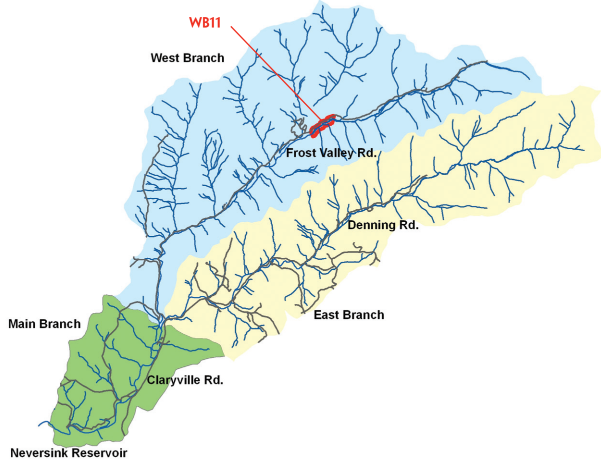
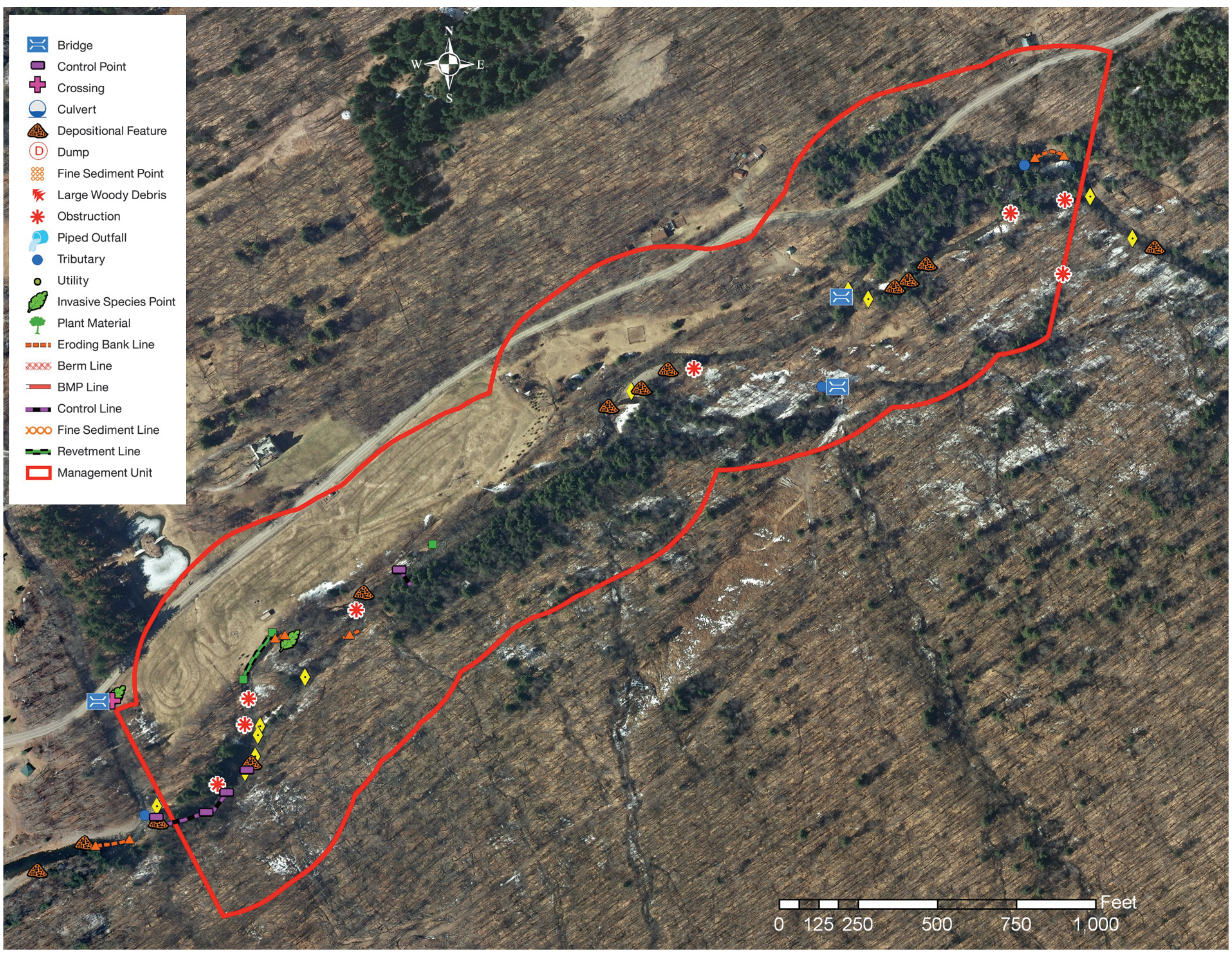
Neversink River West Branch

MANAGEMENT UNIT 11

STREAM FEATURE STATISTICS

- 3.00% of stream length is experiencing erosion
- 2.69% of stream length has been stabilized
- 16.03 acres of inadequate vegetation within the 100 ft. buffer
- None of stream is within 50 ft. of the road
- There is one building structure located within the 100-year floodplain boundary of the Neversink River.





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

This management unit begins as the river flows adjacent to Frost Valley Road near eastern boundary of the Frost Valley YMCA campus near Station 43700 and continues 3,700 feet to the confluence of Biscuit Brook near Station 40000. The drainage area ranges from 8.50 mi^2 at the top of the management unit to 9.40 mi^2 at the bottom of the unit. The valley slope is close to 1.79%. The average valley width is 642.68 ft.

Summary of Recommendations
West Branch Management Unit 11

Intervention Level	Passive restoration of the bank erosion between Station 43700 to Station 43600 (BEMS NWB11_43600).
Stream Morphology	Protect and maintain sediment storage capacity and floodplain connectivity. Conduct baseline survey of channel morphology.
Riparian Vegetation	Investigate and evaluate 13.10 acres of potential riparian buffer improvement areas for future buffer restoration. Various potential riparian buffer improvement sites exist along the right floodplain between Station 42900 and Station 40100 (Figure 7)
Infrastructure	Investigate history and original objectives of revetments and control structures.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	Floodproofing as appropriate. http://www.fema.gov/library/viewRecord.do?id=1420
Water Quality	None.
Further Assessment	Include MU11 in comprehensive Local Flood Hazard Mitigation Analysis of Claryville MUs.

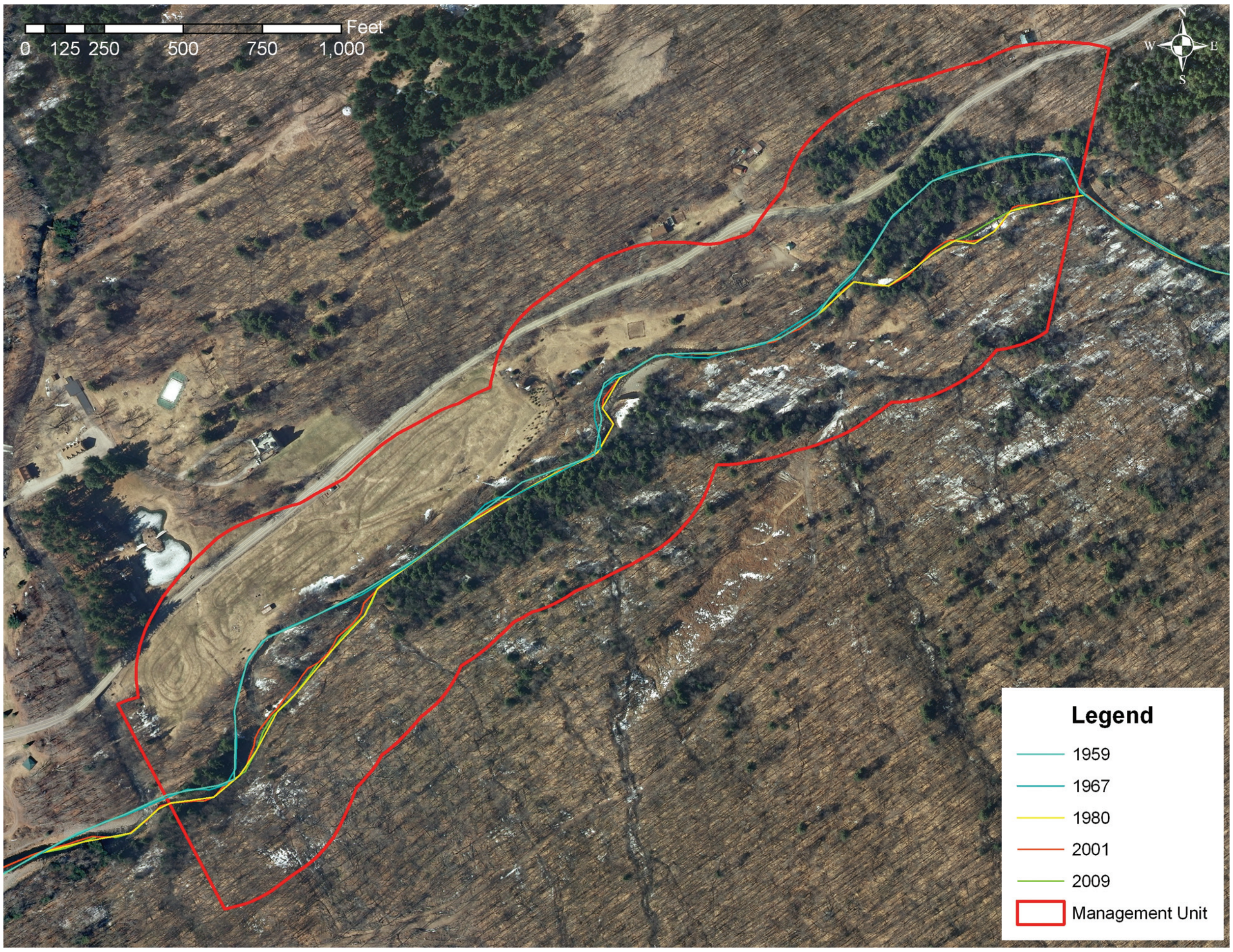
Historic Conditions

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.

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. According to records available from the NYSDEC DART database, no 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.

WBMU11 begins as a side channel meanders across the valley floor towards Frost Valley Road and the right valley wall. At the apex of the meander, from Station 43700 to Station 43600 an eroding bank segment was observed on the right bank (BEMS NWB11_43600). This site was documented an active erosion into a 60-foot high bank caused by both surficial failure and hydraulic erosion at the toe. Shrubs, grasses and sedges were observed growing throughout the exposed till bank and additional boulder accumulation and vegetation was observed at the bank toe. Therefore it is likely that this bank will revegetate and stabilize without treatment (*passive restoration*). However, it is recommended that this site be monitored for changes in condition. *(A1000)*

Bank failure on right bank of side channel (A1000)

Directly downstream of the eroding bank segment a intermittent tributary conveying road drainage from Frost Valley Road was observed joining the side channel from the right bank. *(A1005)*

Intermittent tributary conveying road drainage (A1005)

At a similar elevation further left on the valley floor the main channel is littered with woody obstructions which form sediment deposition areas and pools throughout. At Station 43500 a headcut migrating upstream through the cobble bed was observed in the main channel. *(A1006, A1009)* A series of three significant sediment deposition areas were observed upstream of a divergence around a center island near Station 42950.

Woody debris contributing to pools and deposition (A1006)

Headcut migrating upstream (A1009)

The side channel joins the main channel at the downstream end of the island near Station 42900, directly upstream of the bridge that provides access to the east entrance of the Frost Valley Model Forest. *(A111, A1018)* Depositional features, such as this center island and the bar extending downstream from the island, often form upstream of bridges where the bridge approaches restrict flows that would otherwise effectively transport sediment. Beginning at Station 42900 and continuing until Station 40100, large tracts of herbaceous vegetation fragment the riparian forest along the right floodplain and should be further assessed for the potential of improving the riparian buffer through planting efforts *(Figure 7)*.

The East Entrance Bridge was documented as in good structural and good functional condition. The *normal span* and *effective span* of 38 feet. The bridge is a single span bridge with stacked stone abutments; the right abutment encroaches 4 feet while the left abutment encroaches 9 feet. *(A1016)*

Center bar upstream of bridge (A1011)

Looking upstream at island (A1018)

East Entrance Bridge (A1016)

200 feet south in the model forest a side channel flows adjacent to the left valley wall having diverged from the main channel upstream in WBMU12. Near Station 42650 a second recreational bridge crossing was observed connecting the parking lot near Frost Valley Road to the Frost Valley Model Forest recreational trails and conveying flow in this side channel. This bridge was documented in good structural and functional condition with a normal span and effective span of 25 feet with 1 foot of encroachment on both banks. *(B893)* The Wild Cat Brook tributary converges with this side channel 50 feet downstream of the bridge near Station 42600 conveying flow from the north face of Wildcat Mountain. *(B895)*

The side channel converges with the main channel near Station 42100 behind the apex of a cobble point bar on the left bed. This point bar was documented as 200 feet long with some grass and sedge vegetation. *(B900, A1025)* Downstream of the point bar the main channel follows a short meander to the left before forming a straight reach for 700 feet along a cleared pasture with a 60-foot thick woody riparian buffer. Near Station 41200

East Entrance Bridge (B893)

Wild Cat Brook tributary (B895)

Side channel and main channel convergence (B900)

Cobble point bar on left bed (A1025)

a log cribbing revetment was observed on the right bank. *(B909)* This structure was documented in fair structural condition; because the purpose and past use of the structures remain unclear the functional condition cannot be assessed. Overall, the reach-scale affect of the barbs appears to be formation of a vegetated depositional side bar on the right bank.

Log cribbing revetment on right bank (B909)

Near Station 40080 a log check dam and log cribbing in the left and right bank were observed. This structure was documented in good structural condition; because the purpose and past use of the structures remain unclear the functional condition cannot be assessed. Overall, the reach-scale affect of the check dam and cribbing appears to aggradation throughout this reach. *(B912)*

Log check dam and log cribbing (B912)

It is difficult to decipher the original design objectives of these structures; they may have been designed to improve or enhance aquatic habitat or to protect banks. It is recommended that the history and original objectives of these features be investigated to better understand the current function and ongoing hydraulic effects. Long term monitoring of the structures is also recommended.

Woody debris obstruction causing divergence (B920)

Divergence with dry side channel (B916)

At Station 40950 a dry side channel with a cobble bed a 5-7 years of emergent vegetation diverges from the main channel at a woody debris obstruction. *(B920, B916)* Japanese Barberry, in invasive species, was observed on the right bank of the side channel near Station 40700. *(A1033)*. Across from the barberry bank scour was observed on the right bank extending 30 feet exposing alluvial cobbles with undercutting into a thin riparian buffer on top of the bank. Up slope from the eroding bank site is a covering structure within the FEMA-mapped 100-year flood.

Directly downstream of the scour a sloped stone revetment was observed extending 175 feet from Station 40670 to Station 40495. The revetment was documented in good structural and functional condition as it appeared to be stabilizing the bank along a pasture with no riparian buffer, although some bank scour was observed at the downstream end aggravated by a woody obstruction. Efforts to revegetate along the top of the bank with white pine and white oak saplings were observed. *(A1038, A1037)* A large clump of barberry was observed on the left bank of the side channel across from the revetment. *(A1039)*

Japanese Barberry, invasive species (A1033)

Re-vegetating pasture with White Pine and White Oak saplings (A1037)

Sloped stone revetment on right bank (A1038)

Japanese Barberry on left bank (A1039)

The side channel converges with the main channel at Station 40430 directly upstream of a headcut in the main channel bed followed by a scour pool. *(A1043, A1046)*.

At Station 40330 a side channel conveying flow from the left valley wall converges with the main channel, forming a partly vegetated delta bar in the main channel. *(A1047, A1048)* Slightly downstream of the delta bar a boulder planform control was observed on the left bank followed by a second headcut in the cobble bed of the channel.

Side channel and main channel convergence (A1043)

Headcut and scour pool in main channel (A1046)

Side channel conveying flow from left valley wall (A1047)

Partly vegetated delta bar (A1048)

Headcut in cobble bed of channel (A1052)

(A1052) This series of headcuts is most likely associated with the exposed bedrock forming a grade and planform control on river migration observed slightly downstream on the left bank from Station 40180 through the end of WBMU11 at Station 40000.

WBMU11 ends at Station 40000, slightly upstream of the Biscuit Brook confluence.

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 mix of sediment storage reaches and sediment transport 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 within 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 as is the case in this management unit or as the unintended consequence of poor bridge design, check dams or channel overwidening. This is one process by which floodplains are created and maintained.

In some locations in this management unit, however, relatively low channel sinuosity, narrow, bankfull-stage floodplains of moderate entrenchment with mature vegetation produce transport reaches, which are in a state of *dynamic equilibrium,* effectively conveying sediment supplied from upstream during each flow event. However, the densely forested floodplain still serves as a source of large woody material that that can be introduced into the channel during flood events. This large woody debris often serves as a local obstruction to sediment transport, resulting in the aggradation of bed material and the development of floodplains over the long-term. Healthy undeveloped floodplains throughout the Neversink watershed like the floodplains throughout WBMU13 reduce the velocity of higher flows thereby mitigating the threat of stream bank erosion and property damage during flood events.

To better understand sediment transport 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 (43.72 %) followed by herbaceous vegetation (20.15%) and evergreen closed tree canopy (17.87%). *Impervious* area makes up 2.90% of this unit's buffer. There are 13.1 acres of potential buffer improvement area in this management unit *(see Figure 7)*. No occurrences of Japanese knotweed were documented in this management unit during the 2010 inventory.

There are 0.05 acres of wetland (0.08% of WBMU11 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 A type descriptions and regulations). All of the wetland in WBMU11 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 is one building structure (a covered horse paddock) in WBMU12 within the 100-year floodplain as identified on the FIRM maps. FEMA provides guidance to homeowners on floodproofing at: **http://www.fema.gov/library/viewRecord.do?id=1420**

BANK EROSION One area of erosion was documented in the management unit during the stream feature inventory. From Station 43700 to Station 43600 an eroding bank segment was observed on the right bank (BEMS NWB11_43600). This site was documented an active erosion into a 60-foot high bank caused by both surficial failure and hydraulic erosion at the toe. Shrubs, grasses and sedges were observed growing throughout the exposed till bank and additional boulder accumulation and vegetation was observed at the bank toe. Therefore it is likely that this bank will revegetate and stabilize without treatment (*passive restoration*). However, it is recommended that this site be monitored for changes in condition.

INFRASTRUCTURE A sloped stone revetment was observed extending 175 feet from Station 40670 to Station 40495. The revetment was documented in good structural and functional condition as it appeared to be stabilizing the bank along a pasture with no riparian buffer, although some bank scour was observed at the downstream end aggravated by a woody obstruction. Efforts to revegetate along the top of the bank with white pine and white oak saplings were observed.

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 WBMU11 has been given a "C(T)" class designation with 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 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 WBMU11 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**.