

Town of Cortlandt, Village of Buchanan and Village of Croton-on-Hudson



Community Resilience Building Workshop Summary of Findings January 2019



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OVERVIEW

Municipalities, regional planning organizations, states and federal agencies will need to increase their resiliency and adapt to the likelihood of extreme weather events and mounting natural hazards if they are to avoid continued social, environmental and infrastructure damage and loss. For communities in the Hudson Valley, this need is strikingly evident. Recent devastating events such as Tropical Storm Irene and Superstorm Sandy have reinforced this urgency and compelled leading communities such as the Town of Cortlandt and the Villages of Buchanan and Croton-on-Hudson (Croton) in Westchester County, New York to proactively plan and mitigate potential risks. Ultimately, this type of leadership will reduce the exposure and vulnerability of citizens, infrastructure and ecosystems, as well as serve as a model for communities across the Hudson Valley, New York, and the nation.

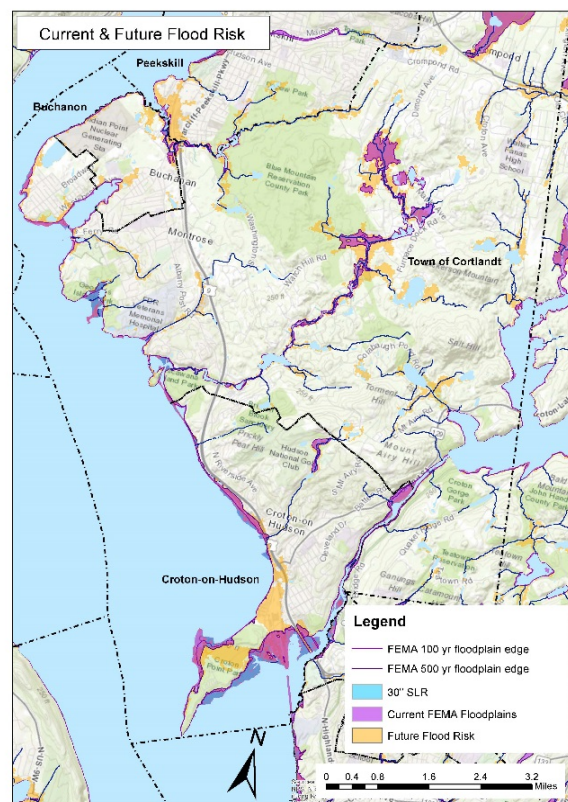


Figure 1. Current and future flood risk for the study areas of Cortlandt, Croton-on-Hudson and Buchanan.

In the summer of 2018, The Nature Conservancy and the Hudson River Watershed Alliance approached municipal officials in the Town of Cortlandt and the Villages of Buchanan and Croton to discuss and identify resilience needs relative to infrastructure, habitat restoration and community resilience. As a result, a strategy was developed to introduce an integrated process to these communities that incorporates current climate projections, identifies areas of risk and develops adaptation strategies. The Community Resilience Building (CRB) Workshop, a unique “anywhere at any scale” community-driven process (www.CommunityResilienceBuilding.com), provided an appropriate platform to engage elected officials, municipal staff and other key stakeholders from all three communities. The purpose of the facilitated, joint-community workshop was ultimately to guide implementation of priority adaptation actions for the southern portions of the Town of Cortlandt and the Villages of Buchanan and Croton (Exhibit 1). The workshop’s central objectives were to:

- Define extreme weather and articulate local natural and climate-related hazards
- Identify existing and future vulnerabilities and strengths
- Develop prioritized actions for the municipalities and broader stakeholder networks
- Identify opportunities for the community to advance actions to reduce risk and increase resilience



This report provides an overview of the top hazards, the current community strengths and concerns, and the suggested actions to improve resilience to natural and climate-related hazards in the Town of Cortlandt and the Villages of Buchanan and Croton today and in the future. The summary of findings will benefit from further comments, corrections and updates from workshop attendees and additional stakeholders alike. The collective community leadership on hazards and community resilience will benefit from the continuous and expanding participation of all those concerned.

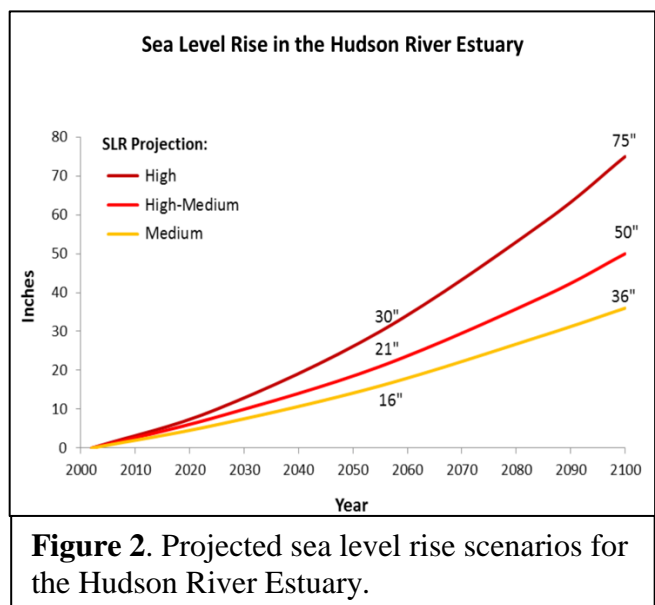
PROJECTED FUTURE CONDITIONS

Current climate and environmental conditions (i.e. magnitude and intensity of storms and drought, sea levels, etc.) are projected to change in ways that will profoundly influence current interactions with natural resources. Various platforms are available to better understand and evaluate how different climate change scenarios are likely to impact Hudson Valley Communities, including:

- The Nature Conservancy's [Natural Resource Navigator](#)
- Scenic Hudson's [Sea Level Rise Mapper](#)
- Columbia University's [Hudson River Flood Decision Support Tool](#)
- New York State [Climate Change Science Clearinghouse](#)

As these and other tools clearly indicate, there are many possible scenarios that could manifest themselves over the course of this century. The numerous factors, both global and local, that influence these outcomes make the extent of these scenarios difficult to predict. Thus, it is important to plan for a range of scenarios as evidenced by [NY's Community Risk and Resiliency Act](#). General trends and rough estimates can be employed for adaptation planning purposes. For example, the riverfront communities of the mid-Hudson region, generally, should be preparing for a *minimum* of 3-6 foot rise in mean sea level by 2100. The entire Hudson Valley region should consider the potential ramifications of:

- Hotter summers
- Increased frequency and length of heat waves and droughts
- Shorter, milder winters
- More winter precipitation
 - If rain = more flooding
 - If snow = 10" of snow or more per storm
- Increased severity and frequency of big storms



- More flooding due to slightly increased precipitation and increased development and impervious surfaces

Details on the ranges of projected future conditions are available through the [New York State Water Resources Institute](#) and through the previously referenced tools referenced (Figure 1 and Table 1).



Figure 3. Projected inundation areas (various shades of blue indicating depth) and current 100-year floodplains (orange highlighted areas) with 6 feet (72 inches) of sea level rise. The images were produced using Scenic Hudson's Sea Level Rise Mapper.



Table 1. Community assets (Infrastructure, Environment and Social) at risk with various sea level rise scenarios and current 100-year storm across the entire Town of Cortlandt. The output was produced using Columbia University's Center for International Earth Science Information Network Hudson River Flood Decision Support Tool 2.0.

| Impact Scenarios for Town of Cortlandt | | | | |
|--|--|--------------------------------------|--------------------------------------|--------------------------------------|
| Type of Impact | | 18" of SLR with current 100 YR Storm | 36" of SLR with current 100 YR Storm | 48" of SLR with current 100 YR Storm |
| <i>Infrastructure</i> | | | | |
| | Total Damaged Buildings | 244 | 297 | 312 |
| | SPDES Wastewater | 1 | 1 | 1 |
| | Wells and Withdrawals | 0 | 2 | 2 |
| | Bridges | 6 | 7 | 8 |
| | Roads (linear miles) | 8 | 9 | 10 |
| | Railroad Passenger Stations | 1 | 1 | 1 |
| | Railroads (linear miles) | 7 | 9 | 10 |
| <i>Environment</i> | | | | |
| | Inundated Land Area (acres) | 858 | 925 | 947 |
| | Inundated Impervious Surface (acres) | 147 | 168 | 174 |
| | Inundated Wetlands | 210 | 213 | 253 |
| <i>Social</i> | | | | |
| | Weighted Social Vulnerability Index of Entire Municipality | 4 (medium) | 4 (medium) | 4 (medium) |

SUMMARY OF FINDINGS

Top Hazards

During the core team meetings that took place prior to the workshop and at the start of the Community Resilience Building workshop, Croton, Buchanan and Cortlandt workshop participants confirmed the top natural climate hazards as the following:

1. *Sea level rise and storm surge:* Projected rises in future mean sea levels, combined with severe coastal storms such as Superstorm Sandy, capable of producing storm surge and coastal flooding.
2. *Inland flooding:* Inland flooding caused by intense precipitation, storms and subsequent runoff from rain or snow, especially in the region's inland streams and other waterways.
3. *Drought:* Higher peak temperatures in summer with sporadic precipitation events which may stress municipal and private resources, especially public water supplies and private wells.

The above hazards have a growing impact on residents, businesses and municipalities in the Village of Croton, the Village of Buchanan and the Town of Cortlandt. Participants in the Community Resilience Building Workshop were asked to identify environmental, infrastructural and societal assets in their communities; determine whether those assets are strengths, vulnerabilities or both; and identify and prioritize actions. The following sections summarize the results of this workshop, based on the participation of attendees from all three municipalities.



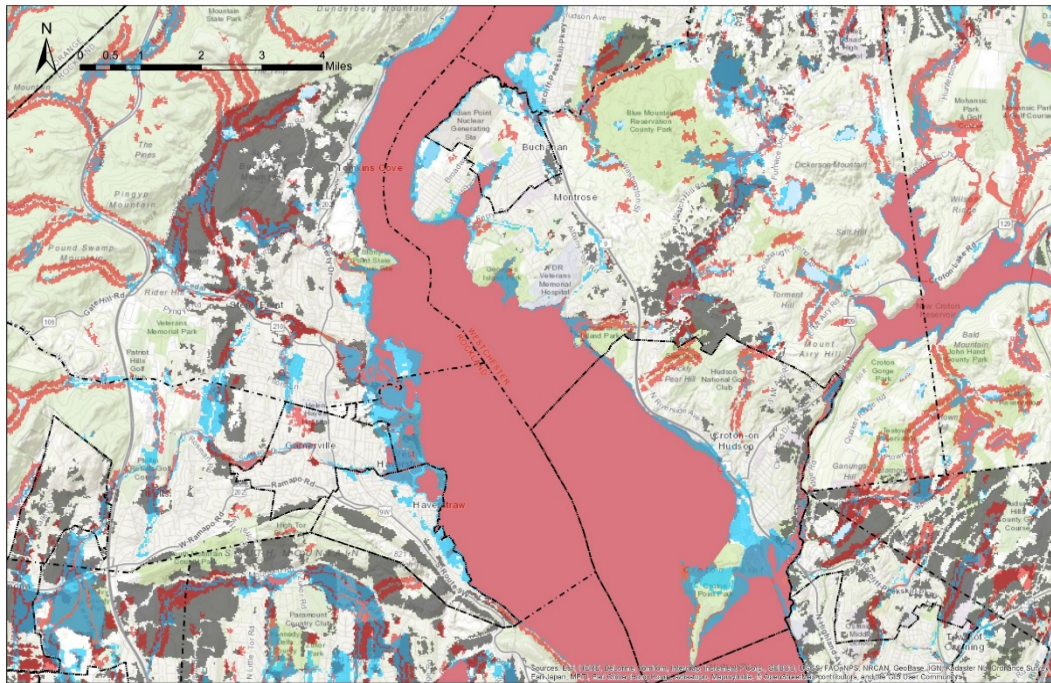


Figure 4. Red indicates existing floodplain and wetland areas. Grey indicates projected development areas. Blue indicates future flood risk areas. Areas where grey intersects with red and blue are high risk and should avoid future development or follow special building requirements and provisions. ©The Nature Conservancy

Key Assets and Areas of Concern

Numerous environmental, infrastructural and societal assets were identified throughout the workshop, which have been grouped in several categories or areas of concern.

There were four major areas of concern related to **environmental assets**:

- The **Croton River Ecosystem**, which includes the Croton River and its confluence with the Hudson River and adjacent wetlands, the Croton River corridor and the Croton Reservoir.
- **Public Parklands and Open Space**, which includes open space and parklands owned by the three municipalities and Westchester County and forest and natural areas.
- **Critical Environmental Lands and Inland Natural Resources**, which includes inland waterbodies, critical environmental areas and the Colabaugh Pond and other wetlands.
- **Privately-Held Open Space**, which includes golf courses and privately-owned forest, natural areas and open space.



There were eight major areas of concern related to **infrastructural assets**:

- **Roads, Transportation and Stream Crossings**, which includes various roadways that have or could experience flooding including Route 9 and 9A, and various bridges and stream crossings.
- **Lake Meahagh**, which includes the bridge, water control structure and a sewer pump station in the Village of Buchanan.
- **Railroads**, which includes the MTA/Amtrak Croton-Harmon station, the lines and tracks as well as the parking lot owned by the Village of Croton, the cell towers and access to the North yard.
- **Wastewater and Stormwater Systems**, which includes a wastewater treatment plant and pump station in the Village of Buchanan, a Westchester County Pump Station in Crotonville in the Town of Ossining, and privately owned septic systems;
- **Drinking Water Systems**, which includes a well field along the Croton River in Croton, the Croton Reservoir owned by NYC DEP which also serves as the water supply for Buchanan and Cortlandt, and park infrastructure;
- **Park infrastructure**, which is found at the municipal and county parks;
- **Utilities**, such as buried utility lines along Route 9, Optimum Cable, ConEd Interconnector, overhead power lines as well as a Microgrid Feasibility Study conducted by the Village of Croton; and
- **Vulnerable Housing and Developed Areas**, which includes Kings Ferry in Verplanck, Brook Street in Croton, Dickey Brook Industrial Area in the Village of Buchanan, the Half Moon Bay Condos and individual property owners.

There were six major areas of concern related to **societal assets**:

- **Municipal and School District Services**, which includes the three municipalities, the county and three public school districts (CHUFSD, Hen Hud, Lakeland).
- **Vulnerable Populations and Neighborhoods**, which includes Brook Street and North/South Riverside Ave in Croton, the Half Moon Bay Condos in Croton, Skyview Rehabilitation and Health Care in Croton, Croton Point Park campers, homes downstream of the Croton Dam along Nordica Drive, trailer parks in Cortlandt, Kings Ferry in Verplanck, Dickey Brook Industrial Area in Buchanan, the VA Hospital in Cortlandt, the Danish Home in Cortlandt, Springvale Apartments in Cortlandt, Furnace Brook Drive in Cortlandt, Meadow Road in Cortlandt, the Blue Mountain Middle School, and Metro North commuters.
- **Emergency Services**, which includes various municipal and school structures that serve as shelters and the system of shared emergency services in the county.
- **Economic Development**, which includes a steamboat dock at Lake Meahagh and backflow mechanisms at Lake Meahagh.



- **Public and Private Access**, specifically related to boat access and launches, and other access points at marinas and yacht clubs.
- **Regulations and Planning**, which includes many mechanisms in process or in place in the three municipalities such as Local Waterfront Revitalization Plans (LWRPs), Comprehensive Plans and their corresponding committees, municipal regulations related to natural resources and land use development, and other assets like a Storm Study Group in Croton and infrastructure plans.

Current Vulnerabilities

Most of the environmental assets identified by workshop participants serve as both a vulnerability and a strength related to the three main hazards. This is a product of the assets capacity to provide open space, natural resources, flood water storage and other ecosystem services juxtaposed with their vulnerability to damage from flood waters and storm surge and potential susceptibility to drought. The actions identified, which will be discussed in further detail in the prioritization section later in this report, include doing a more thorough inventory and hydrologic study of these resources, ensuring continued protections and oversight, identifying and incorporating resilient design, ensuring there are resilience plans in place, and ensuring continued open space protections.

Participants in particular recognized wetlands as a valuable resource for storing floodwaters but also discussed the fact that many revenue-generating properties are located on wetlands, including the MTA Croton-Harmon train station parking lot owned by the Village of Croton which currently experiences flooding. A possible solution at the macro level was to review local wetland laws. Specific solutions to the parking lot would be raising the lot and embracing a more resilient design.

Related to infrastructure, many of the identified assets were considered to be vulnerabilities, though some were also strengths as well. The bridge at Lake Meahagh was seen primarily as a vulnerability and the Village of Buchanan pump station was viewed as both a vulnerability and strength.

The MTA/Amtrak train station and its parking lot, tracks, cell towers and north yard were all important assets, which in many cases, require communication and relationship building over time between the MTA authorities and the municipalities.

The workshop participants identified the issue of downed power and utility lines as a major concern. Participants requested greater involvement from the utility companies and formal communications with municipal emergency networks. There was a need for more maintenance and attention to these issues from utility companies.

Vulnerable housing and other vulnerable developed areas is a major weakness for these municipalities, and generally, greater attention needs to be focused on short-term and long-term planning with these properties and the vulnerable populations that live there. A future stakeholder workshop could be focused on these vulnerable properties and the vulnerable populations throughout these three municipalities.



Perhaps what was most striking in this workshop was the dichotomy between strengths and vulnerabilities related to societal assets - vulnerable populations and neighborhoods on one hand as vulnerabilities and municipal services, regulations and planning mechanisms on the other hand as strengths and assets. While this section will focus on the vulnerabilities, the fact that these municipalities have strong municipal systems and services suggests that these challenges, if targeted with the appropriate municipal resources, can be addressed.

There were many vulnerable neighborhoods and populations identified by workshop participants, especially those with low income housing and underserved populations. The population residing on Brook Street in Croton, in addition to North and South Riverside Ave in Croton were discussed as examples of highly vulnerable populations. The people living in these areas are mostly renters, non-English speakers and a large majority of them are impoverished. Workshop participants concluded that more attention needs to be focused on potential buyouts of the properties in this area over the long term, addressing issues such as the cost of displacing people who are renting, not owning, the properties and other social implications. The municipalities specifically asked for state guidance on how best to handle this issue over time. Another highly vulnerable population was identified as the residents of the two trailer parks located in the Town of Cortlandt, one on Route 9A in Crugers and the second in the hamlet of Verplanck. These locations are in need of an improved evacuation plan and a possible plan to relocate people over time. The VA Hospital, a federal facility, was identified as both a strength and a vulnerability, but very little was known about their evacuation or emergency plans.

Finally, the shared services agreement between the municipalities in Westchester County seemingly puts a strain on the resources of Croton, Buchanan and Cortlandt, who are often called to assist in emergencies further south in the more densely populated areas of the county. This is a vulnerability for these municipalities and their emergency services which could be addressed through their existing agreements.

Current Strengths

Every environmental asset identified by workshop participants was seen as some sort of strength, even if some were also considered vulnerabilities. Large amounts of publicly owned open space was one of the strongest assets identified by workshop participants, which places an ongoing need for open space planning and protection in these communities. Ensuring these parklands and their related infrastructure are prepared and resilient is a natural next step for all of the municipalities and county authorities as well as private entities charged with managing these sites.

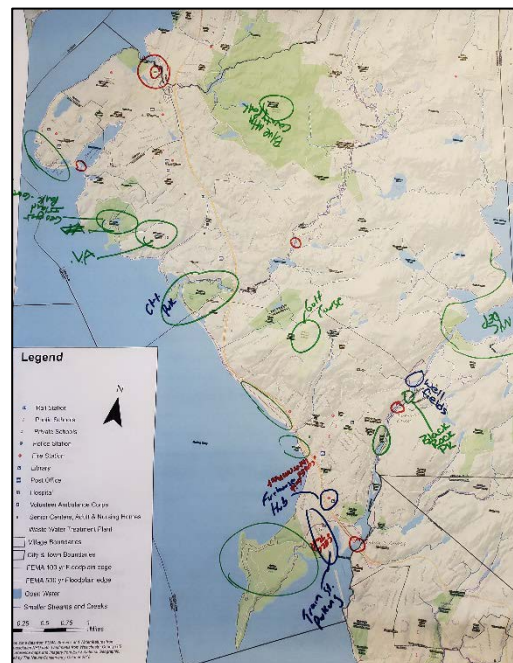


Figure 5. Participatory maps showing assets were created by each working



Specific parks were mentioned as strengths, such as Croton Point and Croton Landing Park, an inland park called Blue Mountain, Silver Lake/Black Rock Park on the Croton River, Oscawana Park and Senasqua Park. Privately owned open spaces, for example golf courses, were also valued as an environmental strength, so encouraging businesses to maintain and further protect these areas was discussed, as well as the use of specific conservation tools such as easements and land acquisition.

Regarding infrastructural assets, there were many more vulnerabilities than strengths. A recently relocated DPW facility in Croton was highlighted as a strength, though it is also a completed action requiring no further action. Two of the stand-alone strengths related to infrastructure include a Microgrid Feasibility Study done by the Village of Croton and a MTA Climate Adaptation Task Force that was discussed but never included in the risk matrix completed by workshop participants. Several of the roads and one bridge, Quaker Bridge in Croton, that are vulnerable to some flooding can also be seen as strengths, functioning as valuable arteries for transporting and evacuating people in times of emergency. The wastewater treatment plant in Buchanan was seen as a strength in managing stormwater for the community.

Many of the greatest strengths in these three communities noted throughout the workshop related to some of the strong societal assets and services already in place, namely some of the municipal services, emergency services, regulations and planning.

The existing communications and emergency management systems already in place in these municipalities represent an asset. Croton, for example, has recently launched a new website with the ability to translate in up to two dozen languages. The municipalities all have a Code Red system available, which could potentially be expanded with additional languages. The area school districts have alert systems; while they are not currently being used in community-based emergencies and hazard events, these systems could be coordinated with the municipalities in emergency situations and expanded to include more languages.

Emergency services include many possible community shelters for use during times of emergency including the Harmon Firehouse where the workshop took place as well as other community structures that serve as shelters. The participants recommended that these sites continue to be maintained and equipped as possible shelter areas.

Finally, all three of the municipalities have committees and plans in place that can and should include resiliency planning and climate adaptation as well as strong environmental and open space protections,

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Figure6. Participants from each work group shared findings and recommendations of their group.



including their Local Waterfront Revitalization Plans (LWRPs) and their Comprehensive Plans. In the Village of Croton, a recently completed Storm Study Group collected information that would be beneficial to all of these communities, and a look into continuing this kind of study should be explored. With so much public and private parkland and open space, these municipalities also discussed maintaining and protecting these areas with continued attention to municipal regulations related to land use development and natural resources.

Top Recommendations to Improve Resilience

Highest environmental priorities:

- Related to the Croton Reservoir, the municipalities should contact NYC DEP and find out their resilience plans for the reservoir in times of inland flooding, drought and other emergencies.
- For Silver Lake and Black Rock Park, both along the Croton River in the Village of Croton, maintain environmental protections and wetlands/water course law and encourage resilient design.
- Related to privately-owned open space in all three municipalities, protect this land through easements, acquisitions, etc. and continue enforcement and oversight.

Highest infrastructural priorities:

- With regard to roads, transportation and stream crossings, the highest priorities were Route 9 and Route 9A, to ensure greater coordination with NYS DOT and Westchester County about resiliency efforts and planning. Dickey Brook, a stream that enters the Hudson River at Indian Point and Charles Point, was also a high priority, with actions identified such as raising the road and equipment to deal with coastal flooding and natural solutions to deal with inland flooding.
- Related to the railroad infrastructure, there were several high priorities identified, including opening a dialogue with MTA/Amtrak to determine their resiliency plans, encouraging resilient design for the parking lot facilities, completing work to harden the infrastructure and floodproofing, raising facilities and building a long-term relationship with MTA/Amtrak.
- There were several high priorities in terms of the infrastructure associated with the wastewater treatment plant and pump station in Buchanan, including coordinating with the engineer to ensure the pump station upgrades include sea level rise and flooding, storm water management to deal with inland flooding, and evaluating floodproofing and relocation options.
- Floodproofing the Westchester County Pump Stations was also identified as a priority.
- With regard to drinking water, the highest priority was maintaining the condition and functionality of the reservoir, which serves as the Buchanan and Cortlandt Water Supply.
- Resiliency planning and design was identified as a high priority for both Senasqua Park in Croton and the Cortlandt Waterfront Park.
- Raising equipment and boats was seen as a high priority for the Viking, Cortlandt and King Marinas.



- In terms of utility infrastructure, sharing the Microgrid Feasibility Study was seen as a high priority. Related to overhead power lines, the priority actions were to have the emergency response network in the communities communicate on a more regular basis and develop a more formal plan, assess trees and bury infrastructure whenever possible.
- Related to vulnerable housing and developed areas, raising the road and weir at the Kings Ferry Road and analyzing the potential redevelopment of the existing trailer park(s) in Verplanck. Croton was interested in evaluating raising homes and considering a buyout process for Brook Street in Croton and Buchanan is interested in evaluating similar options for the Dickey Brook area.
- The creation of new partnerships with Montrose and MTA/Amtrak were important next steps for all involved communities.



Figure 7. Participants mapped community assets performing critical functions.

Highest societal priorities:

- One of the highest priorities was to publicize a new website that was just launched in the Village of Croton, with capabilities in two dozen languages. This was seen as an incredible municipal resource and communication tool moving forward, but residents need to be made aware of its existence.
- The majority of the high priority actions were related to emergency and evacuation planning for vulnerable populations and neighborhoods, including the Half Moon Bay Condos in Croton, the Cortlandt trailer parks, and Dickey Brook in the Village of Buchanan. With regard to the VA Hospital in Cortlandt, which is both a strength and a vulnerability, more information on emergency planning needs to be collected, including what resources they might be able to offer the community and confirming an evacuation route for the patients and staff of the hospital. Downstream neighborhoods of the Croton Dam were seen as a vulnerable population, and the high priority action identified was to contact NYS DOT regarding engineering. The commuter population, also vulnerable, is best served through some of the actions identified in the infrastructure section, including building resiliency into the MTA facilities. With regard to Furnace Brook, priority actions identified were drainage improvements, and culvert and bridge assessment/improvements.
- The Harmon Firehouse in the Village of Croton was identified as a strength, as it serves as a community resource and shelter in times of emergency, so it would be a high priority to maintain it and keep it updated in terms of resources.



- Related to the public and private access points, specifically the yacht clubs, marinas and boat launches, incorporating resilient design was deemed a high priority.
- Several actions were identified as high priorities related to regulations and planning, including ensuring local laws match current regulations, implementing the LWRP when completed in Croton, updating the Comprehensive Plan in Buchanan and sharing infrastructure plans among all the stakeholders.

Medium environmental priorities:

- The Town of Cortlandt could consider reviewing local laws and ordinances are consistent with desired environmental conditions, particularly associated with flooding. This could lead to a flood-prone overlay district.
- For both publicly-owned and privately owned forested and natural areas, implement fire management plans for times of drought.
- Understand any plans being implemented by private yacht clubs on their land.
- Increase awareness of critical environmental areas.

Medium infrastructural priorities:

- Coordinate with Westchester County on the Quaker Bridge and ensure climate resilience is being considered into planning for Washington Bridge, owned by the City of Peekskill.
- For the Route 129 bus garage, communicate with the owners and find out any plans they have.
- Regarding the MTA/Amtrak parking lot, the Village of Croton should consider raising the parking lot, coordinate with the County on transit options and explore the construction of a parking garage.
- Regarding the cell towers at the MTA/Amtrak station, the municipalities should ensure operators have disaster plans in place.
- Westchester County should raise equipment at the County's wastewater pump stations on the Croton River.
- With 80% of the study area relying on septic systems, an evaluation should be done by the municipalities regarding maintenance and location of these systems.
- Raising equipment, such as the intake mechanisms, and incorporating resilient design were identified as medium priorities for the drinking water well fields and controls along the Croton River in the Village of Croton.
- Incorporating resilient design and eliminating unnecessary infrastructure was identified as a medium action for both Croton Point Park and George's Island.
- Storm hardening construction was recommended for the buried utilities along Route 9.
- The municipalities should communicate with Optimum and ConEd to understand their resilience and emergency plans for the Optimum cable and the ConEd interconnector respectively.
- Since the Half Moon Bay Condos are privately owned, the municipalities should communicate with the owners, and determine if they have resilience and emergency plans in place.



- Much more stakeholder engagement is needed to determine a course of action for the Brook Street homes and vulnerable people living there.

Medium societal priorities:

- Identify and implement a service that provides Code Red in other languages,
- Explore other language possibilities for the K-12 alert system being used by all three public school districts (CHUFSD, Hen Hud, Lakeland)
- Village of Croton to maintain contact with Half Moon Bay Condo owners on resiliency plans.
- Village of Croton to ask Sky View Rehabilitation and Health Care if they can serve as a resource in an emergency.
- Town of Cortlandt to communicate with the VA Hospital to find out their emergency plans and what resources they can offer the town.
- Village of Croton to evaluate the Croton Park camping site, and implement an evacuation plan.
- Town of Cortlandt to contact the Danish Home and Springvale Apartments to find out their resilience/evacuation plans.
- Village of Croton to determine buyout options and implications for North/South Riverside Ave and Brook Street, as well as exploring the possibility of levees.
- Drainage improvements and culvert assessments are needed at the Blue Mountain Middle School.
- Evaluate options for the Washington Engine House on High Street, considering new sea level rise and flooding projections.
- Consider applying for FEMA funding for more supplies for the Buchanan Engine.
- Incorporate resilient design in the motorized and non-motorized boat launches, which provide public access as well as emergency access.
- Engage the Interfaith Council in Croton in municipal education efforts.
- Incorporate resilient design, including the possibility of raising structures and prescribing weir management for the Lake Meahagh dock and park.
- Incorporate resilient design for Lents Cove and boat launch, Echo boat launch and Oscawana Park and boat launch.
- Village of Croton to contact yacht club to determine their resilience/emergency plans.
- Implement LWRP in all three municipalities, who are at various stages of finalizing these plans with the NYS Department of State.
- Implement another cycle with a longer and broader scope of the Storm Study Group in Croton.
- Westchester County and municipalities to update the Indian Brook/Croton River Task Force.
- Review Metro North SPDES permits for higher discharge rates (i.e. bigger storms).



WORKSHOP PARTICIPANTS

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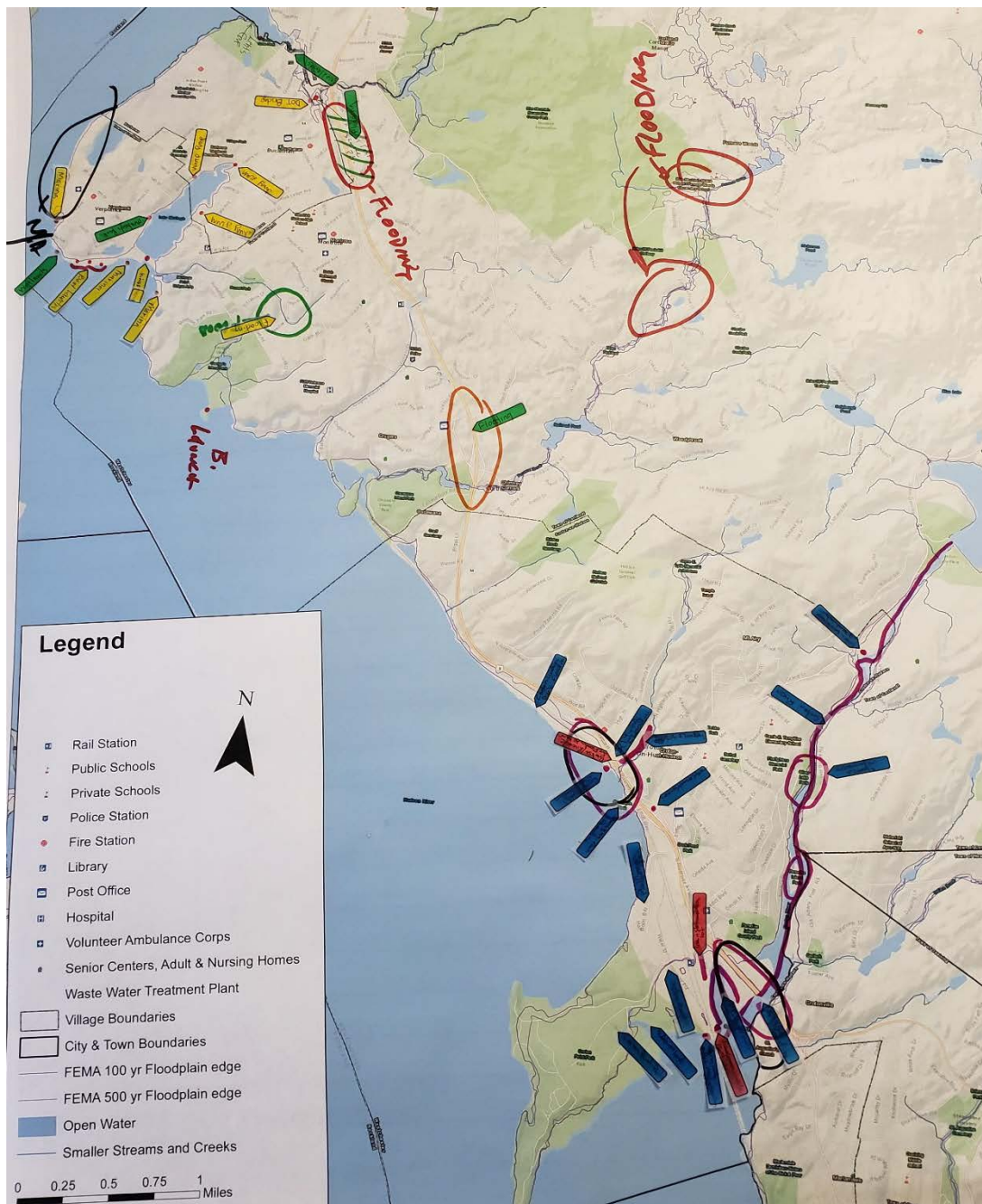
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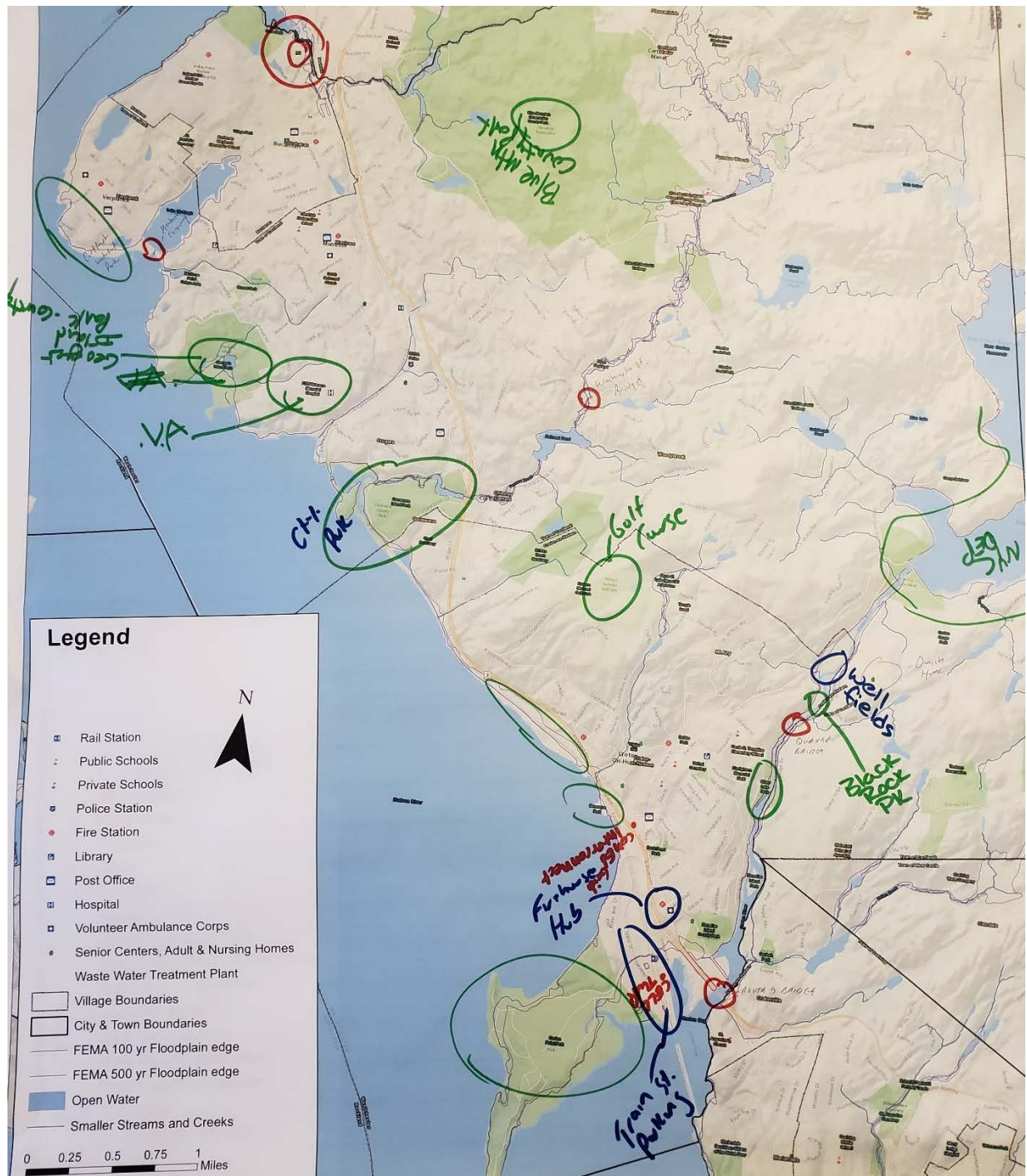
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APPENDIX I. CRB Workshop Base Map and Asset Identification Maps





APPENDIX 2: Available State and Federal Resources



FINANCING WATERFRONT RESILIENCE



Hudson River
Estuary Program

State and federal resources for communities

2018 Summary of financial assistance programs

State and federal agencies offer financial assistance to municipalities and non-profit organizations for activities building resilience to waterfront flooding, sea level rise and other climate risks. This document provides an overview of these assistance programs and how to apply. Eligible activities include municipal planning, improving the resiliency of structures, emergency management planning, waterfront revitalization, public outreach, and floodplain protection. A summary table of all resources, organized by agency, areas of assistance and deadlines, can be found at the end of this document.



View of flooded road in Stony Point following Hurricane Sandy in 2012 (L. Konopko)

- **NYS Department of Environmental Conservation (DEC):** Hudson River Estuary Grants, Climate Smart Communities Grants, Water Quality Improvements Program, Trees for Tribes
 - **Environmental Facilities Corporation (EFC):** Wastewater Infrastructure Engineering Planning, Clean Water Revolving Loan Fund, Green Innovation Grant Program
 - **Federal Emergency Management Agency (FEMA):** Hazard Mitigation Assistance, Public Assistance, Community Rating System
 - **Department of State (DOS):** Local Waterfront Revitalization Program
- **Other Financial Assistance Programs**
 - **New York State Energy Research and Development Authority (NYSERDA):** Clean Energy Communities Program
 - **NYS Office of Parks, Recreation and Historic Preservation (OPRHP):** Parks, Preservation and Heritage
 - **US Housing and Urban Development (HUD)** Community Block Grant Program
 - **Empire State Development (ESD)** Grant program for infrastructure investment
 - **Hudson River Greenway** Communities and Compact Grant Programs
 - **Open Space Funding Options**

[NYS Consolidated Funding Application](#)

New York State's Consolidated Funding Application (CFA) allows communities to design comprehensive projects and with one application, apply to multiple state funding sources. Communities may not apply to federal programs such as FEMA through the CFA. You can download the [2018 CFA Available Resources \(PDF\)](#) online.

LOCAL EXAMPLE: CONSOLIDATED FUNDING APPLICATION



Kingston received a \$1.2 million grant for a public-private intermunicipal partnership to design and build a one mile promenade along the Hudson River. The promenade will feature green infrastructure and offer public access and recreation and keep open space along the waterfront. The funds were awarded from the Department of State's Local Waterfront Revitalization Program through a CFA application.

Overview of Financial Assistance Programs

Below is a summary of financial assistance programs identified by their funding categories related to flood resilience.



Municipal planning



Collaboration and public outreach



Resilient structures



Waterfront economy



Emergency management



Floodplain protection

☒ CFA = grants included in the NYS Consolidated Funding Application

New York State Department of Environmental Conservation (NYS DEC)

The NYS DEC is a state agency focused on the conservation, enhancement, and enjoyment of environmental resources.



Hudson River Estuary Program Grants

The [2018 Request for Applications \(RFA\) for Hudson River Estuary grants](#) cover *Local Stewardship Planning* (\$350,000) and *River Access Improvements for People of All Abilities* (\$950,000). These Requests for Applications (RFAs) implement priorities of the [Hudson River Estuary 2015-2020 Action Agenda](#). All prospective applicants must register in advance in the [New York State Grants Gateway](#) where they can also search and download the full RFA by searching for 'Hudson River Estuary.' Funding for the grants is provided by the New York State Environmental Protection Fund (EPF). For more information on these opportunities, contact HREPGGrants@dec.ny.gov and sign up for our [Climate Resilience Newsletter](#).

Local Stewardship Planning

Up to \$350,000 is available to help communities and local organizations advance six categories of local projects and programs through planning, feasibility studies, and/or design. A 15% match is required.

- Climate adaptation along the Hudson river
- Water supply and waste-water infrastructure resiliency
- Green infrastructure to reduce combined and separated sewer overflows
- Watershed planning and management
- Conservation of natural resources and open space planning
- Natural scenery stewardship planning

Contact: Susan Pepe, NYS DEC, HREPGGrants@dec.ny.gov

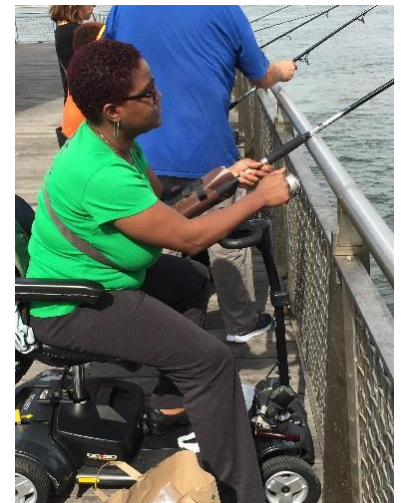
Deadline: 3:00 pm, Wednesday, July 11, 2018

River Access Improvements for People of All Abilities

Up to \$950,000 to local organizations and communities to improve accessibility and flood resilience at existing river access sites for boating, fishing, swimming, wildlife-dependent recreation, or educational interpretation. Projects may include construction of physical improvements, purchase of adaptive equipment, or development of accessibility improvement plans. Incorporating principles of universal design is strongly encouraged.

Contact: Susan Pepe, NYS DEC, HREPGGrants@dec.ny.gov

Deadline: August 22, 2018



Climate Smart Communities (CSC) Grants

Climate Smart Community (CSC) grants (\$8.8 million) will support municipal projects that implement certain CSC actions and help them become certified in the program. A 50% match required.



**Climate Smart
Communities**

Implementation projects (\$10,000 and \$2 million)

- Flood risk reduction
- Emergency preparedness and response improvements for future extreme climate conditions
- Reduction of vehicle miles travelled
- Reduction of food waste, landfill methane leakage or hydrofluorocarbons emissions

Certification projects (\$10,000 to \$100,000)

- Adaptation, land use, transportation and organic waste management actions

Contact: Myra Fedyniak, NYS DEC, (518) 402-8448, cscgrants@dec.ny.gov

Deadline: 4:00 pm, Friday, July 27, 2018, ☒CFA

Water Quality Improvement Project

The Water Quality Improvement Project (WQIP) program (\$79 million) is a competitive, reimbursement grant program that directs funds from the New York State Environmental Protection Fund to projects that reduce polluted runoff, improve water quality and restore habitat in New York's waterbodies. Grant recipients may receive up to 75% of the project costs for high priority wastewater treatment improvement, non-agricultural nonpoint source abatement and control, land acquisition for source water protection, aquatic habitat restoration, and municipal separate storm sewer system projects. Grant recipients may receive up to 50% for salt storage projects and up to 40% for general wastewater infrastructure improvement projects.

Contact: Leila Mitchell, NYS DEC, (518) 402-8179 | user.water@dec.ny.gov

Deadline: 4:00 pm, Friday, July 27, 2018, ☒CFA

Trees for Tribs

Do you own or manage land along a stream? You can apply for free native plants to help reduce erosion and improve habitat along your stream! The [Hudson Estuary Trees for Tribs](#) Program offers free native trees and shrubs for planting along the tributary streams in the [Hudson River Estuary watershed](#). Our staff can help you with a planting plan and work with your volunteers.

Contact: Beth Roessler, NYS DEC, (845) 256-2253, HudsonEstuaryTFT@dec.ny.gov

Deadline: Apply by Thursday, March 1, 2018 for Spring plantings, Wednesday, August 1, 2018 for Fall plantings



Environmental Facility Corporation (EFC)

The EFC is a state agency that assists public and private entities to comply with federal and state environmental quality standards through technical assistance, low cost financing, and green innovation grants.



Wastewater Infrastructure Engineering Planning Grant

The EFC, in cooperation with NYS DEC, offers WIEPG grants (\$3 million) for engineering and consulting services to produce engineering reports to construct or improve municipal wastewater systems. A maximum of \$100,000 in funding is available for communities with median household income of \$85,000 or less in Mid-Hudson and NYC regions and \$65,000 or less in the Capital District region. The municipality must provide a 20% match. The final engineering report can be implemented using EFC or other financing sources. Download the [2018 WIEPG Program \(PDF\)](#).

Contact: Cheryle Webber, NYS DEC, (518) 402-6924, EPG@efc.ny.gov or Leila Mitchell, NYS DEC, (518) 402-8179

Deadline: 4:00 pm, Friday, July 27, 2018, ☒CFA

Clean Water State Revolving Fund

The EFC provides various forms of project finance for water-quality protection projects through the Clean Water State Revolving Fund (CWSRF). A variety of publicly-owned water quality improvement projects are eligible for financing, including point source projects such as wastewater treatment facilities, and nonpoint source projects such as stormwater management projects and landfill closures, as well as certain habitat restoration and protection projects in national estuary program areas. Short and long-term loans are available at no interest and low interest rates.

Contact: Dwight Brown, EFC, (518) 402-7396, CWSRFinfo@efc.ny.gov

Deadline: Open enrollment

Green Innovation Grant Program

The Green Innovation Grant Program (GIGP, \$15 million) funds projects across New York State that utilize unique stormwater infrastructure design and create cutting-edge green technologies. A 10% to 60% match is required. GIGP funds highly-visible projects that are directly attributable to the improvement or protection of water quality and integral to the success of the following eight specific green infrastructure practices:

- Permeable pavement
- Bioretention
- Green roofs and green walls
- Stormwater street trees / urban forestry
- Establishment or restoration of floodplains, riparian buffers, streams or wetlands
- Stream daylighting
- Downspout disconnection
- Stormwater harvesting and reuse

Contact: Brian Hahn, EFC, (518) 402-6924, GIGP@efc.ny.gov

Deadline: 4:00 pm, Friday, July 27, 2018, ☒CFA

LOCAL EXAMPLE: WASTEWATER INFRASTRUCTURE ENGINEERING PLANNING



The City of Kingston received a \$25,000 grant to examine long-term adaptive planning for their wastewater treatment plant. They will implement the plan using low interest loans from the CWSRF.

Federal Emergency Management Agency (FEMA)

FEMA is a national agency that administers programs providing flood insurance, hazard mitigation assistance, and public assistance grants.



Hazard Mitigation Assistance

FEMA currently provide three types of hazard mitigation assistance (HMA):

1. [Hazard Mitigation Grant Program \(HMGP\)](#) assists in implementing long-term hazard mitigation measures. HMGP funds are triggered by a declared disaster and funneled to individual municipalities through the [NYS Division of Homeland Security and Emergency Services \(DHSES\)](#). Funds available: over \$3 million to develop and update Hazard Mitigation plans and implementing Hazard Mitigation projects. Download the [2018 Announcement \(PDF\)](#).
 - DR-4322: Severe Winter Storm and Snowstorm “Stella”
 - DR-4348: Flooding

Contact: DHSES Mitigation Section at (518) 292-2304, NYSOEMHazmit@dhSES.ny.gov
Deadline: Letters of Intent (LOI) due 12:00PM EST on Friday, June 1, 2018.

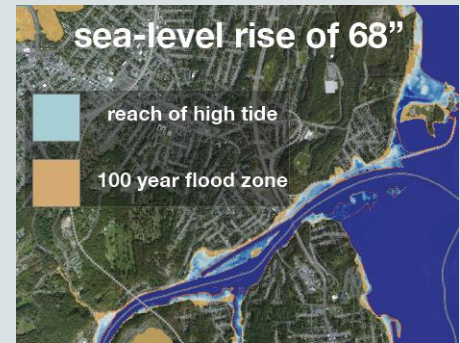
2. [Pre-Disaster Mitigation \(PDM\)](#) provides funds on an annual basis for hazard mitigation planning and projects.
3. [Flood Mitigation Assistance \(FMA\)](#) provides funds on an annual basis for projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP).

Public Assistance Grant Program

Through the Public Assistance (PA) Program, FEMA provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly- owned facilities, and the facilities of certain private non-profit (PNP) organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process.

Contact: FEMA grants are administered by NYS Division of Homeland Security and Emergency Services (DHSES). Visit their website for current grant opportunities: <http://www.dhSES.ny.gov/grants/>

LOCAL EXAMPLE: HAZARD MITIGATION GRANT



Kingston applied for a \$5 million grant from Hurricanes Irene and Sandy Relief Funds to implement Task Force recommendations for riparian buffers, buyouts, the adaptation and fortification of infrastructure, and the purchase emergency generators for pumping stations. The City is awaiting notification of the application's status.

Community Rating System

FEMA also administers the National Flood Insurance Program (NFIP) and the related Community Rating System (CRS), which allows municipalities to reduce flood insurance rates for all policyholders by instating community-scale projects and policies regarding flood resilience.

Contact: 317-848-2898, nfipcrs@iso.com

Department of State (DOS)

The DOS is a planning agency that focuses on economic revitalization and resilient, livable communities.



Local Waterfront Revitalization Program

The Local Waterfront Revitalization Program (LWRP) provides technical assistance, and matching grants (\$15 million) on a reimbursement basis to villages, towns, cities, and counties located along New York's coasts or designated inland waterways, to prepare or implement strategies for community and waterfront revitalization. Funds require a 25% match (15% for environmental justice communities) in the following grant categories:

- Preparing or implementing a Local Waterfront Revitalization Program (LWRP)
- Updating an LWRP to mitigate future physical climate risks
- redeveloping hamlets, downtowns and urban Waterfronts
- Planning or constructing land and water-based trails
- Preparing or implementing a lake-wide or watershed management plan
- Implementing a community resilience strategy

Download the [2018-19 Request for Application \(RFA\) \(PDF\)](#).

Contact: Jamie Ethier, NYS DOS, (518) 473-3656,
Jaime.Ethier@dos.ny.gov

Deadline: 4:00 pm, July 27, 2018, ☒CFA

LOCAL EXAMPLE: COMMUNITY RATING SYSTEM



The Village of Scarsdale is Class 8 certified in the Community Rating System (CRS), which means the village residents receive a 10% discount on flood insurance. The Village of Hyde Park is currently seeking CRS certification.

LOCAL EXAMPLE: LOCAL WATERFRONT REVITALIZATION PROGRAM



The Village of Piermont received a \$35,000 grant to update its Local Waterfront Revitalization Plan, first written in 1992, to include strategies from the Task Force's final Resilience Roadmap Report.

Additional Financial Assistance Resources

New York State Energy Research and Development Authority (NYSERDA)

NYSERDA is a state authority dedicated to promoting energy efficiency and renewable energy sources.



Clean Energy Communities Program

Municipalities that complete four of 10 priority actions will be considered Clean Energy Communities, and eligible for grants up to \$250,000 with *no match requirements*. Locally based outreach and implementation coordinators will provide free, on-demand technical assistance, including step-by-step guidance, case studies, and template contracts to help municipalities implement the Climate Smart Communities and Clean Energy Communities programs.

Contact: cec@nyserda.ny.gov

Deadline: Open application until Monday, September 30, 2019, or once funds run out.

NYS Office of Parks, Recreation & Historic Preservation (OPRHP)

THE NYS OPRHP is a state agency dedicated to preserving and enhancing parks, historic assets and heritage areas.



Grant Program for Parks, Preservation and Heritage

The OPRHP is providing grants (\$19.5 million) for acquisition, planning, development, and improvement of parks, historic properties and heritage areas. Project awards up to \$500,000 with grant funds up to 50% of the total eligible project cost; up to 75% if the project is located in a high-poverty district.

Contact: Erin Drost, NYS OPRHP, (845) 889-3866

Deadline: 4:00 pm, Friday, July 27, 2018, ☒CFA

US Department of Housing and Urban Development (HUD)

HUD is a federal agency aimed to support sustainable, inclusive and affordable communities.



Community Development Block Grant Program (CDBG)

HUD is offering competitive grants (\$22.5 million) for community development projects. Resilient drinking water, clean water and/or stormwater infrastructure projects fall under Category 1: Public Infrastructure (\$750,000 max, \$900,000 for joint applicants, no match required). Construction and renovation projects fall under Category 2: Public Facilities (\$300,000 max). Risk assessment and engineering projects fall under Category 4: Community Planning (\$50,000 per project, 5% match). Visit the [2018 CDBG CFA page](#) for more information.

Contact: 518-474-2057, HCR_CFA@nyshcr.org

Deadline: 4:00 pm, Friday, July 27, 2018, ☒CFA

LOCAL EXAMPLE: PARK DEVELOPMENT



The Village of Freeport received a \$250,000 Parks grant to replace over 1,000 feet of bulkhead at Waterfront Park to reduce soil erosion and improve public safety and recreational access.

Empire State Development (ESD)

ESD is the New York state agency focused on economic development.



Empire State Development Grant Funds

The ESD is offering grant funds (\$150 million) for infrastructure investment that can foster new economic development in Category 2. Grant funds cover up to 25% of project soft costs.

Contact: Meghan Taylor, REDC, 845-567-4882, nys-midhudson@esd.ny.gov

Deadline: 4:00 pm, Friday, July 27, 2018, ☒ CFA

NYS Hudson River Valley Greenway

The Greenway is state agency focused on using regional collaboration to conserve and enhance the natural, scenic and historic resources of the unique Hudson River Valley.



Greenway Communities Grant Program

Financial assistance for planning (\$5,000 to \$10,000 per project, more if multiple municipalities are involved) is available to designated “Greenway Communities” within the Greenway Area. Projects funded under this program include those that relate to community planning, economic development, natural resource protection, cultural resource protection, scenic resource protection, and open space protection. Greenway Compact communities are eligible for greater funds to develop, approve, and implement a regional compact strategy consistent with the Greenway criteria and the Greenway act. A [fillable copy of the application](#) is available.

Contact: 518-473-3835, hvrg@hudsongreenway.ny.gov

Deadline: 4:00 pm, Friday, August 10, 2018 and 4:00 pm, Friday, October 12, 2018

LOCAL EXAMPLE: GREENWAY COMMUNITIES GRANT



The Village of Ossining received a \$15,000 grant to create a Waterfront Recreational Resource Plan to identify ways to promote water-related uses on their 3 miles of Hudson River waterfront, and to outline strategies to increase public access, catalog existing recreational assets, and engage stakeholders to determine demand for possible upgrades.

Open Space Funding Options



Preserving land as open space in floodplains and in coastal areas can foster flood resilience. There are several options for municipalities looking to preserve open space in their community:



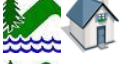













LOCAL EXAMPLE: REAL ESTATE TRANSFER TAX



The Town of Warwick passed a 0.75% Real Estate Transfer Tax and the Town of Red Hook a 2% tax to create a conservation fund to help provide financial support for their Open Space Plans.

- The municipality can advocate to have their land included in the NYS Open Space Plan that is updated every 5 years. This helps the community to show that the land has value outside of traditional development and is a good way to prepare for purchase of the land for open space. The State receives annual funding to purchase lands specifically mentioned in the plan. Municipalities can also seek grant funds to write or update their own Open Space Plan and include floodplain protection as one of the important values that open space provides.
- The municipality can work with a private land trust, like the Walkill Valley Land Trust or the Open Space Institute to purchase the land using easements if it has scenic, ecological and/or agricultural value. Then, the community may be able to work with the land trust to make the property more valuable as floodplain protection.
- The municipality can purchase the land for open space by taking on debt (bonds) or instigating a tax levy. One example of a relevant tax levy is called a Real Estate Transfer Tax, which has been allowed by local law since NYS passed the Hudson Valley Community Preservation Act of 2007. This tax is applied to mortgages on local real estate and is used to create a conservation fund for the community, which can be used to preserve open space.

Summary table of all funding assistance programs

| Agency | Assistance Program | Priority Funding Categories | Grant amounts, required match | Deadline, CFA |
|--------|--------------------|---|-------------------------------|--------------------|
| DEC | ✓ Estuary Grants |  | \$10,500-\$50,000, 15% | 7/11/18 |
| | ✓ CSC Grants |  | \$10,000-\$2M, 50% match | 7/27/18 ☑CFA |
| | ✓ WQIP |  | 25-60% match | 7/27/18 ☑CFA |
| | ✓ T4T |  | N/A | 3/1/18, 8/1/18 |
| EFC | ✓ WIEP |  | ≤\$100,000, 20% match | 7/27/18 ☑CFA |
| | ✓ CWRLF |  | N/A | Open |
| | ✓ GIGP |  | 10-60% match | 7/27/18 ☑CFA |
| FEMA | ✓ HMGP, PDM, FMA |  | Over \$3M, 25% match | 6/1/18 |
| | ✓ PA, CRS |  | N/A | Open |
| DOS | ✓ LWRP |  | 15-25% match | 7/27/18 ☑CFA |
| OTHER | ✓ NYSERDA |  | ≤\$250,000, no match | Open until 9/30/19 |
| | ✓ OPRHP |  | ≤\$500,000, 25-50% match | 7/27/18 ☑CFA |
| | ✓ HUD |  | \$50,000 - \$900,000, 0-5% | 7/27/18 ☑CFA |
| | ✓ ESD |  | 80% match for soft costs | 7/27/18 ☑CFA |
| | ✓ Greenway |  | \$5,000 - \$10,000+ | 8/10/18, 10/12/18 |
| | ✓ Open Space |  | N/A | N/A |

CONTACT INFORMATION

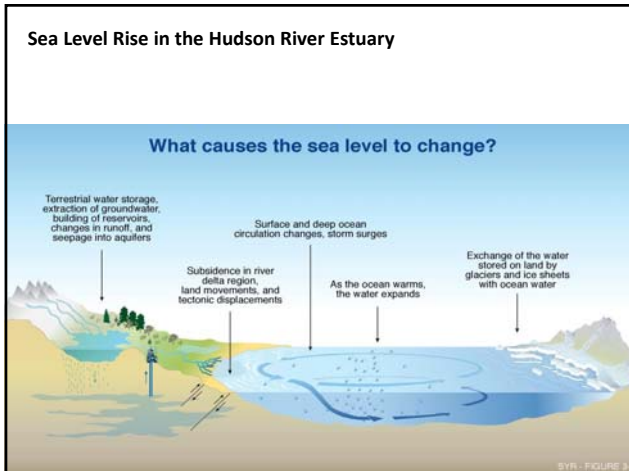
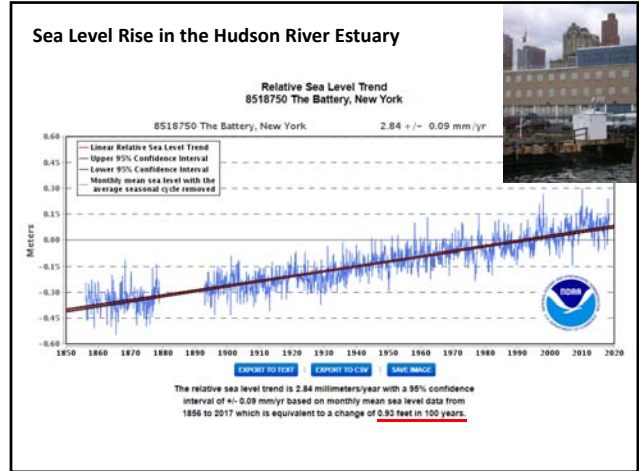
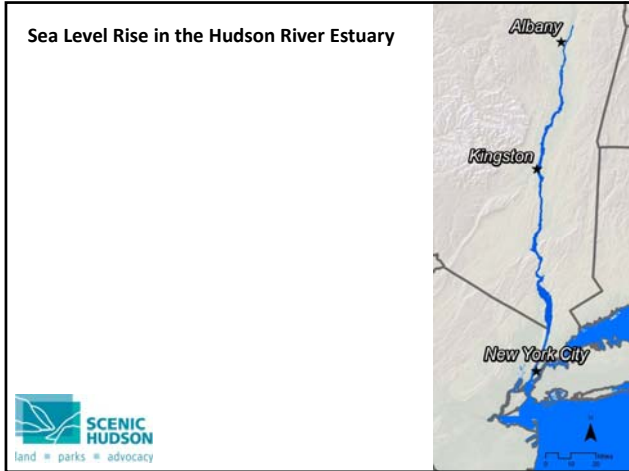
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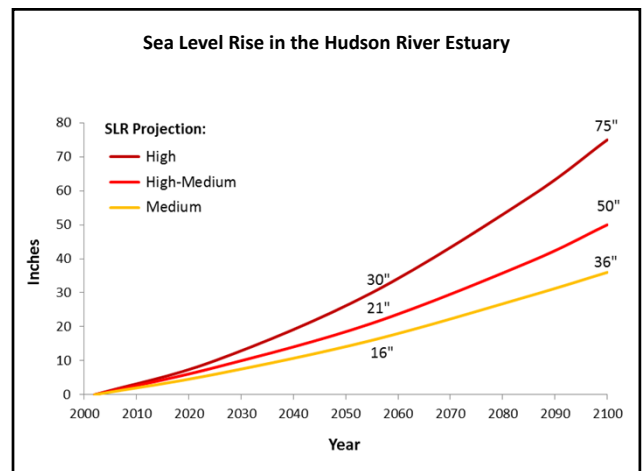
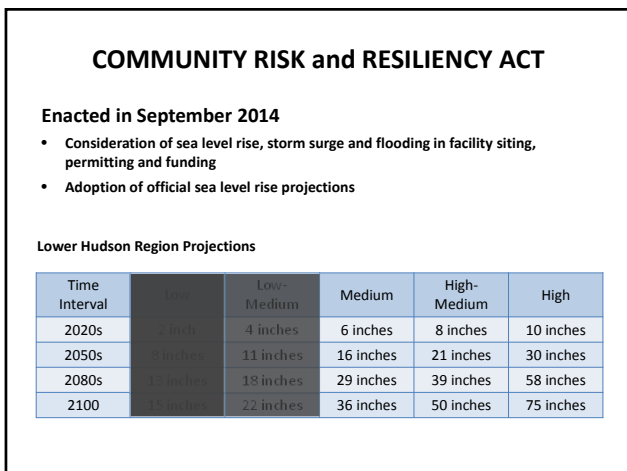
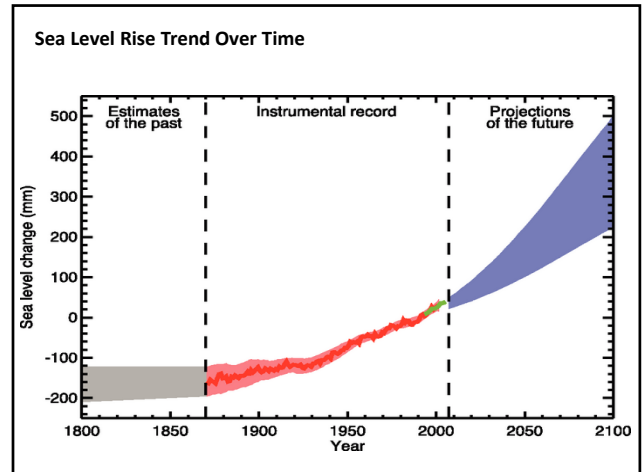
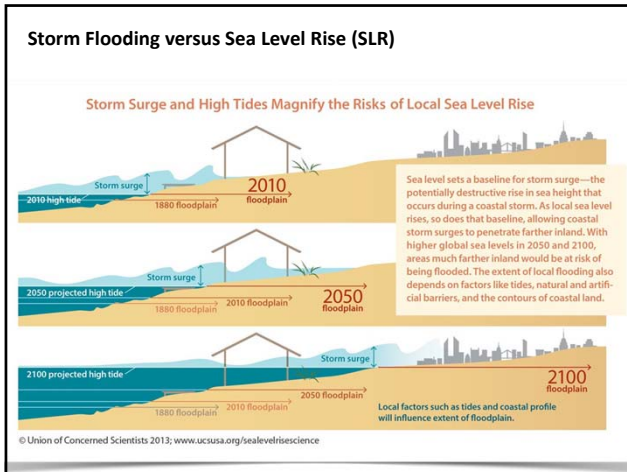
Climate Outreach Specialist, Hudson River Estuary Program

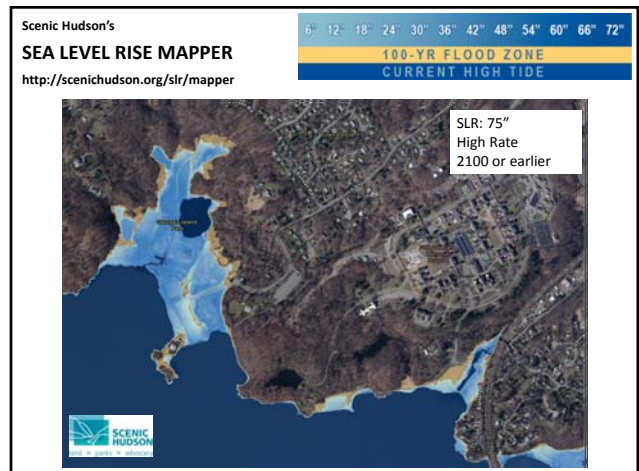
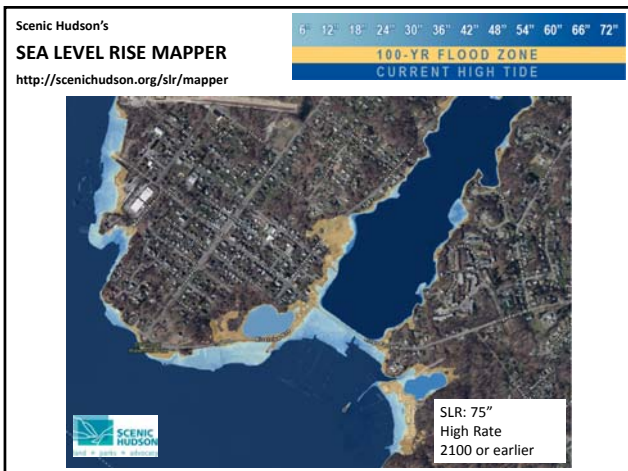
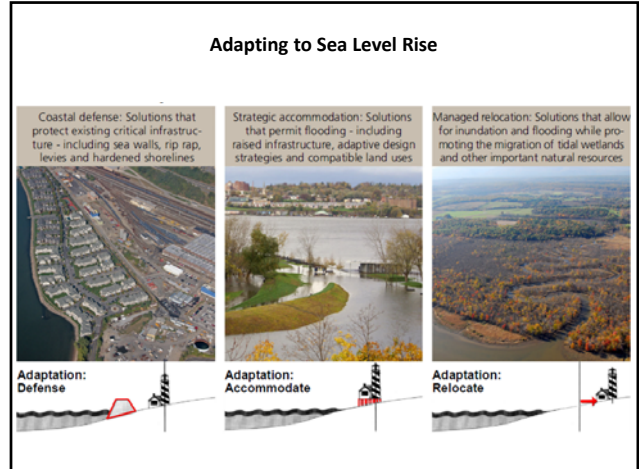
New York State Department of Environmental Conservation

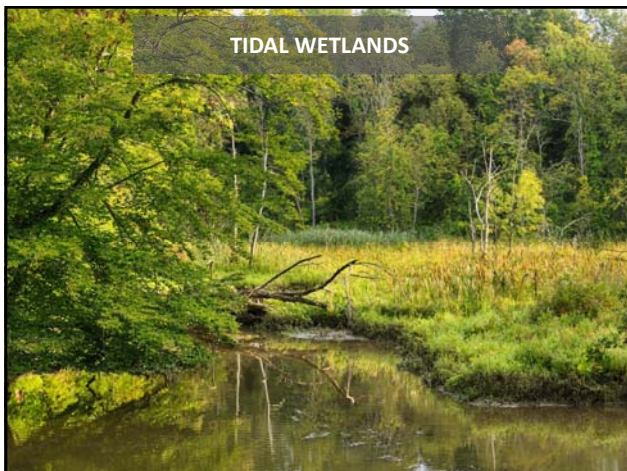
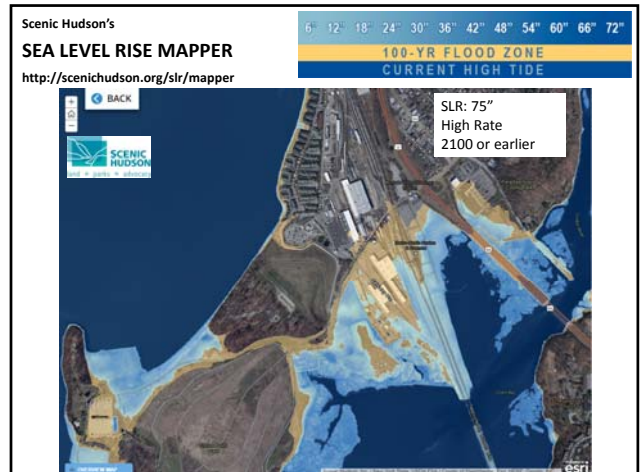
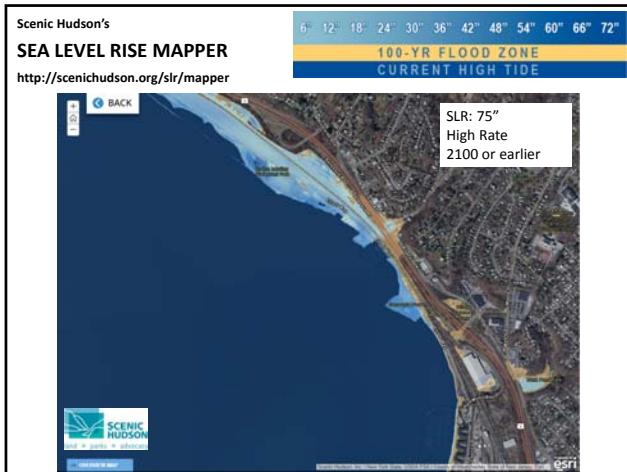
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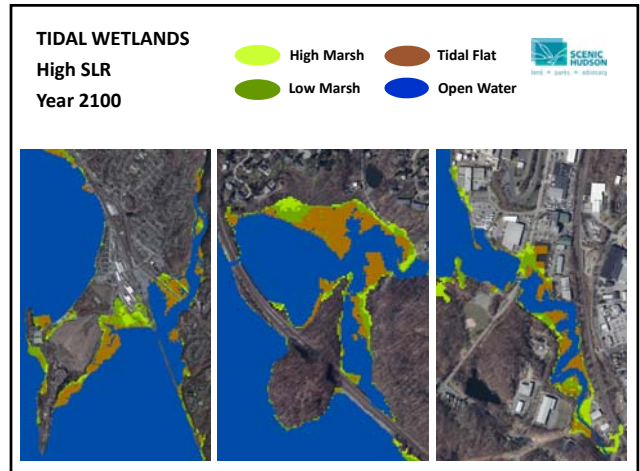
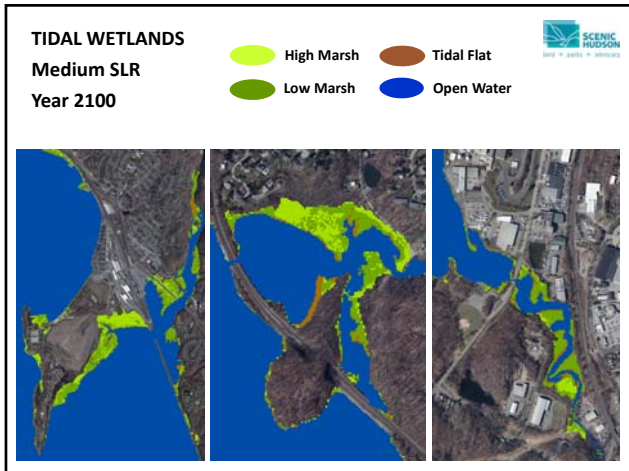
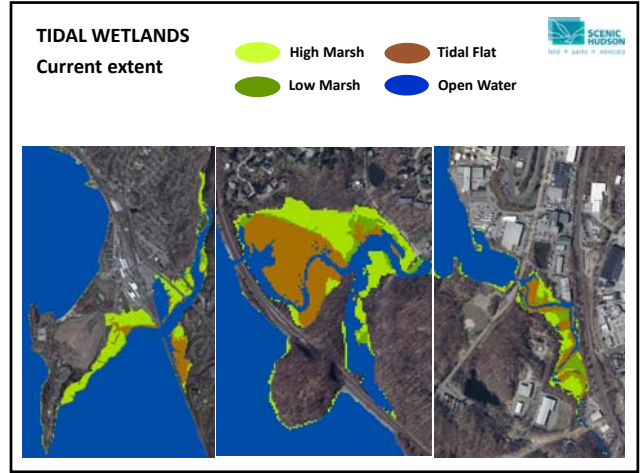
APPENDIX 3: Workshop Presentations

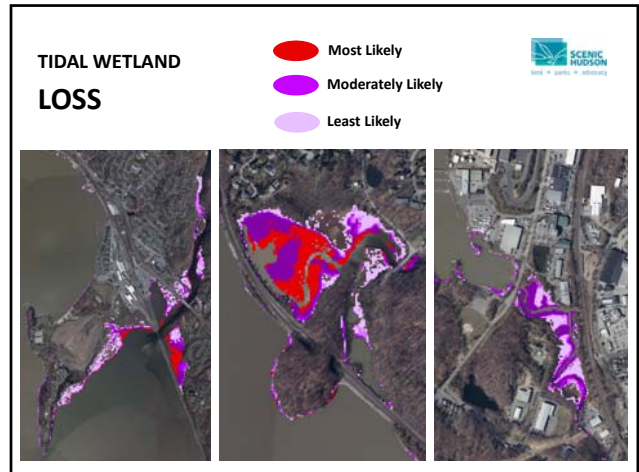
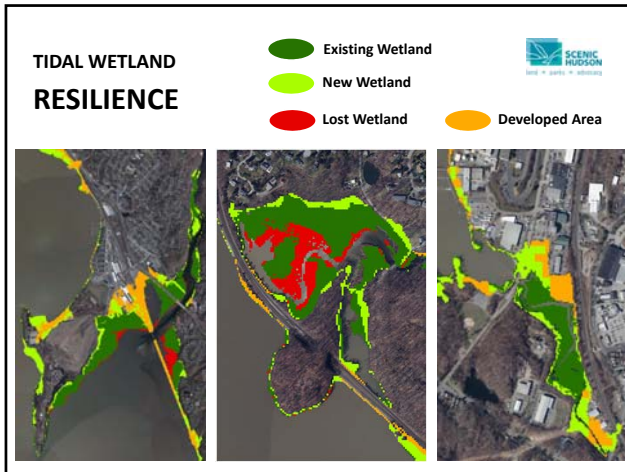












<https://www.scenichudson.org/climatechange>

Home » OUR WORK » Conservation Science » Scenic Hudson and Climate Change

Scenic Hudson and Climate Change

Scenic Hudson is working to help the Hudson Valley develop long range plans for global climate change in general and for sea level rise along the estuary in particular. We do this both as part of our mission as and a direct stakeholder, since we own over 1,000 acres of protected lands along the river's edge. Our goal is to work toward a future that balances and reduces risks to people, property and nature and holds the promise of secure, thriving riverfront communities within a vibrant, healthy ecosystem. Our work on climate change can be divided broadly into two categories: mitigation and adaptation.

Protecting the Pathways

Explore our new interactive guide to preserving Hudson River tidal wetlands in the face of sea level rise.

OUR WORK

Land Preservation

Scenic Hudson SLR Mapper: <http://www.scenichudson.org/slr/mapper>

Additional Resources: <https://www.scenichudson.org/sealevelrise>

Sea Level Rise

An accelerating challenge for people and nature along the Hudson River.

water vegetation both—will be increasingly stressed by rising water levels.

As both a mission-driven organization and a stakeholder owning over 1,000 acres of protected lands along the river's edge, Scenic Hudson is working to catalyze long range planning for sea level rise along the estuary. Our goal is to work toward a future that balances and reduces risks to people, property and nature, and holds the promise of secure, thriving riverfront communities within a vibrant, healthy ecosystem.

Adaptation

- Planning Resources
- Science Resources
- Legal Resources
- Tide/Surge/Emergency Alerts
- Revitalizing Hudson Riverfronts

OUR WORK

Land Preservation

- Saving the Land That Matters Most
- Hudson Valley Conservation Strategy
- Parks Creation
- Farmland Open
- Private Land Open

Conservation Science

Scenic Hudson and Climate Change

Sea Level Rise

- Sea Level Rise Mapper
- About the SLR Mapper
- Disclaimer and Terms of Use
- How to Get These Maps
- Why Is Sea Level Rising?
- Why Land Also Matters
- Planning Resources
- Science Resources
- Legal Resources
- Tide/Surge/Emergency Alerts
- Revitalizing Hudson Riverfronts
- Adaptation Science

Anticipate Possible Flooding Potential
Design Anticipation
Transmission Lines

[-flood-map/](#)

(Google 'Hudson river flood support')

Community Resilience Building Workshop

Town of Cortlandt,
Village of Croton
&
Village of Buchanan

October 19, 2018

A G E N D A

| | |
|----------|--|
| 10:00 | Welcome, Introductions and Workshop Overview |
| 10:15 | Overview Presentation – Info, Resources, Tools |
| 10:45 | Community Resilience Building Work |
| 12:00ish | Lunch (Provided) |
| 12:30ish | Community Resilience Building Work (cont'd.) |
| 1:55 | Report Outs – Community Building Discussion |
| 2:25 | Wrap-up and Next Steps |

Climate and Flooding Overview

- Predicting the future is inherently uncertain
- Data and models can supplement local knowledge
- Resources available to inform decisions:
 - Columbia Hudson River Flood Mapper
<http://www.ciesin.columbia.edu/hudson-river-flood-map/>
 - NY Climate Change Science Clearinghouse
<https://www.nyclimatescience.org/>
 - Scenic Hudson Sea Level Rise Mapper
<http://scenichudson.org/slr/mapper>
 - TNC Natural Resource Navigator www.naturalresourcenavigator.org

Changes in climate by 2050

| Summer max temperature | +4.6 degrees F |
|------------------------|-----------------|
| Days above 95 deg F | 8.6 more days |
| Winter min temperature | +5.5 degrees F |
| Days below freezing | 25.8 fewer days |
| Annual total precip | +1.3 inches |
| Winter precip | +1 inch |
| Summer precip | -0.6 inches |

What it could mean

- ⦿ Hotter summers
- ⦿ More heat waves and droughts that last longer
- ⦿ Shorter, milder winters
- ⦿ Potential for more or less cold spells
- ⦿ More winter precipitation
 - If rain = more flooding
 - If snow = 10" of snow

Changes in climate by 2050: extreme precipitation

| | 10-yr Event | 100-yr Event |
|---|-------------|--------------|
| Current event rainfall | 4.5" | 8.1" |
| Future event rainfall | 5.2" | 9.2" |
| % increase in rainfall | 15.5% | 14.0% |
| Future recurrence interval of current rainfall amount | 5 years | 62 years |

What it could mean

- ⦿ Big storms will be slightly bigger
- ⦿ Big storms will be about twice as likely in any year
- ⦿ The same amount of rainfall could cause more flooding due to development

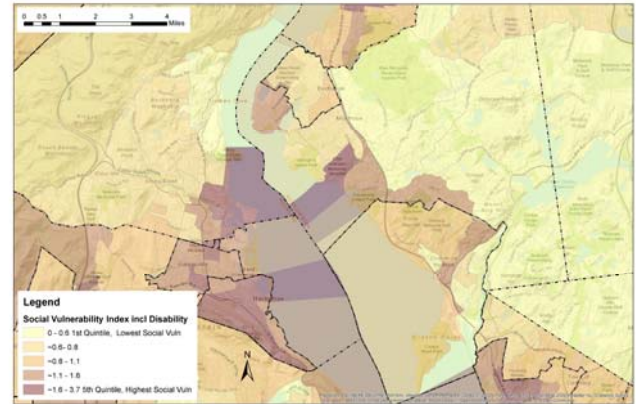
Vulnerability to flooding

- ⦿ Flood events in county (1954-2013) = 41
 - 5 flood disaster declarations

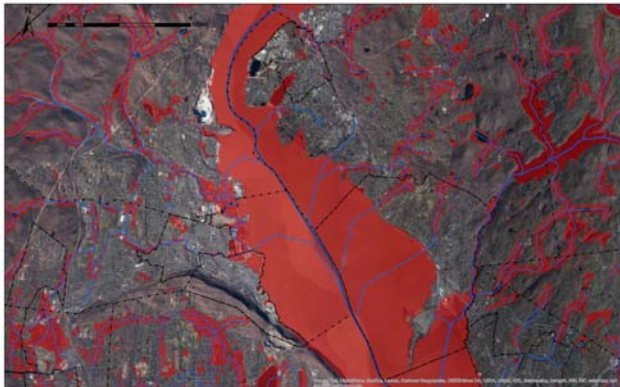
| | Peekskill | Cortlandt | Buchanan | Croton |
|----------------------------------|-----------|-------------|----------|----------|
| # res prop in floodzone | 8 | 39 | 0? | 8 |
| #NFIP policies | 53 | 129 | 4 | 52 |
| \$ paid NFIP claims | \$485,464 | \$1,990,460 | 0 | \$68,056 |
| # repetitive properties (losses) | 5 (2.8) | 10 (3.8) | 0 | 1 (2) |

Social vulnerability

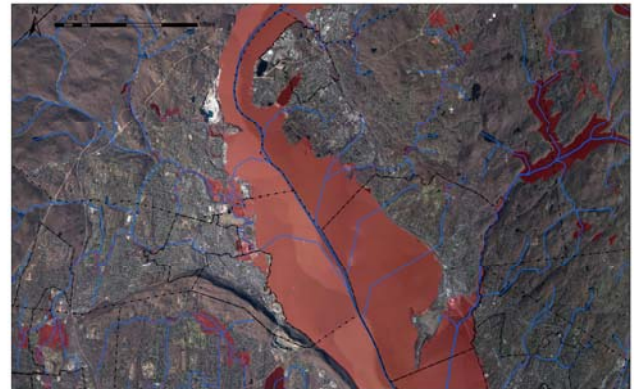
| Impact Scenarios for Town of Cortlandt | | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|--|
| Type of Impact | 18" of SLR with current 100 YR Storm | 36" of SLR with current 100 YR Storm | 48" of SLR with current 100 YR Storm | |
| Infrastructure | | | | |
| Total Damaged Buildings | 244 | 297 | 312 | |
| SPDES Wastewater | 1 | 1 | 1 | |
| Wells and Withdrawals | 0 | 2 | 2 | |
| Bridges | 6 | 7 | 8 | |
| Roads (linear miles) | 8 | 9 | 10 | |
| Railroad Passenger Stations | 1 | 1 | 1 | |
| Railroads (linear miles) | 7 | 9 | 10 | |
| Environment | | | | |
| Inundated Land Area (acres) | 858 | 925 | 947 | |
| Inundated Impervious Surface (acres) | 147 | 168 | 174 | |
| Inundated Wetlands | 210 | 213 | 253 | |
| Social | | | | |
| Weighted Social Vulnerability Index of Entire Municipality | 4 (medium) | 4 (medium) | 4 (medium) | |



How to minimize flood damage



FEMA 100-vr floodplain



Wetlands



Riparian areas



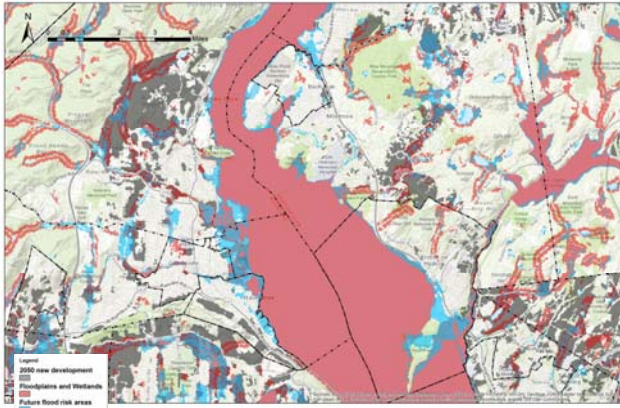
How to minimize flood damage



Reduce future flood risk



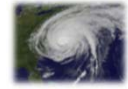
Smart development



"Community Resilience Building" in 100 moves



43,252,003,274,489,856,000 permutations (43 quintillion)



Community Resilience Building WORKSHOP GUIDE



www.CommunityResilienceBuilding.com

Workshop Objectives

- ✓ Understand **connections** – ongoing issues, hazards, and activities within/across the municipalities.
- ✓ Identify & map **vulnerabilities and strengths**.
- ✓ **Develop & prioritize actions** to improve resilience.
- ✓ Opportunities to **advance priority actions**.



Community Resilience Building...

Importance of the Issue

- Implications for Residents
- Business Continuity and Economic Growth
- Public Services and Amenities
- Quality of Life
- Environment
- Infrastructure

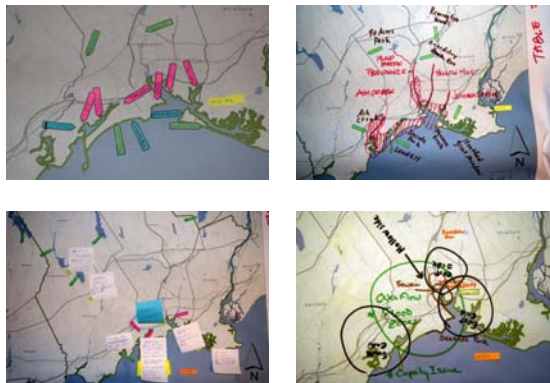
Shared Values...

Terms to consider today...

- **Hazard** = an event or condition that can cause harm or loss. *Which ones? How often & severe? Where?*
- **Vulnerability** = extent to which a community is exposed to or can be damaged by a hazards.
- **Strength** = extent to which a community has and is coping with hazards.
- **Risk** = probability of harmful consequences
- **Resilience** = anticipate, accommodate and/or recover



Base Map Example



Risk Matrix

Waterford, Connecticut (01/11/2012) Eastern Connecticut Risk Assessment Workshop

Vulnerability by Hazards

Risk Matrix developed by Lightstorm Consulting & The Nature Conservancy (01/20/2012)

| Strengths & Vulnerability | Hazard | Urgency & Time | | | |
|---------------------------|------------------|----------------|--------|------|-----------|
| | | Low | Medium | High | Very High |
| Infrastructure | Coastal Flooding | Low | Medium | High | Very High |
| | Storm Surge | Low | Medium | High | Very High |
| | Sea Level Rise | Low | Medium | High | Very High |
| | Coastal Erosion | Low | Medium | High | Very High |
| | Storm Surge | Low | Medium | High | Very High |
| | Sea Level Rise | Low | Medium | High | Very High |
| | Coastal Erosion | Low | Medium | High | Very High |
| Societal | Coastal Flooding | Low | Medium | High | Very High |
| | Storm Surge | Low | Medium | High | Very High |
| | Sea Level Rise | Low | Medium | High | Very High |
| | Coastal Erosion | Low | Medium | High | Very High |
| | Storm Surge | Low | Medium | High | Very High |
| | Sea Level Rise | Low | Medium | High | Very High |
| | Coastal Erosion | Low | Medium | High | Very High |
| Environmental | Coastal Flooding | Low | Medium | High | Very High |
| | Storm Surge | Low | Medium | High | Very High |
| | Sea Level Rise | Low | Medium | High | Very High |
| | Coastal Erosion | Low | Medium | High | Very High |
| | Storm Surge | Low | Medium | High | Very High |
| | Sea Level Rise | Low | Medium | High | Very High |
| | Coastal Erosion | Low | Medium | High | Very High |

Actions

Cross Walk

Action Plan

Expectations of Participants

- ⦿ Permission to be active participants
- ⦿ Your ideas & expertise are needed
- ⦿ Respect contributions of others
- ⦿ Be creative and remain optimistic
- ⦿ Stay on task (as defined by your facilitators)
- ⦿ Be accountable for your group's discussions