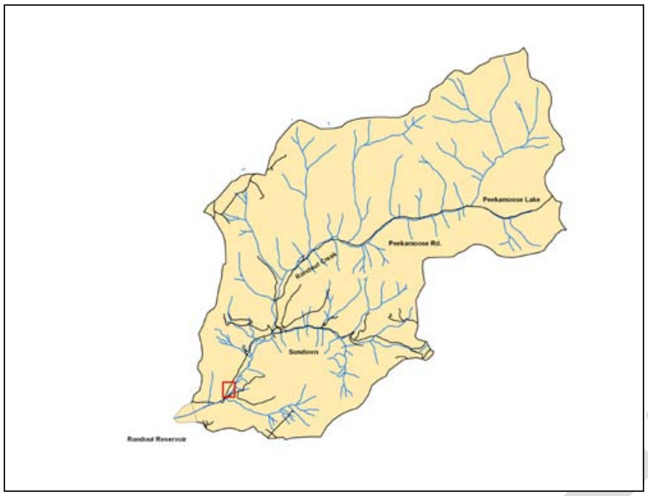
Rondout Creek Management Unit 5



Stream Feature Statistics

11 % of stream length is experiencing erosion

3.14 % of stream length has been stabilized

1.16 acres of inadequate vegetation within the 100 ft. buffer

763 ft. of stream is within 50 ft. of the road

1 house located within the 100-year floodplain boundary

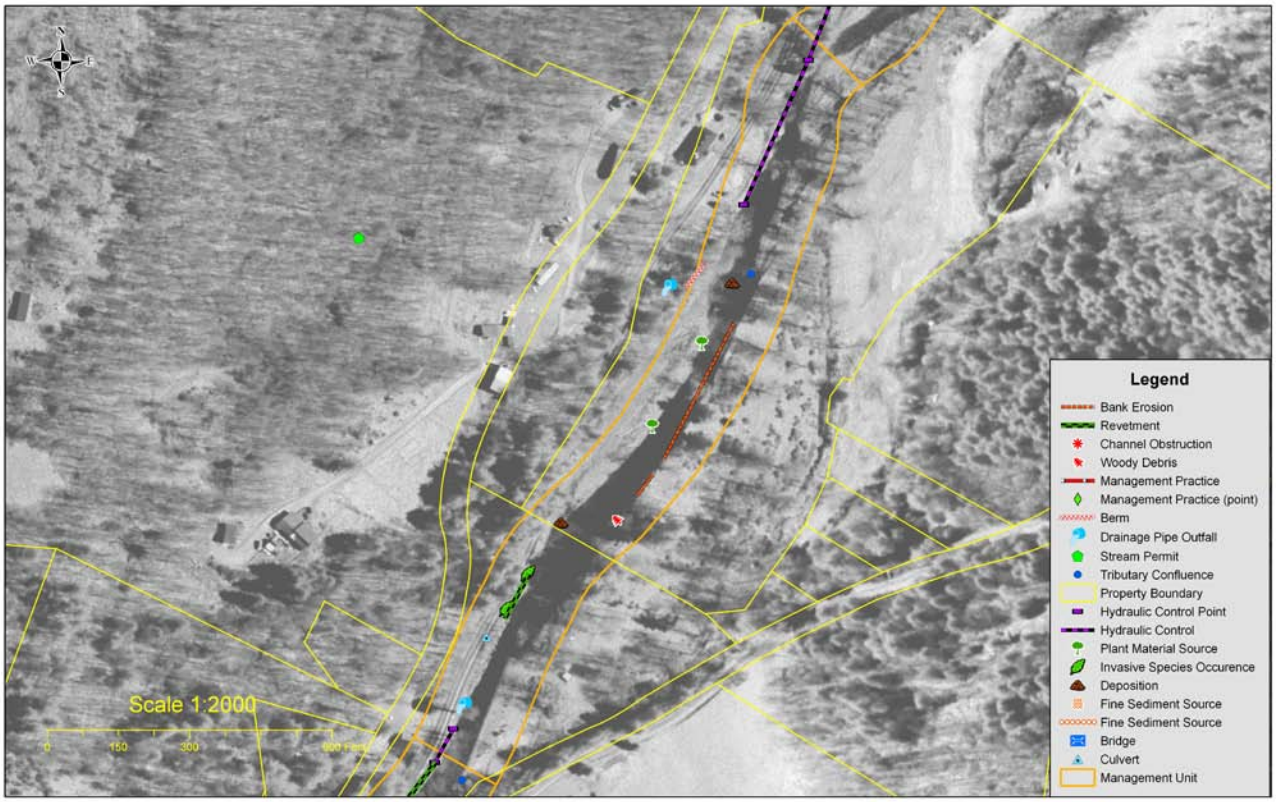


Figure 1 Stream feature inventory MU5

Management Unit 5
Between Station 9600 and Station 7900

Management Unit Description

This management unit begins at a confluence with an unnamed tributary, continuing approximately 1,717 ft. to the confluence with East Mountain Brook. The drainage area ranges from 36.0 mi^2 at the top of the management unit to 35.6 mi^2 at the bottom of the unit. The valley slope is 0.75%. The average valley width is 836.5 ft.

Summary of Recommendations Management Unit 5	
Intervention Level	Assisted Restoration
Stream Morphology	Evaluate sediment transport dynamics
Riparian Vegetation	Install bioengineering treatments on eroding banks at Stn 9000-8600; improve buffer with woody plantings; interplant restored revetment at Stn 7870
Infrastructure	Improve outfall protection of piped road drainage at Stn 8900; replace concrete cribbing revetment at Stn 7900
Aquatic Habitat	Conduct fish habitat and population study
Flood Related Threats	Support development of new Flood Insurance Rate Maps; improve revetment of road embankment
Water Quality	Treat bank erosion sites with bioengineering treatments; improve riparian buffer with plantings where possible; identify turbidity sources in East Mountain Brook
Further Assessment	Conduct stream feature inventory of East Mountain Brook

Historic Conditions

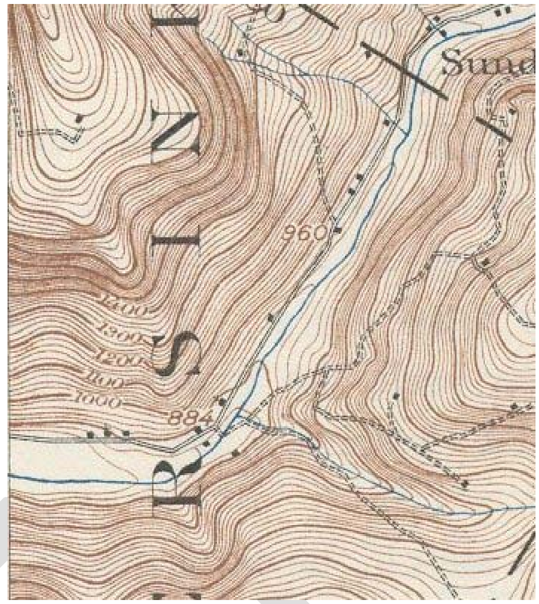


Figure 2 Excerpt of 1905 USGS topo map

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

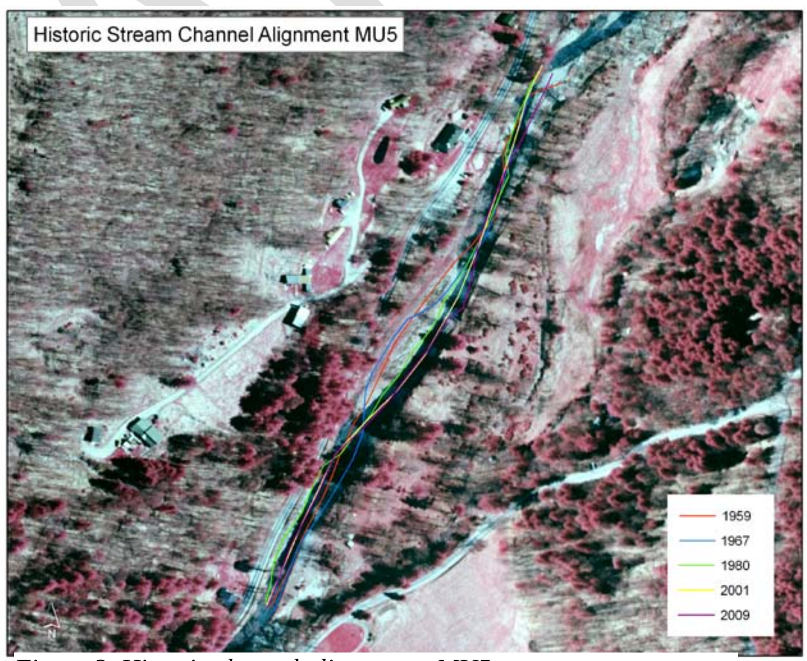


Figure 3 Historic channel alignments, MU5

The somewhat narrow valley floor here is an *alluvial fan* created by the material eroded out of East Mountain Brook and that deposited by the stream when, during large flood events, the quantity of *bedload* from upstream tributaries –particularly Stone Cabin Brook, High Falls Brook and Sundown Creek-- overwhelmed the Rondout's ability to transport it. Alluvial fans at confluences such as this tend to reduce channel slopes in the mainstem and backwater upstream, building the floodplain. In the roughly one hundred and twenty centuries since the retreat of the glaciers, the position of Rondout Creek has moved back and forth across this floodplain numerous times. While MU5 is a straight reach, the alignment of the channel has shifted somewhat since 1959 (Fig. 3), and there is indication that it is trying to reestablish some sinuosity.

In recent decades, landowners in this management unit have received stream disturbance permits from NYSDEC for channel work after flood events (see Fig. 1). Gravel mining and removal of gravel bars can reduce the ability of the channel to pass its sediment load, causing aggradation of the bed and creating conditions for long-term channel instability.

Stream Channel and Floodplain Current Conditions

Revetment, Berms and Erosion

The 2009 stream feature inventory revealed that 11 % (381 ft.) of the stream length exhibited signs of active erosion along 1,717 ft. of total channel length (Fig. 1). Revetment has been installed on 3.14 % (108 ft.) of the stream length. 57.1 ft. of berms were identified in this management unit (1.66 % of stream banks) at the time of the stream feature inventory.

Stream Morphology

The following description of stream morphology references insets in the foldout Figure 17. “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 Rondout Reservoir. Italicized terms are defined in the glossary. This characterization is the result of surveys conducted in 2008 and 2009.

With the convergence of the last of the braided channel threads in MU6, the Rondout begins MU5 as a single channel thread at the right side of the valley floor (Fig. 4), running along the embankment of County Rt. 153/Sundown Road. The right bank is controlled by bedrock ledge for approximately 370 ft. (Fig 5), ending at Station 9230.

Figure 4 Upstream end of MU5

A small spring enters from the floodplain on the left. Remnants of a *sidecast berm* were observed on the right at Station 9000 (Fig. 6), and a piped outfall carrying road drainage, with only fair outfall protection at Station 8900 (Fig. 7).

Figure 6 Berm on the right bank, Stn 9000

Figure 5 Bedrock ledge, right bank

Figure 7 Piped outfall carrying road drainage

Continuing downstream, the bankfull channel widens, and a lateral bar has formed on the right side of the channel. Aggradation, associated with backwatering from the confluence of East Mountain Brook downstream, is evident from here through the remainder of Management Unit 5 (Fig. 8). The lateral bar has vegetated with extensive stands of willow and sedge (Fig 9), which could be harvested for use in bioengineered bank stabilization projects.

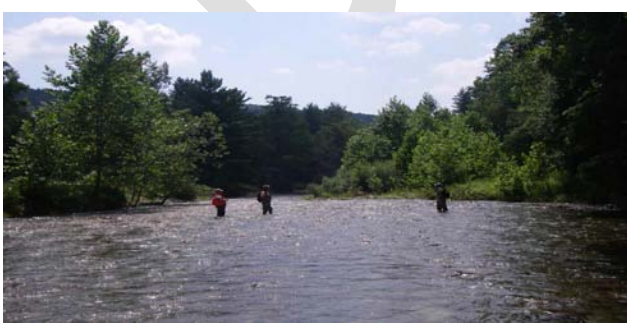


Figure 8 Over-widened and aggrading channel

Figure 9 Willow stand on lateral bar

Figure 10 Bank erosion adjacent to a mowed field along the left bank

Opposite the lateral bar, the left bank is exhibiting moderate erosion (Fig. 10, note technician for scale) for approximately 400 ft. between Stations 9000 and 8600. Some of the adjacent pasture has been mowed. Downstream of the erosion, another lateral bar is forming on the left bank, beginning around Station 8500. A utility line crosses the stream here, with a pole on the left bank at this station.

The formation of these two bars indicates that the stream may be trying to reestablish sinuosity through this management unit. This occurs where the erosive power of the stream is greater than the strength of the material in the bank; under these conditions, banks erode, usually in an alternating left-right sequence, until the lengthening of the stream reduces channel slope sufficiently, and the shear stresses acting on the bank equal its resistive strength. The lateral bars then evolve into point bars on the inside of meanders. Alternatively, equilibrium can be established through increasing the cohesiveness of bank materials with the tensile strength provided by the dense root masses of certain trees, shrubs and sedges.

It is recommended that *bioengineering practices* be installed on this eroding bank, using materials harvested from the opposite bank. Prior to installation of practices, sediment conveyance capacity of the channel should be evaluated to ensure that no channel restoration is necessary.

Opposite the lateral bar on the left, beginning at Station 8400, the channel runs immediately adjacent to the road on the right, with little vegetative buffer through the end of the management unit, and is revetted in two places. The first section, from Station 8300 to 8200, is stacked rock wall (Fig. 11). A stand of the invasive plant, Japanese knotweed, was observed at the downstream end of this rock wall.

Figure 11 Invasive Japanese knotweed at the downstream end stacked rock wall, right bank

At Station 8000, a corrugated plastic piped outfall on the right bank carries road drainage, outfalling on a stone slab (Fig. 12). The right bank is intermittently controlled through the remainder of Management Unit 5 by exposed bedrock ledge (Fig. 13), and a mix of dumped rock and concrete crib wall revetment (Fig. 14).

Figure 12 Plastic piped outfall, right

The revetment is in poor functional condition; at points where it is failing, large rock has also been dumped to provide protection for the embankment.

The floodplain narrows on the left as East Mountain Road angles toward the channel, constricting overbank flows. A small tributary enters on the left from the floodplain at Station 7850, and East Mountain Brook, confluences with the Rondout at Station 7800, the end of Management Unit 5.

Figure 13   Bedrock ledge at Stn 7900

Figure 14 Concrete cribbing revetment, Stn 7870

Figure 15 Confluence of East Mountain Brook, end of MU5

Recommendations for this reach include replacement of the cribbing with stacked rock wall, interplanted where possible with bioengineering treatments. Turbidity has been observed during low flows in East Mountain Brook, and a full stream feature inventory is recommended to identify possible sources of fine sediment and other management concerns.

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 3.2, *Introduction to Stream Processes*).

A major tributary, East Mountain Brook, joins the Rondout Creek at the bottom of Management Unit 5 from the left. Such confluences often produce backwater effects upstream, causing aggradation, and over geologic time, build an alluvial fan, as is seen here (Fig. 16).

Channel gradients are often flattened upstream of confluences, and that also is seen here. Evidence of historical channel management was observed at this site, in the form of a sidecast berm, overly wide channel and revetment.

Aggradation was observed in this management unit, and a sediment transport analysis is recommended to determine if the channel, in its current dimensions, effectively conveys sediment.

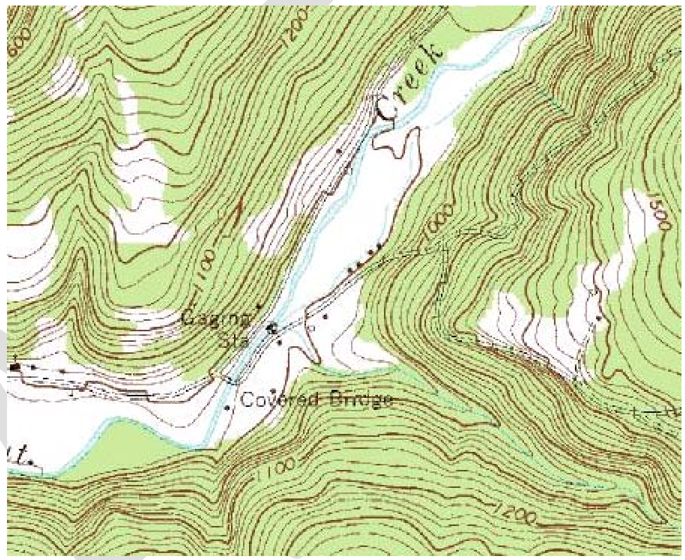


Figure 16 Alluvial fan at confluence of East Mountain Brook

<u>Riparian Vegetation</u>

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 or field usually 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 streambanks 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 streambanks. The result can include rapid streambank erosion and increase surface runoff impacts.

An analysis of vegetation was conducted using aerial photography from 2001 and field inventories (Fig. 18). In this management unit, the predominant vegetation type within the 100 ft. riparian buffer is shrubland (53%) followed by herbaceous vegetation (19%). *Impervious* area (9%) within this unit's buffer is primarily County Rt. 153/Sundown Rd. and unpaved roads. 2 occurrences of Japanese knotweed were documented in this management unit totaling 117 ft^2 during the 2009 inventory.

There are 2 wetlands 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 Rondout 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, *Wetlands and Floodplains*, for wetland type descriptions and regulations). The upstream most wetland is 2.8 acres in size, and is classified as riverine lower perennial, unconsolidated bottom, and permanently flooded (R2UBH). The downstream most wetland is 1.2 acres in size, and is classified as riverine lower perennial, unconsolidated shore, and seasonally flooded (R2USC).

Areas of herbaceous (non-woody) cover present opportunities to improve the riparian buffer with tree plantings, to promote a more mature vegetation community along the streambank and in the floodplains. Suitable riparian improvement planting sites were identified through a watershed-wide remote evaluation of current riparian buffer conditions and existing stream channel morphology (Fig. 19). These locations indicate where plantings of trees and shrubs on and near stream banks can help reduce the threat of serious bank erosion, and can help improve aquatic habitat as well. In some cases, eligible locations include stream banks where rock rip-rap has already been placed, but where additional plantings could significantly improve long-term stream channel stability, as well as biological integrity of the stream and floodplain. These are only *potential* planting sites, and landowners prefer to keep areas mowed or otherwise cleared for many reasons. In some cases, these sites may not be effectively treated with riparian enhancement alone, and full restoration efforts would include channel restoration components in addition to vegetative treatments. For technical and financial resources available to landowners to replant banks and floodplains, see Section 2.6, *Riparian Vegetation Issues in Stream Management*.

It is recommended that a buffer on the floodplain on the left, adjacent to the eroding bank, be planted with woody vegetation to reduce the risk of further erosion, and that bioengineering treatments be installed on the eroding bank and the revetted road embankment, as appropriate. See Section 2.6, *Riparian Vegetation*, for resources available to landowners for revegetating riparian areas of their property.

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. One house is located in the 100-year floodplain, as currently mapped. The upper Rondout Creek 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 have changed.

Bank Erosion

Most of the stream banks within the management unit are considered stable, but 11 % (381 ft.) of the stream length is experiencing erosion; assisted restoration of these streambanks is recommended.

Infrastructure

3.14 % of the stream length in this management unit has been treated with some form of revetment, with stacked rock and concrete cribbing being the dominant materials used.

Aquatic Habitat

Aquatic habitat is one aspect of the Rondout Creek 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 Rondout Creek 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.

In general, trout habitat is of a high quality in the upper Rondout Creek. The flow regime of the Creek 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 (M. Flaherty, personal communication). Management Unit 5 has been identified as supporting trout spawning, affording it a high level of protection.

Historical channel and floodplain management of this management unit, however, have modified the physical structure of the stream in some locations, resulting in the filling of pools, the loss of streamside cover and the homogenization of structure and hydraulics. As physical structure is compromised, interspecies competition is increased. It is recommended that a population and habitat study be conducted on the upper Rondout Creek, 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 Rondout 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 upper Rondout Creek. The cumulative impact of oil, grease, sediment, salt, litter and other unseen pollutants found in road runoff can significantly degrade water quality. Road drainage from Sundown Road in Management Unit 5 is carried by two piped outfalls that outfall directly into the Rondout Creek in this management unit.

Sediment from stream bank and channel erosion pose a potential threat to water quality in the upper Rondout Creek. Clay and sediment inputs into a stream may increase *turbidity* and act as a carrier for other pollutants and pathogens. The bank erosion site in MU5, however, is largely composed of alluvial deposits, which in general contain a lower proportion of fine sediments than glacial till or lacustrine deposits. Nonetheless, these banks should receive bioengineering treatments to reduce fine sediment entrainment. 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 house 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 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 include 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