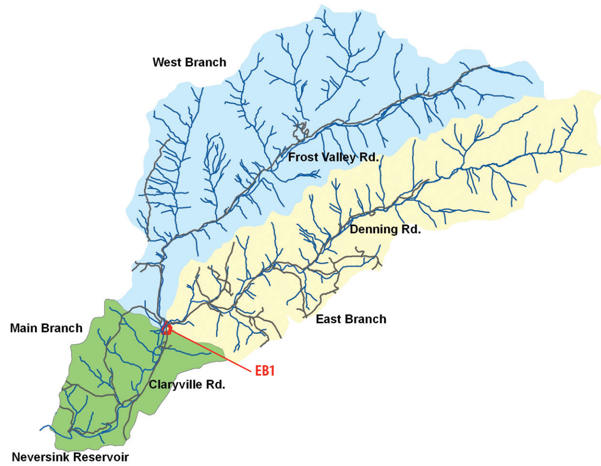
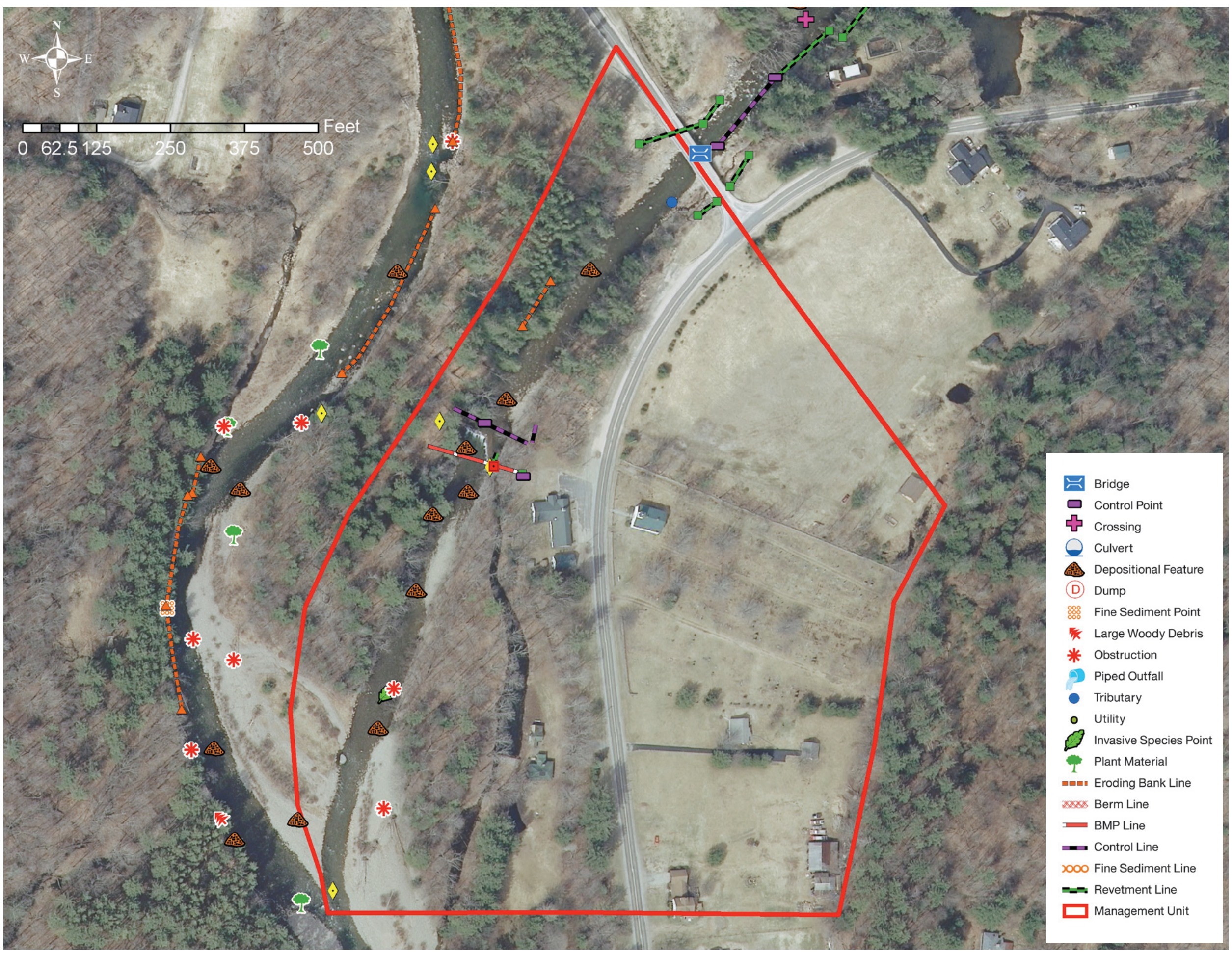
Neversink River East Branch

MANAGEMENT UNIT 1

STREAM FEATURE STATISTICS

- 3% of stream length is experiencing erosion
- 4.87% of stream length has been stabilized
- 13.60 acres of inadequate vegetation within the riparian buffer
- None of the stream length is within 50 ft. of the road
- 1 structure is located within the 100-year floodplain boundary





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

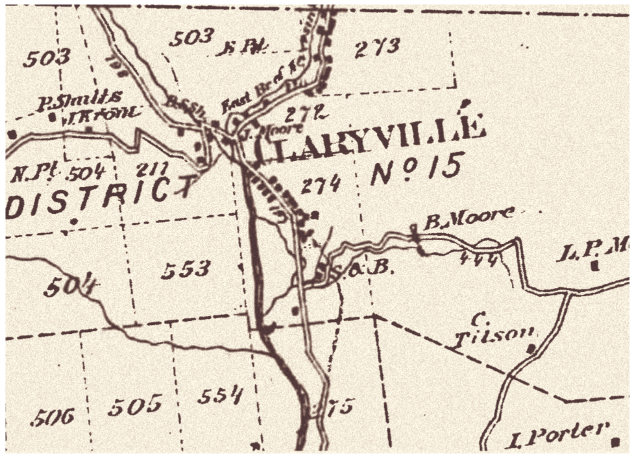
This management unit begins at the confluence of the East and West Branches of the Neversink River, continuing approximately 1,450 ft. to a bridge crossing of West Branch Road. The drainage area ranges from 27.50 mi2 at the top of the management unit to 34.4 mi2 at the bottom of the unit. The valley slope is 0.59%. The average valley width is 165.65 ft.

Summary of Recommendations
East Branch Management Unit 1

Intervention Level	Passive Restoration of the bank erosion site between Station 1140 and Station 1050 (BEMS ID # NEB1_1000).
Stream Morphology	Excessive sediment deposition caused by backwatering at confluence of East and West Branches. Conduct baseline survey of channel morphology, including channel migration at confluence of East and West Branches.
Riparian Vegetation	Investigate occurrence of Japanese Barberry at Station 380.
Infrastructure	Investigate flood threats to Denning Road in left floodplain.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	Assess threats to building structures in 100-year floodplain.
Water Quality	None.
Further Assessment	Long-term monitoring of erosion sites.

Historic Conditions

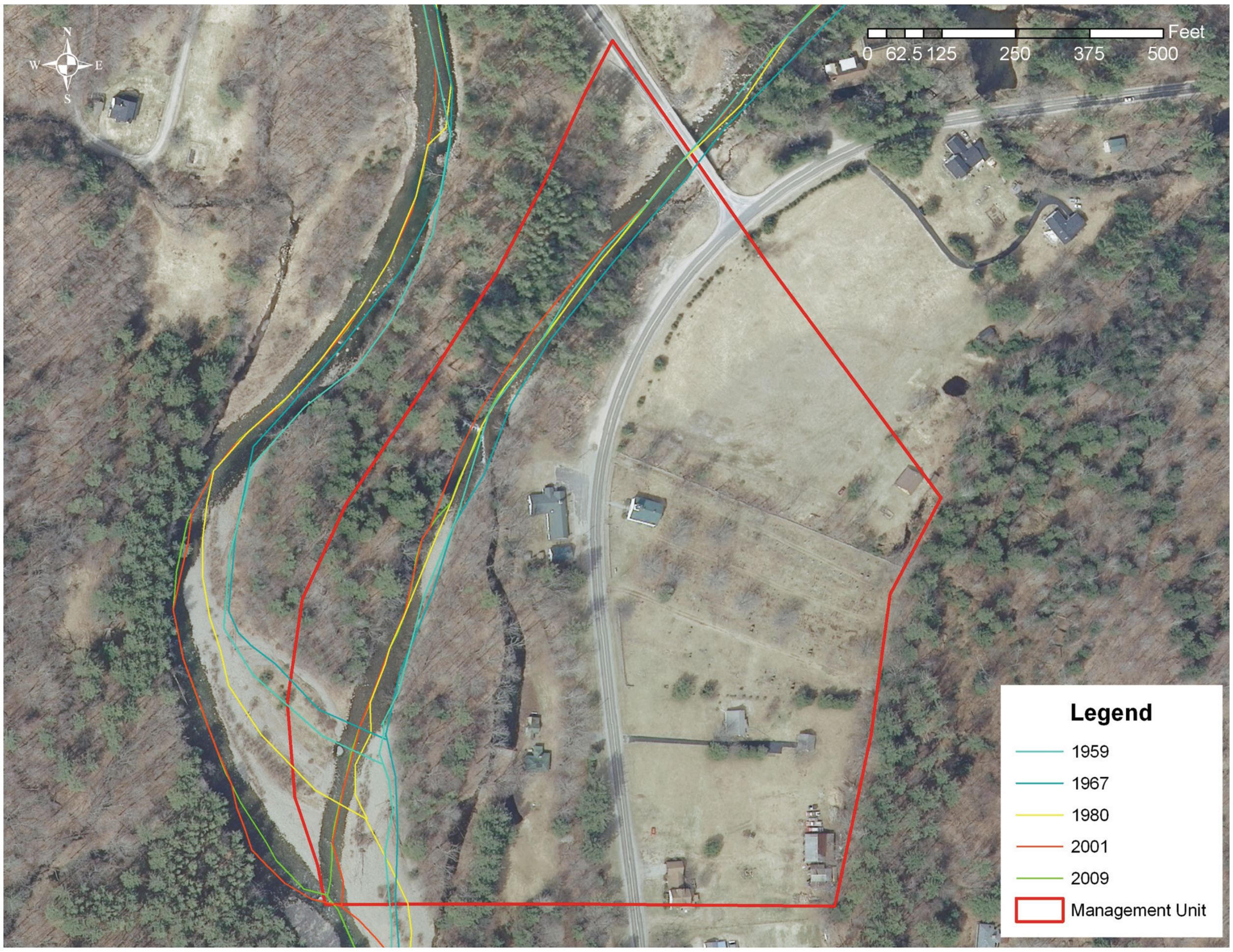
As the glaciers retreated about 12,000 years ago, they left their "tracks" in the Catskills. See Section 2.4 *Geology of Upper Neversink River,* for a description of these deposits. These deposits make up the soils in the high banks along the valley walls on the Neversink mainstem and its tributaries. 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 significant lateral channel instability and 5 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.

EBMU1 begins at the downstream end of the bridge crossing of West Branch Road. The stacked boulder revetments that began on the upstream side of the bridge in EBMU2 continue into this management unit. The revetment along the right bank continues for approximately 60-feet until Station 1390. The left bank is revetted for a length of 40-feet to Station 1410. *(A515)* Continuing downstream past the bridge, the valley floor widens significantly as the stream approaches its confluence with the West Branch. A narrow forested riparian corridor provides some flood protection to the building structures and road in the left floodplain; however, this infrastructure is still at a relatively high risk of inundation during flood events. The East and West Branches are separated by a forested corridor approximately 250-feet in width throughout most of EBMU1.

Left bank revetment at bridge abutment (A515)

A small unnamed tributary enters the main channel from the left bank at Station 1300. This tributary appears to be drainage from the retention pond that was documented approximately 600-feet upstream in EBMU2. *(A517)* This management unit can be largely classified as a sediment storage reach as evidenced by significant deposition of sediment throughout the channel. The likely cause of most of this aggradation is a backwatering effect brought about by the confluence downstream. The first instance of aggradation was documented at Station 1190, where sediment deposition has raised the elevation of the stream bed across the entire channel. This aggradation continues downstream for approximately 280-feet until Station 910. *(B404)*

Drainage from retention pond entering stream (A517)

Full channel aggradation (B404)

The right bank is experiencing erosion beginning at Station 1140 and continuing for approximately 90-feet until Station 1050 (BEMS ID# NEB1_1000). *(B407)* Moderate hydraulic scour of this 8-foot high bank has exposed cobble sized alluvial materials as well as the root structure of several trees. The rate of erosion at this site does not appear to be severe enough to warrant intervention. However, recommendations for this site minimally include monitoring for future changes in condition (passive restoration).


Erosion along right bank (B407)


Timber dam spanning channel width (A522)


Gabion baskets preventing scour caused by divergence (A526)

At Station 850 there is a v-shaped timber dam that spans the entire width of the stream channel. *(A522)* This structure appears to have been placed to provide habitat for trout. The water faces an abrupt vertical drop as it flows over the dam, resulting in a deep scour pool below. The structure appears to be relatively new and continues to function for the creation of habitat. Structures such as this were observed frequently in the East Branch of the Neversink River and can significantly alter flow dynamics. The presence of this dam is forcing a portion of the flow into a side channel in the left floodplain. This channel continues through the floodplain and converges with the main channel downstream of the confluence of the East and West Branches. *(A526)* The scour caused by the divergence along the left bank has resulted in the placement of gabion baskets on the left end of the structure. Gabion baskets are very susceptible to failure during high flows, as larger rocks moved by the stream can continuously hit the cage and cause structural weaknesses. The combination of stresses caused by stream flow and sediment movement can cause tearing of the basket and release of the rock inside, resulting in the structure no longer functioning for its intended purpose.

Just downstream of the habitat structure, a small side channel which diverted from the West Branch converges into EBMU1. It is likely that during significant flow events there are several flood chutes across the dividing forest corridor that exchange flow between the East and West Branch. Deposition begins along the right bank in the form of a cobble side bar at Station 820, continuing downstream for approximately 130-feet until Station 690. This bar is well vegetated with various species of grasses and sedges. Another cobble side bar has formed along the left bank is approximately 200-feet in length and is located between Station 750 and Station 550. Very little vegetation exists along this depositional feature. *(A527)*

Large woody debris has accumulated along the left side of the stream and is causing obstructions to flow at Station 390 and Station 180. *(B429)* Japanese barberry, a species that is invasive to the Catskills, was documented at Station 380. This species was first brought to North America by early settlers for its use in making dyes and jams, as well as its popularity as an ornamental plant. It can have a negative effect on ecosystem health because it can compete against native plant species for resources and effectively lower diversity. The leaf litter of the Japanese Barberry can raise the pH levels of the soil and influence nitrogen levels, therefore making the area unsuitable for native plant species.

A significant amount of sediment deposition begins on both sides of the channel at Station 300. A bar begins along the left side of the stream at this Station and continues approximately 500-feet before ending downstream of the confluence. This bar primarily consists of cobble sized materials and is heavily vegetated with willows, making it an ideal harvest site for restoration materials. *(B425)* Extensive willow stands also exist along the right side of the channel on a bar that divides the two branches leading into the confluence. *(B387)*

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.

Cobble side bar along left bank with little vegetation (A527)

Large woody debris accumulated on left side of stream (B429)

Cobble bar on left side of stream (B425)

Convergence of East and West Branch (B387)

Vertical migration of the channel due to elevation differences at confluence (B383)

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.

An analysis of historical channel alignments at this confluence indicates significant lateral channel migration to the right over the past 50 years. This channel migration can be attributed to a number of natural and human induced changes in the watershed, and can be a reflection of the disturbance history of the channel. Shifts in floodplain land use within the Neversink valley, such as transitions between old growth forest, livestock grazing, and modern development, all contribute to changes seen in channel morphology. Disturbances within the stream channel are also commonplace in the Neversink, and have ranged from the diversion of flow to historical mills and tanneries, to modern day check dams used to create artificial trout habitat. In-channel disturbances such as these have the ability to significantly alter flow regime and sediment transport. In addition to human induced disturbances, this confluence is also naturally susceptible to migration due to the presence of alluvial sediments which are easily eroded and deposited, as well as a lack of any lateral or vertical controls that might prevent migration. These conditions offer little resistance to frequent shifts in the course of flow. At the time of this stream feature inventory, the bed elevation of the West branch was much higher than the East branch at the confluence, resulting in ongoing vertical migration of the channel as water flows over this abrupt elevation drop and scours the bed substrate. *(B383)*

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 largely dominated by sediment storage reaches and occasionally punctuated by short transport reaches. The channel maintains a well connected floodplain on both sides throughout EBMU1. The right floodplain consists of a narrow but densely forested corridor which separates the East and West Branches. The left floodplain is moderately developed and dominated by herbaceous vegetation, but does contain a narrow riparian buffer between the stream and developed area. Sediment is stored in this management unit primarily due to a backwatering effect caused by the confluence of the two branches. During significant events, the current at the downstream end of EBMU1 is slowed by the confluence which prevents the flow necessary to effectively transport sediment out of the management unit. 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 migrations 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. Transport reaches are in a state of *dynamic equilibrium*, effectively conveying sediment supplied from upstream during each flow event. Unpredictable conditions created by changes in channel geomorphology represent risks for nearby property owners during flood events. However, these dynamic disturbance regimes also produce unique and diverse habitat patches, attracting equally diverse plant communities and wildlife.

To better understand sediment transport and sediment transport dynamics 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 binds 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 which are native and therefore well-adapted to the Catskills climate and soil conditions, and as a result often require less maintenance following planting and establishment. Figure 4.4.1.5 shows areas in the stream corridor where vegetated buffer could be improved; these areas may, however, be providing important ecological functions in their current condition. Technical guidance is available from the Catskill Streams Buffer Initiative at the Rondout/Neversink Stream Management Program (for more information, see Section 2.6 Riparian Vegetation).

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.

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 herbaceous vegetation (51.50 %) followed by mixed-closed tree canopy (19.90 %). *Impervious* area makes up 7.14% of this unit's buffer. No occurrences of Japanese knotweed were documented in this management unit during the 2010 inventory.

There are 3.96 acres of wetland (16.60% of EBMU1 land area) within this management unit mapped in the National Wetland Inventory (see Section 2.5, Wetlands and Floodplains for more information on the National Wetland Inventory and wetlands in the Neversink watershed). Wetlands are important features in the landscape that provide numerous beneficial functions including protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters, and maintaining surface water flow during dry periods (See Section 2.5 for wetland type descriptions and regulations).

Freshwater forested-shrub is the largest wetland type in EBMU1, totaling 2.86 acres in size. The other wetland type in this management unit is Riverine (1.10 acres).

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 building structure is located in the 100-year floodplain in EBM1. 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.

A large portion of Denning Road which runs through the left floodplain of this management unit falls just outside the 100-year floodplain boundary and is at high risk of inundation during flood events. There are also several building structures that fall just outside of the floodplain boundary, but could still be inundated during large floods. FEMA provides guidance to homeowners on floodproofing at:
http://www.fema.gov/library/viewRecord.do?id=1420

BANK EROSION The right bank is experiencing erosion beginning at Station 1140 and continuing for approximately 90-feet until Station 1050 (BEMS ID# NEB1_1000). The rate of erosion at this site does not appear to be severe enough to warrant intervention. However, recommendations for this site minimally include monitoring for future changes in condition (*passive restoration*).

INFRASTRUCTURE 4.87% (141 ft.) of the stream bank length in this management unit has been stabilized with revetments in three different locations. The first two occurrences of revetment are a continuation of the stacked boulders which began on the upstream side of the bridge in EBMU2. The revetment along the right bank begins at Station 1450 and continues for approximately 60-feet until Station 1390. The left bank is revetted for a length of 40-feet from Station 1450 to Station 1410. Gabion baskets have been placed along the left bank between Station 830 and Station 790.

There were no berms documented in EBMU1 at the time of this stream feature inventory.

Aquatic Habitat

Aquatic habitat is an important aspect of the Neversink River ecosystem, providing recreational, aesthetic, and economic benefits to the community. 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 East Branch of the Neversink River been given a "C(T)" class designation, supporting 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 were no piped outfalls documented in EBMU1 during this stream feature inventory.

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 currently 1 documented bank erosion site in EBMU1.
This site is not 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

"Interested in stream bank protection, channel maintenance and new FEMA flood maps"