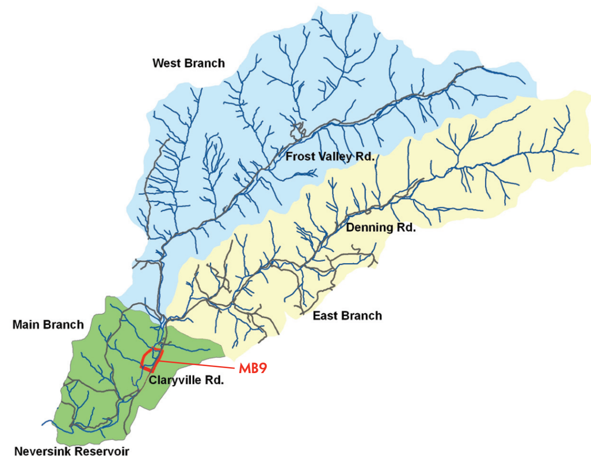
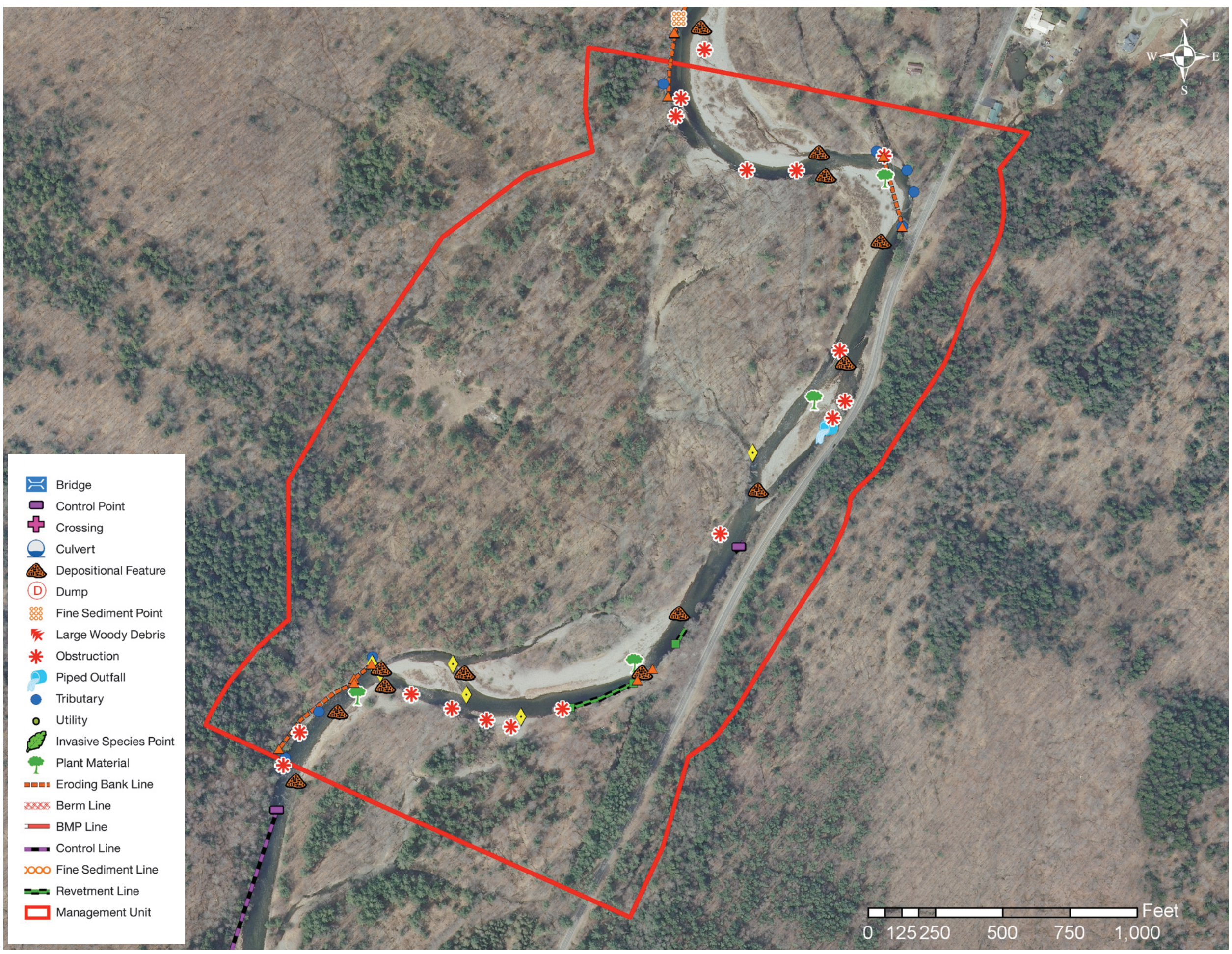
Neversink River Main Branch

MANAGEMENT UNIT 9

STREAM FEATURE STATISTICS

- 10 % of stream length is experiencing erosion
- 3.50 % of stream length has been stabilized
- 0.15 acres of inadequate vegetation within the 100 ft. buffer
- 1,650 ft. of stream is within 50 ft. of the road
- 0 structures located within the 100-year floodplain boundary





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

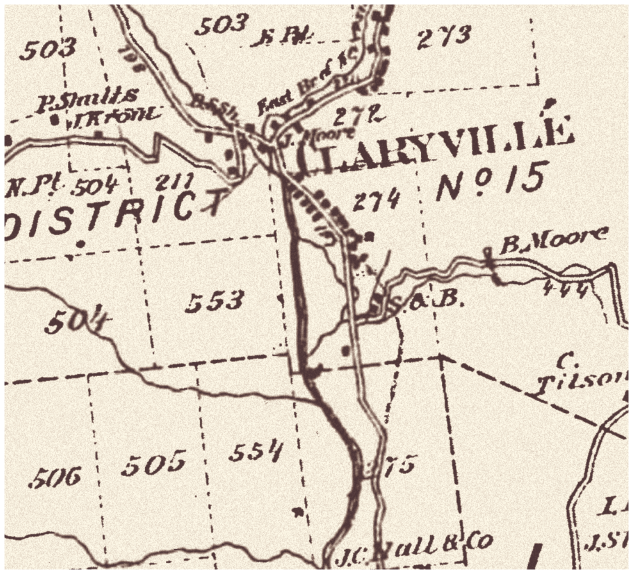
This management unit begins at an unnamed tributary confluence st Station 26750, continuing approximately 4,700 ft. to a confluence with another unnamed tributary. The drainage area ranges from 63.2 mi^2 at the top of the management unit to 65.57 mi^2 at the bottom of the unit. The valley slope is 1.13 %. The average valley width is 1950.47 ft.

Summary of Recommendations
Main Branch Management Unit 9

Intervention Level	Assisted restoration of the bank erosion site between Station 25800 and Station 25525. Analysis of need for channel realignment. Passive restoration of the bank erosion between Station 22550 and Station 22100.
Stream Morphology	Protect and maintain sediment storage capacity and floodplain connectivity. Conduct baseline survey of channel morphology.
Riparian Vegetation	Improve riparian buffer along Claryville Rd.
Infrastructure	Baseline survey of channel morphology and sediment transport analysis. Assess inundation threat to Claryville Rd.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	Assess inundation threat to Claryville Rd.
Water Quality	None.
Further Assessment	Long-term monitoring of erosion sites.

Historic Conditions

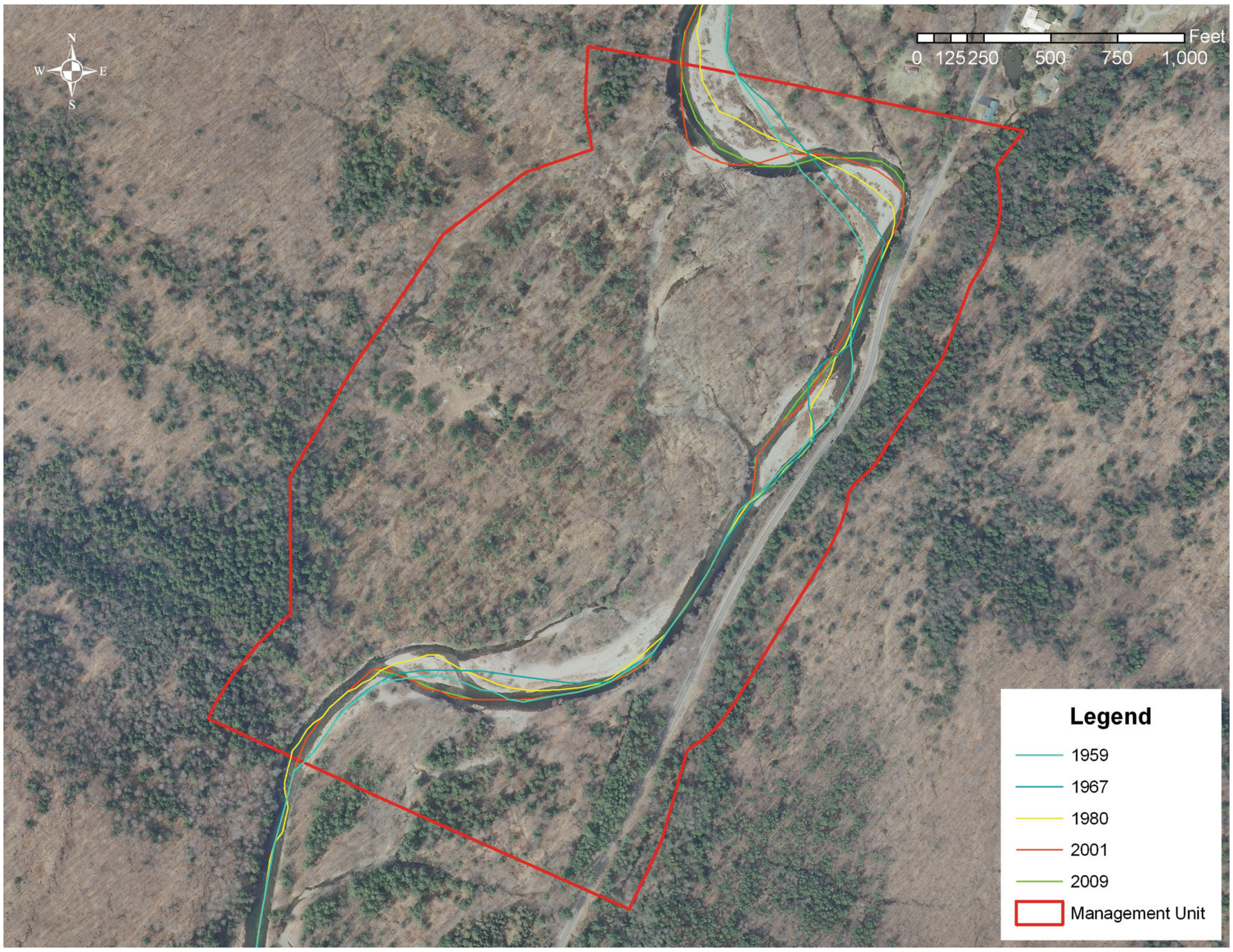
As the glaciers retreated about 12,000 years ago, they left their "tracks" in the Catskills. See Section 2.4 *Geology of Upper Neversink River,* for a description of these deposits. These deposits make up the soils in the high banks along the valley walls on the Neversink mainstem and its tributaries. 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 nine NYS Article 15 stream disturbance permits have 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 at Station 26790 as the channel bends to the left crossing the valley floor until it is deflected back down valley by the embankment of Claryville Road. The erosion of the left bank continues from MBMU10 for 127 feet. 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. *(A81)* 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.

On the outside of the meander bend there is a significant accumulation of woody debris which directs significant flow into a flood chute through the forested floodplain on the right bank, rejoining the mainstem at Station 24500. The floodplain is frequently inundated resulting in extensive large woody debris deposits was well as numerous braided flood chutes throughout.

On the inside of the meander bend as the mainstem meanders to the right and meets the Claryville Road embankment, the flood channels from the forested floodplain on the left bank in MBMU10 rejoin the main channel at Station 25800. The main channel is eroding the left bank between Station 25800 and Station 25525. A small unnamed tributary conveying flow parallel to Claryville Road converges with the mainstem from the left at Station 25650. *(B429)* This minor bank erosion has exposed alluvial materials including silt, sand and cobble. The tight meander curvature is resulting in severe toe scour, undercutting the root structure of a single line of mature trees along the road embankment. Since the bank is unlikely to stabilize without treatment under these conditions, any nearby infrastructure is threatened, including Claryville Road. *(B426)* The cobble bar forming the inside of this meander is heavily vegetated with willows and sedges, beaver activity was observed. *(A93)*

Fine sediment source on left bank (A81)

Woody debris directing flow into flood chute on right bank (A89)

Tributary converging with mainstem on left bank (B429)


Scour on left bank (B426)


Heavily vegetated cobble bar (A93)


Looking downstream, vegetated center bar (B433)


Erosion on left bank (B440)

Recommendations for this site minimally include *assisted restoration* using bioengineering techniques to stabilize the eroding bank. The willow growing on the cobble bar forming the inside of this meander could provide a source of materials for the restoration effort. This site should be assessed for possible full restoration including channel realignment to increase the radius of curvature of the meander at this location and reduce toe scour at the bank.

For the next 2,000 feet the mainstem flows adjacent to Claryville Road between Station 25600 and Station 23600. The Claryville Road embankment is protected by only a narrow riparian buffer. At station 24650 an 18" diameter corrugated metal culvert conveys road drainage from the left valley wall under Claryville Road as a piped outfall with no outfall protection or head wall. There are several significant large woody debris deposits throughout this relatively straight reach contributing to the development of a center bar from Station 24980 to Station 24400 that is vegetated with willow and sedge. *(B433)* At Station 24500 the flood chute that diverged toward the right valley wall at the beginning of the management unit rejoins the mainstem. From Station 23770 to Station 23720 there is bedrock exposed on the left bank that functions as a planform control and provides protection for the road embankment.

Small stack rock wall and berm in left flood plain (B439)

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.

Willow on point bar (A108)

As the channel begins a bend to the right to cross the valley floor, signs of instability were observed on the left bank, including several revetments, berms and undercut banks. Passive restoration is recommended for these bank segments. *(B440)* An unpaved access road runs adjacent to the main channel on the left side of the meander bend. The road bed is at an elevation that effectively blocks flow from the main channel from a former side channel and the associated floodplain downstream. This road berm likely reduces the threat of inundation of the field downstream during flood events. Observations included a small stacked rock wall and berm between Station 23800 and 23700, and 251 feet of placed rip-rap revetment between Station 23530 and Station 23290. *(B433, B439)* The point bar in the inside of this meander bend is vegetated with willow that could be used in bioengineering efforts. *(A108)* At Station 23100 the channel takes many routes throughout the valley floor. One branch forms a flood chute through the left forested floodplain; the mainstem divides around a center bar, with a second branch of the flood chute described above rejoining the mainstem at Station 22840. Several large woody debris deposits are scattered both along the left bank at the downstream extent of this meander bend and throughout the floodplain on the left bank. Beginning at Station 22550 the channel begins to meander to the left, restricted by the glacial

Moderate erosion on right bank (A121)

Woody debris at unnamed tributary on right bank (A125)

till terrace at the right valley wall, where moderate erosion was observed for approximately 460 feet to Station 22100, 50 feet upstream of the end of MBMU9. *(A121)* The downstream 350 feet of this bank is beginning to stabilize through deposition of cobbles and revegetation with grass and sedge at the toe. Three small unnamed tributaries enter from the right in this reach. An accumulation of woody debris was observed at Station 22200. *(A125)* MBMU9 ends at Station 22090.

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 a continuation of sediment storage reaches from the confluence of the East and West Branches to a valley pinchpoint around Station 12000. 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 Deciduous Closed Tree Canopy (43%) followed by Mixed closed Tree Canopy (18%). *Impervious* area (2%) within this unit's buffer is primarily Claryville Road. There are 15.5 acres of potential buffer improvement area in this management unit *(Figure 7)*.

There are 38 acres of wetland (31% of MBMU9 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 9.78 acres in size, and the wetland classified as Freshwater Forested Shrub (inland wetland without flowing water) is 28.24 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. 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.

Due to the relatively low elevation of the left bank immediately adjacent to Claryville Road, the risk of flood inundation is relatively high, threatening access of emergency service to residents. A baseline survey of channel morphology and a sediment transport analysis should be conducted to determine feasible flood hazard mitigation options.

BANK EROSION Due to the a number of conditions in MBMU9, stream banks at several locations within this management unit are at moderate risk of erosion. Two areas of erosion were documented during the stream feature inventory. The first, running 311 ft. along the left bank from Station 25800 to Station 25500, is the result of hydraulic erosion of the toe of the bank. *Assisted restoration* practices are recommended for this site. The second, 460 feet along the right bank from Station 25550 to Station 22100, is also caused by fluvial erosion of the toe. There is some evidence of reestablishment of sedges at the toe. *Passive restoration* is recommended for this site.

INFRASTRUCTURE 3.50% (329 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 23800 to Station 23722 is in good functional and structural condition. This revetment was constructed with stacked rock. The revetment on the left bank from Station 23530 and Station 23290, made of placed rip-rap is in fair functional and structural condition, and appears to be failing in some locations. There were no berms documented in this Management Unit.

Aquatic Habitat

Aquatic habitat is an important aspect of the Neversink River ecosystem, providing recreational, aesthetic, and economic benefits to the community. 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 MBMU9 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 are two bank erosion sites in MBMU9; neither is a potential 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. No structures 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**.