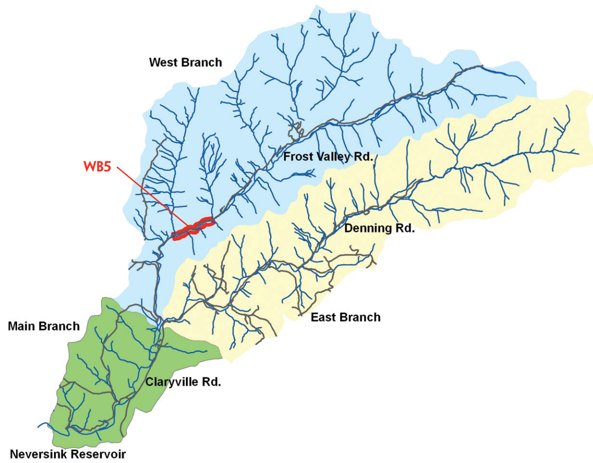
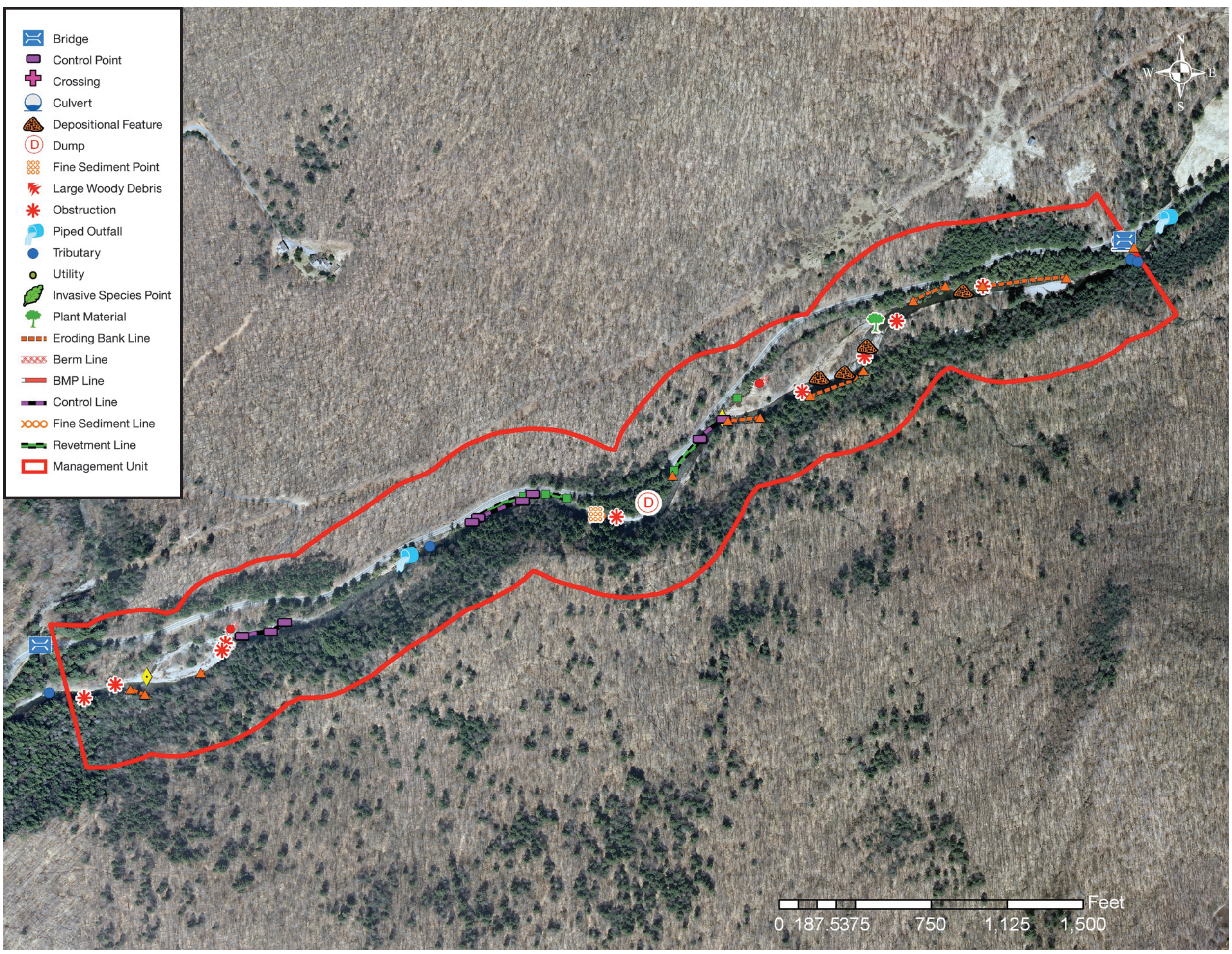
Neversink River West Branch

MANAGEMENT UNIT 5

STREAM FEATURE STATISTICS

- 10.00% of stream length is experiencing erosion
- 4.69% of stream length has been stabilized
- 6.12 acres of inadequate vegetation within the 100 ft. buffer
- 1,500 feet of stream are within 50 ft. of the road
- No building structures are located within the 100-year floodplain boundary





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

This management unit begins at the convergence with Flat Brook at Station 21300, continuing approximately 6,000 ft. to the convergence with Fall Brook near Station 15200. The drainage area ranges from 25.10 mi^2 at the top of the management unit to 31.30 mi^2 at the bottom of the unit. The valley slope is close to 1.04%. The average valley width is 378.46 ft.

Summary of Recommendations West Branch Management Unit 5

Intervention Level	Assisted restoration of the bank erosion site from Station 19715 to Station 19425 (BEMS NWB5_19425), from Station 19135 to Station 18975 (BEMS NWB5_18975), and from Station 18620 to Station 18600 (BEMS NWB5_18600). Further investigation and assisted restoration of bank failure site at Station 18100. Passive restoration of the bank erosion between Station 21310 and 21300 (BEMS NWB5_21300), Station 20914 and Station 20500 (BEMS NWB5_20500), Station 20325 and Station 20150 (BEMS NWB5_20150), Station 15830 to Station 15800 (BEMS NWB5_15800), and Station 15575 to Station 15500 (BEMS NWB5_15500).
Stream Morphology	Protect and maintain sediment storage capacity and floodplain connectivity. Conduct baseline survey of channel morphology.
Riparian Vegetation	Investigate and evaluate 2.44 acres of potential riparian buffer improvement areas for future buffer restoration. Potential riparian buffer improvement areas were observed from Station 18810 to Station 18810, Station 17720 to Station 17470, and Station 16150 to Station 15590 (Figure 7).
Infrastructure	None.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	None.
Water Quality	Investigation of water quality impacts of piped outfall at Station 17020.
Further Assessment	Include MU5 in comprehensive Local Flood Hazard Mitigation Analysis of Claryville MUs.

Historic Conditions

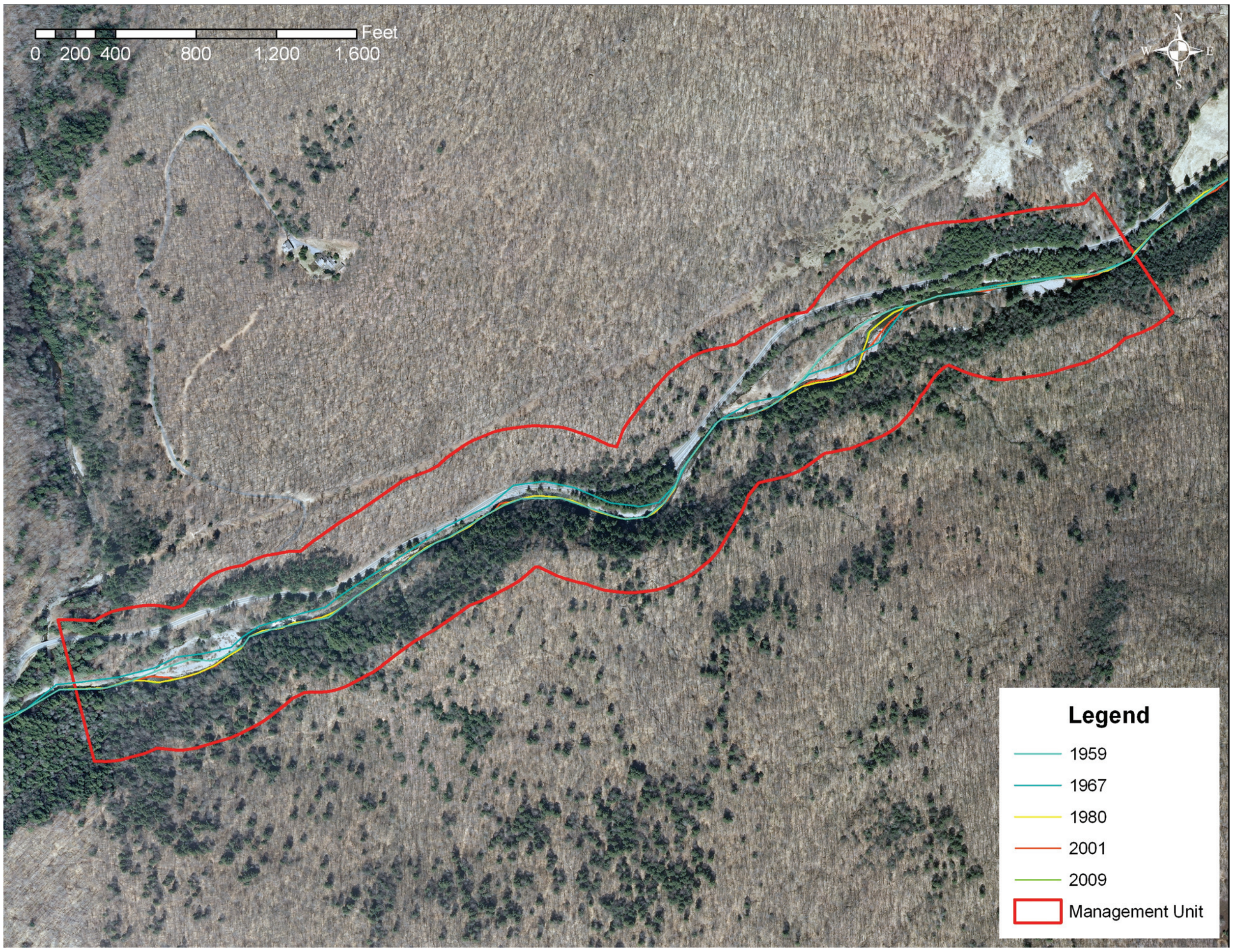
As the glaciers retreated about 12,000 years ago, they left their "tracks" in the Catskills. See Section 2.4 *Geology of Upper Neversink River,* for a description of these deposits. These deposits make up the soils in the high banks along the valley walls on the Neversink mainstem and its tributaries.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

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), Charles Leroy and Lewis S. Trickey owned a sawmill with turning works that were formerly located a quarter-mile upstream from the convergence with Fall Brook in WBMU5. It is likely that the hydraulic pressure of a bedrock cascade near Station 16400 was utilized in sawmill operations. According to Beers' 1875 Atlas, it was located on the left bank and is believed to be operational through at least 1880.

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 no 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.

WBMU5 begins at Station 21300 near the confluence of Flat Brook. A 10-foot long eroding bank segment was observed on the right bank upstream of the confluence (BEMS NWB6_21300). This site was documented as active and appeared to be caused and aggravated by scour associated with the woody obstruction at the downstream extent of the erosion site leading to exposed alluvial materials on the 10-foot high bank. No vegetation was observed at the site, although the top of bank is a thick riparian forest. *(A146)*.

Eroding segment on right bank (A146)

Aggregation at Flat Brook confluence (A147)

It is likely that the wide band of forested wetland between the main channel and Frost Valley Road will significantly slow erosion. Therefore, it is recommended that this bank be left to revegetate and stabilize without treatment (*passive restoration*) and that the site be monitored for changes in condition.

The confluence of Flat Brook was observed at Station 21240. The Flat Brook watershed is 1.6 square miles (3 stream channel miles) that drains the southern face of High Falls Ridge. Significant cobble aggregation was observed at the confluence of the tributary. *(A147)* Across from Flat Brook an intermittent tributary was observed on the left bank conveying flow over some exposed bedrock from the left valley wall to the main channel.

An eroding bank segment was observed on the right bank extending 414 feet from Station 20914 to Station 20500 (BEMS NWB5_20500). This bank site was documented as active with hydraulic erosion leading to bank scour and exposure of unstratified alluvial materials. Some vegetation was observed on the slope and there was hardening at

Eroding segment on right bank (A156)

Eroding right bank (A159)

Divergence around vegetated cobble bar with log jam (A165)

the toe. *(A156)* It is likely that the wide band of forested wetland between the main channel and Frost Valley Road will significantly slow erosion. Therefore, it is recommended that this bank be left to revegetate and stabilize without treatment (*passive restoration*) and that the site be monitored for changes in condition.

An eroding bank segment was observed on the right bank extending 175 feet from Station 20325 to Station 20150 (BEMS NWB5_20150). The bank site was documented as inactive with historic scour sites now fully vegetated and stable although some undercut banks remain. *(A159)* It is likely that this bank will continue to vegetate and stabilize without treatment (*passive restoration*). It is recommended that this site be monitored for changes in condition.

Willows growing in the right bank floodplain near Station 19800 could provide a plant source for future restoration projects in this section of the Neversink River watershed. At Station 19800 the channel diverges around a vegetated cobble bar with a log jam and the upstream end of the depositional bar. *(A165)* Downstream of the divergence an eroding bank segment was observed on the left bank extending 290 feet from Station 19715 to Station 19425 (BEMS NWB5_19425). This bank site was documented as an active hydraulic erosion with soil failure, exposing stratified alluvial materials and some glacial till with a thin riparian buffer at the top of the bank. *(A175)* Recommendations for this site include assisted restoration to improve bank stability and establish a healthy riparian buffer.

An eroding bank segment was observed on the left bank extending 160 feet from Station 19135 to Station 18975 (BEMS NWB5_18975).

This bank site was documented as active, caused by hydraulic erosion and soil failure that has exposed alluvial materials with some undercut banks leading to overhanging trees. Some vegetation was observed at the toe while none was observed on the slope of this bank site. A headcut was observed in the channel bed at the convergence of a small side channel at the downstream end of this eroding bank segment. *(P7280081)* Recommendations for this site include *assisted restoration* to improve bank stability and prevent additional erosion and possible blockage of the channel due to failure of the undercut and leaning trees.

An old stacked rock berm was observed in the right floodplain near a small flood chute extending 50 feet downstream from Station 19300. *(A181)* Slightly downstream on the right bank of the flood chute near Station 19100 a rip rap revetment was observed that was most likely designed to protect Frost Valley Road when flow is conveyed in the flood chute during high flow events. The revetment was documented in fair structural and functional condition. *(A183)* This flood chute converges with the main channel at Station 18950.

Active hydraulic erosion with soil failure site (A175)

Hydraulic erosion exposing alluvial material (P7280081)

Stacked rock berm in right floodplain (A181)

Rip-rap revetment protecting Frost Valley Road (A183)

Downstream of this convergence the main channel flows adjacent to Frost Valley Road for 400 feet from Station 19000 to Station 18600. The first 200 feet of this bank in this segment is stabilized by exposed shale bedrock with some seepage joining the main channel from Frost Valley Road. *(A184)*. Downstream of the exposed bedrock, from Station 18800 to Station 18600, a sloped stone revetment with rip rap between rock slabs was observed. This revetment was documented in good structural and functional condition. *(A188)* Portions of the revetment are potential riparian buffer improvement sites.

Exposed shale bedrock (A184)

A short eroding bank segment was observed at the downstream end of the revetment extending 20 feet from Station 18620 to Station 18600 (BEMS NWB5_18600). This bank failure was appeared to be caused by hydraulic erosion and fluvial entrainment leading to scour and undercutting exposing stratified alluvial sediments and some glacial till. *(A191)* Due to the proximity of this site to the road and the revetment, recommendations for this site include *assisted restoration* to improve bank stability and establish a healthy riparian buffer.

Sloped stone and rip-rap revetment (A188)

A dump site composed of dead root wads was observed on the right bank forested floodplain near Station 18350. *(A193)* A root wad and debris jam was observed on the right bank near Station 18180 which had led to sediment deposition upstream and some scour on the right bank downstream. *(A194)*

A bank failure site was observed on the right bank extending 60 feet from Station 18100 to Station 18040. Although the slope of the 60-foot high bank failure is thickly vegetated, surficial erosion (most likely runoff from the right valley wall)

Eroding bank segment downstream of revetment (A191)

Dump site of dead root wads (A193)

Deposition upstream of woody debris jam (A194)

is leading to undercutting and entrainment of glacial till at the crown of the slope failure. This site was documented as a fine sediment source due to the exposure of glacial till, but is not a significant source of turbidity in the main channel. *(P7280091)* Recommendations for this site include further investigation and evaluation of the source of the surficial runoff, was well as *assisted restoration* to prevent further entrainment of fine sediments, improve bank stability, and establish a healthy riparian buffer.

The main channel flows adjacent to Frost Valley Road at the apex of a meander toward the right valley wall from Station 17900 to Station 17400. The left bank is a forested floodplain for the extent of this river segment while the right stream bed grade in controlled by exposed bedrock and the right bank is stabilized by revetment. A dumped cobble revetment was observed on the right bank from Station 17900 to Station 17800. This revetment was documented in food structural and functional condition although no scour protection was observed at the upstream end. *(A202)* A sloped stone revetment was observed extending 250 feet on the right bank from Station 17700 to Station 17450. This revetment was documented in

Bank failure exposing glacial till (P7280091)

Dumped cobble revetment on right bank (A202) good structural and functional condition. *(A208)* The foundation of the revetment was keyed in to exposed bedrock that was observed in the left stream bed from Station 17750 to Station 17450. *(A211)* This revetment should be investigated for possible interplanting and enhancement of the riparian zone.

An intermittent stream converges with the main channel conveying flow from the left valley wall near Station 17200. The tributary has a cobble lined channel with some large boulders. *(P7280094)* Slightly downstream near Station 17020 a piped outfall conveying flow from the right floodplain and Frost Valley Road was observed in a stacked rock wall on the right bank. The piped outfall was constructed of a 15-inch diameter plastic culvert with 2 feet of outfall. The outfall protection was documented in fair condition. 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.

Sloped stone revetment on right bank (A208)

Revetment keyed into exposed bedrock (A211)

Intermittent stream with cobble and large boulders (P7280094)

Bedrock cascade (P7280097)

After a relatively straight and low gradient sediment transport reach from Station 17400 to Station 16400, a bedrock cascade with some large bedrock pools was observed from Station 16400 to Station 16150. 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), Charles Leroy and Lewis S. Trickey owned a sawmill with turning works that were formerly located a quarter-mile upstream from the convergence with Fall Brook in WBMU5, which coincides with this location. It is likely that the hydraulic pressure of a bedrock cascade near Station 16400 was utilized in sawmill operations. According to Beers' 1875 Atlas, it was located on the left bank and is believed to be operational through at least 1880. A large pool extends 100 feet downstream of the bedrock cascade, and a cobble depositional feature begins at the downstream end of the pool near Station 16050. *(P7280097, A216, P7280098)* A stone berm was observed along the right bank of the pool parallel to the road from Station 16155 to Station 16100. The berm was documented as 4 feet wide and 4 feet high. *(A218)*


Large pool downstream of bedrock cascade (A216)


Looking downstream at pool from cascade (A7280098)

The remaining 900 feet of WBMU5 are a sediment storage reach with sediment aggradation leading to a low channel gradient, which results in woody debris accumulation and lateral migration. In a few areas this lateral migration is leading to bank erosion on the banks of both the right and left floodplain.


Stone berm along right bank (A218)

Two large woody debris accumulations were observed near the upstream end of the vegetated depositional point bar observed on the right bank from Station 16050 to Station 15600. *(A219 and P7280100)* The combined affects of these woody

Woody debris accumulation (A219)

Woody debris accumulation (P7280100)

Eroding left bank segment (P7280103)

debris jams appeared to be direction of flow toward the right into the current main channel alignment and blockage of flow in a dry side channel that flows parallel to Frost Valley Road behind the point bar. The lack of vegetation in the dry side channel indicates that this channel likely conveys flow during high flow events as a cutoff channel. The dry side channel converges with the main channel at Station 15580.

An eroding bank segment was observed on the left bank of the main channel across from the point bar, extending 30 feet from Station 15830 to Station 15800 (BEMS NWB5_15800). The failure appeared to be caused by hydraulic erosion and soil failure resulting in exposure of stratified alluvial materials. A thick riparian buffer was observed on the top of the bank, and the site appeared to be hardening at the toe. *(P7280103)* It is likely that this bank will continue to vegetate and stabilize without treatment (*passive restoration*). It is recommended that this site be monitored for changes in condition.

A second eroding bank segment was observed on the right bank of the main channel at the convergence of the dry side channel, extending 75 feet from Station 15750 to Station 15500 (BEMS NWB5_15500). The bank scour appeared to be caused by hydraulic erosion and fluvial entrainment which is undercutting the bank and exposing root of the riparian vegetation at the top of the bank. A transverse bar and headcut were observed in the main channel directing flow toward the eroding bank. Some sedge was observed growing at the toe of the bank although the bank scour was documented as active. *(P7280106)*

Bank retreat can be expected in this area as all flow has been diverted into this channel leading to higher flows and lower channel gradient in this section facilitates lateral migration towards both banks. However, the wide band of riparian forest at the top of this bank will significantly slow or prevent erosion. Therefore, it is recommended that this bank be left to stabilize without treatment (*passive restoration*) and that the site be monitored for changes in condition.

Transverse bar and headcut (P7280106)

A downed tree was observed causing some bank scour on the right bank near Station 15450, and some woody debris were observed on the left bank near Station 15280. *(P7280110, A221)*

Downed tree causing bank scour (P7280110)

WBMU5 ends at Station 15200, 100 feet upstream of the convergence with Fall Brook.

Woody debris along left bank (A221)

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.

Most of Management Unit 5, however, is composed of sediment transport reaches, with relatively low channel sinuosity, and narrow bankfull-stage floodplains of moderate entrenchment with mature vegetation. In some locations in WBMU5 the river is confined by the bedrock or high banks, with relatively little floodplain available for short-term sediment deposition and storage. Transport reaches, like the areas in WBMU15 with boulder and bedrock grade and planform control, are in a state of *dynamic equilibrium,* effectively conveying sediment supplied from upstream during each flow event. However, the densely forested floodplain serves as a continuous source of large woody material that that can be introduced into the channel during flood events. This large woody debris often serves as a local obstruction to sediment transport, resulting in the aggradation of bed material and the development of floodplains over the long-term. Healthy, undeveloped floodplains throughout the Neversink watershed like those in WBMU5 reduce the velocity of higher flows, thereby mitigating the threat of stream bank erosion and property damage during flood events.

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 deciduous closed tree canopy (43.47 %) followed by evergreen closed tree canopy (42.85%). *Impervious* area makes up 3.83% of this unit's buffer. No occurrences of Japanese knotweed were documented in this management unit during the 2010 inventory.

There are 9.63 acres of wetland (9.68% of WBMU5 land area) within this management unit mapped in the National Wetland Inventory as two 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 3.43 acres in size and the wetland classified as Freshwater Forested Shrub is 6.20 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 no structures WBMU5 within the 100-year floodplain as identified on the FIRM maps.

BANK EROSION Due to the number of conditions in WBMU5, the stream banks within the management unit are at a relatively high risk of erosion, primarily associated with ineffective sediment conveyance. The channel gradient is relatively low in WBMU5, leading to bed aggradation in some areas. Aggrading conditions lead to channel widening via bank erosion. Eight areas of erosion were documented in the management unit during the stream feature inventory.

A 10-foot long eroding bank segment was observed on the right bank upstream of the Flat Brook confluence. This site was documented as active and appeared to be caused and aggravated by scour associated with the woody obstruction at the downstream extent of the erosion site leading to exposed alluvial materials on the 10-foot high bank. No vegetation was observed at the site, although the top of bank is a thick riparian forest.

An eroding bank segment was observed on the right bank extending 414 feet from Station 20914 to Station 20500 (BEMS NWB5_20500). This bank site was documented as active with hydraulic erosion leading to bank scour and exposure of unstratified alluvial materials.

An eroding bank segment was observed on the right bank extending 175 feet from Station 20325 to Station 20150 (BEMS NWB5_20150). The bank site was documented as inactive with historic scour sites now fully vegetated and stable although some undercut banks remain.

An eroding bank segment was observed on the left bank of the main channel across from a point bar, extending 30 feet from Station 15830 to Station 15800 (BEMS NWB5_15800). The failure appeared to be caused by hydraulic erosion and soil failure resulting in exposure of stratified alluvial materials. A thick riparian buffer was observed on the top of the bank, and the site appeared to be hardening at the toe.

An eroding bank segment was observed on the right bank of the main channel at the convergence of a dry side channel, extending 75 feet from Station 15750 to Station 15500 (BEMS NWB5_15500). The bank scour appeared to be caused by hydraulic erosion and fluvial entrainment which is undercutting the bank and exposing root of the riparian vegetation at the top of the bank. A transverse bar and headcut were observed in the main channel directing flow toward the eroding bank. Some sedge was observed growing at the toe of the bank although the bank scour was documented as active.

For varying reasons detailed above, it is likely that these bank will continue to vegetate and stabilize without treatment (*passive restoration*). It is recommended that these sites be monitored for changes in condition.

An eroding bank segment was observed on the left bank extending 290 feet from Station 19715 to Station 19425 (BEMS NWB5_19425). This bank site was documented as an active hydraulic erosion with soil failure, exposing stratified alluvial materials and some glacial till with a thin riparian buffer at the top of the bank. Recommendations for this site include *assisted restoration* to improve bank stability and establish a healthy riparian buffer.

An eroding bank segment was observed on the left bank extending 160 feet from Station 19135 to Station 18975 (BEMS NWB5_18975). This bank site was documented as active, caused by hydraulic erosion and soil failure that has exposed alluvial materials with some undercut banks leading to overhanging trees. Some vegetation was observed at the toe while none was observed on the slope of this bank site. A headcut was observed in the channel bed at the convergence of a small side channel at the downstream end of this eroding bank segment. Recommendations for this site include *assisted restoration* to improve bank stability and prevent additional erosion and possible blockage of the channel due to failure of the undercut and leaning trees.

A short eroding bank segment was observed at the downstream end of the revetment extending 20 feet from Station 18620 to Station 18600 (BEMS NWB5_18600). This bank failure was appeared to be caused by hydraulic erosion and fluvial entrainment leading to scour and undercutting exposing stratified alluvial sediments and some glacial till. Due to the proximity of this site to the road and the revetment, recommendations for this site include *assisted restoration* to improve bank stability and establish a healthy riparian buffer.

INFRASTRUCTURE Slightly downstream on the right bank of the flood chute near Station 19100 a rip rap revetment was observed that was most likely designed to protect Frost Valley Road when flow is conveyed in the flood chute during high flow events. The revetment was documented in fair structural and functional condition.

A sloped stone revetment with rip rap between rock slabs was observed on the right bank extending 200 feet downstream from Station 18800. This revetment was documented in good structural and functional condition.

A dumped cobble revetment was observed on the right bank from Station 17900 to Station 17800. This revetment was documented in food structural and functional condition although no scour protection was observed at the upstream end.

A sloped stone revetment was observed extending 250 feet on the right bank from Station 17700 to Station 17450. This revetment was documented in good structural and functional condition.

An old stacked rock berm was observed in the right floodplain near a small flood chute extending 50 feet downstream from Station 19300.

A stone berm was observed along the right bank of the pool parallel to the road from Station 16155 to Station 16100. The berm was documented as 4 feet wide and 4 feet high.

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 in WBMU5 has 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 is one piped outfall that convey storm water runoff directly into the Neversink River in this management unit (near Station 17020).

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 WBMU5 that is a potential minor 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**.

Community Comments
Fall 2012

"We recommend an update to reflect post-Irene and 9/18/12 flood conditions, particularly for the portion at Station 16050."