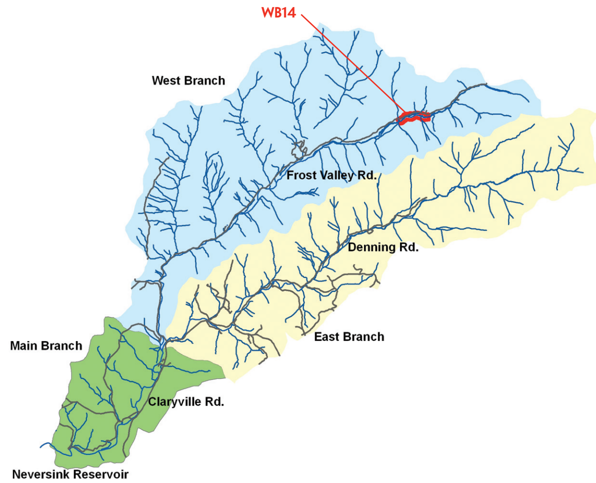
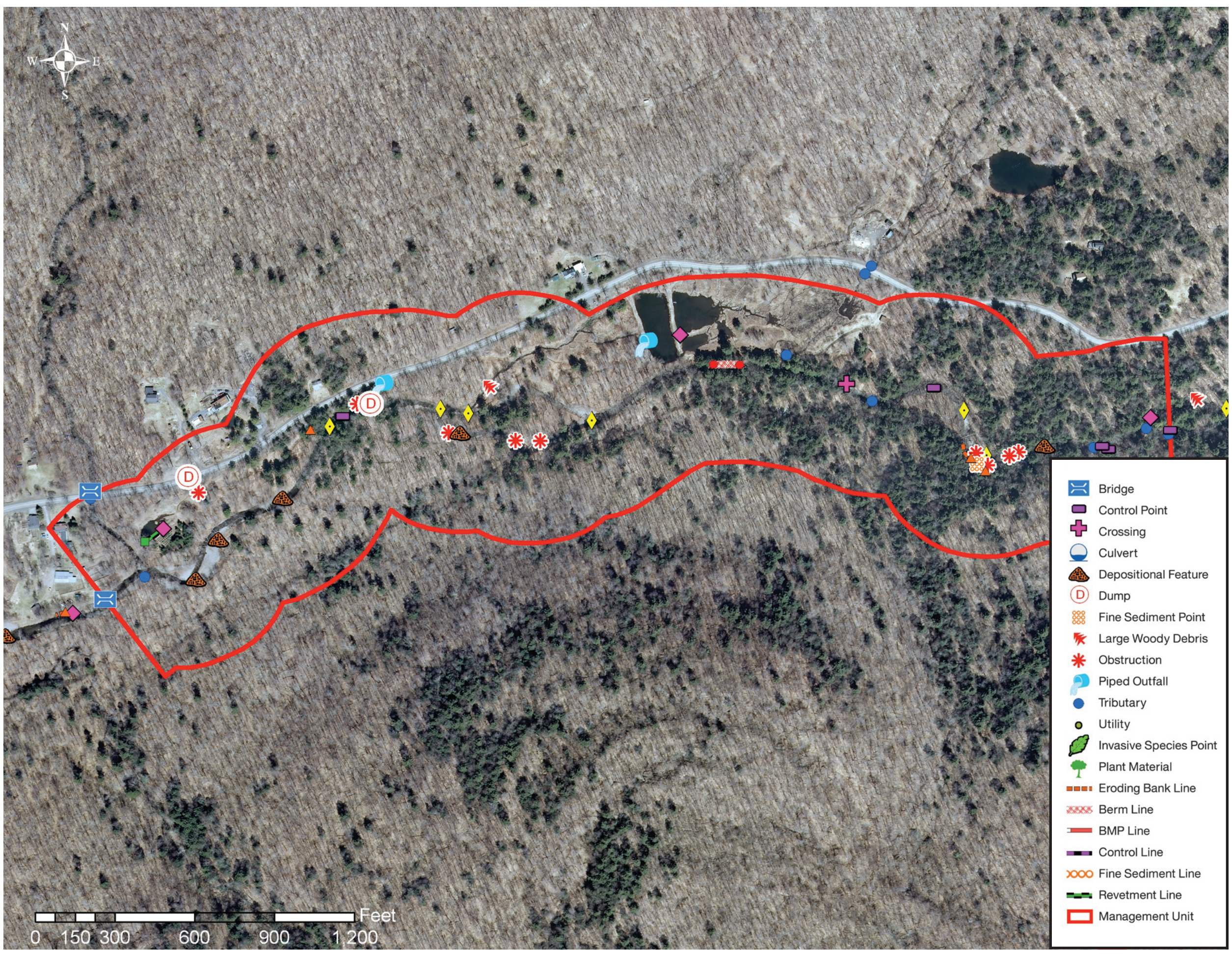
Neversink River West Branch

MANAGEMENT UNIT 14

STREAM FEATURE STATISTICS

- 2.00% of stream length is experiencing erosion
- 0.88% of stream length has been stabilized
- 7.44 acres of inadequate vegetation within the 100 ft. buffer
- None of stream is within 50 ft. of the road
- There is one structure located within the 100-year floodplain boundary





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

This management unit begins at a private bridge crossing near Station 54300, continuing approximately 4,700 ft. to the mudstone grade control point near Station 59000. The drainage area ranges from 3.40 mi^2 at the top of the management unit to 4.60 mi^2 at the bottom of the unit. The valley slope is close to 2.79%. The average valley width is 527.41 ft.

Summary of Recommendations
West Branch Management Unit 14

Intervention Level	Assisted restoration using bioengineering techniques to stabilize the eroding bank at Station 58300. (BEMS NWB14_58275) Preservation elsewhere.
Stream Morphology	Protect and maintain sediment storage capacity and floodplain connectivity. Conduct baseline survey of channel morphology.
Riparian Vegetation	Potential riparian buffer improvement areas from Stn 54320 to Stn 54370.
Infrastructure	None.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	Floodproofing as appropriate. http://www.fema.gov/library/viewRecord.do?id=1420
Water Quality	Evaluate water quality affects of runoff from Frost Valley Road. Maintain household septic systems.
Further Assessment	Include MU15 in comprehensive Local Flood Hazard Mitigation Analysis of Claryville MUs.

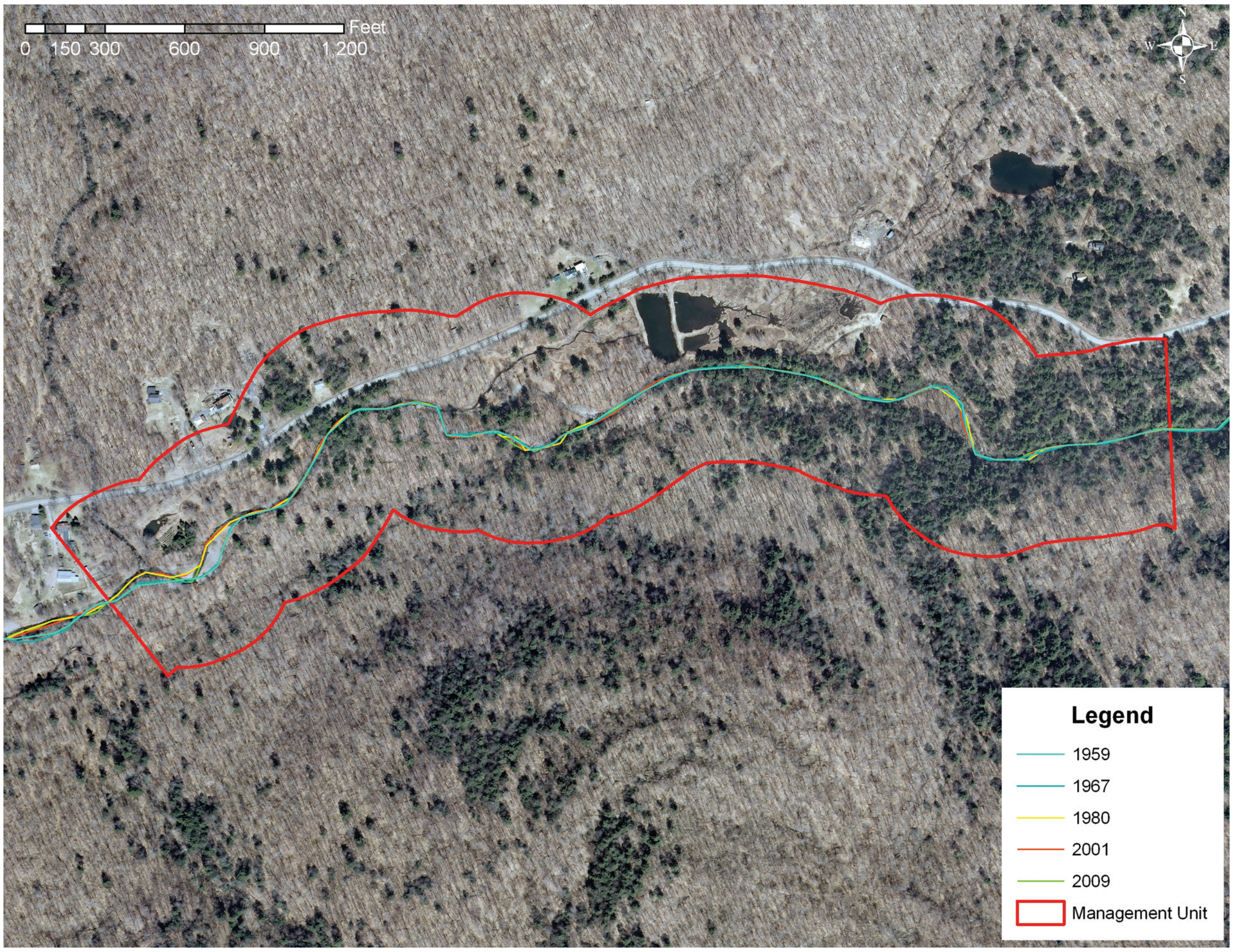
Historic Conditions

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. 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 little lateral channel instability in most of the management unit, with the exception of the last 600 feet, where significant lateral channel migration has occurred in recent decades. This may be due to a combination of natural and anthropogenic influences. According to records available from the NYSDEC DART database, four 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.

WBMU14 begins on New York State land in "forever wild" status; no recommendations are made for lands in forever wild status. Mudstone bedrock controls stream grade near Station 59000, where two tributaries were observed conveying flow off the left valley wall. Near Station 58750 there is a natural rock weir grade control structure followed by convergence of another seep draining the left valley wall with the main channel. *(B709, B714)*

At Station 58700 the river crosses back into private property. 150 feet downstream there was a depositional side bar composed of gravel with no vegetation observed on the right bed. The depositional feature begins downstream of a large boulder and ends 100 feet downstream at the first of a series of large woody debris jams composed of both large logs and condensed branches. *(B721, B715)*

Near Station 58300, directly downstream of a downed tree that spans the width of the main channel, a side channel diverges to the right with the main channel meandering into the left valley wall. A 139-foot bank erosion segment was observed coincident with the apex of the meander bend on the left bank. The erosion site (BEMS NWB14_58275) was classified as a mass failure caused by rotational slip; numerous downed trees blanketed the face of the failure. The bank failure site was documented as approximately 140 high from the stream bed to the crown of the failure.

Natural rock weir grade control (B709)

Seep entering from left valley wall (B714)

Woody debris jam (B721)

Gravel side bar (B715)


Large boulder and downed tree forming grade control (A874)


Recreational stream crossing (B742)


Tributary entering from right floodplain (B743)

The bank erosion appeared inactive due to established vegetation on the slope and accumulation of cobble and small boulders at the toe, and is most likely caused and aggravated by saturated soils due to surface water recharge and overland flow. This site was also identified as a fine sediment source as sand and silt were observed in the exposed soil layers. Recommendations for this site minimally include *assisted restoration* using bioengineering techniques to stabilize the eroding bank.

Near Station 58100 the side channel converges with the main channel as flow is directed back across the valley floor towards Frost Valley Road.

At Station 57950 a boulder in the main channel near the right bank with a downed tree spanning the remainder of the channel control grade at this location, with deposition accumulating upstream and a scour pool immediately downstream. *(A874)*

At Station 57590 a footbridge made of boards and ropes was observed stretching across the main channel from the backyard of a house within 50 feet of the stream bank. *(B742)* This structure is within the 100-year floodplain as identified on the FIRM maps for the Neversink valley. It is recommended that these landowners investigate flood proofing options to protect their residence from damage during a flood event.

At Station 57330 a tributary joins the mainstem from the right floodplain upstream of a group of three open freshwater ponds covering approximately 1.25 acres. *(B743)* It is not clear if this is the small, unnamed tributary that drains the south slopes of Spruce Mountain, or if significant flow is diverted into the pond system. The outfall from the constructed ponds begins at Station 56850 and meanders through a wetland before it converges


Wetland from outflow of constructed pond (A884)


Stacked stone berm (B748)

with the main channel near Station 55850. *(A884)* A stacked stone berm was observed from Station 57180 to Station 57080 that was placed between the main channel and an ATV path observed connecting the house and ponds along the right bank. *(B748)*

Downstream of the ponds, near Station 56550, a dry side channel diverges as the main channel continues a meander to the left. *(B754)* The side channel converges with the wetland drainage channel to the right of the main channel near Station 56000. *(A885)* Two woody obstructions were observed in the main channel downstream of the obstruction. The first, located at Station 56340, is a series of two downed trees spanning the channel width which have trapped sediment leading to depositional bars on the upstream side and scour pools downstream. *(B760)* The second, located on the left bank at Station 56230, is a woody debris jam with a minor eroding bank segment upstream and scour on the left bank downstream. *(B764)* 200 feet downstream a cobble depositional side bar was observed on the right bank with some woody vegetation. The deposition ends at a woody debris jam near Station 55950. *(B771, B776)*


Divergence with dry side channel (B754)


Side channel converging with wetland area (A885)


Downed trees causing deposition upstream and scour downstream (B760)


Woody debris jam causing erosion upstream (B764)


Cobble side bar (B771)


Woody deposition (B776)


Inactive dump site (A887)


Downed tree spanning channel width (A890)

Boulder grade control (A892)

Erosion on right bank (A897)

Downstream of the woody debris jam the channel begins a meander to the right across the valley floor towards Frost Valley Road. A boulder grade control was observed on the right bank at the apex of the meander slightly downstream of an inactive dumping site and a downed tree causing scour on the steep right bank descending from Frost Valley Road. *(A887, A890, A892)*

Concrete structure possibly once used to control flow of side channel (A898)

New York State land, in "forever wild" status, begins again at approximately Station 55500, ending at Station 55000; no recommendations are made for lands in forever wild status. Near Station 55400 the divergence of a man-made side channel into the right bank forested floodplain was observed. A segment of gullying bank erosion was observed slightly downtream in the side channel, apparently caused by surficial flow from roadside drainage along Frost Valley Road (BEMS NWB14_55300). A concrete wall structure that likely served as a gate for the diversion channel into the manmade pond just downstream was observed at the toe of this erosion site. *(A897, A898)* There was little evidence of regular inundation of this side channel. Woody vegetation was observed for the length of the eroding segment so it is anticipated that this bank will revegetate and stabilize without treatment (*passive restoration*).

The side channel continues through the right floodplain until it meet with a man made pond. A poured concrete revetment was observed between the pond and a blue spruce grove for approximately 80 feet. The revetment was documented in fair structure and functional condition as it is likely that is once controlled drainage from the now dry pond. *(A903)* A significant perennial tributary, draining the notch between Spruce and Fir Mountains, converges with the main channel at Station 54400. *(B785)*

Revetment once used to control drainage from pond (A903)

Aggradation was observed throughout the main channel downstream of the man-made diversion, with a significant cobble bar stretching 200 feet from Station 54800 to Station 54600. A dry flood chute was observed on the left channel. *(B780, B783)*

Tributary converging with main channel (B785)

WBMU14 ends at Station 54300, where a private footbridge crosses the main channel connecting the forested left bank with land occupied by an emu and ostrich farm. The bridge is composed of 2"x4" wooden timbers on piers constructed of 55-gallon steel drums, documented in fair structural and functional condition; the owner

Aggradation throughout main channel (B780)

Large side bar (B783)

Private footbridge (A907)

Aggradation upstream of bridge (A909)

reported that the bridge had been damaged and washed out in past flood events. The bridge was documented with a *normal span* of 69 feet and an *effective span* of 51 feet with 6 feet of encroachment on the right bank and 3 feet of encroachment on the left bank. Aggradation was observed upstream of the bridge. Depositional features often form upstream of bridges where the bridge approaches restrict flows that would otherwise effectively transport sediment. While this bridge may obstruct floodplain flows, it doesn't appear to obstruct bankfull channel flows. A stable bankfull width for this location, as estimated by regional hydraulic geometry equations (Miller and Davis, 2003), is about 43 feet, and it is unlikely that the bridge is the cause of the aggradation in the reach upstream. It is possible that the channel is over-widened due to ineffective channel management activities. *(A907, A909)* The overbank area from Station 54370 to Station 54320 (and adjacent areas at the start of Management Unit 13) should be investigated for potential improvement of riparian vegetation and development of a plan for channel management to more effectively protect the landowner's infrastructure.

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 WBMU14, 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.

The last 600 feet of Management Unit 14 is the exception to this characterization; in this reach depositional features, historical migration of the channel and indications of aggradation in the streambed point to ineffective sediment transport. This may be due to the bedload supplied by the tributary the confluences in this area, or by channel management activities in the vicinity of the footbridge at the bottom of the management unit, or a combination of the two.

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 (47.62 %) followed by evergreen-closed tree canopy (18.90 %) and mixed closed tree canopy (18.21%). *Impervious* area makes up 2.37% of this unit's buffer. There are 4.7 acres of potential buffer improvement area in this management unit (see Fig. 7). No occurrences of Japanese knotweed were documented in this management unit during the 2010 inventory.

There are 1.25 acres of wetland (1.64% of WBMU14 land area) within this management unit mapped in the National Wetland Inventory (see Section 2.5, *Wetlands and Floodplains* for more information on the National Wetland Inventory and wetlands in the Neversink watershed). Wetlands are important features in the landscape that provide numerous beneficial functions including protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters, and maintaining surface water flow during dry periods (See Section 2.5 for wetland A type descriptions and regulations). All of the wetland in WBMU14 is classified as Freshwater Pond wetland.

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 is one structure WBMU14 within the 100-year floodplain as identified on the FIRM maps. FEMA provides guidance to homeowners on floodproofing at: **http://www.fema.gov/library/viewRecord.do?id=1420**

BANK EROSION Two areas of erosion were documented in the management unit during the stream feature inventory. Near Station 58300 a 139-foot bank erosion segment was observed coincident with the apex of a meander bend. The erosion site (BEMS NWB14_58275) was classified as a mass failure caused by rotational slip, as evidence by the downed trees on the face of the failure. Near Station 55400 a segment of eroding bank was observed slightly downstream in a side channel which appeared to be caused by surficial piping form Frost Valley Road (BEMS NWB14_55300).

INFRASTRUCTURE A poured concrete revetment was observed between a dry pond and a blue spruce grove for approximately 80 feet in the right floodplain near Station 54500. The revetment was documented in fair structure and functional condition.

A stacked stone berm was observed from Station 57180 to Station 57080 that was placed between the main channel and an ATV path observed connecting the house and ponds throughout the right floodplain.

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 WBMU14 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 several piped outfalls that convey storm water runoff into the right floodplain of the Neversink River from Frost Valley Road in this management unit.

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 WBMU14 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. One structure is 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 pond system in the upper reaches of the management unit represents a potential source of nutrients.

The livestock (emus and ostriches) being kept near the stream at the bottom of the management unit represent a potential source of nutrient and pathogen loading. It is recommended that manure management be discussed with the landowners to ensure adequate isolation of potential water quality contaminants.

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

"Interested in new FEMA flood maps"

"I live on opposite side of the river however Rock Brook is not far from me and has taken out the bridge. And I need to use Frost Valley Road to get to my work daily. Very interested in that particularly."

Near Station 57400 (at road) *"Flooding from tributary"*

Station 56700-56300 *"Erosion"*

Station 55500 *"Eroding bank, culvert drainage"*

Station 55400 *"Sluiceway for pond"*

Station 55000 *"Left bank, plunge"*

Near the border of MU13, Rock Brook tributary overflowed to the road, jumped channel and went through the Johnston compound. This is a potential avulsion site in the next flood and should be a high priority.

On the right side of the road near Rock Brook there is large woody debris accumulation.