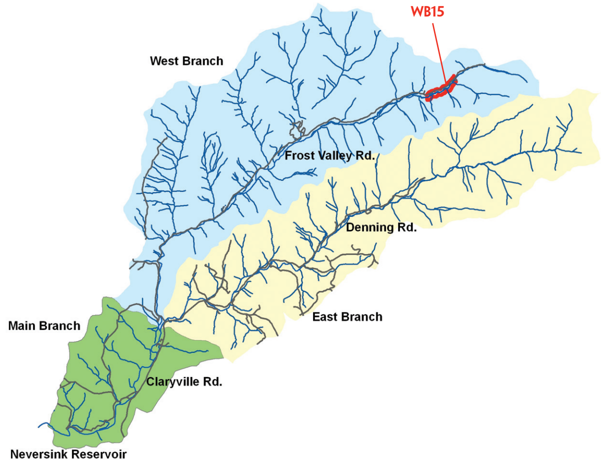
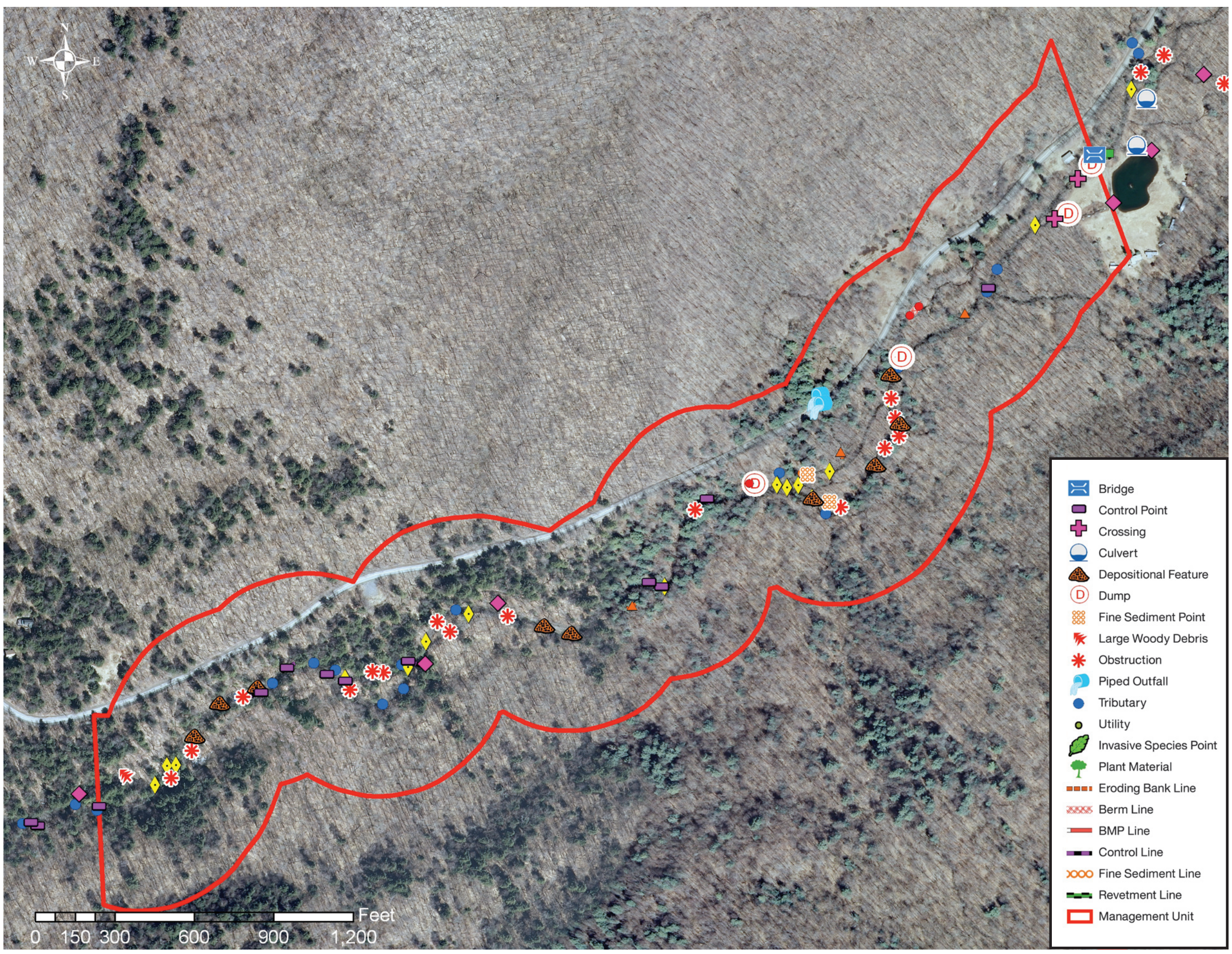
Neversink River West Branch

MANAGEMENT UNIT 15

STREAM FEATURE STATISTICS

- 1.00% of stream length is experiencing erosion
- 0.00% of stream length has been stabilized
- 5.16 acres of inadequate vegetation within the 100 ft. buffer
- None of stream is within 50 ft. of the road
- No structure located within the 100-year floodplain boundary





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

This management unit begins at mudstone grade control point near Station 59000 and continues 5,300 feet to the private driveway accessing the Shandaken Rod & Gun Club at Station 64300. The drainage area ranges from 1.60 mi^2 at the top of the management unit to 3.40 mi^2 at the bottom of the unit. The valley slope is close to 2.16%. The average valley width is 512.92 ft.

Summary of Recommendations West Branch Management Unit 15

Intervention Level	Preservation (primarily NYS lands).
Stream Morphology	Protect and maintain floodplain connectivity for storage capacity and habitat value. Conduct baseline survey of channel morphology.
Riparian Vegetation	Potential riparian buffer improvement area from Stn 64100 to Stn 64300.
Infrastructure	None.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	None.
Water Quality	Evaluate water quality effects of roadside drainage from Frost Valley Road; investigate geologic fine sediment source at Stn 62400. Remediation of dump site downstream of Shandaken Rod & Gun Club bridge.
Further Assessment	Include MU15 in comprehensive Local Flood Hazard Mitigation Analysis of Claryville MUs.

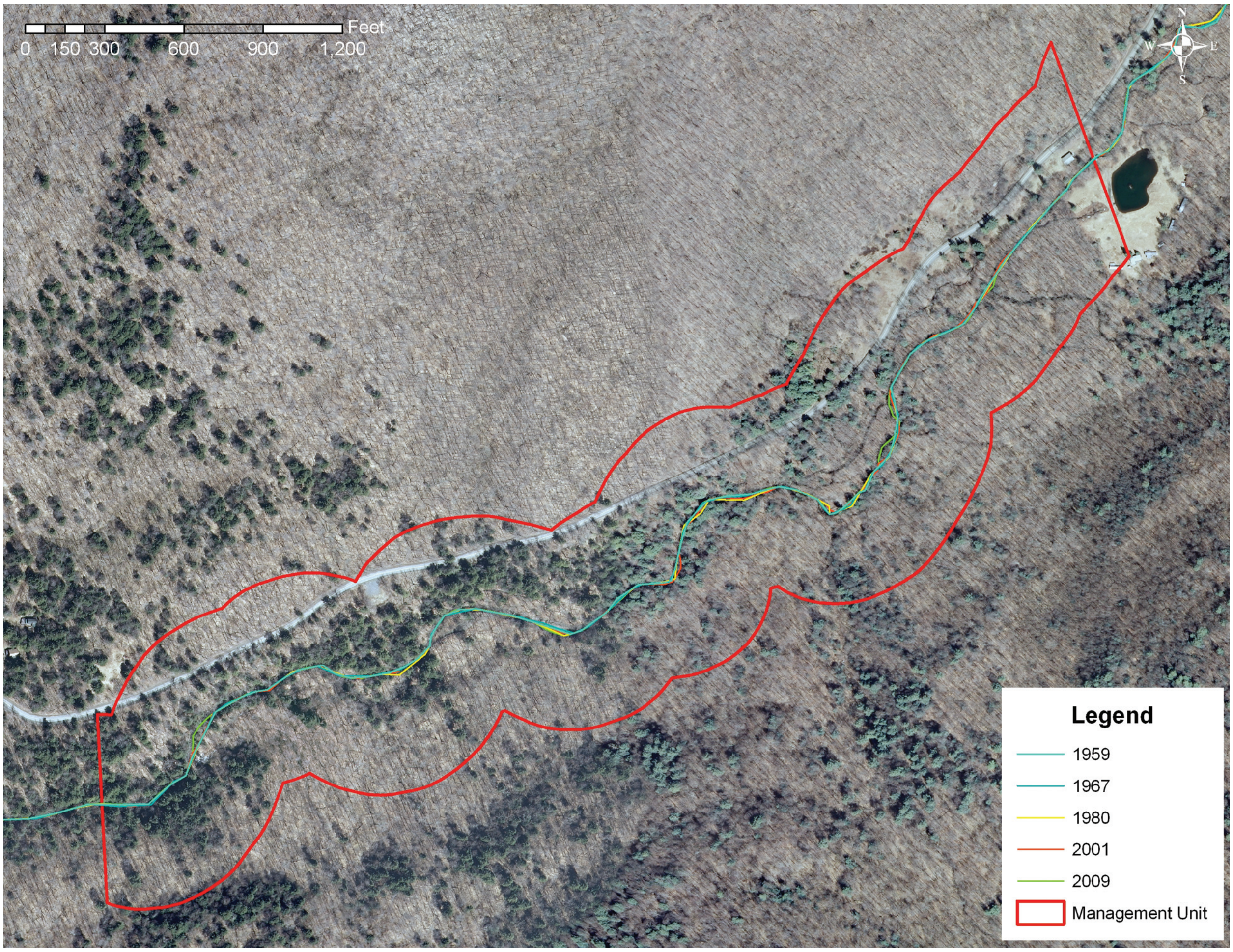
Historic Conditions

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.

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. In this management unit, tributaries draining the left valley wall have contributed a significant volume of larger boulders into the main channel, generally serving to increase channel stability by providing both lateral and vertical control in numerous locations. A comparison of historical channel alignments *(Figure 3, following page)* and in-stream observations made during a stream feature inventory in 2010 *(Figure 1, page 1)* indicate minor lateral channel instability. According to records available from the NYSDEC DART database, three 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/**).



Historical channel alignments from five selected years (Figure 3)

Stream Channel and Floodplain Current Conditions

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

Management Unit 15 runs adjacent to Frost Valley Road, at a distance of between 100 and 300 feet, for nearly the entire management unit, receiving stormwater runoff from roadside drainage in a number of locations. The unnamed private drive bridge on the Shandaken Rod & Gun Club property has a *normal span* of 17 feet, an *effective span* of 15 feet, and ten feet of *encroachment* on both banks. The bridge had a log and timber deck with stacked gabion abutments. *(A775)* The bridge was documented in good functional and structural condition. Depositional features, such as the side bar on the right bank upstream of this bridge, often form upstream of bridges where the bridge approaches restrict flows that would otherwise effectively transport sediment. The upstream deposition and encroachment indicate that this bridge does obstruct floodplain flows.

Private bridge (A775)

Directly downstream of the bridge a dumping site was observed on the left bank that included woody debris and discarded concrete culvert segments. *(A782)* It is recommended that this dump site be cleaned up to prevent additional pollution of the riparian buffer and main channel and the source of the garbage be identified to prevent future dumping. The potential for improvement of the riparian buffer from Station 64300 to 64100 should be investigated.

Dumping site on left bank (A782)

At Station 64200 a stream crossing was observed which possibly provided access to the Shandaken Rod & Gun Club pond and cabins during construction of the bridge. *(A784)* It is recommended that the previously disturbed banks of this crossing be planted to both prevent future crossings in this location and re-established a riparian buffer.

Crossing site (A784)

At Station 63800 the spillway from the Shandaken Rod & Gun Club pond joins the main channel. Fine sand and silt sedimentation as well as some active dumping of plastics sheeting and construction materials were observed in this spillway approximately 100 feet upstream of the convergence. *(B596, B597)* Approximately 70 feet upstream of the convergence an ATV trail was observed crossing the spillway *(B602)*.

At Station 63740 an unnamed perennial tributary joins the mainstem from the left floodplain. Bank erosion was observed on the bank opposite the convergence, and a woody debris pile was observed in the main channel slightly downstream. *(B608)* At Station 63650 another perennial tributary join the main channel from the left terrace and valley wall; just downstream a large boulder controls lateral movement of the main channel *(B617)*. At Station 63620 the channel crosses into New York State land in "forever wild" status; no recommendations are made for lands in forever wild status. The remainder of Management Unit 15 is on state land.

Fine sand and silt sediment (B596)

Dumping site (B597)

Convergence of ATV trail (B602)

Tributary entering on left (B608)

Large boulder controlling lateral movement (B617)

Eroding bank segment (B621)

A 22-foot long eroding bank segment was observed centered around Station 63520 that was documented with banks undercut by up to 3 feet due to hydraulic erosion. Due to the location of this erosion site separated from the road by a dense forest floodplain and the healthy woody riparian buffer on the top of the bank, it is anticipated that this bank will revegetate and stabilize without treatment (*passive restoration*), however, it is recommended that this site be monitored for changes in condition. *(B621)*

Stacked stone wall on right bank (A787)

From Station 63360 to Station 63310 a 50-foot stacked stone wall was observed in the forest floodplain on the right bank. It is possible that this berm was a containment wall for a mill race or an abutment for an old bridge. The proximity of Frost Valley Road indicates that perhaps it provided stabilization for the road before it was paved and managed for storm water runoff (According to Michael Kudish Frost Valley Road connected Branch, NY, a hamlet east of Frost Valley, and the Esopus watershed over the next ridge as early as 1875). *(A787)*

Culvert and woody debris (A789)

At Station 63210 more concrete culvert sections where observed that had most likely been conveyed downstream from the dumping site near the Shandaken Rod & Gun Clib driveway bridge by a high flow event along with a woody debris jam nearby. *(A789)* Slightly downstream road drainage from Frost Valley Road joins the main stem creating a delta bar of fine sediments most likely deposited here from the road. *(A790, A791)*

At Station 63080 a large woody debris jam diverts flow from an historic channel on the right into a channel that instead meanders to the left flowing adjacent to the left valley wall from Station 63000 to Station 62500. *(A794)* Throughout this semi-confined reach the forest floodplain on the right bank is braided with many side channels and flood chutes with cobble beds that convey flow during high flow events. *(A815)*

At Station 62700 there is a 36-foot long eroding bank segment causing by piped runoff from both the right valley wall and Frost Valley Road (BEMS NWB15_62700). *(B634)*. Is it likely that this tributary conveys fine sediments from Frost Valley Road to the main channel in this location. It is

Road drainage joining main channel (A790)

Delta bar composed of fine sediments (A791)

Divergence due to woody debris (A794)

Side channel joining main channel (A815) recommended that the drainage design for Frost Valley road be reviewed in this area, and sediment traps or bioengineering techniques that would prevent addition of fine sediments to the river be considered in any renovations or replacements.

Approximately 300 feet downstream near Station 62400 a fine sediment source--exposed glacial till with high sand and clay content-- was observed. *(B640)* While maps of Catskill geology identify mostly alluvium of modern floodplains, moraines, and thick glacial deposits in this valley, it is possible that this is a small area of exposed lacustrine clay. It is recommended that the geology of this site be investigated for its potential water quality implications, and that the site be monitored for changes in condition.

At station 62500 a tributary draining the slopes of Slide Mountain joins the main channel from the left valley wall and the main channel makes a sharp turn to the right, beginning a long meander across the valley floor.

Just downstream of Station 62200, a 60 foot long, dry stacked stone retaining wall has been built

Eroding bank segment caused by piped runoff (B634)

Exposed glacial till with high sand and silt content (B640)

Three level stone wall terrace on right bank (A824)

Car dumped on terraced berm (A822)

into the terrace wall on three levels on the right bank. *(A824)* The bench surfaces created by the stone walls are an apparently inactive dump site. *(A822)* Slightly upstream of the berm there is an intermittent seepage that coveys flow down a chute through the berm into the main channel. *(A825)* It is possible that this berm was designed for bank stabilization to prevent bank failure on the steep terrace wall. It is recommended that this dump site be remediated to improve the integrity of the riparian buffer and stream, and that the road frontage be secured to prevent future dumping.

Chute conveying intermittent seepage (A825)

Headcut migrating upstream through cobble deposition (A827)

Large boulders constraining main channel (B650)

At Station 62000 the main channel becomes a series of step pools connected by steep cobble riffles, for approximately 500 feet. *(B650)* At this location, the channel is still relatively confined, with a low bankfull bench on the right bank leading to a steep terrace wall, and a similar terrace on the left bank. The channel is characterized by step-pools formed by woody debris and large boulders. Near Station 61600, a headcut appears to be migrating upstream through cobble deposition from a boulder control point on the left bank. *(A827)* Similar step-pool conditions characterize the channel from downstream at Station 61550.

A 37-foot long eroding bank segment was observed near Station 61480, with banks undercut by up to 3 feet due to hydraulic erosion (BEMS NWB15_61400). Due to the location of this erosion site separated from the road by a dense forest floodplain and the healthy woody riparian buffer on the top of the bank, it is anticipated that this bank will revegetate and stabilize without treatment (*passive restoration*). It is recommended that this site be monitored for changes in condition.

At Station 61200 there is a 20-foot wide depositional side bar on the right bank composed of imbricated cobbles and some woody vegetation *(A832)*. At Station 61100 a second depositional side bar on the right bank has revegetated with shrubs. *(A834)* At Station 60950 a large log was observed lodged across the channel that has led to the formation of a cobble deposition bar upstream and a scour pool immediately downstream. *(A835)* Floodplains on the right and left banks become broader and more connected with the channel for the next 500 feet.

Depositional side bar on right bank (A832)

Side bar on right bank with sedge and vegetation (A834)

Large log in channel causing scour and deposition (A835)


Divergence with aggradation upstream (B658)

Near Station 60900 there is a well-used camp site on the right terrace. The channel splits approximately 100 feet downstream near Station 60800; aggradation was observed upstream of this divergence, *(B658)* and woody debris accumulations were observed in both channels. The side channel converges with the main channel at Station 60580. An intermittent tributary joins the main channel from the right bank at Station 60750. Piped flow form Frost Valley road was not observed near this location so it is likely that this is concentrated drainage from the right bank floodplain upstream of this location. *(B659)*


Intermittent tributary joining main branch (B659)

At Station 60450 a natural rock weir across the main, composed of large boulders and cobbles, forms a scour pool downstream. *(A842)* Immediately downstream of the weir the channel splits, with substantial wood debris observed in both channels, and three tributaries draining the left valley wall contribute to flow in that left channel before it rejoins the main channel at Station 60200. At the convergence a large boulder is controlling the grade of the main channel consistent with patterns upstream. *(A845, A847)* At Stations 60150 and 60090 unnamed


Large boulder and cobble rock weir (A842)


Woody debris on both the main and side channel (A845)

intermittent tributaries join the main channel from the right bank, and there is another large boulder on the left bank providing lateral control. *(A849)*

For the next 600 feet downstream stream features alternate between boulders providing grade and planform control on the main channel on either bank, additional flow conveyed by intermittent tributaries and depositional side bars composed of imbricated cobbles and boulders. This follows the pattern of a stream transitioning form a steep headwater stream to a mid-valley stream with a slightly lower slope and increased lateral migration.

Near Station 59400 the channel splits again, with flow directed into a side channel against a terrace in the left valley wall by a large woody debris jam. *(A860)* Near Station 59340 the side channel flows adjacent to a mudstone ledge with an apparently unstable surficial layer of till, and numerous accumulations of woody debris in the channel. *(B681)* The side channel converges with the main channel again near Station 59290.

Looking upstream at convergence (A847)

Boulders constraining lateral movement of main channel (A849)

Large woody debris jam (A860)

Large woody debris jam (B681)

Through the end of the WBMU15, woody debris deposits were observed on both floodplains. At Station 59100 a large downed tree above bankfull was observed downstream of a pool with a mudstone bottom and a boulder forming an obstruction on the right bank. *(B691)*

Downed tree and boulder forming obstruction (B691)

WBMU15 ends at Station 59000 where the river bed and both banks are composed of mudstone that forms a series of steps resulting in a 20-foot elevation drop. *(A862)*

Stream bed and both banks are composed of mudstone at station 59,000 (A862)

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 a sediment transport reach, with relatively low channel sinuosity, bankful stage floodplains of moderate entrenchment with mature vegetation, and overflow channels to accommodate larger discharges of water and sediment when necessary. 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 throughout WBMU15 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 2001 and field inventories *(Figure 5)*. In this management unit, the predominant vegetation type within the 100 ft. riparian buffer is deciduous-closed tree canopy (54.72%) followed by mixed-closed tree canopy (23.04%). Impervious area makes up 3.61% of this units buffer. There are 2.0 acres of potential buffer improvement area in this management unit *(Figure 7)*.

There are no wetland areas in 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 A type descriptions and regulations).

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 WBMU15 within the 100-year floodplain as identified on the FIRM maps.

BANK EROSION Due to the number of conditions in WBMU15, the stream banks within the management unit are at a relatively high risk of erosion, primarily associated with ineffective sediment conveyance. The channel gradient decreases significantly in WBMU15, leading to bed aggradation. Aggrading conditions lead to channel widening via bank erosion. Five areas of erosion were documented in the management unit during the stream feature inventory.

A 22-foot long eroding bank segment was observed centered around Station 63520 that was documented with banks undercut by up to 3 feet due to hydraulic erosion . Due to the location of this erosion site separated from the road by a dense forest floodplain and the healthy woody riparian buffer on the top of the bank, it is anticipated that this bank will revegetate and stabilize without treatment (*passive restoration*), however, it is recommended that this site be monitored for changes in condition

At Station 62700 there is a 36-foot long eroding bank segment causing by piped runoff from both the right valley wall and Frost Valley Road (BEMS NWB15_62700). It is recommended that the drainage design for Frost Valley road be reviewed in this area, and sediment traps bioengineering techniques that would prevent addition of fine sediments to the river be considered in any renovations or replacements.

A 37-foot long eroding bank segment was observed centered around Station 61480 that was documented with banks undercut by up to 3 feet due to hydraulic erosion (BEMS NWB15_61400). Due to the location of this erosion site separated from the road by a dense forest floodplain and the healthy woody riparian buffer on the top of the bank, it is anticipated that this bank will revegetate and stabilize without treatment (*passive restoration*), however, it is recommended that this site be monitored for changes in condition.

INFRASTRUCTURE None of the stream bank length in this management unit has been treated with revetment and there were no berms documented in this management unit.

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 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 mainstem in WBMU15 has been given a "C(T)" class designation with 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 several piped outfalls that convey storm water runoff directly into the Neversink River from Frost Valley road in this management unit. It is recommended that

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 WBMU15 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. 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

Large woody debris/blowdown near MU14.