westchester County. As mentioned previously, detailed topographic information is available for the entire watershed through past LiDAR collections. By leveraging this existing information, the cost to update the existing 1977 model should be significantly reduced.

In total, 18 high priority new or revised detailed riverine segments and lake studies, 17 medium priority detailed riverine studies, and eight lower priority detailed studies were identified as desirable for inclusion in a future Risk MAP project scope, comprising a total of 344 miles of riverine reaches and 7 miles of lake shore. There were also a number of lower priority streams that were targeted for new or revised approximate studies.

High priority detailed studies were recommended for all or portions of the following riverine flooding sources:

- Bashbish Creek
- Catskill Creek
- Esopus Creek
- Hudson River
- Kinderhook Creek
- Normans Kill
- Poesten Kill
- Quacken Kill
- Sawkill Creek
- Wynants Kill
- Wyomanock Creek

These new detailed studies, combined with updated approximate studies in a new digital format, would assist both the communities and the counties in the Mid-Hudson Watershed in effectively enforcing floodplain regulations and managing development, thereby significantly reducing flood risk within the watershed.

The complete recommended scope of work for the Mid-Hudson Watershed is provided in *Appendix M: Mid-Hudson Watershed Recommended Scope of Work Memorandum*.