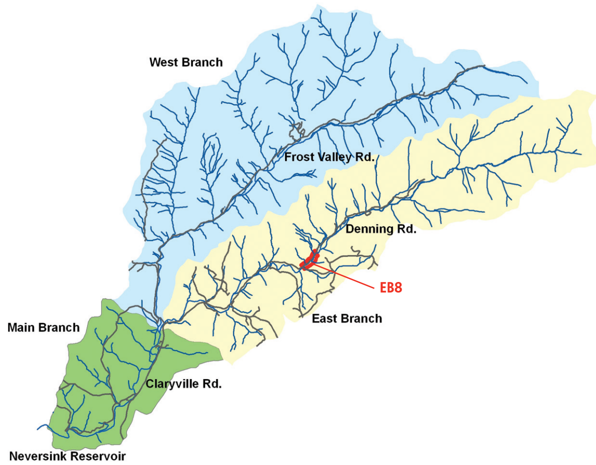
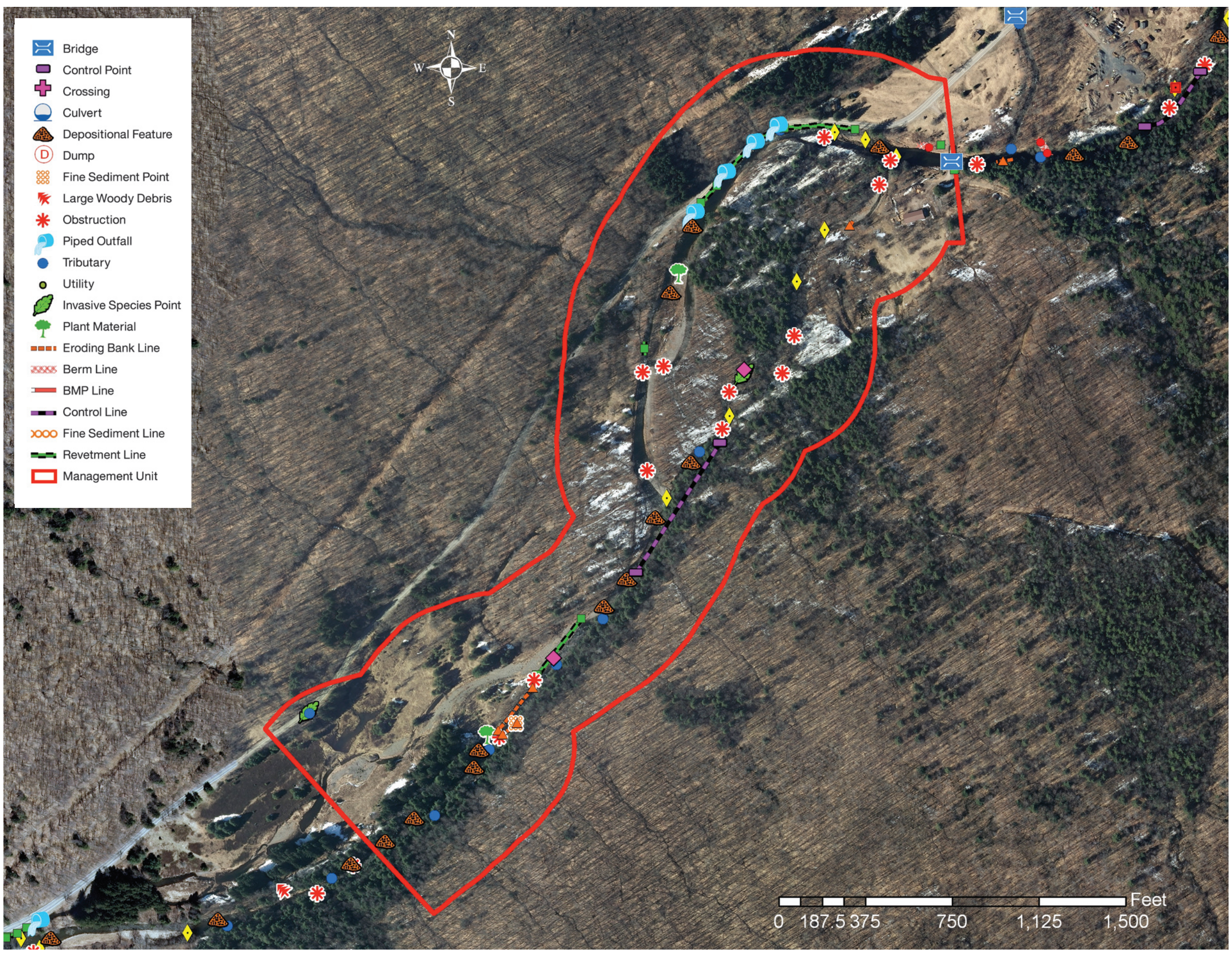
Neversink River East Branch

MANAGEMENT UNIT 8

- 3 % of stream length is experiencing erosion
- None of stream length has been stabilized
- 3.72 acres of inadequate vegetation within the riparian buffer
- 1,516 ft. of the stream length 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 at a bridge crossing of Denning Road, continuing approximately 2,779 ft. to where drainage from a retention pond enters the main channel. The drainage area ranges from 16.70 mi^2 at the top of the management unit to 18.70 mi^2 at the bottom of the unit. The valley slope is 1.18%. The average valley width is 270.30 ft.

Summary of Recommendations East Branch Management Unit 8

Intervention Level	Passive restoration of the bank erosion site between Station 30700 and Station 30500. (BEMS NEB8_30500)
Stream Morphology	Assess sediment deposition and channel migration from the accumulation of large woody debris supplied by the watershed upstream. Conduct baseline survey of channel morphology.
Riparian Vegetation	None.
Infrastructure	Assess flood threats to Denning Road.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	None.
Water Quality	None.
Further Assessment	Long-term monitoring of erosion site. Assess effects of excessive woody debris accumulation and channel migration.

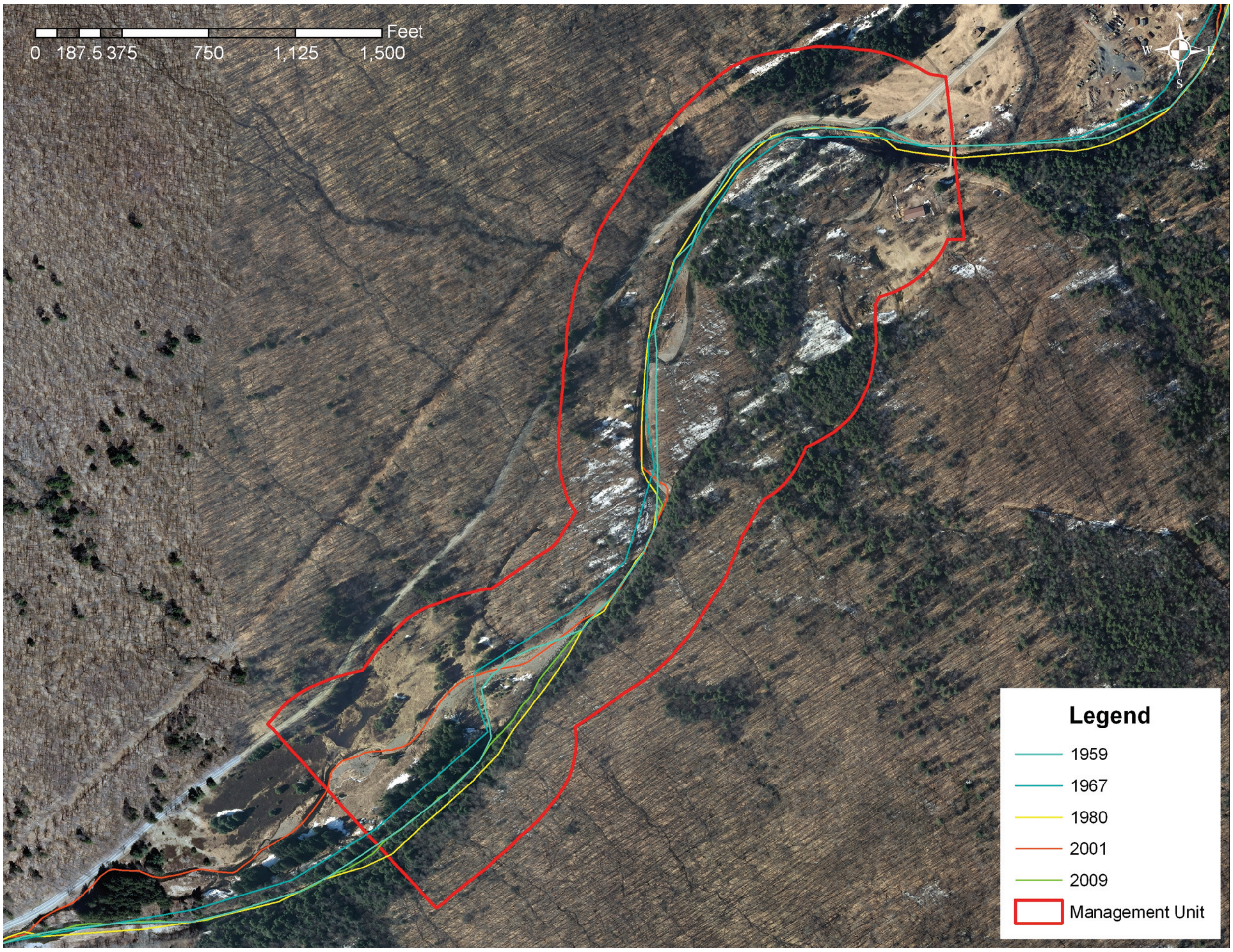
Historic Conditions

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. While 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 in parts, 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.

EBMU8 begins downstream of a convergence with a retention pond drainage channel that was documented in EBMU9. At Station 30760 there is large woody debris that has deposited and become an obstruction on the left side of the channel. *(A317)* This obstruction is reducing the streams power to move sediment through this reach, resulting in the formation of a depositional bar directly downstream. This bar is approximately 175-feet in length and consists primarily of cobble sized materials.

As the stream continues through the upstream end of this management unit, it meanders slightly to the right and flows up against the embankment of Denning Road on the right. The narrow riparian buffer between the road and the stream does not provide enough deeply rooted vegetation to adequately stabilize the stream bank under higher flows. As a result, hydraulic pressure during large events is causing approximately 167-feet of erosion on the right bank between Station 30700 and Station 30530 (BEMS NEB8_30500). *(B224)* Large rocks and sedges are beginning to deposit at the toe of this eroding bank, indicating that it is possible for this bank to stabilize without treatment (passive restoration). However, due to the close proximity of Denning Road, it is recommended that this site be monitored for changes in condition.

Continuing downstream, the first of several small unnamed tributaries documented in EBMU8 enters from the right at Station 30390. *(A318)* This tributary is conveyed under Denning Road through a culvert before flowing into the main channel. Small feeder streams such as this often play an integral role in ecosystem integrity, as they are a source of the cold and well oxygenated water that is necessary to support a diversity of aquatic life.

The stream continues in a relatively straight reach for 400-feet before entering a series of large woody debris obstructions that are contributing to sediment deposition. A large tree with the root structure still attached has deposited along the left bank at Station 30000. *(B226)* At Station 29900, another woody obstruction has deposited

Large woody debris on left side of channel (A137)

Erosion on right bank due to hydraulic pressure (B224)

Small tributary entering on right bank (A318)

Large tree deposited along left bank (B226)

Woody obstruction causing deposition on right side of channel (A319)

Small tributary enters on left through bedrock (B230)

on the right side and is contributing to sediment deposition downstream. *(A319)* Continuing past this obstruction, the channel moves out of the straight reach and begins to meander to the left up against the valley wall. A small perennial tributary enters through the bedrock on the left. *(B230)*

At Station 29720 a downed tree has become lodged on the left bank, leaving its root structure extending into the center of the stream as an obstruction to flow. *(B231)* This obstruction did not appear to be secured on the bank and is likely to be washed from its location in future flood events. Two adjacent small tributaries enter from the left at Station 29650 *(B235)*and Station 29680*(B233)*. Both contribute a perennial cold water flow to EBMU8.

The channel begins to meander back to the right towards Denning Road near Station 29570. Large woody debris has accumulated and is obstructing flow at this station, contributing sediment deposition to the point bar located directly upstream. *(A320)* During larger events this obstruction causes part of the flow to diverge into a small side channel on the right. *(A323)* This side channel was dry at the time that this inventory was conducted; however, it was clear of leaf debris indicating that it has received flow at some point this year.

Flow meanders up against the road embankment at Station 29450 before entering a relatively straight reach for the remainder of EBMU8. The stream flows adjacent to Denning Road in this reach with a very narrow riparian buffer. Stream banks that lack mature deep rooted vegetation are often very unstable and susceptible to erosion during high flows. They also do little to prevent

Downed tree has become lodged on left bank (B231)

Small tributary entering on left bank (B235)

Two small tributaries enter from left bank (B233)

Large woody debris contributing to deposition upstream (A320)

Diverging right side channel (A323)

road runoff which may contain chlorides (salt) and petroleum by-products from reaching the stream. The road also falls well within the 100-year floodplain boundary, putting it at a relatively high risk of inundation during large events.

The channel is controlled laterally by the left valley wall for a 250-foot stretch between Station 28900 and Station 28650 before the valley floor begins to widen towards the end of EBMU8. *(B240)* As the floor widens it begins to form a low elevation floodplain bench on both sides of the stream while remaining very well forested. A large downed tree has deposited as an obstruction to higher flows on the right bench at Station 28750. *(A332)* The deposition of such large debris in close proximity to the road illustrates the threats associated with designing infrastructure in the floodplains.

A small tributary enters from the right bank at Station 28500 through a drainage culvert that runs under Denning Road. *(A334)* This culvert appears to be in relatively good structural condition and is protected both at the headwall and outfall by stone. This drainage was assessed under low flow conditions and it is unclear whether it can effectively convey large flows without contributing to road wash out. The remainder of channel in EBMU8 was documented as being in very stable condition, as evidenced by the well connected floodplain benches on both sides and lack of significant erosion. *(B241)* A significant tributary flows adjacent to New Hill Road before it enters from the left at Station 28080. This tributary contributed a relatively large flow even during dry conditions. *(B243)*

EBMU8 ends at Station 28000, where a bridge allows a stream crossing for Denning Road. The bridge was documented as in good structural and functional condition at the time of this inventory. It appeared to be conveying flows relatively effectively, but displayed some aggradation upstream and scour near the abutments which is typical for bridges under designed to handle large flows. *(A336)*

Widening channel floor (B240)

Large downed tree deposited on right bench (A332)

Small tributary entering on right bank through culvert under Denning Road (A334)

Floodplain benches on both sides lack erosion and indicate stability (B241)

Significant tributary flowing adjacent to New Hill Road (B243)

Looking upstream from Bridge on Denning Road (A336)

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. Aside from the well developed floodplain benches on both sides of the stream near the end of the management unit, the portion of the channel that flows through EBMU8 is relatively confined by the valley walls. 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. Transport reaches are in a state of *dynamic equilibrium,* effectively conveying sediment supplied from upstream during each flow event. 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 (43.90%) followed by mixed-closed tree canopy (42.69%). *Impervious* area makes up 4.44% of this unit's buffer. No occurrences of Japanese knotweed were documented in this management unit during the 2010 inventory.

There are 0.90 acres of wetland (1.97 % of EBMU8 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). The only wetland type in EBMU8 is Riverine.

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 building structures are located in the 100-year floodplain in EBMU8. 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.

Although the stream channel in this management unit is relatively confined by the valley walls, the stream does have access to a narrow strip of floodplain on the right side which contains portions of Denning Road. A significant portion of this road falls within the 100-year floodplain boundary and is at high during flood events. The extremely narrow forested riparian corridor offers little to mitigate flood risks to the road or stabilize the stream banks.

BANK EROSION Due to a number of conditions in EBMU11, the stream bank at one location is experiencing active erosion. Hydraulic pressure during large events is causing approximately 167-feet of erosion on the right bank between Station 30700 and Station 30530 (BEMS NEB8_30500). Large rocks and sedges are beginning to deposit at the toe of this eroding bank, indicating that it is possible for this bank to stabilize without treatment (*passive restoration*).

INFRASTRUCTURE None of the stream bank length in this management unit has been stabilized with revetment. There were no berms documented in EBMU8 during this 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 uses 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 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 one bank erosion sites in EBMU8 that is a potential 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**.