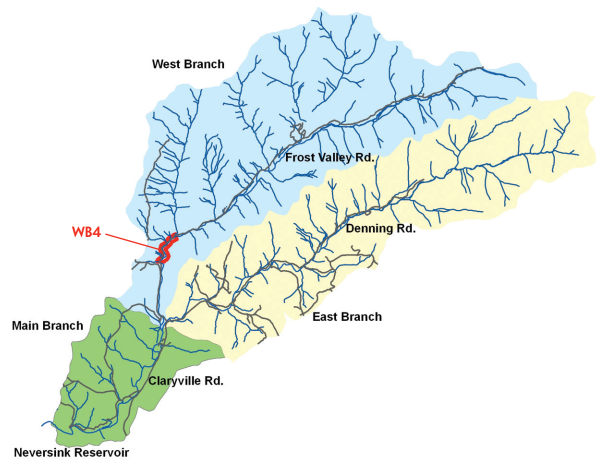
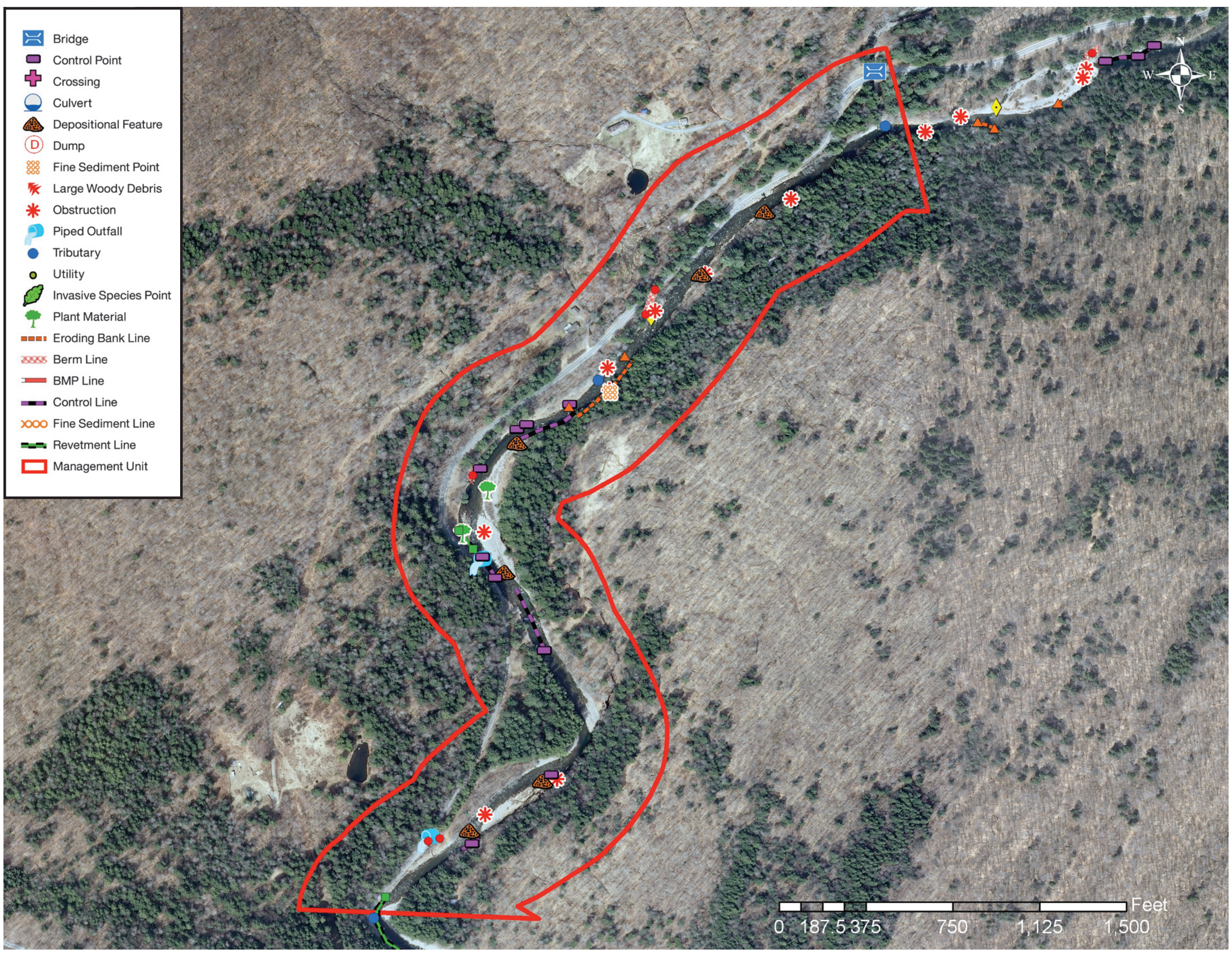
Neversink River West Branch

MANAGEMENT UNIT 4

STREAM FEATURE STATISTICS

- 3.00% of stream length is experiencing erosion
- 2.49% of stream length has been stabilized
- 9.02 acres of inadequate vegetation within the 100 ft. buffer
- 300 feet of stream is within 50 ft. of the road
- There are two building structures located within the 100-year floodplain boundary of the Neversink River





Stream Feature Inventory 2010 (Figure 1)

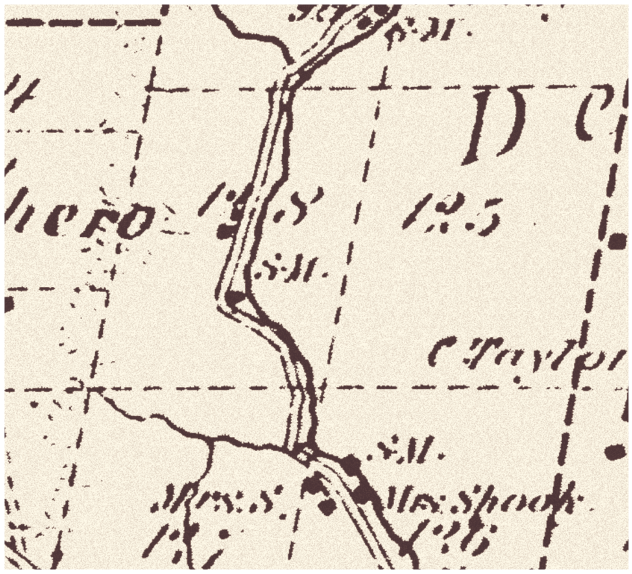
Management Unit Description

This management unit begins near the confluence of Fall Brook at Station 15200, continuing approximately 4,800 ft. to the confluence with Round Pond Brook near Station 10300. The drainage area ranges from 31.30 mi^2 at the top of the management unit to 32.50 mi^2 at the bottom of the unit. The valley slope is close to 1.28%. The average valley width is 532.92 ft.

Summary of Recommendations West Branch Management Unit 4

Intervention Level	Assisted restoration of the bank erosion site from Station 13540 to Station 13200 (BEMS NWB4_13200).
Stream Morphology	Protect and maintain sediment storage capacity and floodplain connectivity. Conduct baseline survey of channel morphology.
Riparian Vegetation	Investigate and evaluate 5.59 acres of potential riparian buffer improvement areas for future buffer restoration. Potential riparian buffer improvement areas were observed at various locations throughout this management unit (Figure 7).
Infrastructure	Inspect revetment beginning at Station 10380 on the right bank for scour that could lead to structural instability.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	Floodproofing as appropriate. http://www.fema.gov/library/viewRecord.do?id=1420
Water Quality	Investigation of water quality impacts of piped outfalls at Station 12360 and Station 10650. Maintain household septic systems.
Further Assessment	Include MU4 in comprehensive Local Flood Hazard Mitigation Analysis of Claryville MUs.

Historic Conditions



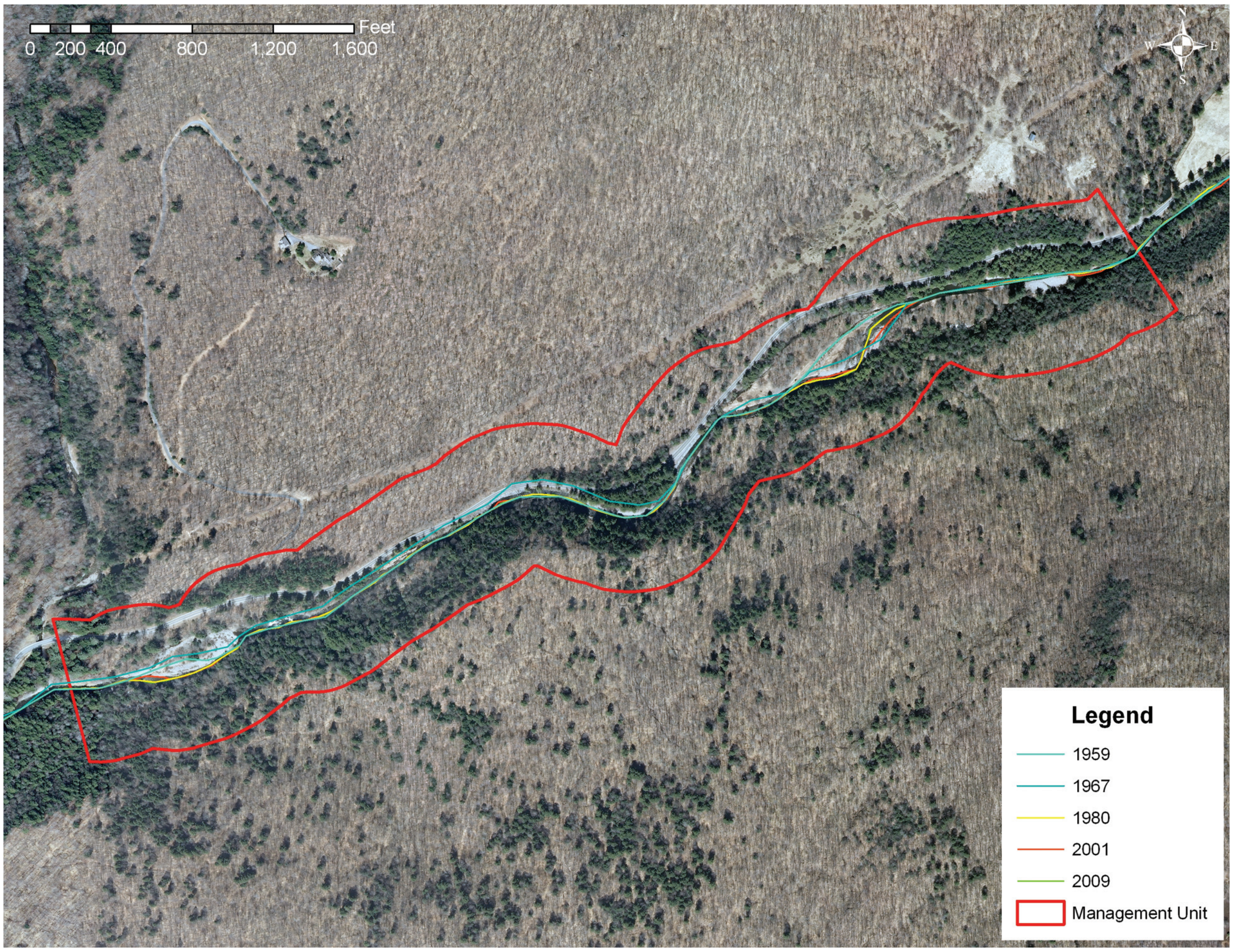
Excerpt from 1875 Beers Map (Figure 2)

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.

According to the map of Forest Industries in the Catskills and the associated descriptions included in *The Catskill Forest: A History* by Michael Kudish (Purple Mountain Press, 2000), Joseph H. Prothero owned a sawmill that was formerly located downstream of the convergence with Fall Brook. While no historic raceways or other evidence of the sawmill was observed in this management unit, according to Beers' 1875 Atlas, it was located on the right bank near the convergence of the unnamed tributary near Station 13400.

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



Historical channel alignments from five selected years (Figure 3)

floodplain numerous times in many locations. A comparison of historical channel alignments *(Figure 3)* and in-stream observations made during a stream feature inventory in 2010 *(Figure 1, page 1)* indicate some lateral channel instability. According to records available from the NYSDEC DART database twenty-seven NYS Article 15 stream disturbance permits have been issued in this management unit. These permits pertain to activities which have the potential to significantly impact stream function, such as bank stabilization, stream crossings, habitat enhancement, and logging practices. database (**http://www.dec.ny.gov/cfmx/extapps/envapps/**).

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.

WBMU4 is features a distinct S-curve meander in the river between the confluences of Fall Brook and Round Pond Brook. The upstream reaches begin with a meander across the valley floor to the right valley wall from Station 15200 to Station 12700. WBMU4 begins with the confluence of Fall Brook at Station 15100. At the confluence the Fall Brook watershed includes approximately 5 square miles draining a valley between High Falls Ridge and the Beaver Kill Range to the north. A cobble delta bar was observed in the main channel at the confluence. *(A224)* Potential riparian buffer improvement areas were identified between Station 14700 and Station 14250 *(Figure 7)*. A large downed tree was observed on a left bank floodplain terrace at Station 14600, followed by a cobble bankfull bench with grass and sedge vegetation beginning at Station 14450 and extending 400 feet to Station 14050. *(A228)* Another downed tree was observed on the floodplain terrace near the end of the cobble bar.

Cobble delta bar in main channel at confluence (A224)

Cobble bankfull bench (A228)

At Station 13900 a 115-foot stone berm was observed in the thick forested riparian buffer between a flood chute in the right floodplain and Frost Valley Road. The berm appeared to be actively maintained as evidenced by recently placed stones. Some scour was observed on the right bank at the downstream end of the berm indicating that the flood chute conveys flow during high flow events. *(A237 and A235)* A headcut was observed in the main channel near at large boulder at Station 13800 that has caused a minor drop in stream grade at this location.

Actively maintained berm on right floodplain (A237)

The riparian buffer has the potential to be improved along the right bank between Station 13550 and Station 12910. An eroding bank segment was observed on the left bank extending 340 feet from Station 13540 to Station 13200 (BEMS NWB4_13200). This bank failure site was documented as active; while there is hardening at the toe, hydraulic erosion and fluvial entrainment are causing scour at the crown of the bank exposing glacial till. The 50-foot length of the eroding segment from 13450 to 13400 was documented as a fine sediment source although it is not a significant source of turbidity. In addition, an unnamed tributary conveying flow from the right valley wall (and former location of Prothero sawmill) was observed joining the main channel across from the bank failure site near Station 13400. It is possible that the additional sediment and flow conveyed by this tributary is contributing to this bank erosion. *(A242)* Due to the active erosion at the tip of the bank failure and the ongoing contribution from the tributary, recommendations for this site include *assisted restoration* to improve bank stability.

Scour on right bank downstream of berm (A235)

Erosion on left bank (A242)

Two building structures are located within the FEMA-mapped 10-year floodplain on the right bank north of Frost Valley Road near Station 13400. Exposed shale bedrock was observed directly downstream of the bank erosion site, extending 260 feet from Station 13200 to Station 12940. The bedrock is constraining the river laterally on the left bank and forming a grade control for the left bed for this segment of the river. *(A253)* A partially vegetated cobble point bar begins at Station 12940 and continues through Station 12300. The willow growing on this bar near Station 12500 was documented as a potential plant source for restoration projects throughout this section of the river. *(A258)* Across from the point bar, at the apex of the meander toward the right valley wall near Station 12800, placed quarry rock forms a stream bed grade control on the right bed. *(P7290125)* Downstream of the quarry rock a 40-foot long stone berm was observed on the right bank.

As the main channel begins to flow east across the valley floor toward the left valley wall more revetment and exposed bedrock were observed stabilizing the right bank, which is within 50 feet of Frost Valley Road in this location. A stone gabion revetment was observed extending 100 feet from Station 12520 to Station 12420 on the right bank. This revetment was documented as in good structural and functional condition, although the riparian buffer was documented as thin with mangled fencing on top of the gabions. *(P72901130)* A sloped stone revetment was observed in good structural and functional condition extending 60 feet from Station 12420 to Station 12360. Both of these revetments were most likely designed to stabilize the bank near Frost Valley Road.

Bedrock grade and planform control (A253)

Potential willow harvest source (A258)

Placed quarry rock forming grade control (P7290125)

A piped outfall was observed at the end of this revetment near Station 12360 conveying flow from Frost Valley Road to the main channel. The outfall is constructed of a 2-foot diameter smooth steel pipe with 3 feet of outfall and good outfall protection. *(A263)* It is recommended that the water quality impacts of this outfall be investigated to better understand and possibly mitigate the water quality implications of this conveyance.

Exposed bedrock was observed providing stream bed grade control for the width of the main channel from Station 12400 to Station 12280, and again from Station 12200 to Station 11900. *(A260, A266)* The river reaches the apex of the meander toward the left valley wall near Station 11500 before meandering toward the right valley wall again to converge with Round Pond Brook. A large fallen tree was observed above bankfull height on the left bank near Station 11300. *(A272)* Exposed bedrock controls stream bed grade for the width of the channel from Station 11300 to Station 11230, followed by a thickly vegetated cobble center bar observed on the left bed. *(A276)* This cobble center bar ends near Station 10800, where exposed bedrock again forms a grade control for the width of the main channel for 85 feet to Station 10715.

Stone gabion revetment on right bank (P7190130)

Piped outfall conveying flow from Frost Valley Road (A263)

Exposed bedrock providing grade control (A260)

Bedrock grade control (A266)

Fallen tree above bankfull height (A272)

The main channel flows within 50 feet of the main channel for the remaining 400 feet of WBMU4. A stone berm was observed between the main channel and Frost Valley road extending 50 feet from Station 10700 to Station 10650. A piped outfall conveying flow from Frost Valley road, through the right bank floodplain to the main channel was observed at the end of this berm. The outfall is constructed of a 18-inch diameter plastic pipe, and appeared to convey fine sediments from the road based on outwash observed on the right bank. *(P7290144)* It is recommended that the water quality impacts of this outfall be investigated to better understand and possibly mitigate the water quality implications of this conveyance.

Vegetated cobble center bar (A276)

A stacked rock revetment was observed protecting Frost Valley Road for the last 80 feet of the management unit beginning near Station 10380 and continuing into WBMU3. The potential exists for adding a riparian buffer to this revetment. The revetment was documented in good structural and functional condition although deposition on the left bank appeared to be directing flow toward the revetment, which could be causing scour below the water level. It is recommended that this revetment be inspected for structural stability. *(A280)*

Fine sediment outwash on right bank (P7290144)

Stacked rock revetment protecting Frost Valley Road (A280)

WBMU4 ends at Station 10300, at the apex of a meander toward the right valley wall approximately 50 feet upstream of the convergence with Round Pond Brook.

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 contains both sediment storage reaches and sediment transport reaches. The storage reaches act as a "shock absorber", holding *bedload* delivered during large flow events in depositional bars and releasing it slowly over time in more moderate flood events. These depositional areas are very dynamic, with frequent lateral channel migration through bank erosion, *avulsions* and woody debris accumulations. The densely forested portion of the watershed 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 storage reaches can result from natural conditions, like the widening valley floor and decreased channel slope as is the case in this management unit or as the unintended consequence of poor bridge design, check dams or channel overwidening. This is one process by which floodplains are created and maintained. Healthy undeveloped floodplains throughout the Neversink watershed like the floodplains on both banks throughout WBMU4 reduce the velocity of higher flows thereby mitigating the threat of stream bank erosion and property damage during flood events.

In some locations in WBMU4 the river is confined by the bedrock or high banks leaving no accessible floodplain for sediment deposition and storage. This section of the river acts as a transport reach. Transport reaches are in a state of *dynamic equilibrium,* effectively conveying sediment supplied from upstream during each flow event.

To better understand sediment transport dynamics of this section of the Neversink, a baseline survey of channel form and function is recommended for this management unit.

Riparian Vegetation

One of the most cost-effective methods for landowners to protect streamside property is to maintain or replant a healthy buffer of trees and shrubs along the bank, especially within the first 30 to 50 ft. of the stream. A dense mat of roots under trees and shrubs bind the soil together, and makes it much less susceptible to erosion under flood flows. Mowed lawn does not provide adequate erosion protection on stream banks because it typically has a very shallow rooting system. Interplanting with native trees and shrubs can significantly increase the working life of existing rock rip-rap placed on stream banks for erosion protection. Riparian, or streamside, forest can buffer and filter contaminants coming from upland sources or overbank flows. Riparian plantings can include a great variety of flowering trees and shrubs, native to the Catskills, which are adapted to our regional climate and soil conditions and typically require less maintenance following planting and establishment.

Some plant species that are not native can create difficulties for stream management, particularly if they are invasive. Japanese knotweed (Fallopia japonica), for example, has become a widespread problem in recent years. Knotweed shades out other species with it's dense canopy structure (many large, overlapping leaves), but stands are sparse at ground level, with much bare space between narrow stems, and without adequate root structure to hold the soil of stream banks. The result can include rapid stream bank erosion and increase surface runoff impacts. There were no occurrences of Japanese knotweed documented in this management unit during the 2010 inventory.

An analysis of vegetation was conducted using aerial photography from 2009 and field inventories *(Figure 5)*. In this management unit the predominant vegetation type within the riparian buffer is evergreen closed tree canopy (44.00 %) followed by deciduous closed tree canopy (31.14%). *Impervious* area makes up 4.50% of this unit's buffer. No occurrences of Japanese knotweed were documented in this management unit during the 2010 inventory.

There are 8.60 acres of wetland (10.87% of WBMU4 land area) within this management unit mapped in the National Wetland Inventory as three distinct classifications (see Section 2.5, *Wetlands and Floodplains* for more information on the National Wetland Inventory and wetlands in the Neversink watershed). Wetlands are important features in the landscape that provide numerous beneficial functions including protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters, and maintaining surface water flow during dry periods (See Section 2.5 for wetland A type descriptions and regulations). The wetland classified as Riverine is 1.79 acres in size, the wetland classified as Freshwater Forested Shrub is 4.42 acres in size, and the wetland classified as Freshwater Pond is 2.39 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. The upper Neversink River is scheduled to have its FIRMs updated with current surveys and hydrology and hydraulics analysis in the next few years, and the mapped boundaries of the 100-year floodplain are likely to change. There are two structures WBMU4 within the 100-year floodplain as identified on the FIRM maps; they are located on the right bank north of Frost Valley Road near Station 13400. 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 in WBMU4, the stream banks within the management unit are at some risk of erosion, primarily associated with ineffective sediment conveyance. The channel gradient is relatively low in WBMU4, leading to bed aggradation in some areas. Aggrading conditions lead to channel widening via bank erosion. One area of erosion was documented in the management unit during the stream feature inventory.

An eroding bank segment was observed on the left bank extending 340 feet from Station 13540 to Station 13200 (BEMS NWB4_13200). This bank failure site was documented as active; while there is hardening at the toe, hydraulic erosion and fluvial entrainment are causing scour at the crown of the bank exposing glacial till. The 50-foot length of the eroding segment from 13450 to 13400 was documented as a fine sediment source although it is not a significant source of turbidity. Due to the active erosion at the tip of the bank failure, recommendations for this site include *assisted restoration* to improve bank stability.

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Aquatic Habitat

Aquatic habitat is one aspect of the Neversink River ecosystem. While ecosystem health includes a broad array of conditions and functions, what constitutes "good habitat" is specific to individual species. When we refer to aquatic habitat, we often mean fish habitat, and specifically trout habitat, as the recreational trout fishery in the Catskills is one of its signature attractions for both residents and visitors. Good trout habitat, then, might be considered one aspect of "good human habitat" in the Neversink River valley.

Even characterizing trout habitat is not a simple matter. Habitat characteristics include the physical structure of the stream, water quality, food supply, competition from other species, and the flow regime. The particular kind of habitat needed varies not only from species to species, but between the different ages, or life stages, of a particular species, from eggs just spawned to juveniles to adults.

New York State Department of Environmental Conservation (DEC) classifies the surface waters in New York according to their designated 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 mainstem and major tributaries in WBMU4 have been classified as "C(T)" connoting best usage for fishing, and indicating the presence of trout. Trout spawning likely occurs in this management unit, but has not yet been documented in the DEC classification.

Channel and floodplain management can modify the physical structure of the stream in some locations, resulting in the filling of pools, the loss of stream side cover and the homogenization of structure and hydraulics. As physical structure is compromised, inter-species competition is increased. Fish habitat in this management unit appears to be relatively diverse.

It is recommended that a population and habitat study be conducted on the Neversink River, with particular attention paid to temperature, salinity, riffle/pool ratios and quality and in-stream and canopy cover.

Water Quality

The primary potential water quality concerns in the Neversink as a whole are the contaminants contributed by atmospheric deposition (nitrogen, sulfur, mercury), those coming from human uses (nutrients and pathogens from septic systems, chlorides (salt) and petroleum by-products from road runoff, and suspended sediment from bank and bed erosion. Little can be done by stream managers to mitigate atmospheric deposition of contaminants, but good management of streams and floodplains can effectively reduce the potential for water quality impairments from other sources.

Storm water runoff can have a considerable impact on water quality. When it rains, water falls on roadways and flows untreated directly into the Neversink River. The cumulative impact of oil, grease, sediment, salt, litter and other unseen pollutants found in road runoff can significantly degrade water quality. There are two piped outfalls that convey storm water runoff directly into the Neversink River in this management unit. It is recommended that the water quality impacts from the outfalls at Station 12360 and Station 10650 be investigated to better understand and possibly mitigate the water quality implications of these conveyances.

Sediment from stream bank and channel erosion pose a potential threat to water quality in the Neversink River. Clay and sediment inputs into a stream may increase *turbidity* and act as a carrier for other pollutants and pathogens. There is one bank erosion site in WBMU4 that is a potential minor 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. Two 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

Concerns:

Jones Flats area: *"Upstream barrier to return all the main stream to the historic path along the southern bank and not partially across the mud field by the beaver pond is no longer very effective and needs repair…flow through the field carries sediment…ends very close to the main road and overflows there in any substantial flood. ..Would it be possible to repair that barrier?"*

*"…number of substantial tree trunks strewn along the banks.
In any flood these become battering rams eroding the banks as they are carried downstream.
While the removal would be temporary it should be worth the cost to prevent this erosion."*

"Regular damage to the road at the Round Pond outlet"

*"Planting of willows and the like along banks is desirable…
it damages a trout stream to widen it if this makes more shallow in ordinary flows,
destroys holding pools and leaves less available oxygen…in the water.
A stream that preserves good fishing is itself more likely to be looked after."*