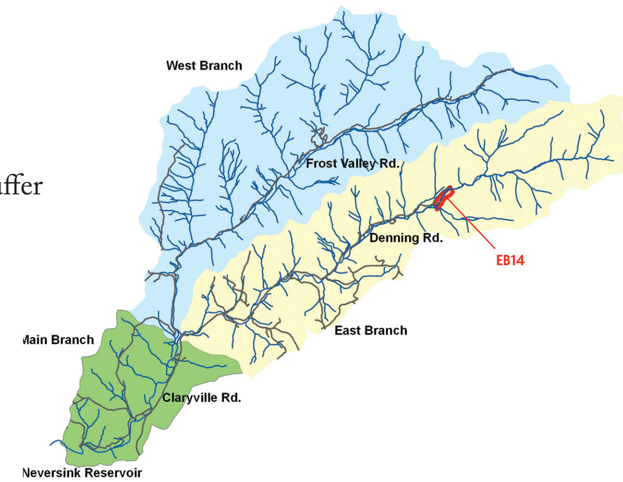
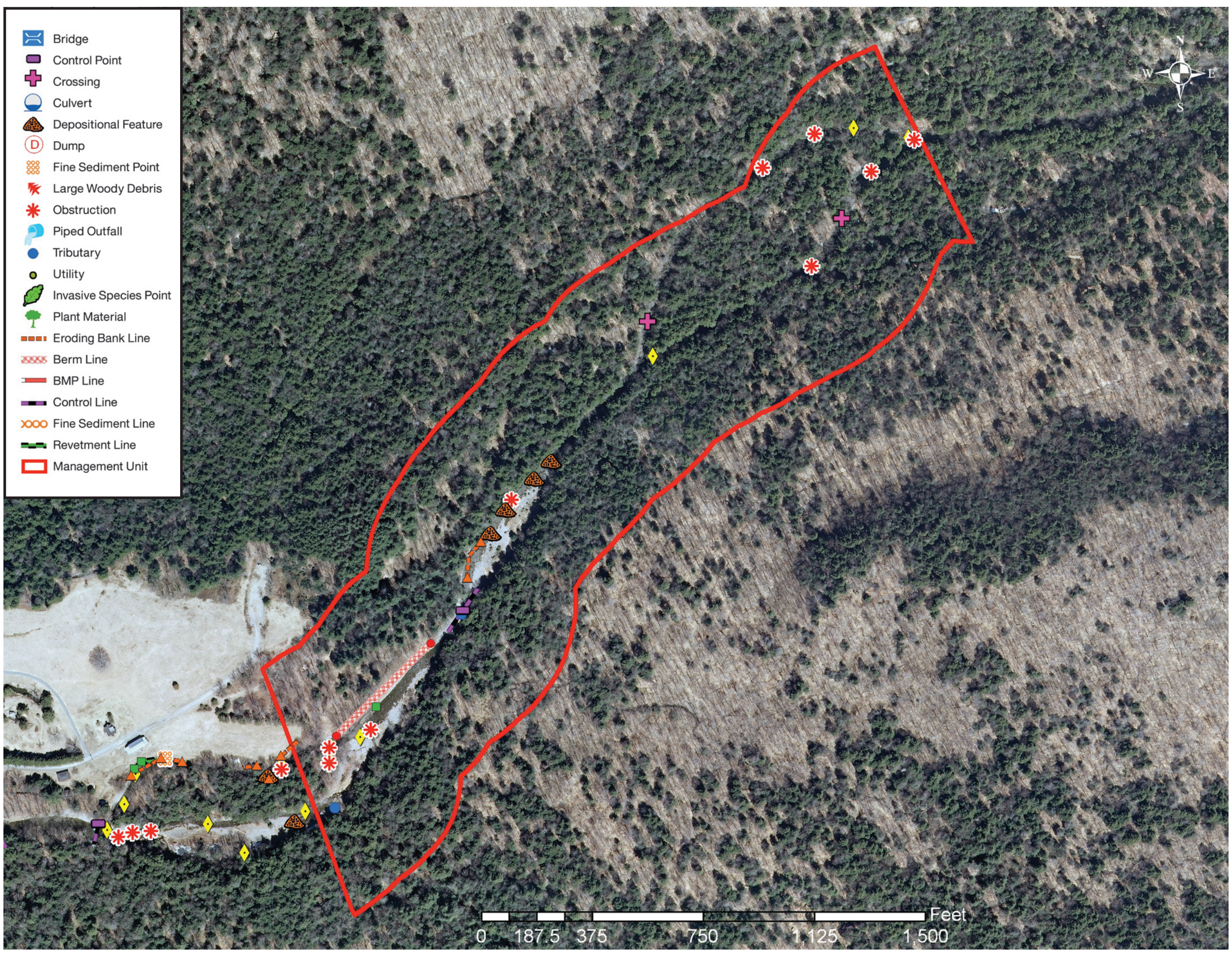
Neversink River East Branch

MANAGEMENT UNIT 14

- 2 % of stream length is experiencing erosion
- 0.25 % of stream length has been stabilized
- 2.11 acres of inadequate vegetation within the riparian buffer
- None of stream is within 50 ft. of the road
- No houses are located within the 100-year floodplain boundary





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

This management unit begins at a confluence with Tray Mill Brook, continuing approximately 3,234 ft. to a major channel divergence. The drainage area ranges from 8.90 mi^2 at the top of the management unit to 10.70 mi^2 at the bottom of the unit. The valley slope is 1.04 %. The average valley width is 635.27 ft.

Summary of Recommendations
East Branch Management Unit 14

Intervention Level	Assisted restoration of the bank erosion site between Station 47800 and Station 47920. (BEMS NEB14_47700) Assisted restoration of the bank erosionsite between Station 46930 and Station 46900. (BEMS NEB14_46900) (continues into EBMU13)
Stream Morphology	Assess sediment deposition resulting from the accumulation of large woody debris supplied by the watershed upstream. Baseline survey of channel morphology and sediment transport analysis.
Riparian Vegetation	Improve buffer along right bank between Station 46930 and Station 46900 (continues into EBMU13).
Infrastructure	None.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	None.
Water Quality	None.
Further Assessment	Long-term monitoring of erosion sites.

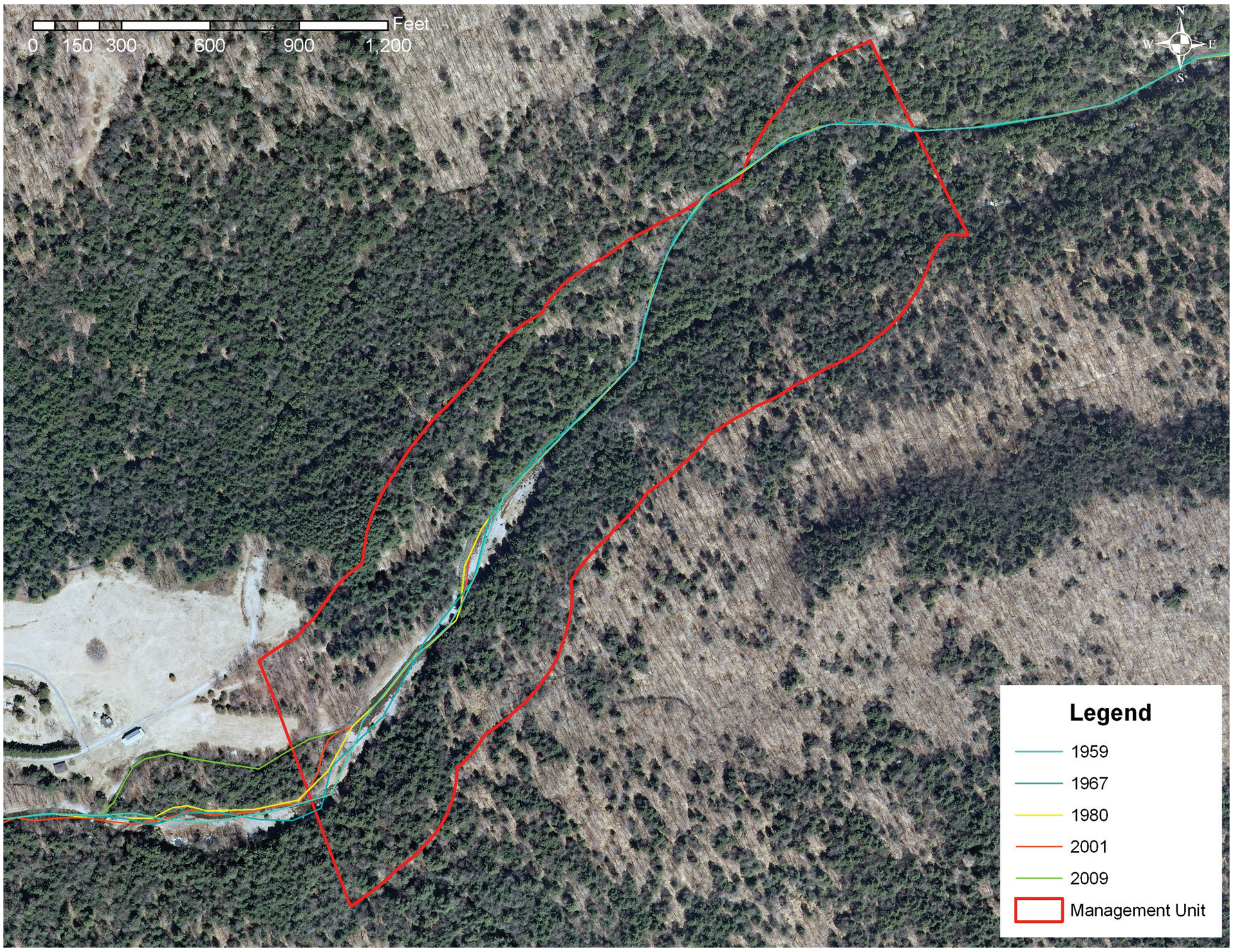
Historic Conditions

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 some lateral channel instability, and no NYS Article 15 stream disturbance permits have been issued in this management unit, according to records available from the NYSDEC DART database (**http://www.dec.ny.gov/cfmx/extapps/envapps/**).



Historical channel alignments from five selected years (Figure 3)

Stream Channel and Floodplain Current Conditions

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

Management Unit 14 begins at Station 50100 as the upper East Branch continues to flow out of New York State forest preserve land and onto property owned by the Alexander Tison Preserve on the right bank and the Frost Valley YMCA on the left bank. This section of stream is characterized by large woody debris obstructions that are likely sourced by the dense forest upstream which provides a consistent supply of mature woody tree material. Accumulation of woody debris in this management unit is first evident at Station 50100, where a log jam obstruction across the main channel has caused a portion of the flow to divert into a secondary side channel. *(A13)*.

The side channel at this divergence holds a perennial flow, and continues the trend of large woody debris accumulation that is evident throughout this reach. Two obstructions were recorded in this side channel, both consisting of trees from the adjacent banks that had fallen in after their roots had been scoured out. These obstructions are becoming larger as they continue to catch other woody debris that is being transported from upstream. *(A20)* The main channel at this divergence consists of a long and shallow riffle system that is confined by the valley wall on the right bank, resulting in toe scour and destabilization of some of the trees along this bank. *(A2)* Tree blow down resulting from this destabilization has caused a small obstruction at station 49830, and a much larger obstruction at Station 49650. *(A6)* A recreational road and stream ford crosses the main channel at Station 48900 *(A21)*, continuing approximately 700-feet in the northeast


Log jam in main channel (A13)


Fallen tree in diverted side channel (A20)


Destabilization of trees along right bank due to toe scour (A2)


Obstruction in channel due to scour (A6)

direction until it eventually crosses the side channel further upstream. *(A18)*. The main channel and side channel come to a convergence at Station 48650, where the stream continues in a single channel for the rest of the management unit. *(A24)*

A depositional area begins at Station 48300, where a side bar consisting of cobbles has formed on the left bank. The bar is vegetated with grass and sedges on the upstream end, but transitions to woody vegetations and shrubs at Station 48200, indicating that this bar has been established for a long period of time. *(A28)* At Station 47920 the stream begins to meander to the left near the downstream end of the side bar, causing a 120-foot long segment of erosion on the right bank, and ending at Station 47800 (BEMS NEB14_47700). The inserted photo shows the unconsolidated alluvial sediments exposed by fluvial erosion at this location. *(A43)* Though actively eroding under high flows, the toe of this eroding bank is currently being protected from scour by large cobbles that have been deposited. The rooting depth of the mature trees present on this bank helps to provide stability to the exposed soils. A riparian buffer including woody vegetation can strengthen the stream bank and slow erosive forces of higher flows during flood

Recreational road and stream ford (A21)

Recreational road crossing side channel (A18)

Looking upstream at main and side channel convergence (A24)

Left bank cobble side bar with woody vegetation (A28)

Right bank erosion showing unconsolidated alluvial sediments (A43)

Left bank mudstone control (A48)

events. Recommendations for this bank erosion site minimally include monitoring for significant changes in condition and possible assisted restoration with techniques to stabilize the bank.

Continuing directly downstream of the side bar the stream is controlled on the left bank by a 173-foot section of mud stone beginning at Station 47800. *(A48)* This mud stone is only exposed on the lower portion of the bank, controlling the stream during low flows, but still allowing access to the floodplain during large flows. A spring enters from the left bank at Station 47700, contributing a perennial flow.

Stone berm on right terrace (A49)

The channel begins to approach the first occurrence of development on the East Branch near the downstream end of this management unit. At Station 47500 there is an old stone berm spanning 446-feet along the right terrace, located between the active channel and an abandoned relict channel. *(A49)* This berm is overgrown by mature woody vegetation and does not appear to be maintained. A newly placed gabion basket exists on the right bank at station 47200, intended to deflect flows away from a barn in the floodplain. *(A51)* 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.

Gabion basket on right bank (A51)

Large log causing channel divergence (A55)

Side channel without leaf litter (A56)

Large woody debris causing partial reroute of main channel (A60)

Headcut migrating upstream (A61)

The downstream end of this management unit is another area characterized by channel divergences and braiding caused by the accumulation of large woody debris. Directly downstream of the gabion basket a large log has deposited on the left bank, and is most likely the cause of a channel divergence at the same location. *(A55)* The flow in this side channel was sub-surface at the point of divergence, but re-surfaces further downstream and maintains a significant flow into the next management unit. However, the lack of leaf litter accumulation on the substrate suggests that this side channel is active under higher flows and has received significant flow at some point this year. *(A56)* Another large woody debris obstruction at Station 47025 causes the main channel to reroute a portion of its flow to a side channel on the left bank. *(A60)* Scour is occurring directly downstream of the obstruction because the water faces an abrupt vertical drop as it flows over the debris. This continuous scour is resulting in a headcut which is actively migrating upstream, and will continue to do so until it meets a substrate that is not erodible. *(A61)*

The densely forested riparian buffer which characterizes most of this management unit transitions to open mowed fields on the right bank at Station 46930 in the developed area of the Alexander Tison Preserve. Hydraulic erosion begins at this station as a result of the grass and herbaceous vegetation not providing adequate stability to the stream bank under high flows. The alluvial deposits that make up the stream bank continue to be eroded for approximately 8-feet until the end of EBMU14 at Station 46900 (BEMS NEB14_46900), continuing into EBMU13. A riparian buffer including woody vegetation can strengthen the stream bank and slow erosive forces of higher flows during flood events. Recommendations for this bank erosion site minimally include *assisted restoration* with riparian planting techniques to restore the forest connectivity and stabilize the bank.

EBMU14 ends at station 46900, where Tray Mill Brook enters the side channel from the left.

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 formed by the presence of large woody debris obstructions. 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 is stored where large woody debris has accumulated in the management unit, and is transported relatively effectively in most other locations. Storage reaches act as a “shock absorber”, holding bedload delivered during large flow events in depositional bars and releasing it slowly over time in more moderate flood events. These depositional areas are very dynamic, with frequent lateral channel migration through bank erosion, *avulsions* and woody debris accumulations. This is one process by which floodplains are created and maintained. Sediment storage reaches can result from natural conditions or as the unintended consequence of poor bridge design, check dams or channel overwidening. While such unpredictable conditions represent risks for nearby property owners, these dynamic disturbance regimes produce unique and diverse habitat patches, attracting equally diverse plant communities and wildlife.

To better understand sediment transport 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 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.

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 evergreen-closed tree canopy (62.38%) followed by mixed-closed tree canopy (30.01%). There was no documented *impervious* area within this unit's buffer. No occurrences of Japanese knotweed were documented in this management unit during the 2010 inventory.

There are no documented wetlands in EBMU14.

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. No houses are located in the 100-year floodplain in EBMU14. 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.

High flows are confined on the left bank of this management unit, but some floodplain connectivity does exist on the lower elevations of the right bank where the Alexander Tison Preserve is located. The risk of flood inundation is relatively high in this area, threatening the infrastructure on this property. FEMA provides guidance to homeowners on floodproofing at: **http://www.fema.gov/library/viewRecord.do?id=1420**

BANK EROSION The dense mature forest upstream of EBMU14 is a large source of woody debris material that will continue to accumulate in this management unit. Stream banks located near debris obstructions are at risk of erosion due to the re-routing of flows. Two areas of erosion were documented during the stream feature inventory. The first, running 120 feet along the right bank from Station 47920 to Station 47800, is the result of hydraulic erosion. *Assisted restoration* practices are recommended for this site. The second, 30 feet (continues into EBMU13) along the right bank from Station 46930 to Station 46900, is also caused by fluvial erosion. *Assisted restoration* is also recommended for this site.

INFRASTRUCTURE 0.25% (16 ft.) of the stream bank length in this management unit has been treated with some form of stabilization. The only revetment existing in EBMU14 is a gabion basket at Station 47200 on the right bank which looked to be newly placed and in good structural and functional condition. One berm was documented in this management unit between Station 47500 and Station 45150, totaling 6.92% (447.5 ft.) of the total length of stream bank. This old stone berm appeared to be unmaintained and overgrown with mature woody vegetation.

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 are no piped outfalls or road drainages that convey storm water runoff directly into the Neversink River in EBMU14.

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 are two bank erosion sites in EBMU14 that are a potential 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**.