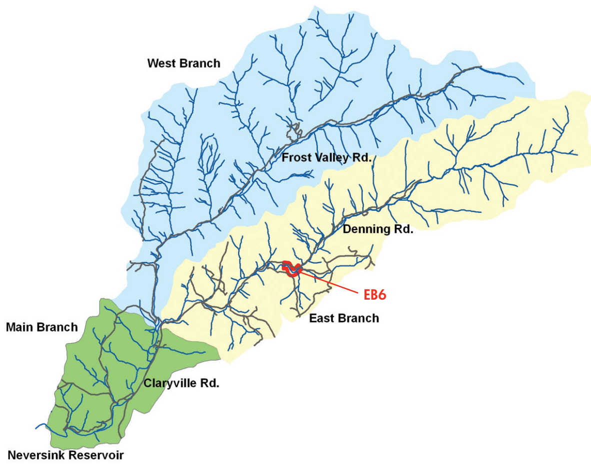
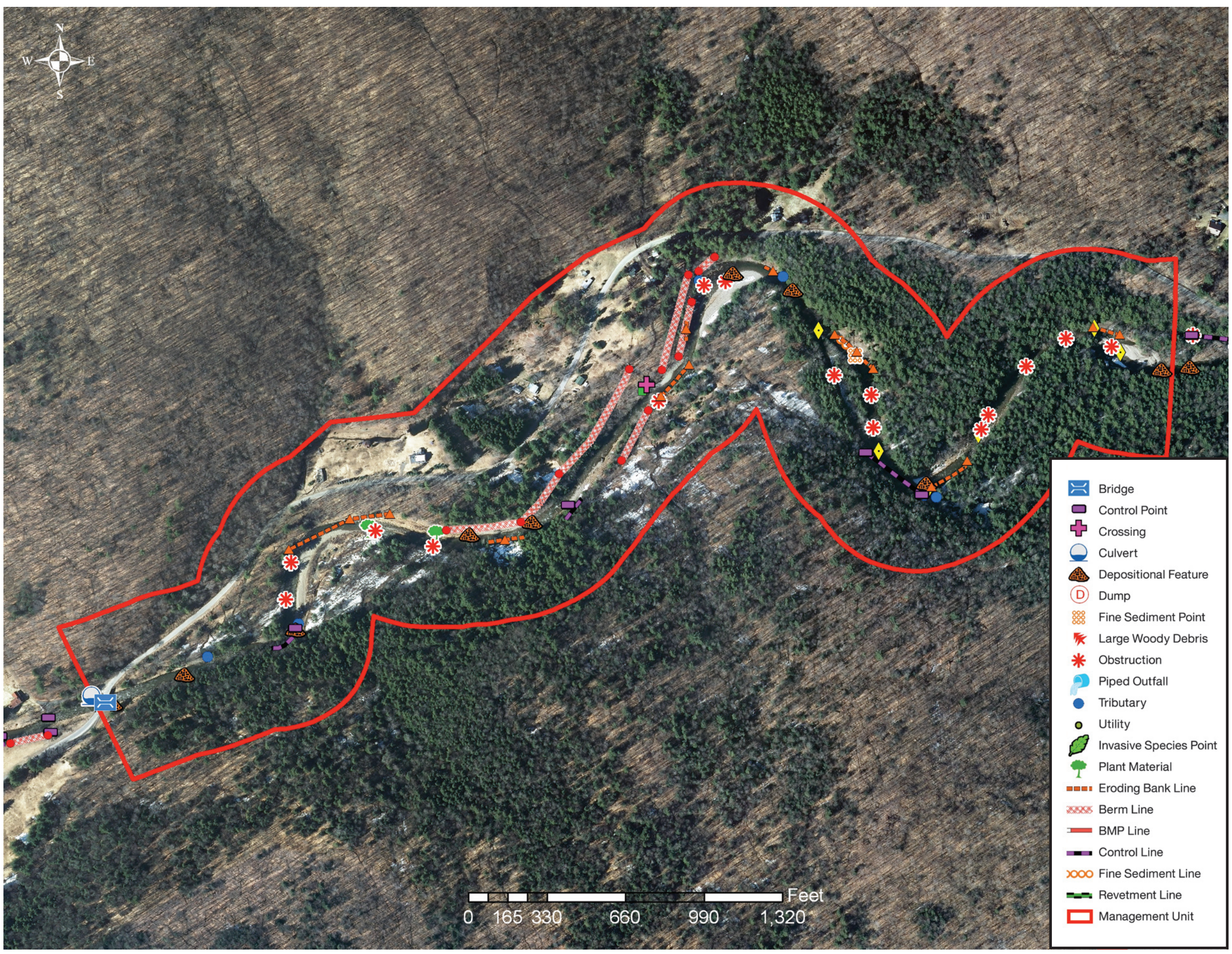
Neversink River East Branch

MANAGEMENT UNIT 6

- 12% of stream length is experiencing erosion
- 0.48% of stream length has been stabilized
- 16.12 acres of inadequate vegetation within the riparian. buffer
- 100 ft. of the stream length is within 50 ft. of the road
- 10 structures are located within the 100-year floodplain boundary





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

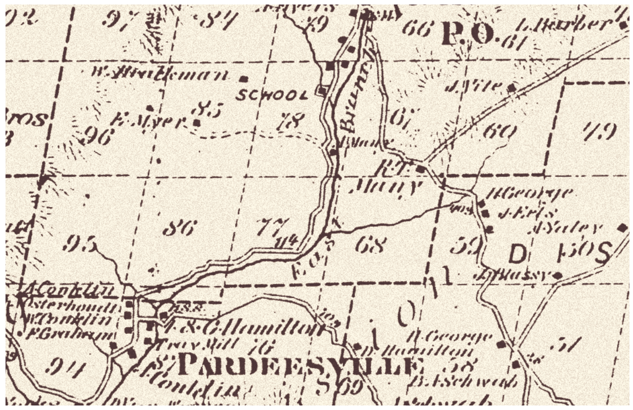
This management unit begins at a bridge crossing of Denning Road, continuing approximately 6,399 ft. before ending at a location where the valley floor begins to widen. The drainage area ranges from 19.90 mi^2 at the top of the management unit to 21.40 mi^2 at the bottom of the unit. The valley slope is 1.21%. The average valley width is 1394.98 ft.

Summary of Recommendations East Branch Management Unit 6

Intervention Level	Assisted restoration of the bank erosion site between Station 24730 and Station 24610 (BEMS # NEB6_24600). Passive restoration of the bank erosion site between Station 23820 and Station 23630 (BEMS # NEB6_23600) Passive restoration of the bank erosion site between Station 23040 and Station 22820 (BEMS # NEB6_22800). Passive restoration of the bank erosion site between Station 22530 and Station 22420 (BEMS # NEB6_22400). Passive restoration of the bank erosion site between Station 22010 and Station 21950 BEMS # NEB6_21900). Assisted restoration of the bank erosion site between Station 21860 and Station 21680 (BEMS # NEB6_21600). Passive restoration of the bank erosion site between Station 20850 and Station 20700 (BEMS # NEB6_20700). Assisted restoration of the bank erosion site between Station 20300 and Station 19835 (BEMS # NEB6_19800).
Stream Morphology	Assess sediment deposition from the accumulation of large woody debris supplied by the watershed upstream. Conduct baseline survey of channel morphology.
Riparian Vegetation	None.
Infrastructure	Investigate flood threats to Denning Road. Assess ability of Denning Road bridge to effectively convey flood flows. (Check this against bridge writeup in MB)
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	Assess threats to structures in 100-year floodplain. Floodproofing as appropriate. http://www.fema.gov/library/viewRecord.do?id=1420
Water Quality	Further assessment of documented potential fine sediment source (BEMS # NEB6_22800).
Further Assessment	Long term monitoring of erosion sites. Assess effects of excessive woody debris accumulation and excess sediment deposition.

Historic Conditions

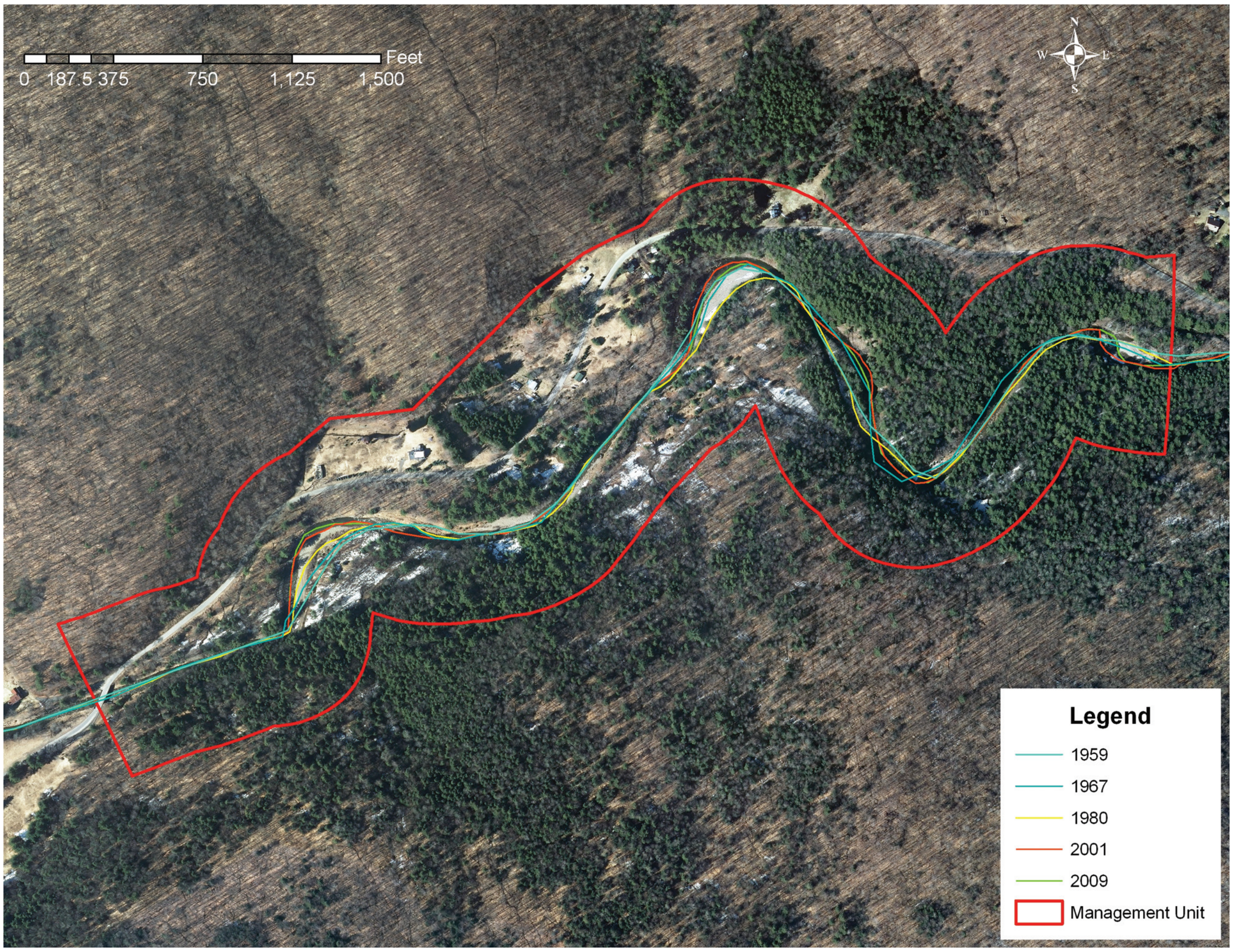
As the glaciers retreated about 12,000 years ago, they left their "tracks" in the Catskills. See Section 2.4 *Geology of Upper Neversink River,* for a description of these deposits. These deposits make up the soils in the high banks along the valley walls on the Neversink mainstem and its tributaries. 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, only 1 NYS Article 15 stream disturbance permit has 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.

The East Branch of the Neversink River continues to move away from the left valley wall as it enters EBMU6, maintaining a densely forested left floodplain at the top of this management unit. The trend of sediment deposition and aggradation that was evident in previous management units upstream continues here, beginning with the formation of a point bar on the right side at Station 25000. *(B36)* This bar is approximately 200-feet in length, ending at Station 24800. The accumulation of large woody debris on the point bar is contributing to the diversion of a portion of stream flow into a side channel to the right.

Historical aerial imagery of this reach indicates that the channel has migrated significantly since 1980, most likely due to the deposition of large woody debris and resulting obstruction to flow. A large amount of woody debris has accumulated across the channel at Station 24700 and is diverting flow out of the historical channel and towards the right bank. *(A31)* As the water is forced in this direction, the hydraulic pressure put on the right bank during high flows has resulted in approximately 120-feet of erosion from Station 24730 to Station 24610 (BEMS # NEB6_24600). *(A30)* If the woody obstructions were removed from the channel, it is possible that flow would return to the historic channel and alleviate the pressure on this bank. The rooting depth of the mature trees already present on this bank will help to provide stability to any exposed soils. Therefore, assisted restoration is recommended at this site for the removal of large woody debris obstructions.

The side channel which previously diverted to the right converges with the main channel at Station 24730. The elevation of the stream bed in the main channel is significantly higher than that of the side channel. As flow from the main channel enters the convergence, it experiences enough of a vertical drop to cause scour. This continuous scour is resulting in a headcut which is actively migrating up the main channel, and will continue to do so until it meets a substrate that is not erodible. *(B38)*

At Station 24500, flow begins to meander to the left and re-connects with the historic channel.

Point bar on right side of stream (B36)

Large woody debris diverting flow (A31)

Erosion on right bank (A30)

(A33) Large woody debris has deposited and caused obstructions to flow at several locations around this meander bend. Large trees have become lodged along the right bank at Stations 24500, 24300, 24030, and 23970. *(A37)* A dry relict side channel enters from the left floodplain at Station 23950.

The left bank begins to erode and expose cobble sized materials as the channel approaches the point of the meander bend at Station 23820. This bank erosion is caused by hydraulic pressure as flow begins to make the turn around the bend, continuing approximately 190-feet before ending at Station 23630 (BEMS # NEB6_23600). *(A43–60 Stitched)* Large rocks are beginning to deposit at the toe of this eroding bank along with a healthy establishment of sedges, indicating that it is possible for this bank to stabilize without treatment (passive restoration). However, it is recommended that this site be monitored for changes in condition.

At the downstream end of the eroding bank a small perennial tributary enters from the left bank at Station 23630. *(B45)* The flow of this tributary was partially blocked by woody debris at the time that this inventory was conducted. A headcut exists in the same location as the stream flows over a series of boulders. *(B44)* On the opposite side of the stream, a point bar has formed on the inside of the meander bend. This depositional area is approximately 50-feet in length, ending at Station 23580. *(A61)*

The channel hits the exposed bedrock of the left valley wall at Station 23600, which continues to control flow for approximately 300-feet until Station 23300. *(B41)* A spring enters through the upstream end of the bedrock wall, contributing a perennial source of cold water to the stream. As this exposed bedrock wall ends, the valley floor begins to open up on both sides allowing the

Headcut migrating upstream (B38)

Convergence with historic channel (A33)

Large trees lodged on right bank (A37)

Left bank erosion (A43–60)

Small perennial stream entering on left bank (B45)

Headcut at tributary entrance (B44)

Looking upstream at point bar on right bank (A61)

Exposed bedrock on left valley wall (B41) stream access to its floodplain during high flows. At Station 23390 a side channel diverges into the left floodplain. *(A64)* This side channel continues for approximately 560-feet before converging back with the main channel at Station 22760.

Channel diversion into left floodplain (A64)

Continuing downstream, the stream begins to hug the right valley wall and large woody obstructions were documented along the left bank at Stations 23280 and 23120. *(A69)* Both of these obstructions were located above the water level at the time that this inventory was conducted, but could be of significant impact to higher flows. A massive bank failure begins at Station 23040, continuing approximately 220-feet until Station 22820 (BEMS # NEB6_22800). *(A73–75)* At some point hydraulic erosion at the toe of this bank destabilized the steep slope, causing mature trees to slide down with their roots intact and re-establish at a lower elevation on the bank. The establishment of these trees along with various shrubs and sedges near the toe indicate that this bank may have reached an angle of repose where it will begin to stabilize without treatment (passive restoration) (please double check, it is difficult to determine from the photos). Because glacial till is exposed at various points on the eroding bank and is a potential significant source of fine sediment, it is recommended that this site be monitored for future changes in condition.

Large woody obstructions (A69)

Massive bank failure (A73–75)

Straight aggraded main channel (B64)

Road drainage entering stream (B71)

Hill slope failure on right bank (B65–67)

At Station 22580, the channel becomes very straight and aggraded before entering a meander to the left. *(B64)* A hill slope failure exists on the right bank beginning at Station 22530, continuing approximately 110-feet to Station 22420 (BEMS # NEB6_22400). *(B65–67)* This failure appears to be able to recover without treatment (passive restoration), as evidenced by the establishment of a significant amount of herbaceous vegetation on the bank. There is a drainage that enters near the upstream end of the failure which carries storm water runoff from the road. *(B71)* Although the bank has recovered, water carried through this drainage always has the potential to saturate the bank and contribute to more failure. Therefore, it is recommended that this bank be monitored for future changes in condition.

The channel takes a sharp left turn away from the valley wall at Station 22400 and enters a relatively straight reach. Large woody debris has deposited on the left side of the stream at Station 22250, and the right side at Station 22180. *(A79)* This debris is causing an obstruction to flow which is contributing to the formation of a point bar on the inside of the meander bend beginning at Station 22400. This depositional area continues for approximately 350-feet to Station 22050.

Point bar on left side of stream (A79)

Stacked coble berm on right bank (B77)

The stream flows adjacent to Denning Road located in the right floodplain for the remainder of this management unit. In several spots there is not an adequate riparian buffer of mature woody vegetation between the road and the stream. Several berms have been installed along the right bank in an attempt to compensate for the lack of riparian vegetation and mitigate flood risks to Denning Road. Each of the berms with a visible beginning and end point was documented individually; however, it is important to note that several of the berms may have at one point in history been one long continuous berm that has deteriorated over time. The first of these berms consisting of stacked cobble sized stones begins at Station 22280 and continues approximately 90-feet to Station 22190. *(B77)* A spring seep enters the stream at the downstream end of this berm before a second 415-foot long berm begins, continuing until Station 21775. *(B81)* Directly in front of this berm, there is an older berm which is situated closer to the stream between Station 22100 and Station 21850. *(A84)* The bank located between this berm and the stream is eroding 22010 and Station 21950 due to hydraulic

Stacked cobble berm on right bank (B81)

Older berm situated closer to the stream (A84) pressure on the steep section of bank (BEMS # NEB6_21900). *(A85)* Large rocks have deposited at the toe and are protecting it from further scour, indicating that this bank may stabilize without treatment (passive restoration). However, it is recommended that this site be monitored for future changes in condition.

A large woody debris obstruction has deposited at Station 21650 *(B92)*. This debris consists of a full mature tree that still had green leaves at the time of this inventory, indicating that it was deposited relatively recently. The obstruction is forcing flows into the left bank, and the resulting hydraulic pressure on the bank is causing erosion beginning at Station 21860, continuing approximately 180-feet to Station 21680 (BEMS # NEB6_21600). *(B89)* The materials in this bank consist of cobbles and course silts, which can be entrained into the stream flow during large 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.

Erosion of right bank (A85)

Large woody obstruction (B92)

Left bank erosion due to obstruction (B89)

Relict bridge abutment on right bank (A89)

Directly across the stream there are several homes that have been established in the right floodplain. Several stream features documented in this location are reflective of human interaction with the stream. A relict bridge abutment was observed on the right bank at Station 21700, indicating that this was once a location where the stream could be crossed. *(A89)* Although this abutment is no longer functional as a crossing, it does serve as a point where the stream is controlled under high flows. A berm is located further back into the right floodplain, beginning at Station 21700 and ending at Station 20500. *(A93)* This berm begins as older cobble sized materials at the upstream end, changing to larger boulders near the downstream end that appear to have been recently placed.

Berm located on right floodplain (A93)

The channel flows close to the left valley wall at Station 21100, coming in contact with exposed bedrock. Flow continues to be controlled on the left side until Station 21000. *(B55)* After this control point the channel begins to meander slightly to the right, forming a point bar at the inside of the meander from Station 20900 and Station 20620. *(A92)* The majority of this bar

Bedrock on left valley wall (B55)

Point bar forming on right side of channel (A92)

Willow harvest site at Station 20200 (B115)

Left bank failure (B101–104)

is vegetated with grasses and sedges. Near the downstream end of the bar there is a relatively large establishment of willows that could potentially be harvested for use in restoration projects. A similar willow harvest site was also documented at Station 20200. *(B115)*

A bank failure was documented on the left bank beginning at Station 20850, continuing approximately 150-feet to Station 20700 (BEMS # NEB6_20700). *(B101–104)* This steep bank is 120 feet high and consists of silts which are a potential source of fine sediment. Large cobbles have deposited at the toe of this bank along with the establishment of sedges, both of which aid in re-stabilization. A large percentage of the slope appears to have re-vegetated since the last slide, suggesting that this bank may be able to stabilize without treatment (passive restoration). However, due to the presence of fine sediment it is recommended that this site be monitored for any future changes in condition

Continuing downstream, several points where large woody debris is causing an obstruction to flow were documented. These obstructions are contributing to sediment deposition throughout the reach. At Station 20500, several downed trees have accumulated on the left bank and are extending into the channel. *(B105)* A similar situation exists at Station 20200, where large woody debris has deposited at the point where the stream meanders sharply to the left. This station is also the upstream end of a point bar forming at the inside end of the meander bend. *(B112–114)* The right bank is eroding on the outside of this meander bend, beginning at Station 20300, continuing approximately 465-feet until Station 19835 (BEMS # NEB6_19800). *(A99)* Woody obstructions at Station 19800 and Station 19650 are contributing to this erosion by deflecting flows into the bank. Cobbles have deposited at the toe of this bank along with the establishment of sedges, both of which aid in re-stabilization. However, because of the hydraulic pressure put on this bank by the tight radius of curvature around the meander bend it is unlikely that this site would stabilize without treatment. The proximity of Denning Road to this erosion site raises concern for risk of infrastructure damage. Therefore, recommendations for this bank erosion site minimally include monitoring for significant changes in condition and possible assisted restoration with to remove woody debris obstructions and alleviate pressure on the eroding bank.

Large woody debris deposited on point bar (B112–114)

Downed trees accumulating on left bank (B105)

Right bank erosion (A99)

Exposed bedrock on left valley wall (B122)

Tributary entering through left bedrock wall (B118)

Tributary entering on left floodplain adjacent to Denning Road (A111)

At Station 19500 the stream again meets exposed bedrock at the left valley wall before continuing into a relatively straight reach for the remainder of this management unit. *(B122)* A small tributary enters from the left through the bedrock wall, contributing a significant perennial flow. *(B118)* Another tributary enters from the right floodplain at Station 19140. This tributary runs adjacent to Denning Road from which it receives drainage during storm events making it a potential source for contaminants from road runoff. It is likely that this tributary contributes chlorides (salt) and petroleum by-products from road runoff to the Neversink. *(A111)* A 200-foot long cobble side bar has formed on the left side beginning Station 19000. *(B125)* This bar is free of any vegetation or debris, indicating that it is frequently inundated during large events.

EBMU6 ends at Station 18700 where a bridge allows Denning Road to cross over the stream channel. This bridge appears to be well maintained and was documented in good structural and functional condition. *(A112)*

Cobble side bar on left side of channel (B125)

Denning Road bridge (A112)

It does however constrict flow during large events, as its abutments are not spaced wide enough and cause backwatering during significant flows. This is evident in the formation of a side bar just upstream of the bridge at Station 18730. The left bridge abutment has been revetted with stacked rocks to prevent scour. This revetment appears to be relatively new and actively maintained, indicating that it has been a source of concern for road maintenance officials. *(A116)*

Left bridge abutment with revetment (A116)

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 in EBMU6 is controlled on the left throughout much of the management unit by the valley wall, but does maintain relatively good floodplain connectivity on the right. 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. Infrastructure influenced deposition of sediment is evident in EBMU6 at Denning Road bridge, which is inadequately designed to effectively transport sediment. 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 mixed-closed tree canopy (33.83%) followed by evergreen-closed tree canopy (22.55%). *Impervious* area (2.86%) within this unit's buffer is primarily Denning Road. No occurrences of Japanese knotweed were documented in this management unit during the 2010 inventory.

There are 8.26 acres of wetland (7.37% of EBMU6 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 dominant wetland type EBMU6 is Riverine at 4.85 acres in size, followed by freshwater forested shrub wetland (inland wetland without flowing water) at 3.04 acres in size.

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. Ten building structures are located in the 100-year floodplain in EBMU6. 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. The majority of Denning Road within this management unit also falls within the 100-year floodplain boundary and is at high risk of inundation during flood events. FEMA provides guidance to homeowners on floodproofing at:
http://www.fema.gov/library/viewRecord.do?id=1420

BANK EROSION Due to a number of conditions, bank erosion was documented at 8 locations in this management unit. The first site consists of hydraulic erosion on the right bank for approximately 120-feet from Station 24730 to Station 24610 (BEMS # NEB6_24600). Assisted restoration is recommended at this site for the removal of large woody debris obstructions. Hydraulic erosion was also documented for approximately 190-feet beginning at Station 23820 and ending at Station 23630 (BEMS # NEB6_23600). Passive restoration is recommended for this site. Mass hill slope failures were evident between Station 23040 and Station 22820 (BEMS # NEB6_22800), as well as Station 22530 to Station 22420 (BEMS # NEB6_22400). Passive restoration is recommended for both of these sites as they appear to be stabilizing without treatment. Hydraulic erosion again occurs between Station 22010 and Station 21950 (passive restoration) BEMS # NEB6_21900), and between Station 21860 and Station 21680 (assisted restoration) (BEMS # NEB6_21600). Another hill slope failure was documented between Station 20850 and Station 20700 (BEMS # NEB6_20700). Passive restoration is recommended at this site. The final bank erosion site in EBMU6 exists between Station Station 20300 and Station 19835 (BEMS # NEB6_19800), with a recommendation of assisted restoration.

INFRASTRUCTURE 0.48% (62 ft.) of the stream bank length in this management unit has been stabilized with revetment. This revetment is at the bridge abutment at Station 18700. There were 5 berms documented in EBMU6, totaling 16.31 % (2,087.7 ft) of the total length of stream banks.

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 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 are currently 8 documented bank erosion sites in EBMU6 that could be sources of fine sediment. One of these sites could 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**.