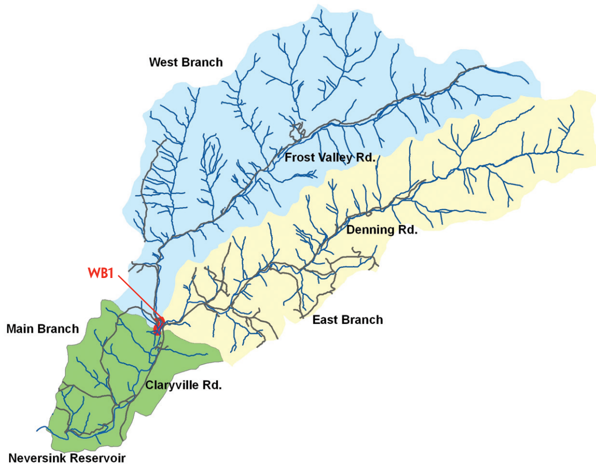
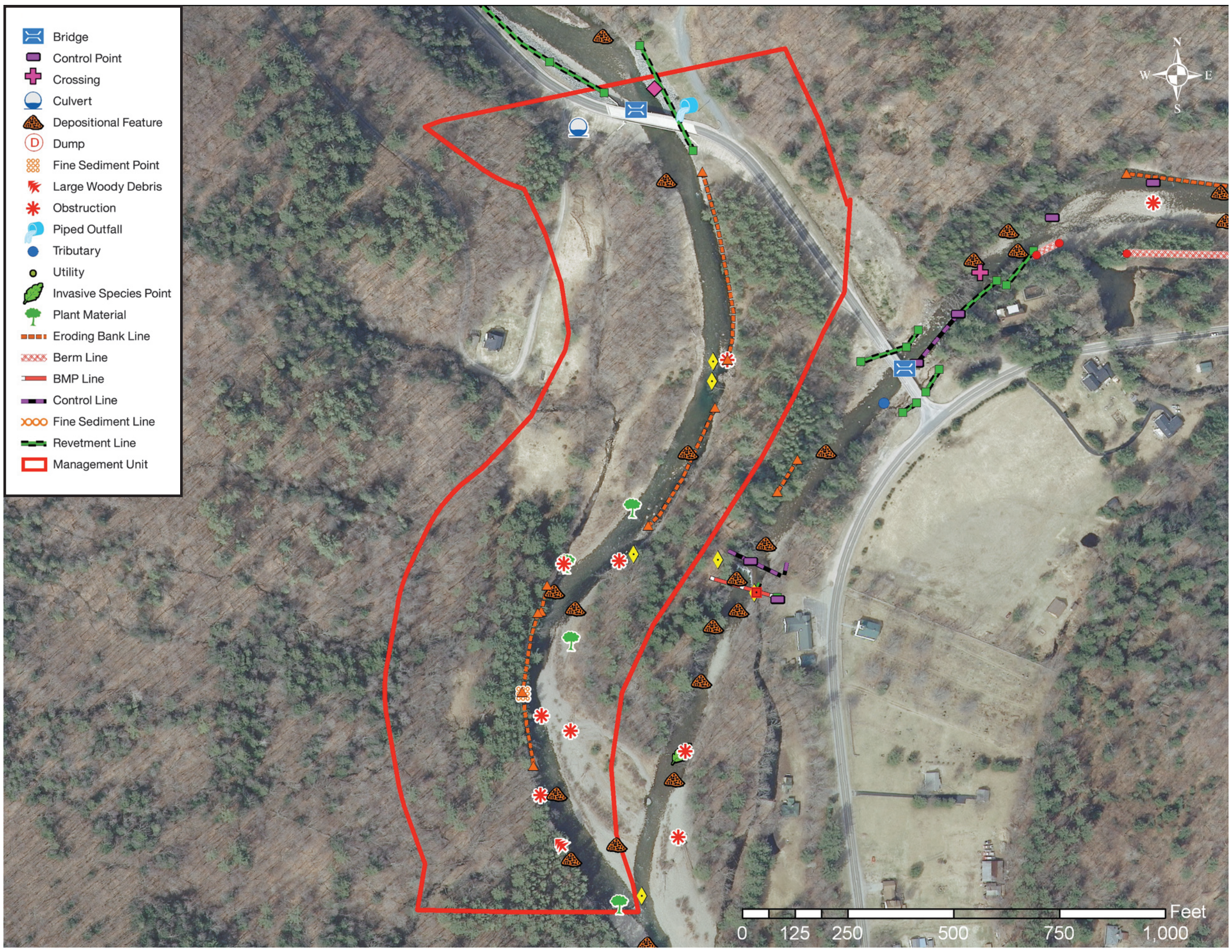
Neversink River West Branch

MANAGEMENT UNIT 1

STREAM FEATURE STATISTICS

- 27.00% of stream length is experiencing erosion
- 4.48% of stream length has been stabilized
- 4.56 acres of inadequate vegetation within the 100 ft. buffer
- None 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

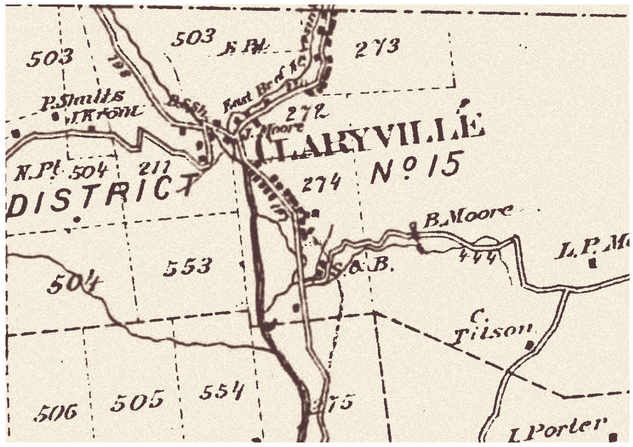
This management unit begins the the Frost Valley Road Bridge at Station 2200, continuing approximately 2,300 ft. to the confluence of the East Branch of the Neversink River. The drainage area ranges from 33.90 mi2 at the top of the management unit to 34.40 mi2 at the bottom of the unit. The valley slope is close to 0.21%. The average valley width is 275.35 ft.

Summary of Recommendations
West Branch Management Unit I

Intervention Level	Assisted restoration of the bank erosion sites from Station 1430 to Station 1100 (BEMS NWB1_1100) and Station 760 to Station 400 (BEMS NWB1_700 and BEMS NWB1_400). Passive restoration of the bank erosion between Station 1950 and Station 1500 (NWB1_1500).
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. Riparian buffer improvement areas were observed on both banks in the areas between Station 2200 to Station 1400 and on the left bank from Station 910 to 770 (Figure 7).
Infrastructure	None.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	None.
Water Quality	None.
Further Assessment	Include MU1 in comprehensive Local Flood Hazard Mitigation Analysis of Claryville MUs.

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.

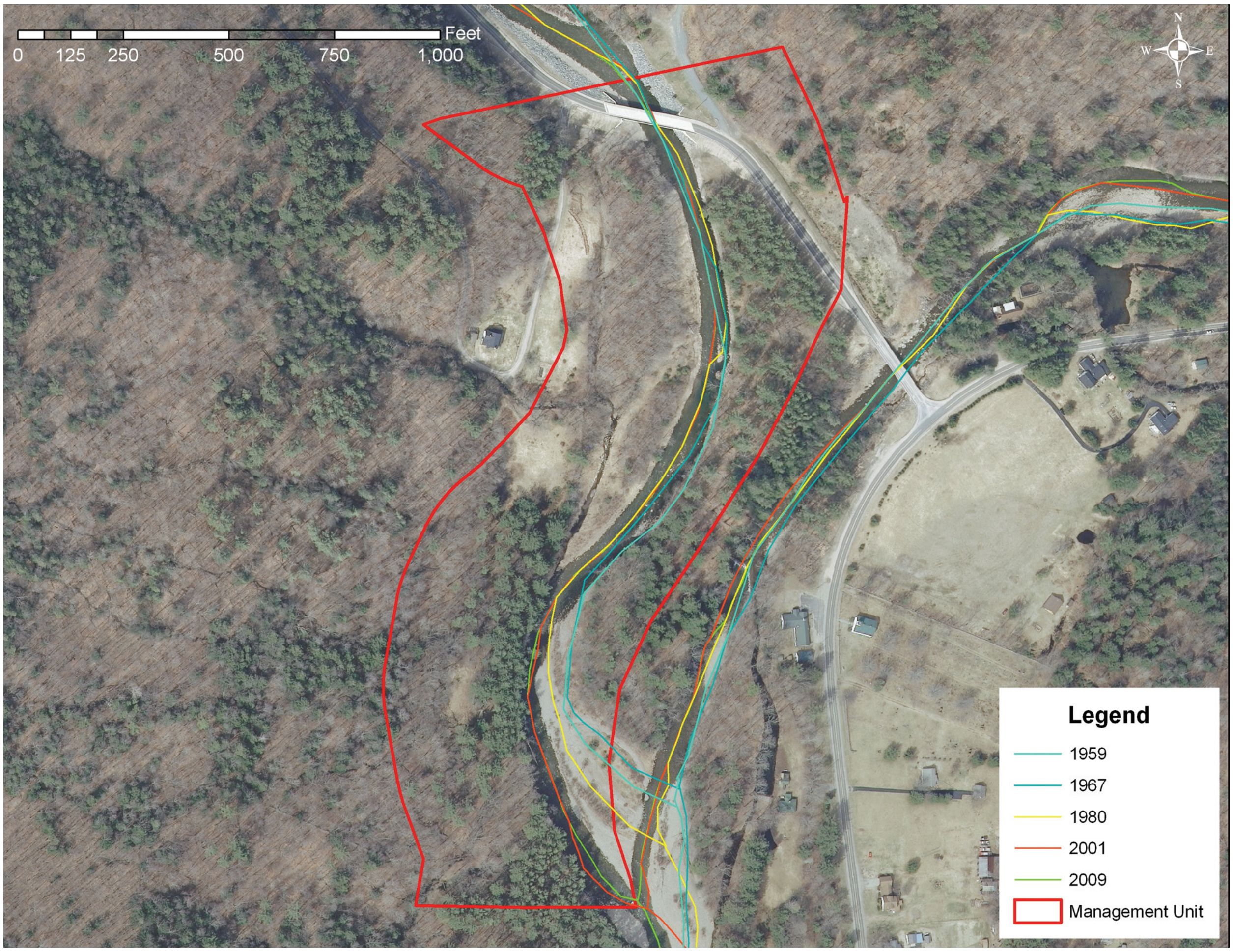


Excerpt from 1875 Beers Map (Figure 2)

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.

According to the map of Forest Industries in the Catskills and the associated descriptions included in *The Catskill Forest: A History* by Michael Kudish (Purple Mountain Press, 2000), a sawmill with turning works was formerly located in in WBMU1 just above the confluence with the East Branch of the Neversink. This sawmill was reported to be part of Tiverton Farm which extended north and wet of the mill, including the area around Round Pond in Ulster County. Reports vary, but this mill was believed to be operational through at least 1896.

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



Historical channel alignments from five selected years (Figure 3)

floodplain numerous times in many locations. A comparison of historical channel alignments *(Figure 3)* and in-stream observations made during a stream feature inventory in 2010 *(Figure 1, page 1)* indicate significant lateral channel instability. According to records available from the NYSDEC DART database 25 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/**).

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 with the end of a depositional side bar on the right bed that continued under Frost Valley Road Bridge from WBMU2. Potential buffer improvement sites were documented on both banks between Station 2200 and Station 1400, and further downstream along the left bank between Station 910 and Station 770 *(Figure 7)*. Across from the end of this bar, near Station 1950, an eroding bank segment was observed on the left bank.
This bank segment extends 450 feet to Station 1500 (BEMS NWB1_1500). The bank site was documented as active; hydraulic erosion and fluvial entrainment are exposing stratified alluvial materials and undercutting the riparian vegetation on the top of the bank but up to 1 foot in some places. Vegetation and hardening with large boulder were observed. *(B361)*

Eroding segment on left bank (B361)

It is likely that the wide band of riparian forest with old hemlock growth between the main channel and Frost Valley Road will significantly slow erosion on this bank. Therefore, it is recommended that this bank be left to revegetate and stabilize without treatment (*passive restoration*) and that the site be monitored for changes in condition.

Toppled foundation on left bank (B367)

A toppled foundation was observed on the left bank at the end of this eroding bank segment near Station 1500. *(B367, A24)* According to the map of Forest Industries in the Catskills and the associated descriptions included in *The Catskill Forest: A History* by Michael Kudish (Purple Mountain Press, 2000), a sawmill with turning works was formerly located in in WBMU1 just above the confluence with the East Branch of the Neversink. It is possible that this foundation was part of the mill, which was believed to be operational through at least 1896. The headcut and pool observed in the main channel slightly downstream from the foundation near Station 1450 could also be indicators of the remains of a sawmill raceway or mill wheel. *(A23)*

A bank eroding segment was observed on the left bank extending 330 feet from Station 1430 to Station 1100. (BEMS NWB1_1100) on the outside of a wide meander bend. Although vegetation and hardening at the toe were observed, this bank site had several boulder obstructions and large woody debris jams increasing scour on the bank. This site was documented as active with erosion on the crown of the failure during high flow events exposing stratified alluvial materials. *(B370 and B373)* Due to the increased pressure on the bank from the main channel at the outside of the meander bend and the scour aided by debris accumulation, recommendations for this site include *assisted restoration* using *bioengineering* techniques to increase bank stability.

A flood chute was observed diverging into the floodplain on the left bank near Station 1000,

Construction debris (A24)

Pool at topple foundation site (A23)

Actively eroding left bank segment (B370)

Woody debris jams increasing scour on left bank (B373)

Flood chute on left flood plain (B375)

Potential willow harvest source (A29)

apparently diverted by a woody debris jam. Across from this divergence, a side channel conveying flow form the right floodplain joins the main channel around a cobble depositional bar vegetated with willow. This willow was documented as a potential plant source for restoration project in the watershed, and could potentially be used for assisted restoration of the eroding bank segment slightly upstream on the left bank. *(B375, A29)*

Slightly downstream of this convergence a transverse bar was observed spanning the width of the cobble bed channel, directing flow in toward an eroding bank segment on the right bank. *(A35)* A cobble point bar begins on the left bank near Station 800, also forcing flow toward the eroding right bank. *(B381)*

Two distinct eroding bank segments were observed on the right bank on the outside of this meander bent. The first extends 60 feet from Station 760 to Station 700 (BEMS NWB1_700). This site was documented as inactive with grass and sedge vegetation observed on the slope and hardening at the toe. However, the eroding bank segment from Station 760 to Station 400 (BEMS NWB1_400)

Transverse bar spanning channel width (A35)

Cobble point bar on left side of channel (B381)


Eroding right bank segment (A42)


Delta bar (B383)

was documented as active; no vegetation was observed on the slope or at the toe and hydraulic erosion during high flow events appears to entrain fine sediments included in bank materials. This bank was documented as a potential source of fine sediments although it is not a significant source of turbidity. *(A42)*

Due to the increased pressure on the bank from the main channel at the outside of the meander bend and the scour aided by debris accumulation, recommendations for this site include *assisted restoration* using *bioengineering* techniques to increase bank stability and reduce entrainment of fine sediments.

The remaining reach of the West Branch features significant sediment deposition and large woody debris accumulation due to backwatering from the convergence with the East Branch at Station 0. A delta bar with cobble, gravel and sand was observed between the two branches at the convergence. *(B383)* WBMU1 ends at this convergence at Station 0.

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 contains mostly sediment storage reaches. The 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. The densely forested portion of the watershed upstream of this management unit serves as a continuous source of large woody material that is transported downstream and deposited during flood events. This large woody debris often serves as an obstruction to sediment transport, resulting in the aggradation of bed material. Sediment storage reaches can result from natural conditions, like the widening valley floor and decreased channel slope in WBMU1 or as the unintended consequence of poor bridge design, check dams or channel overwidening.

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 (44.64 %) followed by evergreen closed tree canopy (14.81%). *Impervious* area makes up 1.89% of this unit's buffer. No occurrences of Japanese knotweed were documented in this management unit during the 2010 inventory.

There are 6.70 acres of wetland (14% of MBMU1 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 wetlandA type descriptions and regulations). All of the wetland in MBMU1 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. There are no structures WBMU1 within the 100-year floodplain as identified on the FIRM maps.

BANK EROSION Due to a number of conditions in WBMU1, the stream banks within the management unit are at high risk of erosion, primarily associated with ineffective sediment conveyance. The channel gradient is relatively low in WBMU1, leading to bed aggradation in some areas. Aggrading conditions lead to channel widening via bank erosion. Four areas of erosion were documented in the management unit during the stream feature inventory.

An eroding bank segment was observed on the left bank extending 450 feet to Station 1500 (BEMS NWB1_1500). The bank site was documented as active; hydraulic erosion and fluvial entrainment are exposing stratified alluvial materials and undercutting the riparian vegetation on the top of the bank but up to 1 foot in some places. Vegetation and hardening with large boulder were observed.

It is likely that the wide band of riparian forest with old hemlock growth between the main channel and Frost Valley Road will significantly slow erosion on this bank. Therefore, it is recommended that this bank be left to revegetate and stabilize without treatment (*passive restoration*) and that the site be monitored for changes in condition.

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INFRASTRUCTURE None of the stream bank length in this management unit has been treated with revetment and 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 WBMU1 has been classified as "A(T)" connoting 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. There are no piped outfalls 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 WBMU1 that is 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. 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

"Our impression is that these are some of the most severe erosion spots, and deserve priority treatment."