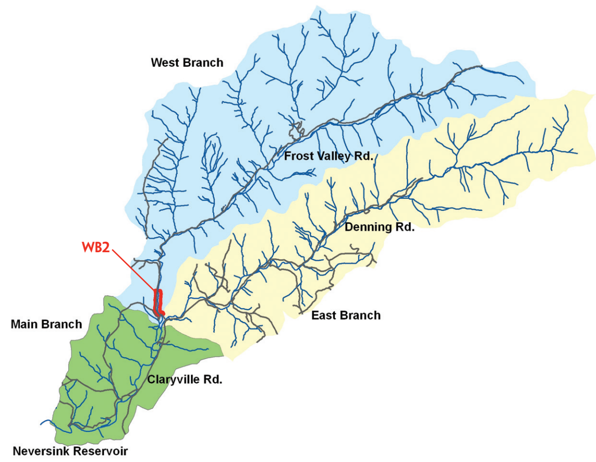
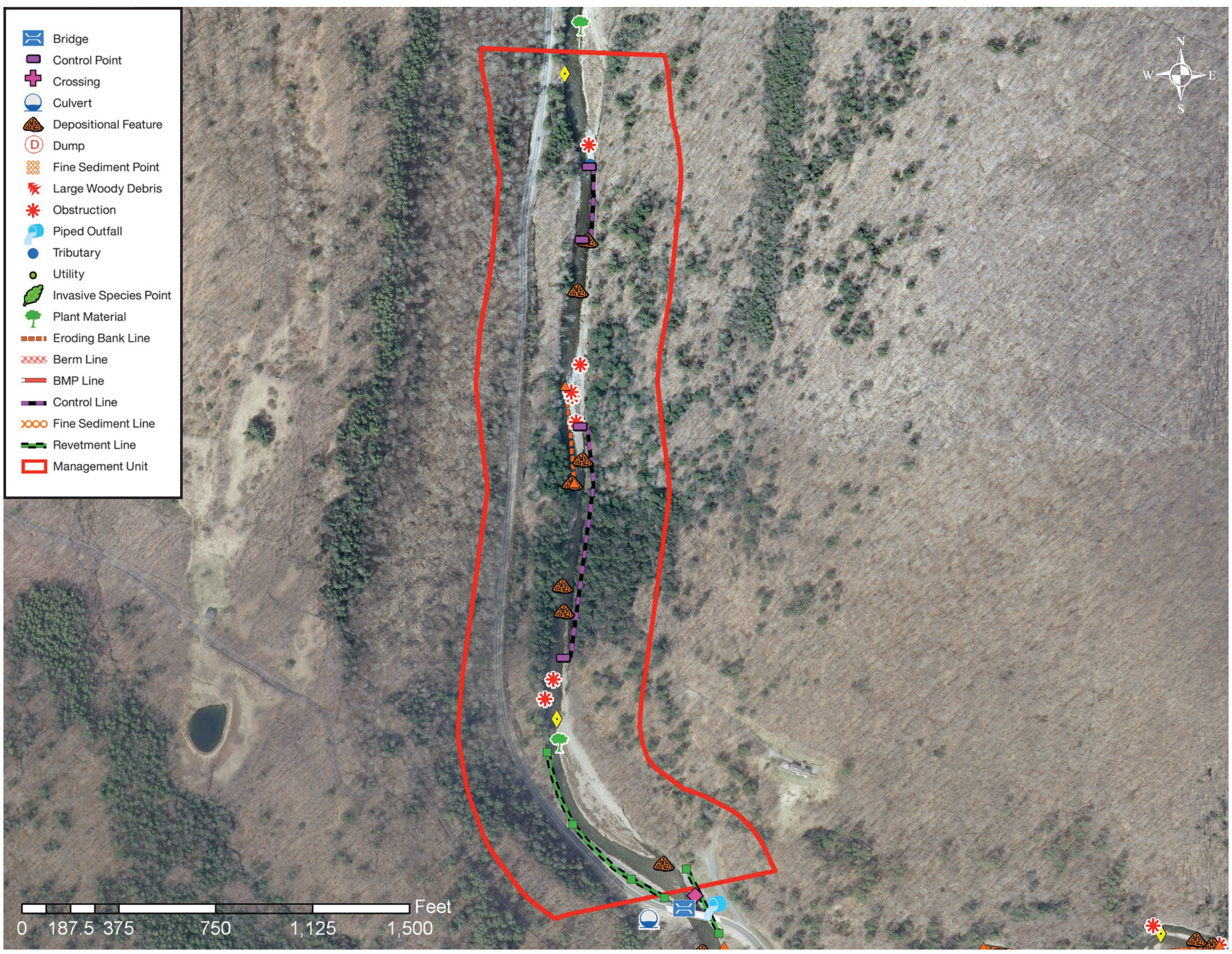
Neversink River West Branch

MANAGEMENT UNIT 2

STREAM FEATURE STATISTICS

- 5.00% of stream length is experiencing erosion
- 11.97% of stream length has been stabilized
- 4.86 acres of inadequate vegetation within the 100 ft. buffer
- 600 feet of stream is within 50 ft. of the road
- No structures are located within the 100-year floodplain boundary





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

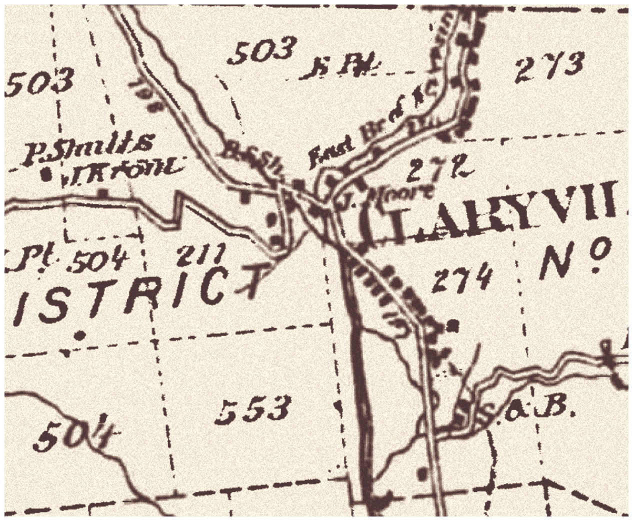
This management unit begins a confined valley point slightly downstream of a stretch of exposed bedrock on the right bank near Station 5700, continuing approximately 3,400 ft. to a center bar slightly upstream of the Frost Valley Road Bridge. The drainage area ranges from 33.50 mi^2 at the top of the management unit to 33.90 mi^2 at the bottom of the unit. The valley slope is close to 1.11%. The average valley width is 364.92 ft.

Summary of Recommendations West Branch Management Unit 2

Intervention Level	Full restoration of the channel from Station 3000 to Station 1900 in WBMU1. Passive restoration of the bank erosion from Station 4405 to Station 4025 (BEMS NWB2_4025).
Stream Morphology	Protect and maintain sediment storage capacity and floodplain connectivity. Conduct baseline survey of channel morphology.
Riparian Vegetation	Investigate and evaluate 2.22 acres of potential riparian buffer improvement areas for future buffer restoration. Potential riparian buffer improvement areas were observed from Station 4830 to Station 4110 and Station 3480 to 2110 (Figure 7).
Infrastructure	Full restoration of the channel, including revetment, from Station 3000 to Station 1900 in WBMU1.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	None.
Water Quality	Investigation of water quality impacts of water conveyed via piped outfalls at Station 2200.
Further Assessment	Long-term monitoring of erosion sites.

Historic Conditions

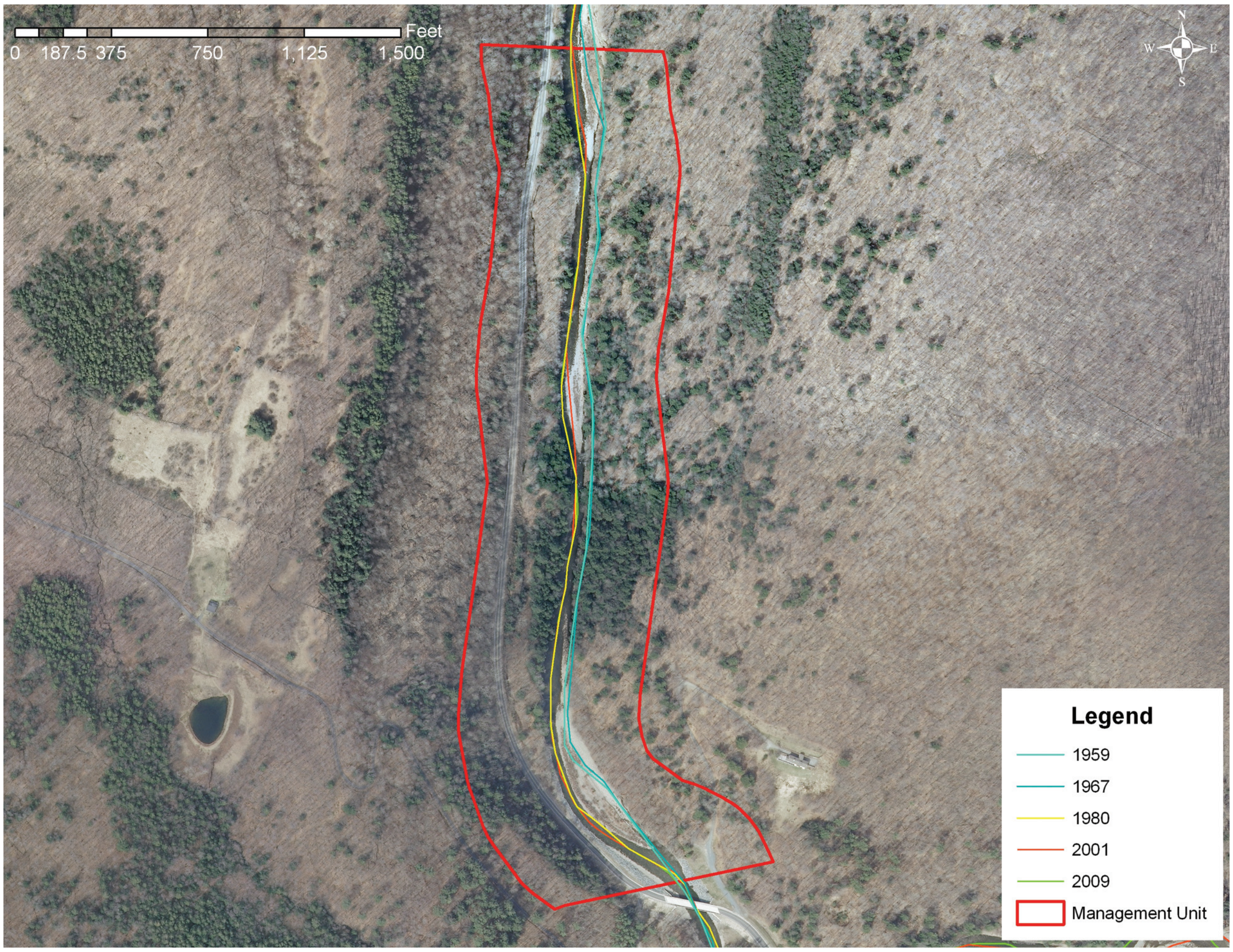
As the glaciers retreated about 12,000 years ago, they left their "tracks" in the Catskills. See Section 2.4 *Geology of Upper Neversink River,* for a description of these deposits. These deposits make up the soils in the high banks along the valley walls on the Neversink mainstem and its tributaries. 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 some lateral channel instability. According to records available from the NYSDEC DART database one NYS Article 15 stream disturbance permits have been issued in this management unit. These permits pertain to activities which have the potential to significantly impact stream function, such as bank stabilization, stream crossings, habitat enhancement, and logging practices. database (**http://www.dec.ny.gov/cfmx/extapps/envapps/**).



Historical channel alignments from five selected years (Figure 3)

Stream Channel and Floodplain Current Conditions

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

The section of river included in WBMU2 is confined on both banks by the valley wall. There is consistently between 60-100 foot wide forested riparian buffer on the right bank between the main channel and Frost Valley Road until the end of the management unit. This riparian buffer area varies between bankfull height and a higher terrace, with flood chutes that convey flow during high flow events observed in some locations.

One such flood chute was observed diverging from the main channel at Station 5600. Near Station 5340 a recently downed tree from the right bank was observed across the main channel. *(P7290176)* Exposed bedrock was observed from Station 5260 to Station 4980 at the foot of the left valley wall forming both a stream bed grade control on the left stream bed and a planform control on the left bank. *(A327)* At the downstream end of the exposed bedrock a cobble side bar vegetated with grass and sedge was observed on the left bed. The side bar extends approximately 180 feet from Station 4960 to Station 4780. *(P2790181)* Various potential riparian buffer improvement areas exist along the left side of the stream between Station 4830 and Station 4110 *(Figure 7)*.

From Station 4500 to Station 4100 a depositional point bar was observed littered with at least three large woody debris piles (including some plywood construction debris) near Station 4500. *(A331)* This depositional feature appeared to be forcing flow in the main channel into the right bank during high flow events, where an eroding bank segment was observed extending 380 feet from Station 4405 to Station 4025 (BEMS NWB2_4025). *(A339)*

Downed tree across main channel (P7290176)

Bedrock forming grade and planform control (A327)

Vegetated cobble side bar (P7290181)

Side bar with construction debris (A331)


Eroding segment on right bank (A339)


Woody debris jam on right bank (A344)

This eroding bank segment was documented as inactive; hardening at the toe and vegetation on the slope were observed, as well as downed trees near Station 4380 and Station 4280 that appear to be causing sediment deposition and further bank stabilization. It is recommended that this bank be left to further revegetate and stabilize without treatment (*passive restoration*) and that the site be monitored for changes in condition.

Exposed bedrock forming a lateral constraint on the main channel was observed on the left bank extending 920 feet from Station 4240 to Station 3320. Additional potential riparian buffer improvement sites are located between Station 3480 and Station 2110. On the right bank near Station 4240 a vegetated cobble side bar at bankfull height was observed extending approximately 640 feet downstream. Multiple recently downed trees from the right bank and woody debris jams were observed in the channel near Station 3200 before the main channel splits around a thickly vegetated center bar near Station 3100. *(A344)* The willow observed growing on the center bar was documented as a possible plant source for restoration projects in this segment of the river. Depositional features, such as this center bar, often form upstream of bridges where the bridge approaches restrict flows that would otherwise effectively transport sediment.

The majority of the flow in the channel is diverted to the right around the center bar, where it flow directly adjacent to Frost Valley Road beginning near Station 2800 and continuing through the end of WBMU2 to the Frost Valley Road Bridge.
A revetment was observed on the right bank beginning at Station 2980 and continuing to the right abutment of the Frost Valley Road Bridge. The revetment is constructed of dumped and placed rip rap, and was documented in good functional and good structural condition. After the main channed converges downstream of the center bar near Station 2400, a dumped rip rap


Left bank revetment (B355)

revetment was observed on the left bank extending from Station 2300 to the left abutment of the Frost Valley Road Bridge, and continues on the left bank for 100 feet downstream of the bridge. This revetment was documented in good functional condition and new structural condition. A piped outfall was observed at the end of this revetment constructed of an 18 inch diameter plastic pipe conveying road drainage from the bridge. The USGS gauge station #01434498, West Branch Neversink River at Claryville, was observed on the left bank at the end of this revetment. *(B355, A345)*

The Frost Valley Road Bridge, County Bridge #187, has a *normal span* of 155 feet and an *effective span* of 138 feet, with 10 feet on encroachment on the right bank and no 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 upstream, contributing to the aggradation observed both upstream and downstream of the bridge. The bridge was documented in good structural and good functional condition. *(A11)*

Recommendations for this site include a *full restoration* project from Station 3000 continuing into WBMU1 to Station 1900. This project would require geomorphic and sediment transport analyses of the reach and would likely include construction of a vegetated bankfull height bench on the right bank at the toe of the existing revetment, which would be designed to increase the radius of curvature of both meanders near the bar and a establish a channel width closer to the typical width for this drainage area in the Catskills region. The depositional materials of the current center bar and the willow growing on the bar could potentially be used to form the bench and plant the right bank revetment, respectively. Soil *bioengineering* and inter-planing of the right bank revetment with willow, low shrubs, sedge and grasses will establish a healthy riparian buffer and decreased flow velocities along the right bank and the road during high flow events.

WBMU2 ends at the Frost Valley Road Bridge near Station 2200.

Frost Valley Road bridge (A11)

Right bank revetment (A345)

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).

The majority of this management unit is composed of sediment transport reaches, with relatively low channel sinuosity, bankful stage floodplains of moderate entrenchment with mature vegetation, and overflow channels to accommodate larger discharges of water and sediment when necessary. Much of WBMU2 is confined by bedrock or high banks on one or both sides. Transport reaches, like the areas in WBMU15 with boulder and bedrock grade and planform control, are in a state of *dynamic equilibrium,* effectively conveying sediment supplied from upstream during each flow event. However, the densely forested floodplain serves as a continuous source of large woody material that that can be introduced into the channel during flood events. This large woody debris may serve as a local obstruction to sediment transport, resulting in the aggradation of bed material and the continued development of floodplains over the long-term. Healthy, undeveloped floodplains throughout the Neversink watershed like those throughout WBMU2 reduce the velocity of higher flows, thereby mitigating the threat of stream bank erosion and property damage during flood events.

Instead, this section of the river acts as a transport reach. Transport reaches are in a state of *dynamic equilibrium,* effectively conveying sediment supplied from upstream during each flow event.

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 2009 and field inventories *(Figure 5).* In this management unit the predominant vegetation type within the riparian buffer is deciduous closed tree canopy (52.94 %) followed by mixed closed tree canopy (19.08%). *Impervious* area makes up 4.75% of this unit's buffer. No occurrences of Japanese knotweed were documented in this management unit during the 2010 inventory.

There are 2.70 acres of wetland (4.82% of WBMU2 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 A type descriptions and regulations). The wetland classified as Riverine is 2.26 acres in size and the wetland classified as Freshwater Forested Shrub is 0.44 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. There are no structures WBMU2 within the 100-year floodplain as identified on the FIRM maps.

BANK EROSION One area of erosion was documented in the management unit during the stream feature inventory.

An eroding bank segment was observed extending 380 feet from Station 4405 to Station 4025 (BEMS NWB2_4025). This eroding bank segment was documented as inactive; hardening at the toe and vegetation on the slope were observed, as well as downed trees near Station 4380 and Station 4280 that appear to be causing sediment deposition and further bank stabilization. It is recommended that this bank be left to further revegetate and stabilize without treatment (*passive restoration*) and that the site be monitored for changes in condition.

INFRASTRUCTURE A revetment was observed on the right bank beginning at Station 2980 and continuing to the right abutment of the Frost Valley Road Bridge. The revetment is constructed of dumped and placed rip rap, and was documented in good functional and good structural condition. After the main channel converges downstream of the center bar near Station 2400, a dumped rip rap revetment was observed on the left bank extending from Station 2300 to the left abutment of the Frost Valley Road Bridge. This revetment was documented in good functional condition and new structural condition.

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. The mainstem in WBMU2 has been classified as "C(T)" connoting best usage for 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 is one piped outfalls, upstream of the left abutment of the Frost Valley Road Bridge near Station 2200 that convey storm water runoff directly into the Neversink River in this management unit.

Sediment from stream bank and channel erosion pose a potential threat to water quality in the Neversink River. Clay and sediment inputs into a stream may increase *turbidity* and act as a carrier for other pollutants and pathogens. There is one bank erosion site in WBMU2 that is a potential minor source of fine sediment. This site does not 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. Four 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**.

Community Comments

Fall 2012

"Riparian buffer improvements for 2.22 acres along Stations 4830–4110 and 3480–2110 will be welcome."