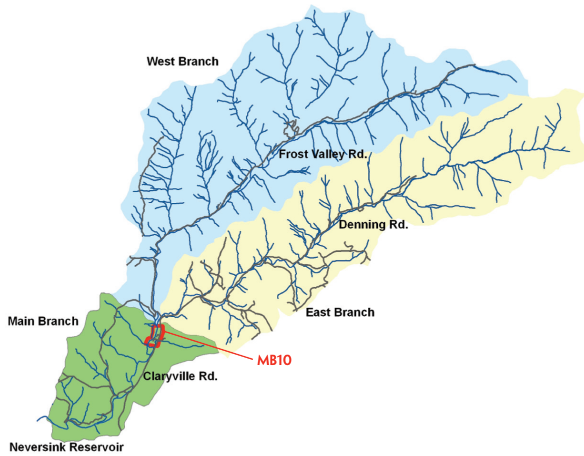
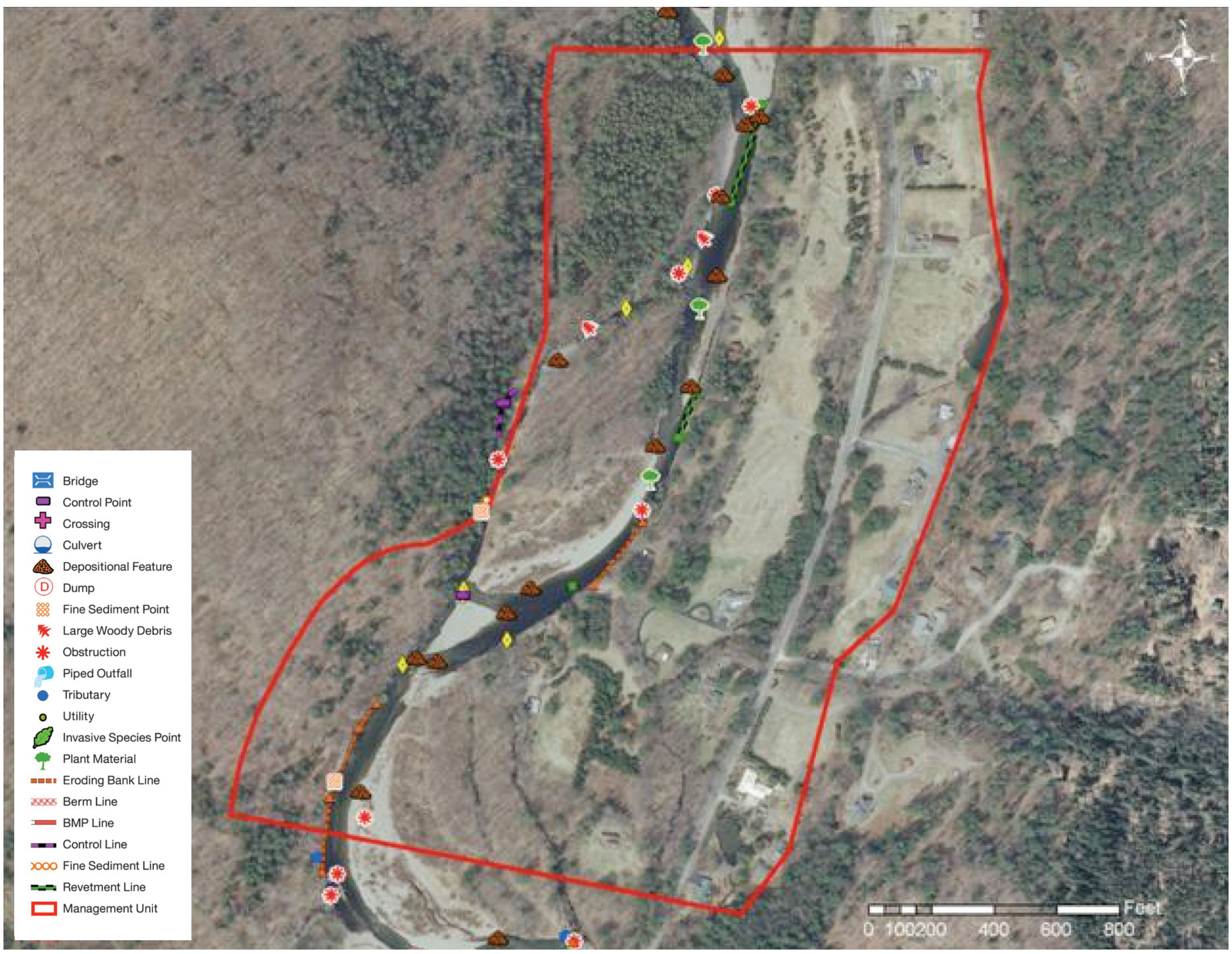
Neversink River Main Branch

MANAGEMENT UNIT 10

STREAM FEATURE STATISTICS

- 11 % of stream length is experiencing erosion
- 8.42 % of stream length has been stabilized
- 0.15 acres of inadequate vegetation within the 100 ft. buffer
- 0 ft. of stream is within 50 ft. of the road
- 4 structures located within the 100-year floodplain boundary





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

This management unit begins a the confluence of the east and west branches of the Neversink River and continues approximately 3,065.7 ft. downstream to an unnamed tributary confluence on the right bank. The drainage area ranges from 62.0 mi^2 at the top of the management unit to 63.20 mi^2 at the bottom of the unit. The valley slope is 0.68 %. The average valley width is 1439.03 ft.

Summary of Recommendations
Main Branch Management Unit 10

Intervention Level	Assisted restoration of the bank erosion site between Station 28080 and Station 28020. Passive restoration of the bank erosion between Station 27220 and Station 26680.
Stream Morphology	Protect and maintain sediment storage capacity and floodplain connectivity. Conduct baseline survey of channel morphology.
Riparian Vegetation	Improve riparian buffer from: Station 28900 to Station 28020; 28080 to Station 28020.
Infrastructure	None.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	Flood proofing as appropriate. http://www.fema.gov/library/viewRecord.do?id=1420
Water Quality	Maintain household septic systems.
Further Assessment	Long-term monitoring of erosion sites.

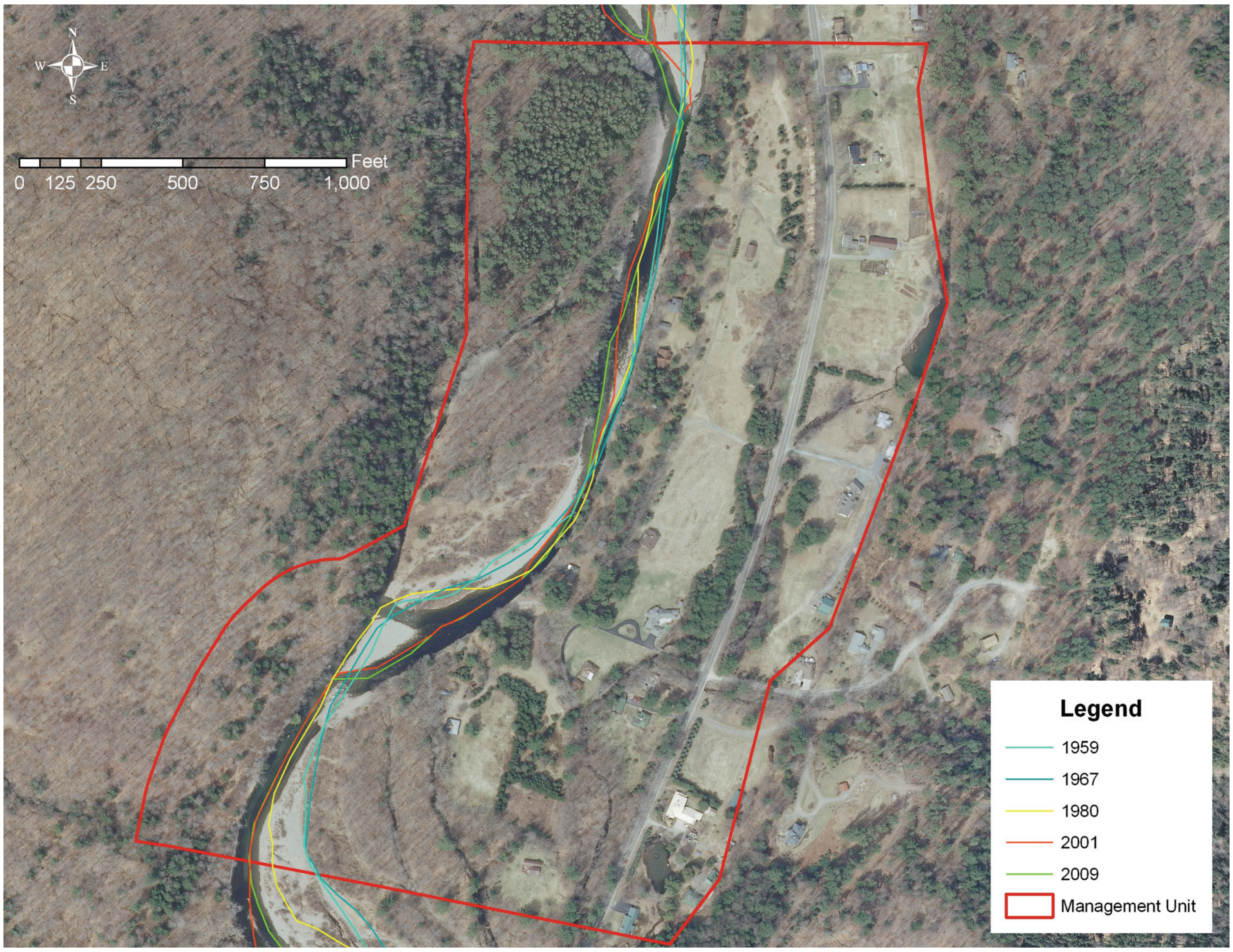
Historic Conditions

As the glaciers retreated about 12,000 years ago, they left their “tracks” in the Catskills. See Section 2.4 *Geology of Upper Neversink River,* for a description of these deposits. These deposits make up the soils in the high banks along the valley walls on the Neversink mainstem and its tributaries. These soils are eroded by moving water, and are then transported downstream by the River. During the periods when the forests of the Neversink watershed were heavily logged for bark, timber, firewood and to make pasture for livestock, the change in cover and the erosion created by timber skidding profoundly affected the Neversink hydrology and drainage patterns.

Excerpt from 1875 Beers Map (Figure 2)

The 1875 Beers Atlas of this area indicates that by that time, the stream had been harnessed for manufacturing, primarily saw mills, woodworking shops and tanneries *(Figure 2).* Raceways were built in the floodplains to divert water to ponds for use as needed. Floodplains were profoundly altered in the process, as these watercourses also became areas of preferential channelized flow when floodwaters inundated the floodplains. When woody debris jams blocked the primary channels, these raceways sometimes eroded out to become major secondary channels, or even took over the full flow to become a new primary watercourse.

During large runoff events, floodplains adjacent to the confluence of major tributaries receive large slugs of material eroded out of the steep streams draining the valley walls. overwhelmed the Neversink’s ability to transport it, creating an alluvial fan. Like changes in the floodplains made by humans, these episodes can result in catastrophic shifts in channel alignment. In the roughly one hundred and twenty centuries since the retreat of the glaciers, the position of Neversink River has moved back and forth across its floodplain numerous times in many locations. A comparison of historical channel alignments *(Figure 3, following page)* and in-stream observations made during a stream feature inventory in 2010 *(Figure 1, page 1)* indicate significant lateral channel instability, and foiurteen NYS Article 15 stream disturbance permits have been issued in this management unit, according to records available from the NYSDEC DART database (**http://www.dec.ny.gov/cfmx/extapps/envapps/**).



Historical channel alignments from five selected years (Figure 3)

Stream Channel and Floodplain Current Conditions

The following description of stream morphology references stationing in the foldout Figure 4. "Left" and "right" references are oriented looking downstream, photos are also oriented looking downstream unless otherwise noted. Stationing references, however, proceed upstream, in feet, from an origin (Station 0) at the confluence with the Neversink Reservoir. Italicized terms are defined in the glossary. This characterization is the result of surveys conducted in 2010.

The first 250 feet of this management unit is characterized by depositional features formed by the confluence of the East and West Branch. Backwatering associated with the joining of two flows reduces the flow rate at a confluence, leading to decreased sediment transport capacity. As a result, confluences typically exhibit bar formation, channel shifting, and a resetting of vegetation growth after each major flood event. Depositional bars on both the right and left banks from Station 29800 to Station 29550 are variously sorted with sand, gravel and cobble. The bars feature scattered grass, sedge and shrub growth. Within this reach the right bank is a low vegetated terrace below the *bankfull* elevation. Several woody debris piles scattered throughout this terrace indicate that it is regularly flooded. The left bank is at a slightly higher elevation, and is developed with residential structures close to the edge of the bank, including four structures at least partially within the FEMA-mapped 100-year floodplain. The bank along these structures is revetted with large dumped or stacked rip-rap at the upstream end from Station 28900 to Station 28020 and is eroding at the unprotected downstream end. *(B394, B400).*

Looking upstream, large stacked revetment on left bank (B394)

Erosion at downstream end of large revetment on left bank (B400)

At Station 29100 on the right bank there is a channel diversion where the floodplain terrace elevation drops. At the time of the stream feature inventory during the summer of 2010 the side channel was free of leaf debris indicating that the channel had received flow during winter and spring flood events. In addition, woody debris has accumulated associated with occasional flow into this side channel. This side channel flows through the floodplain on the right until it is confined by the right valley wall, where it follows a bedrock ledge for 45 ft.

At the divergence a cobble center bar has formed in the main channel from Station 29300 to Station 29100 *(B398).* This *aggradation* is due to the loss of sediment transport capacity caused by the divergence of flows.

Looking downstream at large cobble center bar (B398)

Proceeding downstream, the main channel bends to the right along a long point bar, with 254 ft. of erosion along the left bank, from Station 28080 to Station 28020. *(B406)* until it rejoins the right channel thread at the valley wall. At Station 27700, the right channel thread reconverges with the main channel, with significant deposition of sand, gravel and cobble. *(A076, A080)*.

Recommendations for this reach of the Neversink River include assisted restoration of eroding and revetted bank as appropriate, and improvement of the *riparian* buffer. However, this reach is likely to require ongoing management due to the confluence at the upstream end and the divergence at the downstream end.

The relic millrace discussed in the history section above conveys significant flows during large flood events causing minor erosion in MBMU9. Further investigation of this channel in MBMU10 is recommended to determine how to best manage these impacts.

Downstream of the convergence the main channel begins a wide meander to the left. Upstream of this meander, a forested floodplain is formed on the left bank that features several flood chutes including two well-defined side channels. *(B411)* Across from the left bank floodplain on the

Erosion on left bank (B406)

Downstream view of convergence (A076)

Looking upstream at convergence and cobble center bar (A080)

Side channels on left bank (B411)

Erosion and fine sediment on right bank (A84)

outside of the meander bend 449 feet of the bank is eroding exposing alluvial materials, from Station 27220 to Station 26680. This bank was identified as a fine sediment source. Sedge has established at the toe of the eroding bank indicating that the bank is beginning to stabilize. However, this is not preventing entrainment of fine sediments higher on the bank slope. *(A84)* It is anticipated that this bank will revegetate and stabilize without treatment (passive restoration). However, it is recommended that this site be monitored for changes in condition.

It is recommended that this entire MU be included in a comprehensive Local Flood Hazard Mitigation Analysis to investigate hydraulics and sediment transport in the stream corridor, from Station 10500 on the East Branch, upstream of Sawmill Road through Station 14800 on the Mainstem, downstream of the Halls Mills covered bridge. The purpose of the analysis would be to develop a comprehensive solution for reducing flooding threats to this relatively dense population center of the Neversink Valley.

MBMU10 ends at Station 26800, where an unnamed tributary enters from the right.

Sediment Transport

Streams move sediment as well as water. Channel and floodplain conditions determine whether the reach aggrades, degrades, or remains in balance over time. If more sediment enters than leaves, the reach aggrades. If more leaves than enters, the stream degrades. (See Section 3.1 for more details on Stream Processes).

This management unit represents the beginning of a series of sediment storage reaches with well-connected floodplains m the confluence of the East and West Branches to a valley pinchpoint around Station 12000. Sediment is transported relatively effectively through the relatively steeper upstream and then, below the confluence, enters a lower valley slope where sediment is deposited. Storage reaches act as a "shock absorber", holding *bedload* delivered during large flow events in depositional bars and releasing it slowly over time in more moderate flood events. These depositional areas are very dynamic, with frequent lateral channel migration through bank erosion, *avulsions* and woody debris accumulations. Sediment storage reaches can result from natural conditions or as the unintended consequence of poor bridge design, check dams or channel overwidening. While such unpredictable conditions represent risks for nearby property owners, these dynamic disturbance regimes produce unique and diverse habitat patches, attracting equally diverse plant communities and wildlife. This is one process by which floodplains are created and maintained. Healthy undeveloped floodplains throughout the Neversink watershed reduce the velocity of higher flows thereby mitigating the threat of stream bank erosion and property damage during flood events.

To better understand sediment transport and sediment transport dynamics a baseline survey of channel form and function is recommended for this management unit..

Riparian Vegetation

One of the most cost-effective methods for landowners to protect streamside property is to maintain or replant a healthy buffer of trees and shrubs along the bank, especially within the first 30 to 50 ft. of the stream. A dense mat of roots under trees and shrubs bind the soil together, and makes it much less susceptible to erosion under flood flows. Mowed lawn does not provide adequate erosion protection on stream banks because it typically has a very shallow rooting system. Interplanting with native trees and shrubs can significantly increase the working life of existing rock rip-rap placed on stream banks for erosion protection. Riparian, or streamside, forest can buffer and filter contaminants coming from upland sources or overbank flows. Riparian plantings can include a great variety of flowering trees and shrubs, native to the Catskills, which are adapted to our regional climate and soil conditions and typically require less maintenance following planting and establishment.

Some plant species that are not native can create difficulties for stream management, particularly if they are invasive. Japanese knotweed (Fallopia japonica), for example, has become a widespread problem in recent years. Knotweed shades out other species with it's dense canopy structure (many large, overlapping leaves), but stands are sparse at ground level, with much bare space between narrow stems, and without adequate root structure to hold the soil of stream banks. The result can include rapid stream bank erosion and increase surface runoff impacts. There were no occurrences of Japanese knotweed documented in this management unit during the 2010 inventory.

An analysis of vegetation was conducted using aerial photography from 2001 and field inventories *(Figure 5)*. In this management unit, the predominant vegetation type within the 100 ft. riparian buffer is Herbaceous vegetation (32%) followed by Deciduous Closed Tree Canopy (30%). *Impervious* area (4%) within this unit's buffer is primarily Claryville Road. There are 30.4 acres of potential buffer improvement area in this management unit *(Figure 7)*.

There are19.39 acres of wetland (21% of MBMU10 land area) within this management unit mapped in the National Wetland Inventory as two distinct classifications (see Section 2.5, *Wetlands and Floodplains* for more information on the National Wetland Inventory and wetlands in the Neversink watershed). Wetlands are important features in the landscape that provide numerous beneficial functions including protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters, and maintaining surface water flow during dry periods (See Section 2.5 for wetland type descriptions and regulations). The wetland classified as Riverine is 9.22 acres in size, and the wetland classified as Freshwater Forested Shrub is 9.87 acres in size.

Flood Threats

INUNDATION As part of its National Flood Insurance Program (NFIP), the Federal Emergency Management Agency (FEMA) performs hydrologic and hydraulic studies to produce Flood Insurance Rate Maps (FIRM), which identify areas prone to flooding. Four structures are located in the 100-year floodplain here. The upper Neversink River is scheduled to have its FIRMs updated with current surveys and hydrology and hydraulics analysis in the next few years, and the mapped boundaries of the 100-year floodplain are likely to change.

Four structures in MBMU10 lie at least in part within the 100-year floodplain as identified on the FIRM maps. Due to the relatively low elevation of the terrace on the left bank, the risk of flood inundation is relatively high for most of the households in this management unit. FEMA provides guidance to homeowners on floodproofing at: http://www.fema.gov/library/viewRecord.do?id=1420

BANK EROSION Due to the a number of conditions in MBMU10, the stream banks within the management unit are at a relatively high risk of erosion. Two areas of erosion were documented during the stream feature inventory. The first, running 254 ft. along the left bank from Station 28080 to Station 28020, is the result of hydraulic erosion of the toe of the bank. *Assisted restoration* practices are recommended for this site. The second, 449 feet along the right bank from Station 27220 to Station 26680, is also caused by fluvial erosion of the toe; this bank was identified as a source of fine sediment. There is some evidence of reestablishment of sedges at the toe. *Passive restoration* is recommended for this site.

INFRASTRUCTURE 8.42% (517 ft.) of the stream bank length in this management unit has been treated with some form of stabilization. The revetment on the left bank from Station 29650 to Station 29310 is in good functional condition and appears to be a recently placed. This revetment was constructed with dumped or placed boulder rip-rap. Similarly, the revetment on the left bank from Station 28700 to Station 28540 is in also in good functional condition and new structural condition, made of dumped or placed rip-rap designed to protect nearby residential property. There were no berms documented in this Management Unit.

Aquatic Habitat

Aquatic habitat is one aspect of the Neversink River ecosystem. While ecosystem health includes a broad array of conditions and functions, what constitutes "good habitat" is specific to individual species. When we refer to aquatic habitat, we often mean fish habitat, and specifically trout habitat, as the recreational trout fishery in the Catskills is one of its signature attractions for both residents and visitors. Good trout habitat, then, might be considered one aspect of "good human habitat" in the Neversink River valley.

Even characterizing trout habitat is not a simple matter. Habitat characteristics include the physical structure of the stream, water quality, food supply, competition from other species, and the flow regime. The particular kind of habitat needed varies not only from species to species, but between the different ages, or life stages, of a particular species, from eggs just spawned to juveniles to adults.

New York State Department of Environmental Conservation (DEC) classifies the surface waters in New York according to their designated usses in accordance with the Clean Water Act. The following list summarizes those classifications applicable to the Neversink River.

1. The classifications A, AA, A-S and AA-S indicate a best usage for a source of drinking water, swimming and other recreation, and fishing.
2. Classification B indicates a best usage for swimming and other recreation, and fishing.
3. Classification C indicates a best usage for fishing.
4. Classification D indicates a best usage of fishing, but these waters will not support fish propagation.

Waters with classifications AA, A, B and C may be designated as trout waters (T) or suitable for trout spawning (TS). These designations are important in regards to the standards of quality and purity established for all classifications. See the DEC Rules & Regulations and the Water Quality Standards and Classifications page on the NYSDEC web site for information about standards of quality and purity.

In general, trout habitat is of a high quality in the Neversink River. The flow regime above the reservoir is unregulated, the water quality is generally high (with a few exceptions, most notably low pH as a result of acid rain; see Section 3.1, *Water Quality*), the food chain is healthy, and the evidence is that competition between the three trout species is moderated by some *partitioning* of available habitat among the species. Both the mainstem and the unnamed tributary in MBMU1 have been given a "B(T)" class designation, supporting swimming and fishing, and indicating the presence of trout. Trout spawning likely occurs in this management unit, but has not yet been documented in the DEC classification.

Channel and floodplain management can modify the physical structure of the stream in some locations, resulting in the filling of pools, the loss of stream side cover and the homogenization of structure and hydraulics. As physical structure is compromised, inter-species competition is increased. Fish habitat in this management unit appears to be relatively diverse.

It is recommended that a population and habitat study be conducted on the Neversink River, with particular attention paid to temperature, salinity, riffle/pool ratios and quality and in-stream and canopy cover.

Water Quality

The primary potential water quality concerns in the Neversink as a whole are the contaminants contributed by atmospheric deposition (nitrogen, sulfur, mercury), those coming from human uses (nutrients and pathogens from septic systems, chlorides (salt) and petroleum by-products from road runoff, and suspended sediment from bank and bed erosion. Little can be done by stream managers to mitigate atmospheric deposition of contaminants, but good management of streams and floodplains can effectively reduce the potential for water quality impairments from other sources.

Storm water runoff can have a considerable impact on water quality. When it rains, water falls on roadways and flows untreated directly into the Neversink River. The cumulative impact of oil, grease, sediment, salt, litter and other unseen pollutants found in road runoff can significantly degrade water quality. While there are no piped outfalls that convey storm water runoff directly into the Neversink River in this management unit, the proximity of Claryville Road to the channel provides some risk of storm water runoff reaching the river during storm events.

Sediment from stream bank and channel erosion pose a potential threat to water quality in the Neversink River. Clay and sediment inputs into a stream may increase *turbidity* and act as a carrier for other pollutants and pathogens. There is one bank erosion site in MBMU10 that is a potential minor source of fine sediment.

Nutrient loading from failing septic systems is another potential source of water pollution. Leaking septic systems can contaminate water making it unhealthy for swimming or wading. Four residences are located in relatively close proximity to the stream channel in this management unit. These homeowners should inspect their septic systems annually to make sure they are functioning properly. Each household should be on a regular septic service schedule to prevent over-accumulation of solids in their system. Servicing frequency varies per household and is determined by the following factors: household size, tank size, and presence of a garbage disposal. Pumping the septic system out every three to five years is recommended for a three-bedroom house with a 1,000-gallon tank; smaller tanks should be pumped out more often.

The New York City Watershed Memorandum of Agreement (MOA) allocated 13.6 million dollars for residential septic system repair and replacement in the West-of-Hudson Watershed through 2002, and the program was refunded in 2007. Systems eligible included those that are less than 1,000-gallon capacity serving one-or-two family residences, or home and business combinations, less than 200 feet from a watercourse. Permanent residents are eligible for 100% reimbursement of eligible costs; second homeowners are eligible for 60% reimbursement. For more information, call the Catskill Watershed Corporation at 845-586-1400, or see **http://www.cwconline.org/programs/septic/septic_article_2a.pdf.**

Community Comments
Fall 2012

"Interested in stream bank protection, channel maintenance and new FEMA flood maps"

"flooded in 2010 and 2011"

Alyssa Seclen property is Michael Hafner

"flooded 3 times in last 40 years"

"flooded 2011 and 2012"

"Interested in channel maintenance (cut the trees and remove the gravel)"

"flooded 2 times last 2 years"

*"Interested in stream bank protection, elevating my residence,
channel maintenance and new FEMA flood maps"*

"Interested in stream bank protection, channel maintenance and new FEMA flood maps"

"While I appreciate that your concerns are big picture and long term health of the Neversink, those of us who live along the river and were flooded twice in 13 months, are more concerned with what immediate steps can be taken to prevent another flood in the next few months. We are less concerned with water quality, fish and wildlife habitat, vegetation, cobble bars, etc... Your study does mention that another cause of flooding in the MU is the earlier diversion of the river to supply water to the tannery factory near the Claryville road. It appears to me that a berm or dike could be constructed along that stretch to contain the river in its main channel. Such a step, in conjunction with diversion of the West Branch, could eliminate or greatly reduce the threat of flooding."

*"All of the debris on the right bank needs to be removed...
Major dredging is needed to deepen channel and increase the rate of flow."*

"There is no mention of deepening the channel"