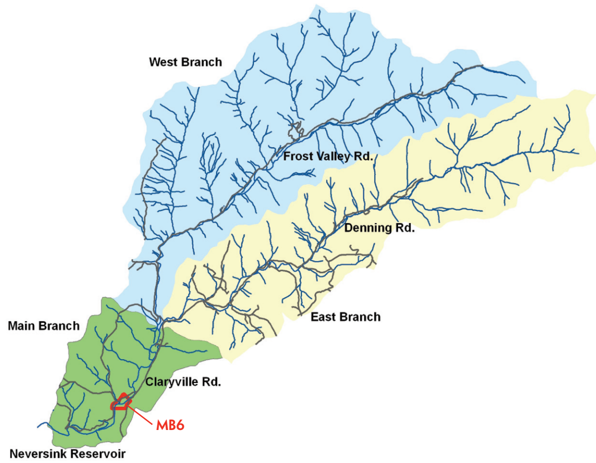
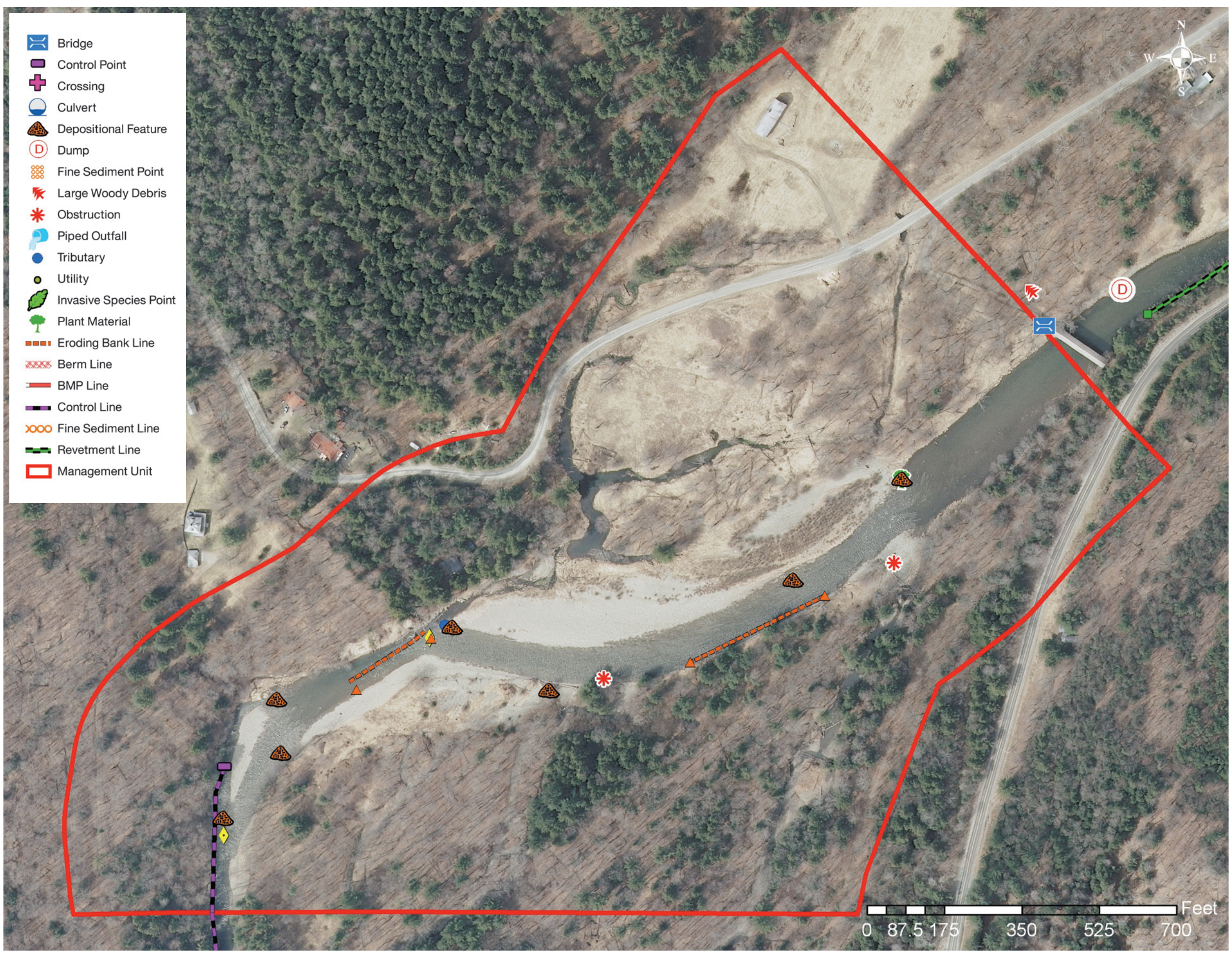
Neversink River Main Branch

MANAGEMENT UNIT 6

STREAM FEATURE STATISTICS

- 15% of stream length is experiencing erosion
- 16.09% of stream length has been stabilized
- 13.76 acres of inadequate vegetation within the 100 ft. buffer
- None of stream is within 50 ft. of the road
- There are no structures located within the 100-year floodplain boundary





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

This management unit begins at a change in valley type at Station 14800, continuing approximately 2,522 ft. to a private bridge crossing at Station17200. The drainage area ranges from 66.6 mi^2 at the top of the management unit to 67.9 mi^2 at the bottom of the unit. The valley slope is 1.65 %. The average valley width is 1386.15 ft.

Summary of Recommendations Main Branch Management Unit 6

Intervention Level	Passive Restoration of the left bank erosion site (BEMS NMB6_16200). Recommended Assisted Restoration via bioengineering of the right bank erosion site (BEMS NM6_15400).
Stream Morphology	Conduct baseline survey of channel morphology. Conduct assessment channel evolution at gauge.
Riparian Vegetation	Riparian buffer vegetation improvement as appropriate.
Infrastructure	Assess culverts conveying flow from side channels and tributaries under Hunter Road for possible upgrade.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	Assess threats to structures in 100-year floodplain of unnamed tributary.
Water Quality	Restore and monitor BEMS sites.
Further Assessment	Include MU6 in comprehensive Local Flood Hazard Mitigation Analysis of Claryville MUs.

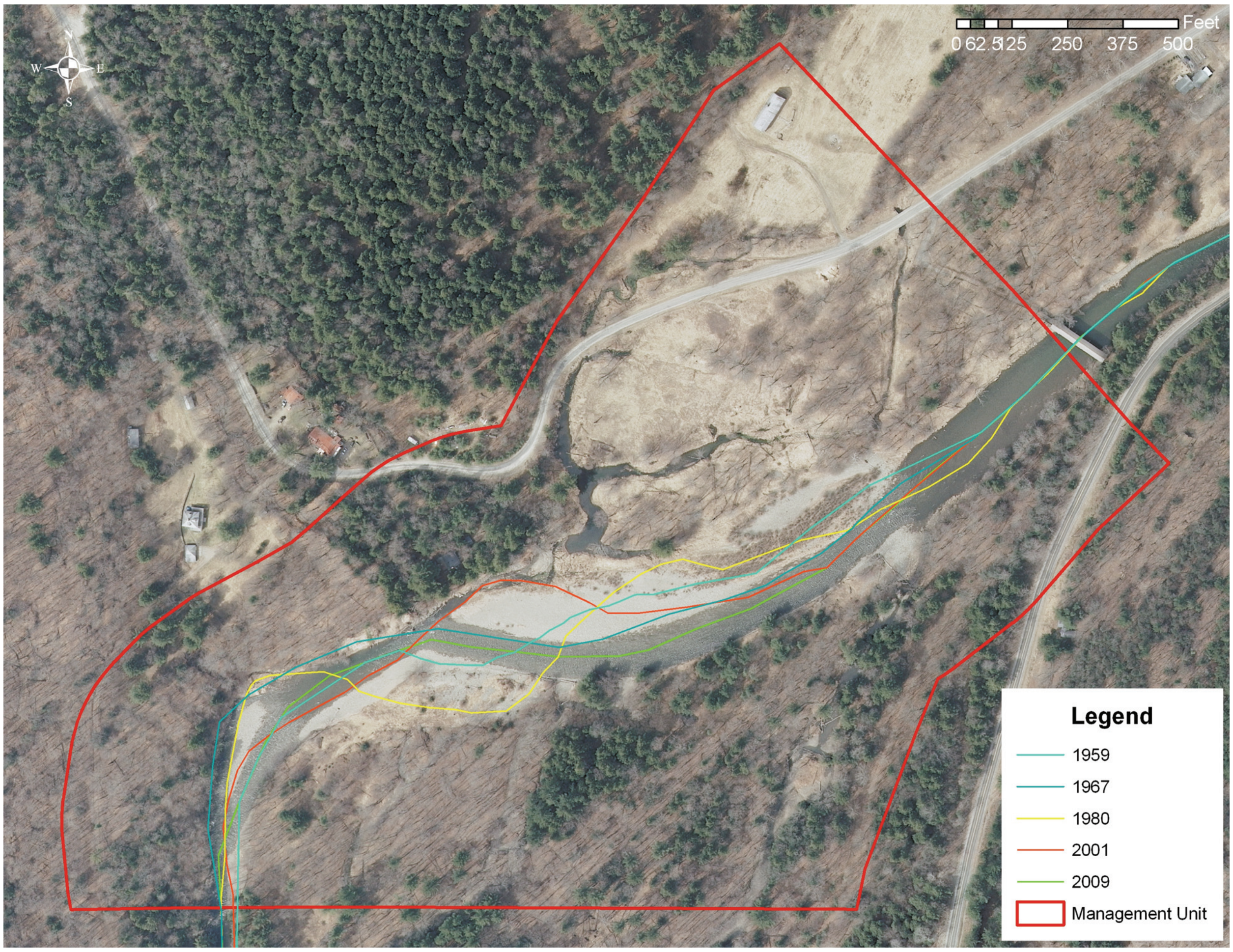
Historic Conditions

Excerpt from 1875 Beers Map (Figure 2)

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.

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 3 NYS Article 15 stream disturbance permit has 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.

This management unit begins 50 feet downstream of the covered bridge located at Station 17350. A USGS gauge, Station 01435000 'Neversink River Near Claryville, NY', is located in a pool at this site upstream of a riffle in the main channel at Station 16800. Part of the flow from the side channel that diverged in MBMU8 rejoins the main channel at Station 16820; the remainder of the flow travels on the north side of Hunter road and converges downstream. During high flow events these flows backwater, resulting in a flood hazard along Hunter Road.

Woody debris jam on left bank at divergence with side channel (A188)

A depositional point bar also begins on the right bank at this location forming the inside of a meander bend. The point bar is vegetated with grass, sedge and willows which were documented as a potential plant source for future restoration projects in the watershed. *(A188)* Slightly downstream at Station 16680 an accumulation of woody debris was observed on the left bank as well as the divergence of a side channel with significant flow into the left floodplain. This is one of the several divergences into this floodplain, providing evidence that the floodplain features many braided flood chutes and is likely inundated during flood events.

Stabalizing left bank (B488)

Approximately 100 feet downstream of the woody debris a 340-foot long segment of bank erosion was observed on the left bank from Station 16540 to Station 16200 (BEMS NMB6_16200) Sedge has established at the toe of the eroding bank indicating that the bank is beginning to stabilize. *(B488)* The riparian corridor is well-vegetated in this location, therefore it is anticipated that this bank will revegetate and stabilize without treatment (passive restoration). It is recommended that this site be monitored for changes in condition. In addition, there is some undercutting of the vegetated left bank apex of the meander bend evidenced by a downed tree at Station 16020. *(B490)*

Undercutting of left bank and downed tree (B490)

Cobble point bar on left bank (B491)

Upstream view of convergence of side channel (A190)

Dumped rock revetment on right bank (A191)

Hydraulic erosion on right bank exposing glacial outwash (A199)

Directly downstream of the apex the main channel curves back to the right, and a vegetated cobble point bar begins on the left bank, extending from Station 15900 to Station 15200. This point bar is vegetated with trees and shrubs. (491) At the apex of this meander, documented near Station 15600, several unnamed tributaries join the main channel conveying drainage from Blue Hill and the side channel that diverged in MBMU8. *(A190)* The right bank of the main channel is revetted with dumped rock to protect a residence 60 feet upslope. This revetment which appears to be in poor functional condition may also be stabilizing the confluence of the main channel and the tributaries conveying drainage off Blue Hill *(A191)*. FEMA Flood Insurance Rate Maps indicate that the 100-year flows from this tributary inundate adjacent residences along Hunter Road.

Directly downstream of the tributary confluence erosion was observed on the right bank for 204 feet from Station 15604 to Station 15400 (BEMS NM6_15400). This erosion segment was documented as 45 feet high featuring hydraulic erosion via fluvial entrainment which has exposed glacial outwash. *(A199)*

Recommendations for this site include investigation of the tributaries conveying drainage off Blue Hill as well as the side channel in the right floodplain and the adequacy of all of the culverts conveying flow under Hunter Road and Blue Hill Road. Based on the geology observed in the eroding bank, it is likely that these tributaries have the potential to incise, which could have several impacts including further destabilization of the bank nearby, conveyance of additional fine sediment to the main channel, and aggravation of conditions leading to flood hazards for Hunter Road.

Although there is established vegetation providing some protection of the bank at the toe, continued entrainment of toe materials is likely during high flow events. Recommendations for this site include *assisted restoration* using *bioengineering* techniques to stabilize the eroding bank. The vegetation on the point bar beginning upstream at Station 16800 could be a plant source for this bank restoration effort.

Around Station 15200 the channel in forced to the left by the right valley wall resulting in a depositional side bar along the right bank from Station 15300 to Station 15000 with some sedge vegetation *(A208)*. There is a side channel between the bar and exposed bedrock interspersed with woody vegetation beginning at Station 15100. This bedrock provides control on both the stream bed and bank for 1,057 feet through the end of MBMU6, ending at Station 14050 in MBMU5. *(A225)* For this section of MBMU6, and into the first third of MBMU5 the river is semi-confined, indicating that while flow is constrained by the exposed bedrock on the right bank, the main channel is fairly well connected to the floodplain on the left bank. This is confirmed by the several flood chutes and debris piles on the left bank through out this segment of the river.

Depositional side bar on right bank (A208)

Bedrock on right bank (A225)

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.

MBMU6 ends at Station 14800 as the main channel exits the wide meander to the right bank and continues in a relatively straight channel along the exposed bedrock into MBMU5.

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 is approaching the end of a series of sediment storage reaches occasionally punctuated by short transport reaches from the confluence of the East and West Branches to a valley pinchpoint around Station 12000. Transport reaches are in a state of *dynamic equilibrium,* effectively conveying sediment supplied from upstream during each flow event. 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, such as the depositional point bars throughout MBMU6, are very dynamic, with frequent lateral channel migration through bank erosion, *avulsions* and woody debris accumulations. This lateral migration is illustrated in MBMU6 by the multiple meander alignments that have dominated this management unit throughout the last forty years. This is one process by which floodplains are created and maintained. 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.

To better understand sediment transport dynamics of this section of the Neversink, a baseline survey of channel form and function is recommended for this management unit. In addition, long-term data collection (from 1937 to present) at the USGS gauge, Station 01435000 'Neversink River Near Claryville, NY', located at the beginning of this management unit, provides a unique opportunity to conduct an analysis of rates and trends in sediment storage at a specific point in the river over time. Analysis of these gauge records for channel evolution at this location is recommended.

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 deciduous-closed tree canopy (43.89%) followed by herbaceous vegetation (15.66%). *Impervious* area makes up 2.86% of this unit's buffer, and 11.6 acres of potential buffer improvement area were identified in the management unit *(Figure 7).*

There are 16.47 acres of wetland (27% of MBMU6 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 8.61 acres in size and the wetland classified as Freshwater Forested Shrub is 7.86 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. Two structures are located in the 100-year floodplain in this management unit. 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.

Two structures in MBMU6 lie within the 100-year floodplain of the main channel as identified on the FIRM maps. In addition three structures appear to be within the 100-year floodplain of the unnamed tributary that joins the main channel at Station 15600. Inundation of several sections of Hunter Road by flow in tributaries and side channels represents a significant threat to safety in this management unit. Assessment of culverts conveying these channels under Hunter Road is recommended. FEMA provides guidance to homeowners on floodproofing at: http://www.fema.gov/library/viewRecord.do?id=1420

BANK EROSION Due to a number of conditions in MBMU6, stream banks within this management unit are at a relatively high risk of erosion. Two areas of erosion were documented during the stream feature inventory. The first, running 340 ft. along the left bank from Station 16540 to Station 16200 (BEMS NMB6_16200), is the result of hydraulic erosion of the toe of the bank. 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. A second high bank 204 feet in length from Station 15604 to Station 15400 (BEMS NM6_15400) is also caused by erosion of the toe of the bank. Further erosion of this bank could threaten development upslope. While there is some evidence of reestablishment of sedges at the toe of the slope, assisted restoration using bioengineering techniques to stabilize the eroding bank and prevent further entrainment of fine sediments during high flow events is recommended for this site.

INFRASTRUCTURE Approximately 250 feet revetment was documented on the right bank downstream of the tributary confluence at Station 15600. This revetment was constructed with dumped or placed boulder rip-rap and was most likely designed to protect nearby residential property. Culvert conveying flow from side channels and tributaries under Hunter Road backwater during high flow conditions and should be assessed for possible upgrade. 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 flood chute in the left floodplain in MBMU6 have been given a "A(T)" class designation with best use as a source of drinking water, for use swimming and fishing, and indicating the presence of trout. The unnamed tributary in MBMU6 has 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 Hunter Road to the tributary that joins the main stem in this management unit 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 are two bank erosion sites in MBMU6 that are potential sources 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. Three structures are located in relatively close proximity to the tributary that join the mainstem in this management unit and one cabin is located directly adjacent to the main channel.. 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

"Small runoff stream is widening and flooding driveways above main channel"

"Bank erosion from recent Sandy precipitation"

"Interested in stream bank protection"