

# Esopus Creek NEWS

Published by Cornell  
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## Local Flood Analysis - Results!

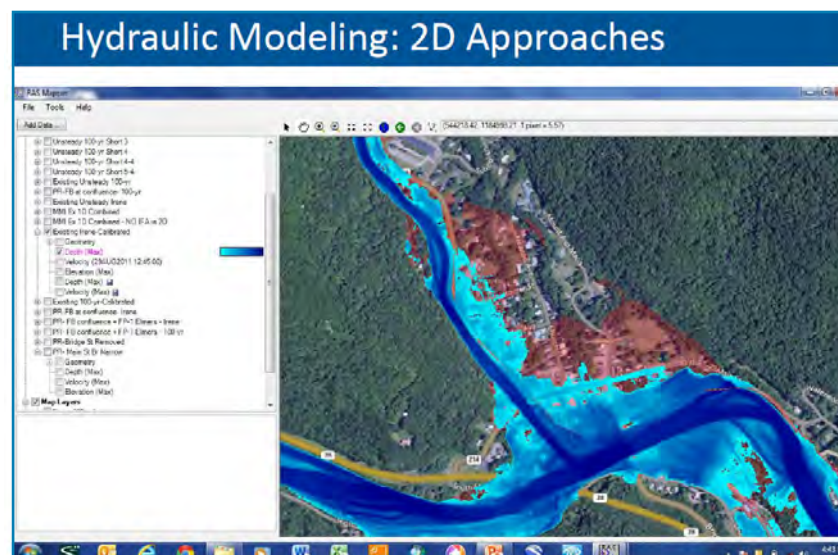
THE RESULTS ARE IN and as expected, there are no easy, or cheap solutions that completely remove flooding from the Ashokan watershed hamlets of Phoenicia and Mt. Tremper. But there are actions that computer and engineering analyses show can reduce the depth of flooding and the extent of smaller, but more frequent floods.

Towns still need to select by vote exactly which flood projects will move forward, and then locate funding for the projects. However, a benefit-to-cost ratio over 1.0 makes a project potentially eligible for FEMA assistance, and for funding from the Ashokan Watershed Stream Management Program (AWSMP) and the Catskill Watershed Corporation. The funding sources can each cover at least a portion of approved project costs.

Another approach Towns are pursuing is to work with County and State transportation

agencies to prioritize infrastructure improvements, like replacing culverts and bridges if according to analysis results, they are aging out and block floodwaters, putting public and private assets at risk.

The local flood analysis methodology was developed following the catastrophic flooding of Hurricanes Irene and Lee in 2011. The approach features computer modeling of stream systems and public engagement. All partners agreed that Towns should lead the analyses with funding provided by the NYC Department of Environmental Protection (DEP). DEP contracted with County organizations and the Catskill Watershed Corporation to assist the Towns. The first projects in the Ashokan Watershed were advanced by the Town of Shandaken, looking at options for Phoenicia and Mt. Tremper, and by the Town of Olive looking at Boiceville and West Shokan.



Consulting firms hired by the Towns first examined the extent and depth of predicted flooding to identify risks to the community. Here an advanced approach models the flow of water in multiple directions - including water flowing from the top of image to the bottom of image onto Main Street before entering the Esopus Creek at Phoenicia, for a storm the size of Hurricane Irene.

The AWSMP provided the Town of Shandaken with funding to run a local flood analysis in 2014. Shandaken hired consulting firm Milone & MacBroom, Inc. (MMI) to do computer and engineering assessments and compile benefit-cost information used to determine project feasibility. Shandaken's flood advisory committee worked with MMI to hold a series of meetings at which members of the public identified a range of flood mitigation solutions to be evaluated. The maps at right show solutions that proved to be both cost-beneficial and feasible. Solutions were presented to the Shandaken Town Board in January 2016.

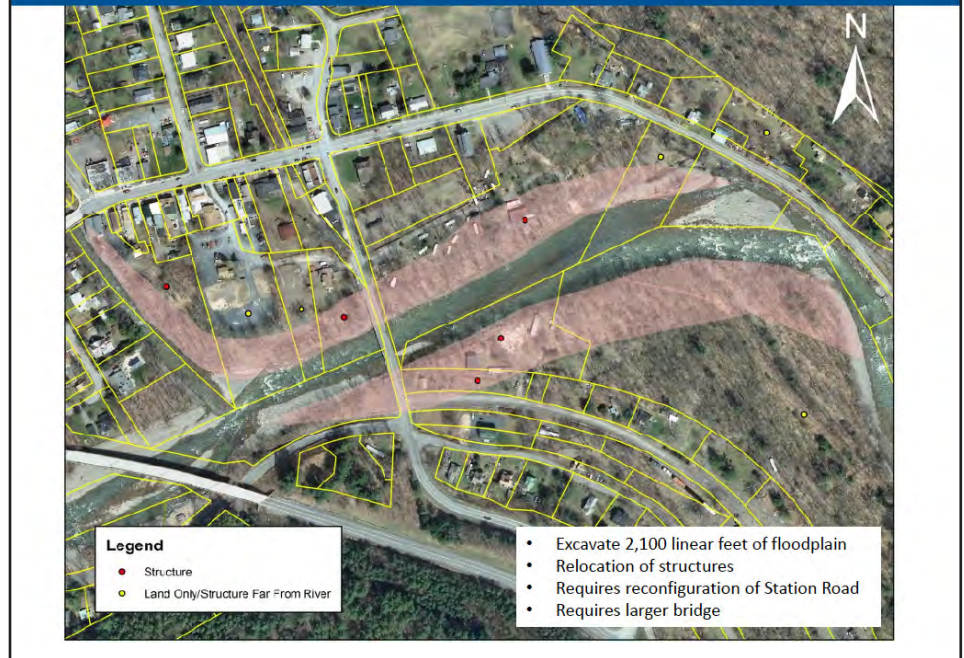
It should be noted that some of the flood mitigation options recommended involve the relocation of businesses or residences out of zones where flood waters are predicted to be the deepest during floods. Any relocations that would occur are to be voluntary - the landowner must choose to enter into a buyout and relocation program, and may need to seek Town support. This means that any solution that moves forward would require the support of affected individuals, the community at large, permitting agencies and funders.

Town flood committees looked in particular at actions that would have off-site flood reduction benefits, meaning the action would benefit multiple businesses or residences or public infrastructure like roads and bridges. Typical actions evaluated included removing and replacing bridges with larger spans and altered structures, excavating and lowering floodplains adjacent to the channel, resizing channels through sediment removal, and building levees and berms.

Non-structural solutions like flood-proofing buildings, elevating utilities, and elevating buildings were also recommended. The Towns are examining the relocation of critical facilities such as firehouses and emergency response centers out of floodplains. Next steps for the Towns may be to seek funding for professional planning services and costs associated with relocating critical facilities.

## PHOENICIA

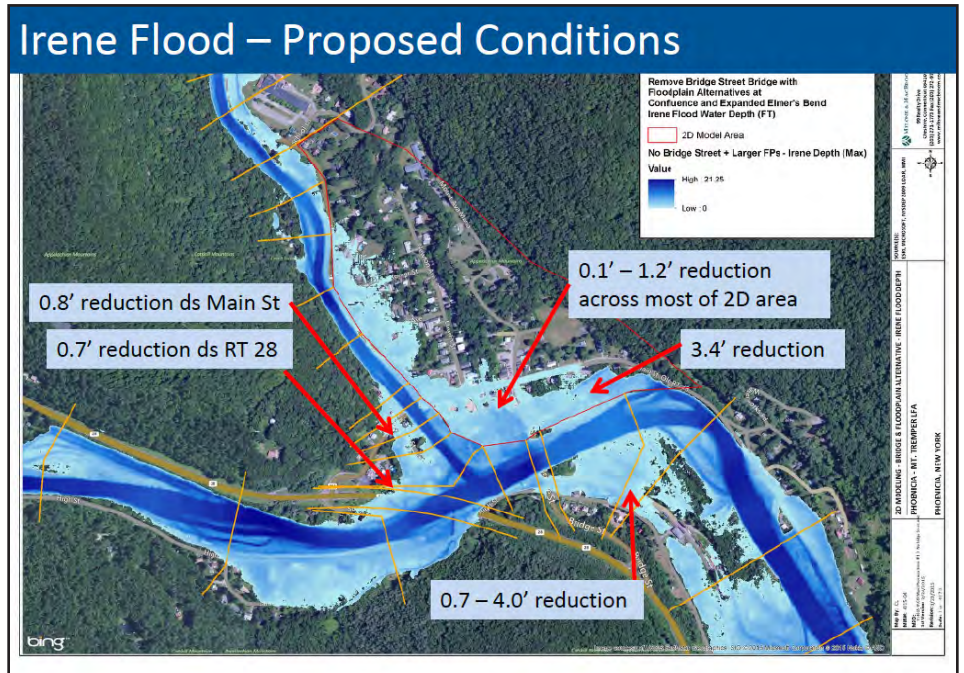
### Floodplain Creation and Bridge Replacement



This floodplain enhancement scenario includes replacement of the Bridge St. bridge with a larger structure.

FLOODPLAIN ENHANCEMENT (excavating within the existing floodplain to increase flood flow conveyance) was analysed along both banks of Esopus Creek and Stony Clove Creek in several configurations. The configuration that yielded the

greatest flood reduction benefit involves floodplain enhancement on both sides of Esopus Creek and the left bank of Stony Clove Creek, in combination with the replacement of the Bridge Street bridge with a larger structure.



For this scenario the benefits outweigh the costs: Benefits = \$10,181,582, Costs = \$10,022,638.

*Alternatives that yielded a benefit-cost ratio greater than 1.0 were floodplain enhancement in Phoenicia (with replacement of the Bridge St. bridge) and floodplain enhancement along the Esopus Creek in Mt. Tremper*

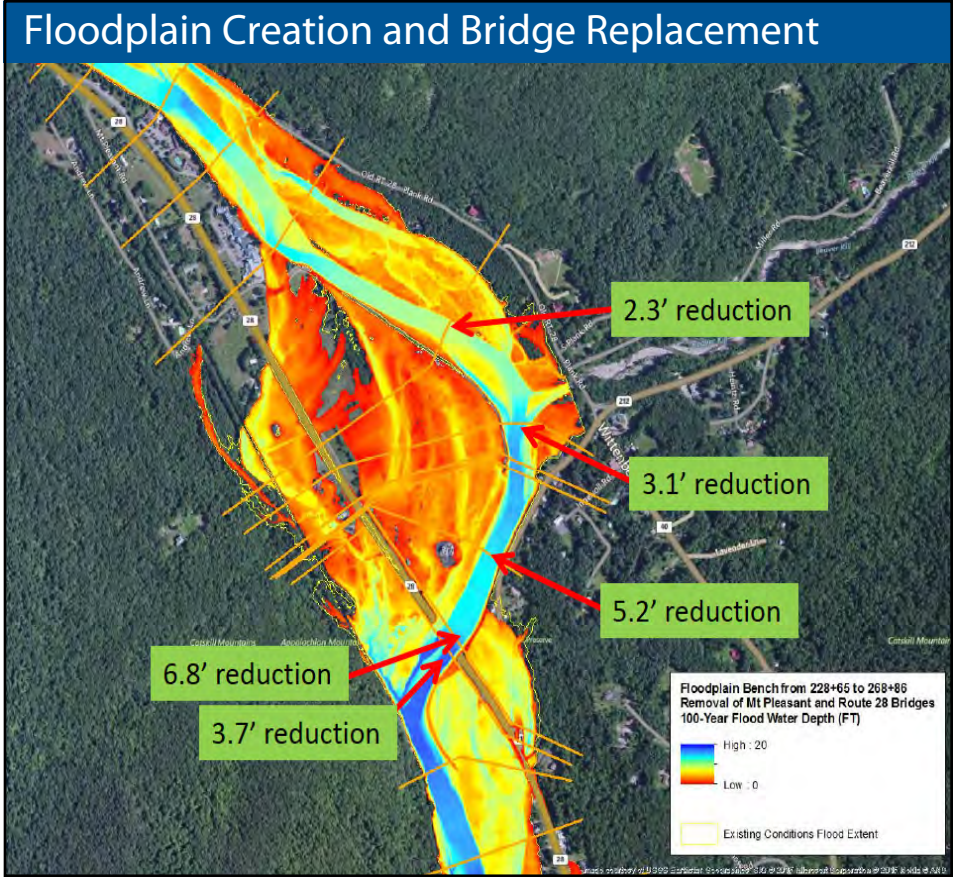
The following actions were recommended for both the Phoenicia and Mt. Tremper study areas:

- Seek to relocate the most flood-vulnerable properties where there is owner interest and funding available.
- Move existing structures out of the floodway.
- Some of the homes in the floodplain are rarely flooded. Residents and businesses may benefit from minor individual property improvements (see below).
- Investigate and address flooding associated with under-sized culverts and smaller drainageways.
- Work with property owners to secure or relocate fuel tanks to eliminate sources of potential contamination (funding is available from the Catskill Watershed Corporation).
- Work to identify and remove vacant and abandoned structures to prevent future hazards.

Potential property protection measures include (funding sources vary):

- Elevation of a structure.
- Construction of property improvements such as barriers and floodwalls (contact the local Floodplain Administrator about permit requirements; not funded by AWSMP, CWC or FEMA).
- Dry floodproofing of a structure to keep floodwaters from entering.
- Wet floodproofing to allow floodwaters to pass through the lower area of a structure unimpeded.
- Performing other home improvements to mitigate damage from flooding, such as relocating valuables and elevating utilities.

**MOUNT TREMPER**



The benefits outweigh the costs for the floodplain enhancement alone (a ratio of 1.63).

OF THE VARIOUS Route 28 bridge configurations modeled, the greatest flood reduction benefit resulted from removal of road embankments on both sides of the Esopus Creek and replacement with a larger structure that would span the entire floodplain area. Floodplain enhancement would occur along 3,400 linear feet of the Esopus Creek channel on the inside of the bend just downstream of the Emerson Resort, as well as 1,800 linear feet of the channel on the inside of the bend just downstream of the Route 28 bridge.

The combined flood reduction benefits of floodplain enhancement and bridge replacement under a range of flows are substantial, and MMI recommended the Town pursue this option over the long-term.

The scenarios that were examined within the Mt. Tremper study area are:

1. Removal of Accumulated Sediment Bars in Esopus Creek

2. Mt. Tremper Dredging of Esopus Creek
3. Mt. Pleasant Bridge Removal
4. Route 28 Bridge Replacement
5. Enhance Levee in Place by Increasing its Height
6. Levee Relocation Scenarios
7. Mt. Tremper Floodplain Enhancement on Esopus Creek with/without Route 28 Bridge Replacement
8. Floodplain Bench on Beaver Kill
9. Plank Road Bridge Replacement

TO REVIEW the full range of options evaluated in both Phoenicia and Mt. Tremper and how benefits and costs were derived, view or download the full *Local Flood Analysis Report for Phoenicia and Mt. Tremper* at:

<http://ashokanstreams.org/publications-resources/>

Sources: Final Draft Local Flood Analysis Report for Phoenicia and Mt. Tremper, Milone & MacBroom, Inc.