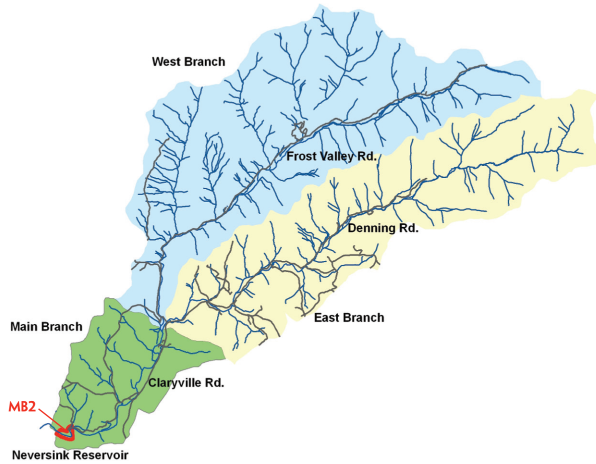
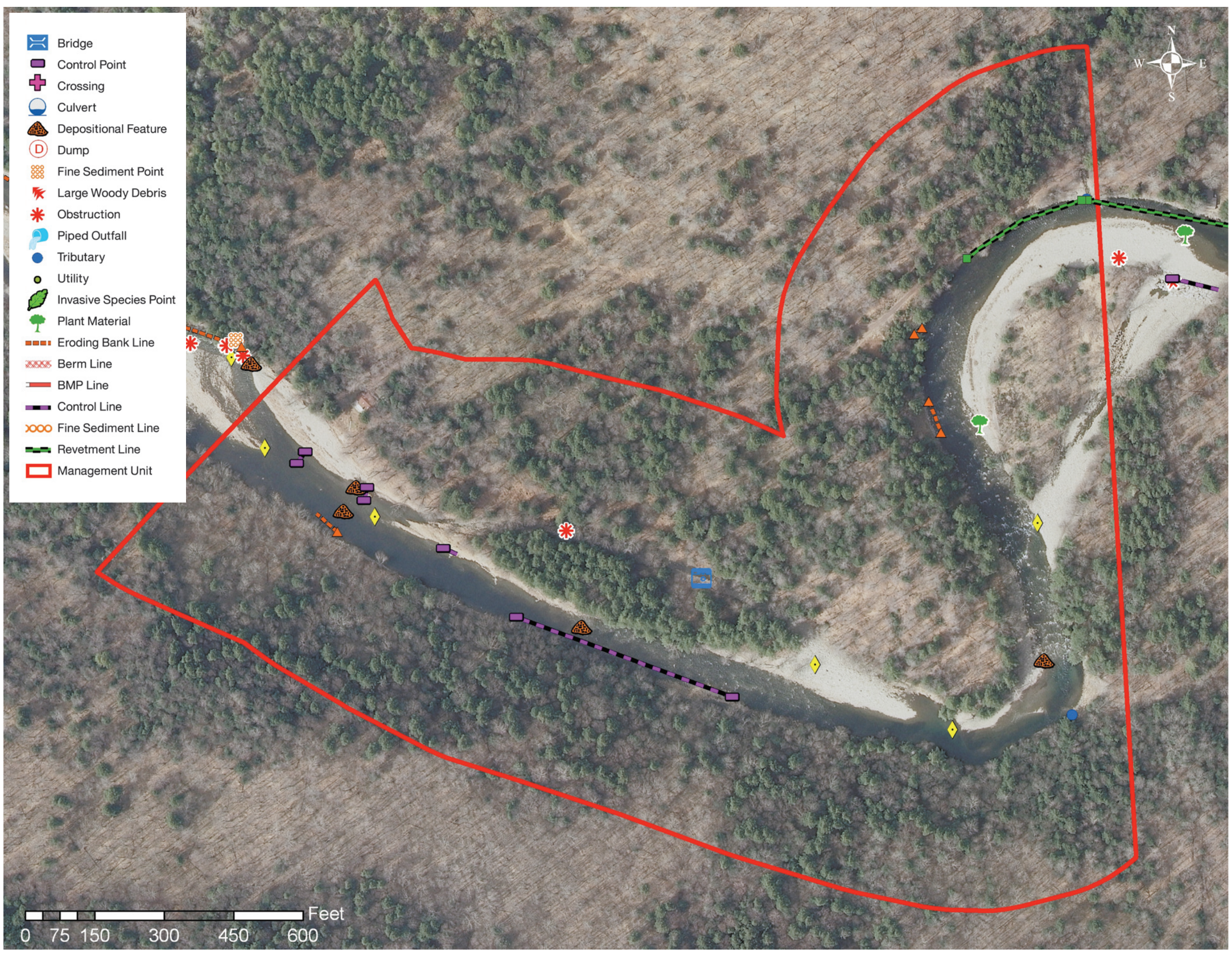
Neversink River Main Branch

MANAGEMENT UNIT 2

STREAM FEATURE STATISTICS

- 19% of the stream length is experiencing erosion
- 4.29% of stream length has been stabilized
- 0.15 acres of inadequate vegetation within the 100 ft. buffer
- None of stream is within 50 ft. of the road
- Two structures are located within the 100-year floodplain boundary





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

This management unit begins at the end of property owned by NYCDEP at Station 3000, continuing approximately 3,272 ft. to a confluence with Dry Brook at Station 6300. The drainage area ranges from 70.0 mi2 at the top of the management unit to 70.4 mi2 at the bottom of the unit. The valley slope is 0.76 %. The average valley width is 1751.09 ft.

Summary of Recommendations Main Branch Management Unit 2

Intervention Level	Conduct stability assessment of BEMS NMB2_5840. Monitor BEMS NMB2_5600 and BEMS NMB2_3200 for changes in condition (passive restoration).
Stream Morphology	Conduct baseline survey of channel morphology.
Riparian Vegetation	Improve riparian buffer near Stn 3300.
Infrastructure	Investigate history and original objectives of control structures.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	Conduct stability assessment of BEMS NMB2_5840 as potential treat to private road. Floodproofing as appropriate. http://www.fema.gov/library/viewRecord.do?id=1420
Water Quality	None.
Further Assessment	Include MU2 in comprehensive Local Flood Hazard Mitigation Analysis of Claryville MUs.

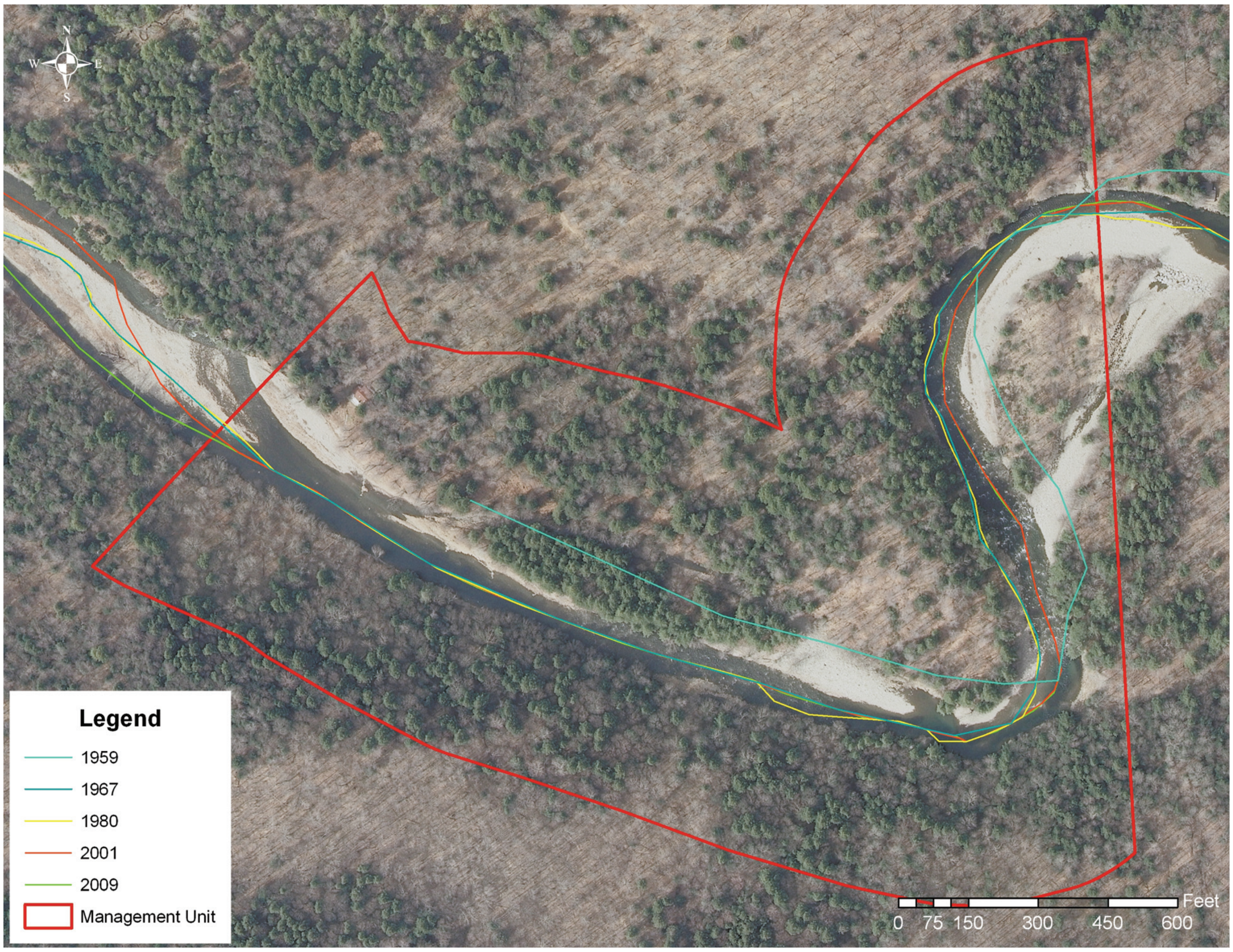
Historic Conditions

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 upstream of this management unit 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 seven 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.

MBMU2 begins at the confluence of Dry Brook at Station 6300. The Dry Brook watershed is 0.77 square miles which includes 2 miles of stream channel. *(A269)*. Directly downstream of the confluence a 280-foot long sloped stone revetment was observed from Station 6300 to Station 6020. This revetment was documented in good structural and functional condition, although some scour was observed behind

Dry Brook Confluence (A269)

Sloped stone revetment on right bank (A270)

the revetment at the upstream and downstream ends. This revetment appears to protect the private road used to access the cabins on the stream bank upstream of the Dry Brook confluence. *(A270)*

Approximately 150 feet downstream of the revetment, at the apex of the meander on the right bank, a 22-foot eroding bank segment was observed from Station 5840 to 5860 (BEMS NMB2_5840). The bank failure was documented as 25 feet high caused by hydraulic erosion, specifically fluvial entrainment, which exposed alluvial materials. *(A272)* A more detailed stability assessment including identification of possible drainage issues from the private road upslope is recommended.

Right bank failure (A272)

Another 100 feet downstream on the right bank, from Station 5700 to Station 5628 (BEMS NMB2_5600) a second eroding bank segment was observed with similar characteristics. Although it was slightly larger at 35 feet high and 72 feet long, it was also caused by hydraulic erosion perpetuated by fluvial entrainment exposing alluvial materials. Vegetation and large boulders were contributing to hardening at the toe and woody vegetation was observed from the toe all the way to the crown of the bank failure.*(A275)*

Hydraulic erosion on right bank with hardening at toe (A275)

There is a structure located on the crown of this bank failure within the 100-year floodplain. 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.

While the outside of the meander bend has occasional bank failures and revetment to protect the bank from erosion through this segment of the mainstem, the inside of the meander is formed by a vegetated cobble point bar which is separated from a forested floodplain by a well-defined flood chute. *(A276)* At Station 5400 the side channel that diverged at Station 6600 in MBMU3 re-joins the main channel. *(B538)*

From Station 5400 to Station 5100 (300 feet downstream of the convergence) there is a rock riffle leading up to the apex of the final meander in the S-curve where the main channel forms a deep scour pool against exposed bedrock of the left valley wall from Station 5000 to Station 4700. *(A280)* This pool is called the Big Bend Pool and is known as a very productive and popular fishing spot. The inside of this narrow meander is formed by a depositional point bar with material size beginning as cobbles but eventually converting to a sandy beach at the downstream extent, likely due to additional sedimentation allowed by lower velocities in the large pool. *(A278, A279)* At Station 4970 a small intermittent tributary joins the main channel from the left valley wall at the upstream end of the Big Bend Pool.

For the remainder of the management unit the main channel is *semi-confined,* constrained by the bedrock on the left bank while maintaining connectivity to the floodplain on the right bank during flood events. At Station 4350 a side

Cobble point bar and flood chute (A276)

Convergence of side channel (B538)

Big Bend Pool, scour pool against left valley wall bedrock (A280)

Upstream start of point bar, cobble composition (A278)

Downstream end of point bar, sand composition (A279)

channel diverges into the forested floodplain on the right bank. Although the channel was dry during the stream inventory, it appears to convey flow during high flow events as evidenced by some bank scour and debris patterns along the cobble channel bed. *(A284)* This side channel rejoins the mail channel at Station 3400 behind a vegetated cobble bar.

The main channel flows along the left valley wall with exposed bedrock providing lateral control for approximately 500 feet from Station 4260 to Station 3760. *(B277)* This reach is a sediment storage reach as evidenced by aggradation of depositional bars with a transverse bar and *head cut* migrating upstream observed at Station 3900. *(B275)*

Downstream of the convergence of the side channel a series of grade control structures was observed extending from the right bank. The first is a boulder grade control observed at Station 3500 extending approximately 47 feet at a right angle from the right bank. This structure was documented as in good structural condition. A scour pool has formed downstream of the control

Divergence with side channel at right bank (A284)

Exposed bedrock on left valley wall (B277)


Transverse bar and headcut migrating upstream (B275)


Scour pool downstream of headcut (B280)


Boulder grade control (A289)

structure. (*B280*) Another grade control structure was observed 120 feet downstream at Station 3420. This structure in constructed of boulders and extends 29 feet into the channel angled upstream. It was documented as in good structural condition. There is a scour pool immediately downstream of this structure followed by a vegetated depositional side bar. *(A289)* The final structure is log cribbing embedded in the stream bed at Station 3200 which was documented in poor structural condition. *(A294)* The functional condition of these three structures cannot be assessed as their purpose and maintenance history remian unclear. Given the history of this section of the river as a fishing destination, it is likely that these control structures were designed to improve or enhance fish habitat, and likely contributed to sediment deposition in this reach. There is a residential structure on the right bank near Station 3300 that appears to be within the 100-year floodplain; the structure may also have been designed to encourage deposition and protect the nearby bank, on which the residence is located, from erosion.

Features like these control strutures were observed frequently on the main branch of the Neversink River. It is recommended that the history and original objectives of these features be investigated to better understand their current function and ongoing hydraulic effects. Long term monitoring of the structures is also recommended.

It is possible that the channel widens near Station 3300 due to aggradation and backwatering effects from the Neversink reservoir. An eroding bank segment was observed on the left bank across from these control structures for 60 feet from Station 3330 to Station 3270. (BEMS NMB2_3200) This erosion site is 4 feet high and was documented to expose fine materials although it does not

Log cribbing embedded in stream (A294)

Divergence around cobble center bar (A293)

represent a significant source of turbidity. It is anticipated that this bank will stabilize without treatment (*passive restoration*), however, it is recommended that this site be monitored for changes in condition.

The final feature observed in MBMU2 is a divergence at Station 3100 around a cobble center bar vegetated with grass and sedge *(A293)*. MBMU2 ends 100 feet downstream of this divergence at Station 3000.

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 a sediment storage reach impacted by backwatering effects from the Neversink Reservoir slightly downstream. Storage reaches like this one 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. While there is little change in the channel alignment associated with these processes in this management unit, the depositional features present are very dynamic, releasing and storing significant volumes of bed load with each major flow event.

Sediment storage reaches can result from natural conditions—such as they are in this location, defined by larger topographic features—or as the unintended consequence of poor bridge design, check dams or channel over-widening.

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.

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 Mixed Closed Tree Canopy (25%) followed by Deciduous closed Tree Canopy (11%). *Impervious* area (<1%) within this unit's buffer is a residential structure.

There are 13.21 acres of wetland (25% of MBMU2 land area) within this management unit mapped in the National Wetland Inventory (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). All of the wetland in MBMU2 is classified as riverine wetland.

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. Two structures in MBMU2 lie within the 100-year floodplain as identified on the FIRM maps. FEMA offers guidance on floodproofing homes in floodprone areas at: **http://www.fema.gov/library/viewRecord.do?id=1420**

BANK EROSION Three areas of erosion were documented during the stream feature inventory. A 22-foot eroding bank segment was observed from Station 5840 to 5860 (BEMS NMB2_5840). The bank failure was documented as 25 feet high caused by hydraulic erosion, specifically fluvial entrainment, which exposed alluvial materials. 100 feet downstream on the right bank, from Station 5700 to Station 5628 (BEMS NMB2_5600) a second eroding bank segment was observed with similar characteristics. Although it was slightly larger at 35 feet high and 72 feet long, it was also caused by hydraulic erosion perpetuated by fluvial entrainment exposing alluvial materials. Finally, an eroding bank segment was observed on the left bank across from these control structures for 60 feet from Station 3330 to Station 3270. (BEMS NMB2_3200) This erosion site is 4 feet high and was documented to expose fine materials, although it does not represent a significant source of turbidity.

It is anticipated that the last two of these eroding bank segments will revegetate and stabilize without treatment (*passive restoration*). A more detailed stability assessment including identification of possible drainage issues from the private road upslope is recommended for the first site. It is also recommended that all three sites be monitored for changes in condition.

INFRASTRUCTURE 4.29% of the stream bank length in this management unit has been treated with revetment. A 280-foot long sloped stone revetment was observed from Station 6300 to Station 6020. This revetment was documented in good structural and functional condition, although some scour was observed behind the revetment at the upstream and downstream ends. This revetment appears to protect the private road used to access the cabins on the stream bank upstream of the Dry Brook confluence. 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. The mainstem in MBMU2 has 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. 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 the private road to the channel at the upstream end of the management unit provides a minor 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 three bank erosion sites in MBMU2 that are a potential minor source of fine sediment. None of the sites represent a significant source of turbidity.

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. One structure is 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**.