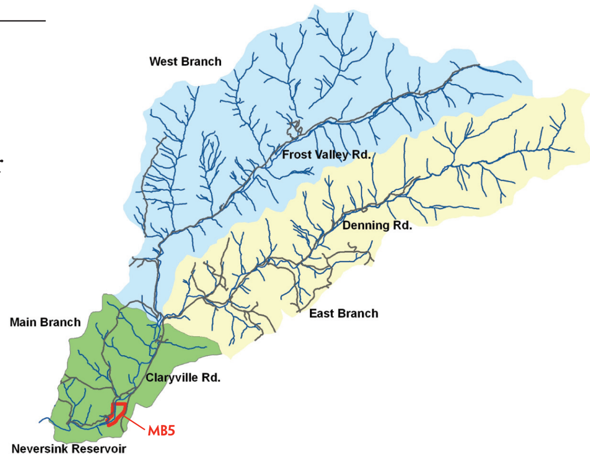
Neversink River Main Branch

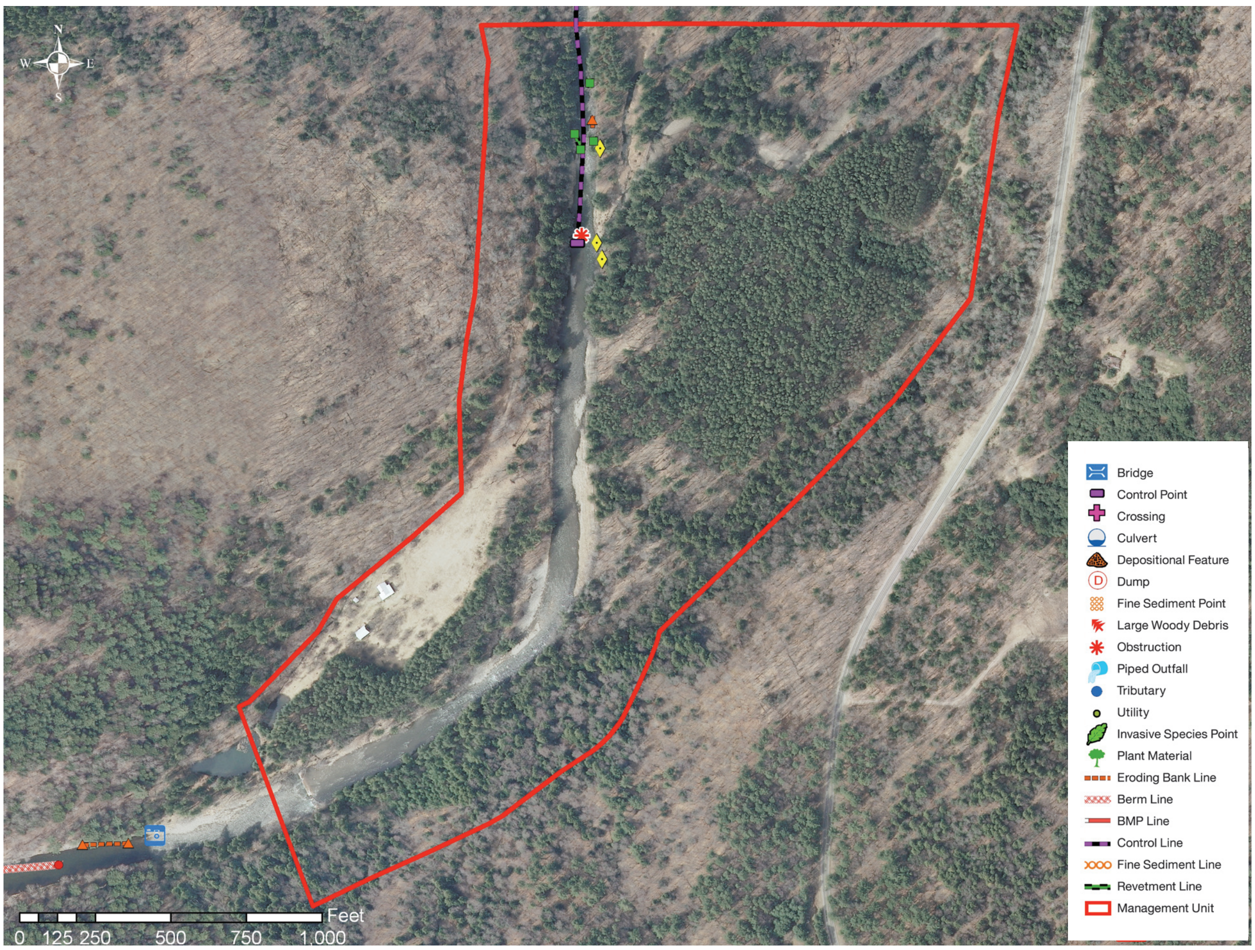
MANAGEMENT UNIT 5

STREAM FEATURE STATISTICS

- 1% of stream length is experiencing erosion
- 1.87% of stream length has been stabilized
- 6.97 acres of inadequate vegetation within the 100 ft. buffer
- None of stream is within 50 ft. of the road
- There are no structures located within the 100-year floodplain boundary

Percentages reported represent the length of features observed where the inventory was allowed relative to the total length of the management unit. Features in the undocumented portions of the stream could change these percentages.





Stream Feature Inventory 2010 (Figure 1)

Management Unit Description

This management unit begins at a change in valley type at Station 11700, continuing approximately 3,087 ft. to a change in valley type at Station 14800. The drainage area ranges from 67.9 mi^2 at the top of the management unit to 68.6 mi^2 at the bottom of the unit. The valley slope is 0.68 %. The average valley width is 654.51 ft.

Summary of Recommendations Main Branch Management Unit 5

Intervention Level	Passive Restoration of the left bank erosion site (BEMS NMB5_14400).
Stream Morphology	Conduct baseline survey of channel morphology.
Riparian Vegetation	Improve riparian buffer as appropriate from Station 13500 to Station 9770.
Infrastructure	Investigate history and original objectives of control structures.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	None.
Water Quality	None.
Further Assessment	Include MU5 in comprehensive Local Flood Hazard Mitigation Analysis of Claryville MUs.

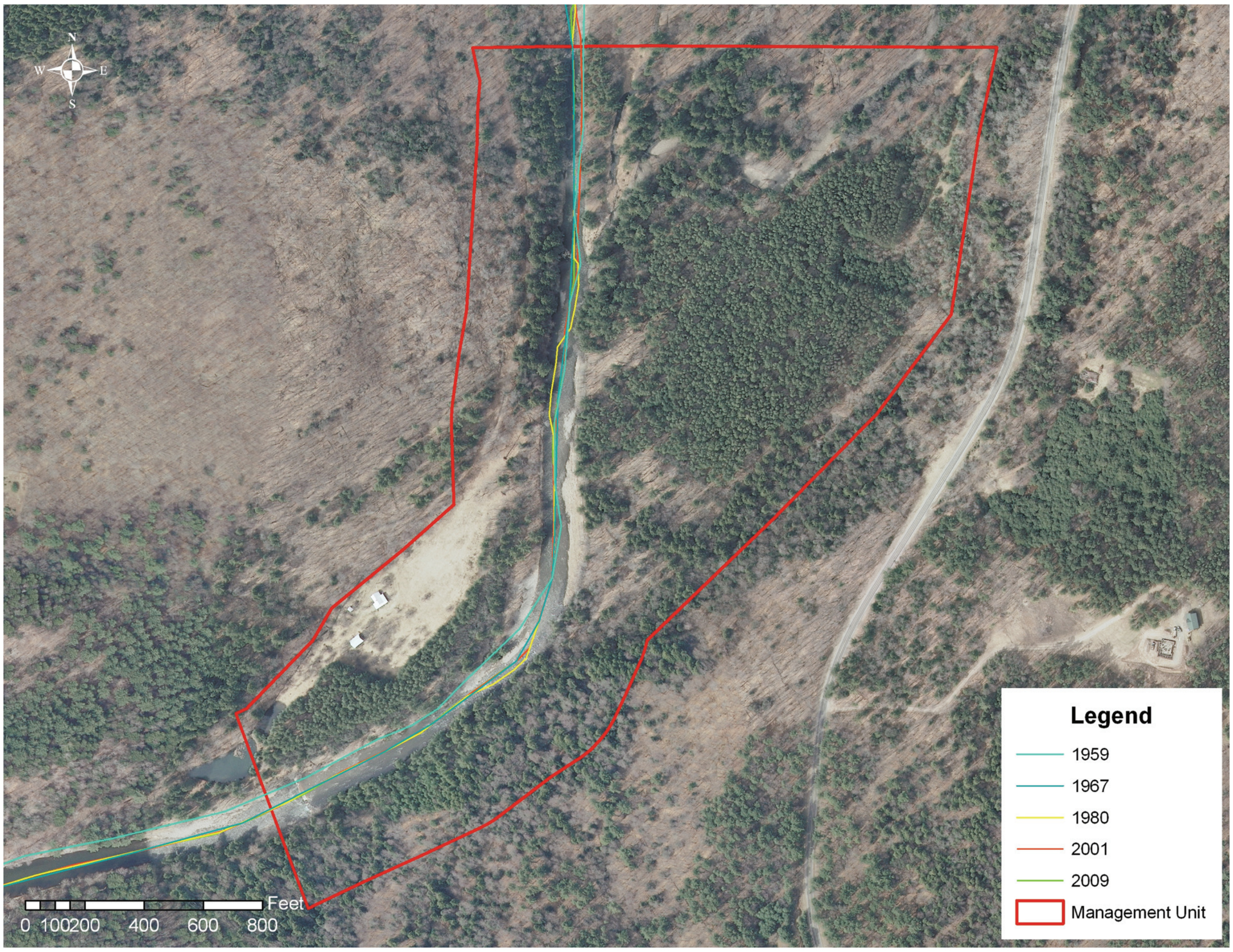
Historic Conditions

Excerpt from 1875 Beers Map (Figure 2)

As the glaciers retreated about 12,000 years ago, they left their "tracks" in the Catskills. See Section 2.4 *Geology of Upper Neversink River,* for a description of these deposits. These deposits make up the soils in the high banks along the valley walls on the Neversink mainstem and its tributaries. These soils are eroded by moving water, and are then transported downstream by the River. During the periods when the forests of the Neversink watershed were heavily logged for bark, timber, firewood and to make pasture for livestock, the change in cover and the erosion created by timber skidding profoundly affected the Neversink hydrology and drainage patterns.

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, and 6 NYS Article 15 stream disturbance permits have been issued in this management unit, according to records available from the NYSDEC DART database (**http://www.dec.ny.gov/cfmx/extapps/envapps/**).



Historical channel alignments from five selected years (Figure 3)

Stream Channel and Floodplain Current Conditions

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

MBMU5 begins at Station 14800 as the main channel exits the wide meander to the right valley wall and continues in a relatively straight channel along exposed bedrock continuing from MBMU6 to Station 14050. This bedrock provides control on both the stream bed and bank. At Station 14600 on the left bank there is a 32-foot segment of log cribbing holding placed boulder rip rap below a terrace. *(B493)*

Structures like this one were observed frequently on the main branch of the Neversink River. It is difficult to decipher the original design objectives; they may have been designed to improve or enhance aquatic habitat or to protect banks. It is recommended that the history and original objectives of these structures be investigated to better understand the current function and ongoing hydraulic effects of these structures. The structural condition of the cribbing here was documented as fair; because the purpose and past use of the structures remain unclear the functional condition cannot be assessed.

Approximately 100 feet downstream of the log cribbing there is a 40-foot segment of bank erosion into the terrace on the left bank from Station 14460 to Station 14420 (BEMS NMB5_14400). Sedge and shrubs have established at various heights along the 5-foot high eroding bank indicating that the bank is beginning to stabilize. *(B496)* 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.

Approximately 20 feet downstream of the bank erosion site there are stacked rock revetments on both banks. The segment on the left bank, extending 30 feet from Station 14410 to Station 14380, is constructed of stacked rock with a line of rebar pinned to the top rocks.*(B495)*. The structure is slumping in the middle, and scour was observed on the banks behind the stacked rock. *(B497)*.The segment on the right bank, extending 55 feet from Station 14410 to Station 14355, is made of stacked rock without rebar reinforcement and angles downstream toward the thalweg of the main channel *(A219)*. Both revetments were documented as in fair structural condition;

Log cribbing on left bank (B493)

Sedge and shrub stabilizing left bank erosion (B496)

Stacked rocked with pinned rebar on left bank (B495)

Slumping revetment due to scour (B497)

Stacked rock revetment on right bank (A219)

because the purpose and past use of the structures remain unclear the functional condition cannot be assessed.

Downstream of the revetment structures the elevation of the terrace on the left bank declines as several flood chutes converge with the main channel from the floodplain on the left. These convergences, located at Station 14380 *(B499)*, Station 14050 *(B500)* and Station 14000 *(B501)*, confirm the description of this reach at *semi-confined,* which indicates that the main channel is constrained by the bedrock on the right bank while maintaining connectivity to the floodplain on the left bank during flood events.

At Station 14080, 30 feet upstream of the end of the exposed bedrock, there is a 40 foot long boulder barb extending into the main channel from the right bank angled slightly downstream. This obstruction reroutes flow in the main channel upstream and has created a scour pool directly downstream, which could indicate that this barb was installed to create fish habitat. *(A223)*

Convergence with left bank flood chute at Station 14380 (B499)

Convergence with left bank flood chute at Station 14050 (B500)

The remainder of MBMU5 and most of MBMU4 was not included in the stream survey because the landowner of the parcel including the river from Station 13500 to Station 9770 did not permit access. However, inspection via publicly available aerial images and topography reveals that the main channel meanders gently to the right adjacent to the left valley wall with a residence visible on the inside of the meander bend on the right bank. The residence is separated from the channel by a partially forested and partially cleared floodplain. There is a grade control structure, possibly an old timber dam, that is visible on aerial images at Station 11800. Wetlands and open water ponds are also visible in aerial photographs in the forested floodplain spanning the border of MBMU5 and MBMU4 at Station 11700.

Boulder barb on right bank creating scour pool for possible fish habitat (A223)

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).

The upper reaches of this management unit are the end of a series of sediment storage reaches occasionally punctuated by short transport reaches from the confluence of the East and West Branches to a valley pinchpoint around Station 12000. Storage reaches act as a "shock absorber", holding bedload delivered during large flow events in depositional bars and releasing it slowly over time in more moderate flood events. These depositional areas are very dynamic, with frequent lateral channel migration through bank erosion, *avulsions* and woody debris accumulations. This is one process by which floodplains are created and maintained. While there are relatively few depositional features in this reach that would store and release sediment in the short term, the well-connected floodplains on both the right and left banks upstream of Station 12000 store sediment on a longer time scale.

Sediment storage reaches can result from natural conditions or as the unintended consequence of poor bridge design, check dams or channel over-widening. While such unpredictable conditions represent risks for nearby property owners, these dynamic disturbance regimes produce unique and diverse habitat patches, attracting equally diverse plant communities and wildlife.

Downstream of Station 12000 the river is confined on both sides by the valley wall leaving no accessible floodplain for sediment deposition and storage. Instead, this section of the river acts as a transport reach. Transport reaches are in a state of *dynamic equilibrium,* effectively conveying sediment supplied from upstream during each flow event.

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

Riparian Vegetation

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

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

An analysis of vegetation was conducted using aerial photography from 2001 and field inventories *(Figure 5).* In this management unit, the predominant vegetation type within the 100 ft. riparian buffer is evergreen-closed tree canopy (48.91%) followed by deciduous-closed tree canopy (23.08%). *Impervious* area makes up 0.11% of this unit's buffer, and 6 acres of potential riparian buffer improvement area were identified *(Figure 7).*

There are 8.04 acres of wetland (9% of MBMU5 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 type descriptions and regulations). The wetland classified as Riverine is 7.69 acres in size and the wetland classified as Freshwater Forested Shrub is 0.34 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 in MBMU5 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 One area of erosion was documented during the stream feature inventory. This 40-foot segment of eroding bank is into the terrace on the left bank from Station 14460 to Station 14420 (NMB5_14400). Sedge and shrubs have established at the at various heights along the 5-foot high eroding bank indicating that the bank is beginning to stabilize. It is anticipated that this bank will revegetate and stabilize without treatment *(passive restoration)*. It is also recommended that this site be monitored for changes in condition.

INFRASTRUCTURE 1.87% of the stream bank length in this management unit has been treated with revetment. At Station 14600 on the left bank there is a 32-foot segment of log cribbing the was documented as in fair structural condition. There is a 30-foot revetment from Station 14410 to Station 14380 constructed of stacked rock with a line of rebar pinned to the top rocks. There is a second revetment on the right bank in this reach, extending 55 feet from Station 14410 to Station 14355, made of stacked rock without rebar reinforcement. Both revetments were documented as in fair structural condition. The purpose and past use of these three structures remain unclear so the functional condition cannot be assessed.

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 MBMU5 has been given a "A(T)" class designation with best use as a source of drinking water, for use swimming and 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.

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 MBMU5 that is a potential minor source of fine sediment. It is not, however, a significant source of turbidity.

Nutrient loading from failing septic systems is another potential source of water pollution. Leaking septic systems can contaminate water making it unhealthy for swimming or wading. Two structures are located in relatively close proximity to the stream channel in this management unit. These homeowners should inspect their septic systems annually to make sure they are functioning properly. Each household should be on a regular septic service schedule to prevent over-accumulation of solids in their system. Servicing frequency varies per household and is determined by the following factors: household size, tank size, and presence of a garbage disposal. Pumping the septic system out every three to five years is recommended for a three-bedroom house with a 1,000-gallon tank; smaller tanks should be pumped out more often.

The New York City Watershed Memorandum of Agreement (MOA) allocated 13.6 million dollars for residential septic system repair and replacement in the West-of-Hudson Watershed through 2002, and the program was refunded in 2007. Systems eligible included those that are less than 1,000-gallon capacity serving one-or-two family residences, or home and business combinations, less than 200 feet from a watercourse. Permanent residents are eligible for 100% reimbursement of eligible costs; second homeowners are eligible for 60% reimbursement. For more information, call the Catskill Watershed Corporation at 845-586-1400, or see **http://www.cwconline.org/programs/septic/septic_article_2a.pdf**.

Community Comments

Fall 2012

Comments for 5–6: *"Side channel becoming more active in past 5 years; more woody debris on banks... Significant spawning activity by brook trout in upper pond and its tributaries...eroding bank is at rip rap installed in 1998 by my father. We've lost 15 feet of bank; this would eventually threaten the house... Do you have any thoughts on how to improve or build out this revetment?...In general we want to protect the house while minimizing any impact on the river and its fish."*

"The erosion...has been occurring for many years. It has worsened dramatically in the major floods of 2011 and 2012. It is currently significantly more eroded than the pictures in your report show. This is the kind of erosion that seems like a real possibility for the bank in front of our house...This kind of bank erosion is happening all over the river and I assume that it's one of the reasons why the river gets turbid so much more easily these days than it used to and why floods seem to deposit so much more sand than I remember them doing in the past."

"The cribbing you refer to as B493 was put in by my father. It is probably the second or even the third version of the cribbing in this particular spot. As a kid, my father had me moving stones out of the riverbed and into that cribbing or one just like it."

"The purpose of the structures was to improve the trout habitat...My father Leonard Wright, Jr. put all of these in place over a period that extended over 30 years. (He wrote a book called "Neversink" which includes his thoughts about these structures). Before these were put in, this segment of the river held only a few small fish. The idea was that, with the bedrock on the one bank, putting a cribbing or rock structure that would squeeze the river during a flood would create a scour. In addition, the rock or logs create hiding spots and structure that encourage larger fish to hold there."