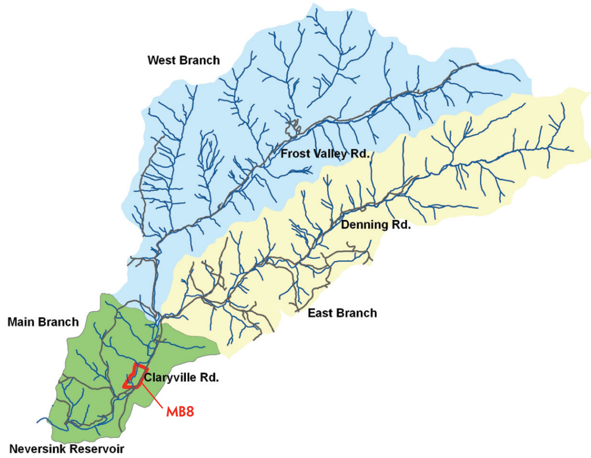
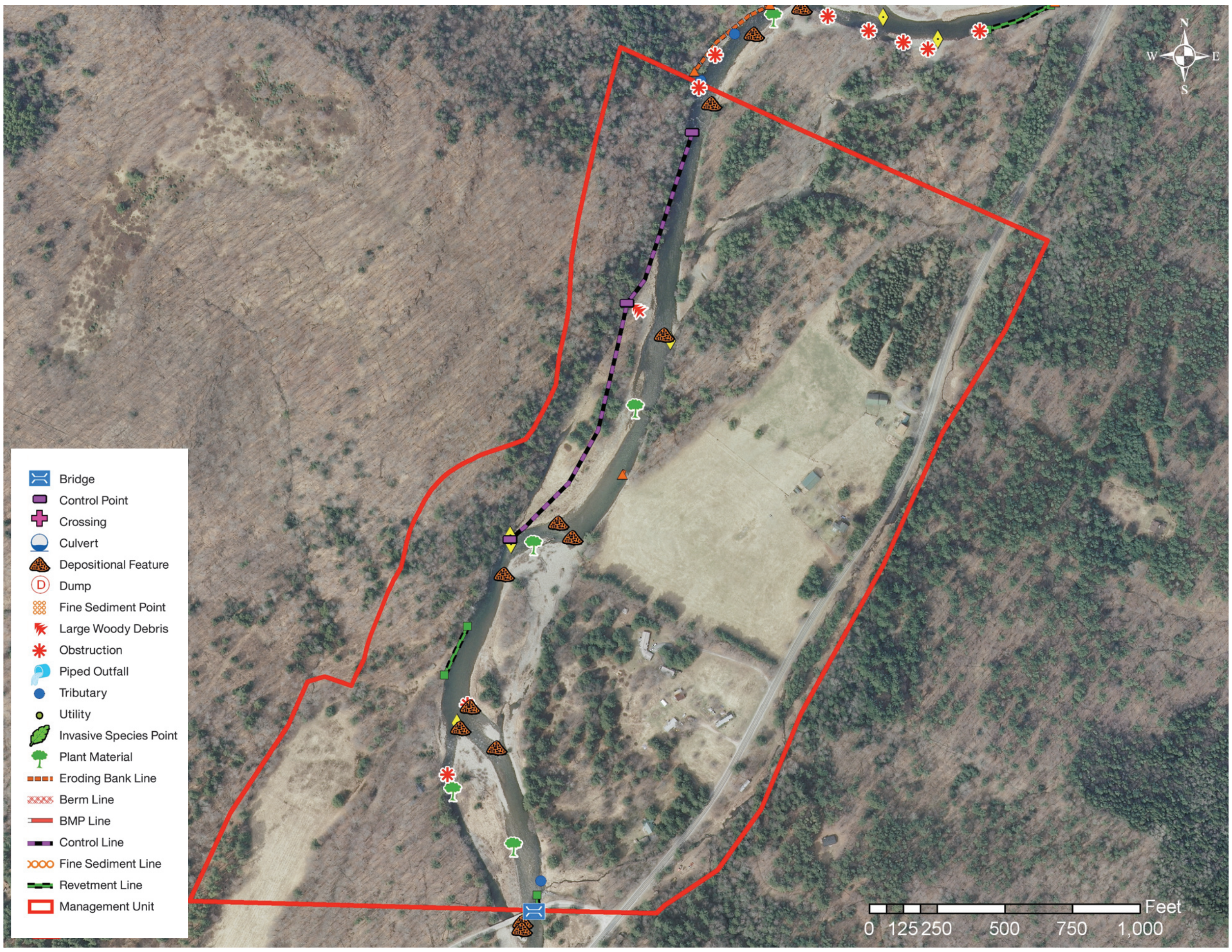
Neversink River Main Branch

MANAGEMENT UNIT 8

STREAM FEATURE STATISTICS

- None of stream length is experiencing erosion
- 3.95 % 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
- 1 structure located within the 100-year floodplain boundary





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

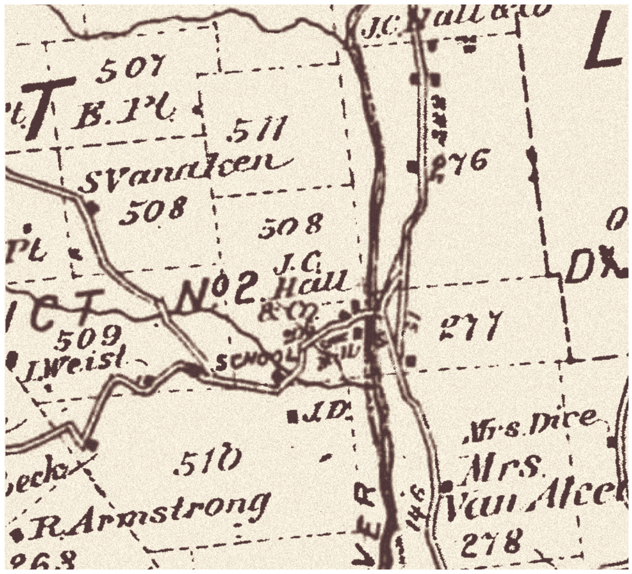
This management unit begins at a bridge on Hunter Road, continuing approximately 3,428.3 ft. to a confluence with an unnamed tributary. The drainage area ranges from 65.5 mi^2 at the top of the management unit to 66.4 mi^2 at the bottom of the unit. The valley slope is 0.01 %. The average valley width is 1500.89 ft.

Summary of Recommendations
Main Branch Management Unit 8

Intervention Level	Assisted Restoration of the bank erosion site between Station 20620 and Station 20600. Recommended Full Restoration site from Station 19700 to Station 1800 including Hunter Road bridge renovation/replacement.
Stream Morphology	Protect and maintain sediment storage capacity and floodplain connectivity. Conduct baseline survey of channel morphology.
Riparian Vegetation	Improve riparian buffer along mowed field between Station 20620 and Station 20600.
Infrastructure	Coordinate channel restoration with Hunter Road bridge renovation/replacement.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	Floodproofing as appropriate. http://www.fema.gov/library/viewRecord.do?id=1420
Water Quality	Maintain household septic systems. Perform synoptic water quality monitoring to determine potential impacts of storm water runoff.
Further Assessment	Long-term monitoring of erosion sites.

Historic Conditions

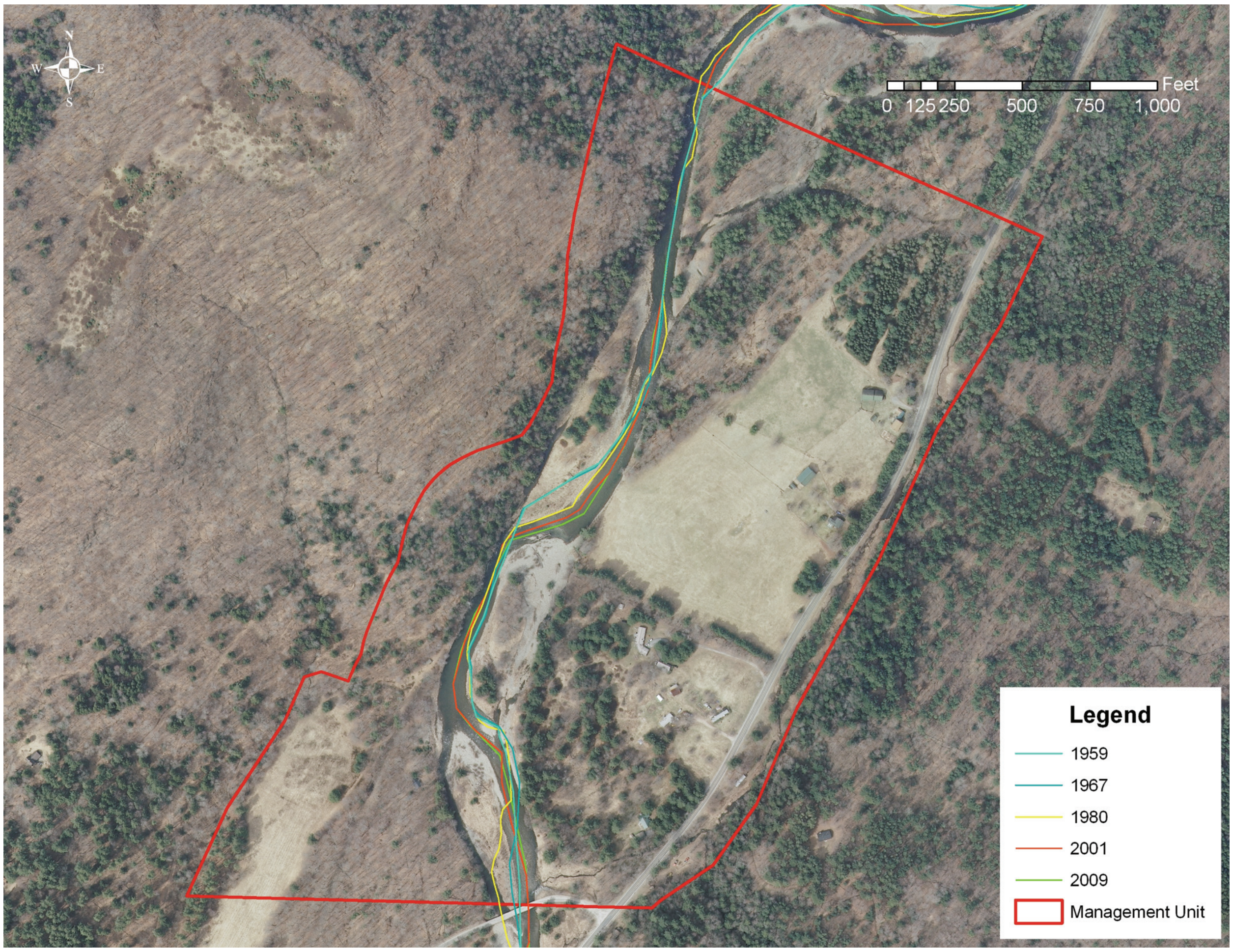
As the glaciers retreated about 12,000 years ago, they left their "tracks" in the Catskills. See Section 2.4 *Geology of Upper Neversink River,* for a description of these deposits. These deposits make up the soils in the high banks along the valley walls on the Neversink mainstem and its tributaries. 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. While 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, no 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.

This management unit begins at Station 22000 as the channel runs along exposed bedrock on the right valley wall until Station 21300 with access to the floodplain on the left bank. For much of MBMU8 this bedrock constrains any shift in the stream channel to the right, forcing any lateral migration to the left into the floodplain terrace composed on unconsolidated alluvial sediments. At Station 21250 a side channel continues along the right valley wall, separated from the main channel by a forested floodplain. A large woody debris accumulation on the right bank at the divergence indicates significant flow along the right bank into the side channel during flood events. *(A132)* The main channel then meanders slightly left, pulling away from the valley wall at Station 21100 around a depositional bar that is well connected to a vegetated floodplain. The main channel then begins a meander to the right around the depositional bar, against a floodplain terrace. At Station 20600 there is a 24-foot long bank erosion segment of this terrace along a mowed field with no riparian buffer. As the bank at this location has retreated, the point of the bar at the apex of the meander appears to be advancing based on analysis of historic channel alignments. *(A136)*. Unconsolidated alluvial sediments exposed by fluvial erosion at this location were observed. *(B467)* These unconsolidated sediments are highly susceptible to erosion, highlighting the importance of a healthy riparian buffer in these conditions. A riparian buffer including woody vegetation can strengthen the stream bank and slow erosive forces of higher flows during flood events.

Debris accumulation on right bank at divergence (A132)

Erosion on right bank at field with no riparian buffer (A136)

Recommendations for this site include assisted restoration using bioengineering techniques to establish a riparian buffer and stabilize the eroding bank. The willow growing on the cobble bar forming the inside of this meander slightly upstream at Station 20850 could provide a source of materials for the restoration effort. *(A134)*

Unconsolidated alluvial sediments on right bank (B467)

Willow on cobble bar at Station 20850 (A134)

Large debris on flood plain (B469)

Directly downstream of the eroded bank a vegetated cobble point bar has formed partially from alluvial materials eroded from the bank failure on the left bank upstream. This point bar forms the inside of a meander bend that is restricted by the valley wall on the right bank. This point bar and well-connected floodplain are littered with large woody debris and host a native willow colony that could be used a plant source for assisted restoration efforts.*(B469)* A flood chute has formed through this floodplain along the left bank that conveys significant flow during flood events. This flood chute starts at Station 20300 and converges with the main channel at Station 19300. Residential structures are located in the 100-year floodplain approximately 300 feet to the left of this flood chute (Fig. 1). At Station 20200 the side channel and main channel converge against the right valley wall. From Station 19800 to Station 19600 there is a placed stacked rock wall revetment protecting the right bank and a lean-to slightly up-slope. (A140, A142) This revetment was documented as in fair structure and functional condition.

At the downstream end of the revetment the main channel meanders to the left, re-crossing the

Placed stacked rock revetment on right bank (A140)

Lean-to on right bank, upslope of revetment (A142) valley floor. At Station 19500 a divergence was observed directing a portion of flow across the forested floodplain on the right. This could have consequences related to flood hazard management downstream in MBMU6. Also at this point a large woody debris accumulation signals the beginning of a depositional formation which forces flow to the right. At this point the main channel splits around a vegetated center bar likely formed by backwatering caused by the Hunter Road bridge. Depositional features, such as this center bar, often form upstream of bridges where the bridge approaches restrict flows that would otherwise effectively transport sediment. (B474 with call-out "bridge approach blocking floodplain flow"). The main channel forms a straight reach for the 700 feet leading up to the Hunter Road bridge.

Bridge approach blocking floodplain flow (B474)

At Station 18750 an unnamed tributary joins the main channel from the left bank, directly upstream of 70 feet of placed rip rap revetment stabilizing the left bank upstream of the Hunter Road bridge abutments. *(B476)*. This revetment was documented as in good functional condition and fair structural condition. Lack of scour protection has allowed flow underneath some of the boulders.

Rip rap revetment upstream of left bank bridge abutments (B476)

The Hunter Road bridge, county bridge #3357070, has a normal span of 199 feet, an effective span of 192 feet, twelve feet of encroachment on the right bank and nine feet of encroachment on the left bank. These documented field conditions indicate that this bridge does obstruct floodplain flows. However, the exceptionally wide span of this bridge is twice the typical width for a channel with this drainage area in the Catskills region. This overwidened condition creates a shallow channel which lacks the power to convey sediment from

Looking downstream at Hunter Road Bridge (A164) upstream, contributing to the aggradation observed both upstream and downstream of the bridge. The Hunter Road bridge is constructed with one support pier made of five steel columns, and was documented as in fair functional condition and poor structural condition. *(A164)*

The Hunter Road bridge is currently scheduled for repair or replacement in the next several years. At that time recommendations for this site is a *full restoration* project from Station 19700 continuing into MBMU7 to Station 18000. This project would require geomorphic and sediment transport analyses of the reach and would likely include re-establishment of an effective bankfull width with construction of a vegetated bankfull elevation bench on the right bank both upstream and downstream of the bridge span. The project might also include placement of *flow deflection structures* to reduce erosive forces on the banks, particularly at Claryville Road (discussed further in MBMU7) and Station 19600.

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.

Directly downstream of the Hunter Road bridge the side channel along the right valley wall converges with the mainstem. MBMU8 ends 50 feet downstream of the Hunter Road Bridge at Station 18600.

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 continuation of a series of sediment storage reaches from 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. 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 a baseline survey of channel form and function is recommended for this management unit in coordination with the geomorphic analysis that would be required for bridge renovation/replacement.

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 (31%) followed by Deciduous Closed Tree Canopy (26%). *Impervious* area (3%) within this unit's buffer is primarily Claryville and Hunter Roads. Thirty-three acres within MBMU8 were identified as potential riparian buffer improvement sites *(Figure 7)*.

There are 29.4 acres of wetland (26% of MBMU8 land area) within this management unit mapped in the National Wetland Inventory with 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 12.18 acres in size, and the wetland classified as Freshwater Forested Shrub (inland wetland without flowing water) is 17.20 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. One structure is 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.

One structure in MBMU8 lies 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 residences 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 MBMU8, the stream banks within the management unit are at a relatively high risk of erosion. One area of erosion was documented during the stream feature inventory. At Station 20600 there is a 24-foot long and 15-foot high bank erosion segment along a mowed field with no riparian buffer. Assisted restoration is recommended for this site, most likely using bioengineering techniques to establish a riparian buffer and stabilize the eroding bank.

INFRASTRUCTURE 3.95% (270 ft.) of the stream bank length in this management unit has been treated with some form of stabilization. The revetment from Station 19800 to Station 19600 on the right bank is constructed of placed stacked rock wall revetment to protect private property. This revetment was documented as in fair structural and functional condition. The second revetment is 70 feet of placed rip rap revetment stabilizing the left bank upstream of the Hunter Road bridge abutments. This revetment was documented as in good functional condition and fair structural condition. Lack of scour protection has allowed flow underneath some of the boulders. 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 MBMU8 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. There are no piped outfalls that convey storm water runoff directly into the Neversink River in this management unit. The small unnamed tributary that enters the main channel near the downstream end of the management unit runs along the left valley wall directly adjacent to Claryville Road for approximately 4,000 feet before joining the mainstem, creating potential impacts to water quality from road contaminants and elevated temperatures typical of storm water runoff. Recommendations for this site might include synoptic water quality monitoring to determine potential impacts.

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. The bank erosion site located at Station 20600 in MBMU8 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. 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.**