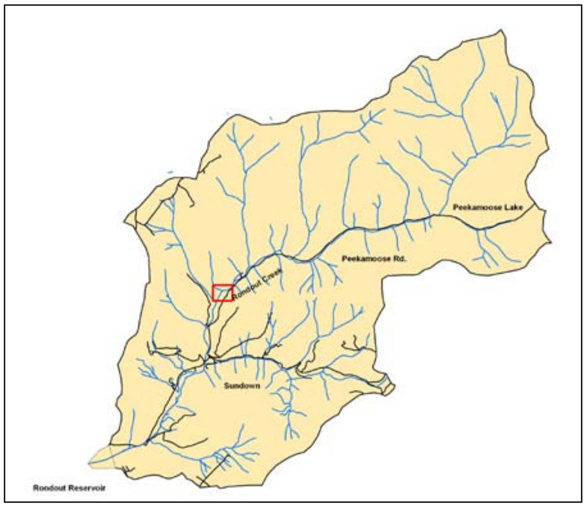
Rondout Creek Management Unit 10



Stream Feature Statistics

12 % of stream length is experiencing erosion

0 % of stream length has been stabilized

0 acres of inadequate vegetation within the 100 ft. buffer

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

0 houses located within the 100-year floodplain boundary

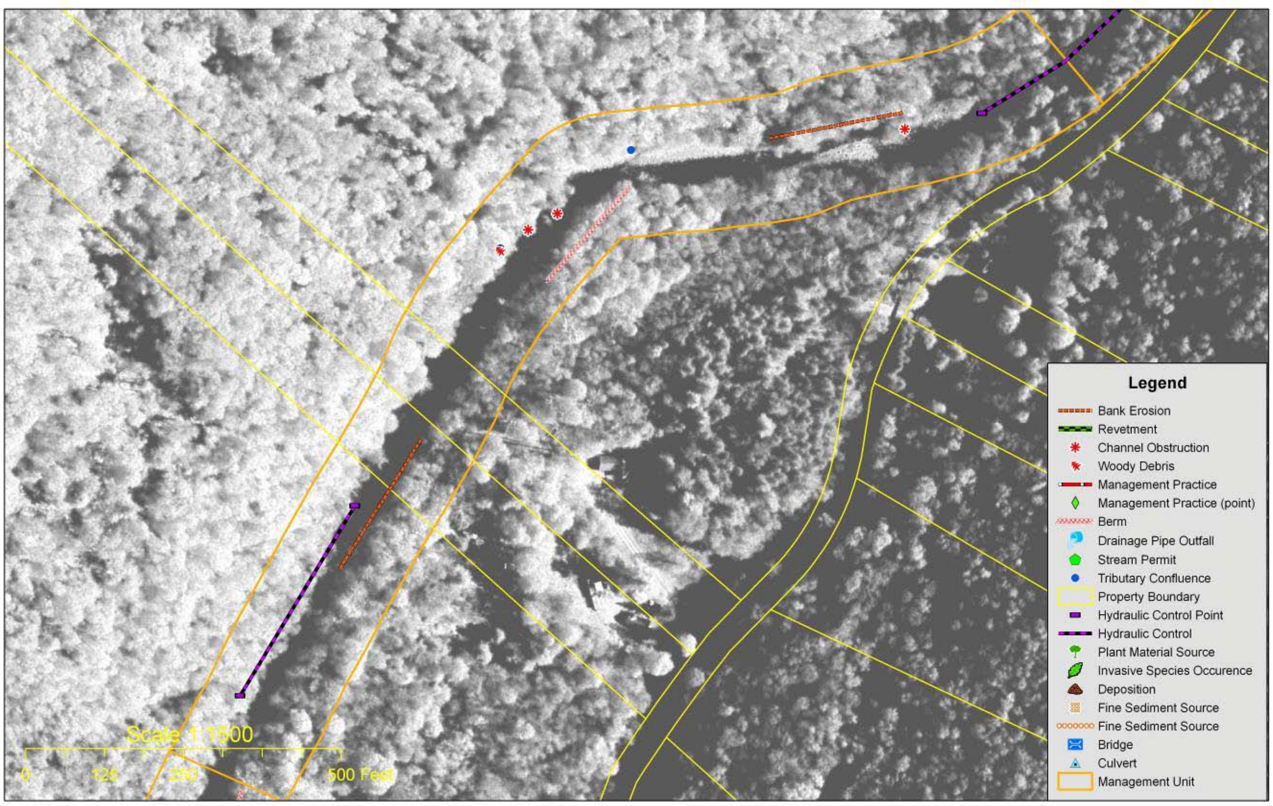


Figure 1 Management Unit 10 Stream feature inventory

Management Unit 10
Between Station 25,300 and Station 27,200

Management Unit Description

This management unit begins at a valley “pinch point” or confinement, and continues approximately 1,892 ft. to the confluence of High Falls Brook. The drainage area ranges from 22.3 mi^2 at the top of the management unit to 22.0 mi^2 at the bottom of the unit. The valley slope is 0.86 %. The average valley width is 683.7 ft.

Summary of Recommendations Management Unit 10	
Intervention Level	Passive self-recovery at Stn 26700; Assisted self-recovery with soil bioengineering treatments at Stn 25800
Stream Morphology	Conduct a hydraulics study to evaluate sediment transport dynamics throughout management unit.
Riparian Vegetation	Mitigate bank erosion at Stn 25800 with soil bioengineering treatments. Evaluate need for buffer enhancements throughout the management unit.
Infrastructure	None.
Aquatic Habitat	Generally good; watershed fishery study is recommended.
Flood Related Threats	Evaluate functionality of berms through an updated hydraulics study of the management unit (flood study).
Water Quality	Evaluate resident eligibility and interest in CWC Septic Repair and Replacement Program.
Further Assessment	Conduct stream feature inventory of High Falls Brook.

Historic Conditions

As the glaciers retreated about 12,000 years ago, they left their "tracks" in the Catskills. See Section 2.4 *Geology of 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. The valley floor here is an alluvial floodplain, deposited by the stream when, during large flood events, the quantity of material eroded out of upstream tributaries –particularly Stone Cabin Brook and High Falls Brook-- overwhelmed the Rondout's ability to transport it. In the roughly one hundred and twenty centuries since the retreat of the glaciers, the position of Rondout Creek probably moved back and forth across this valley floor floodplain numerous times.

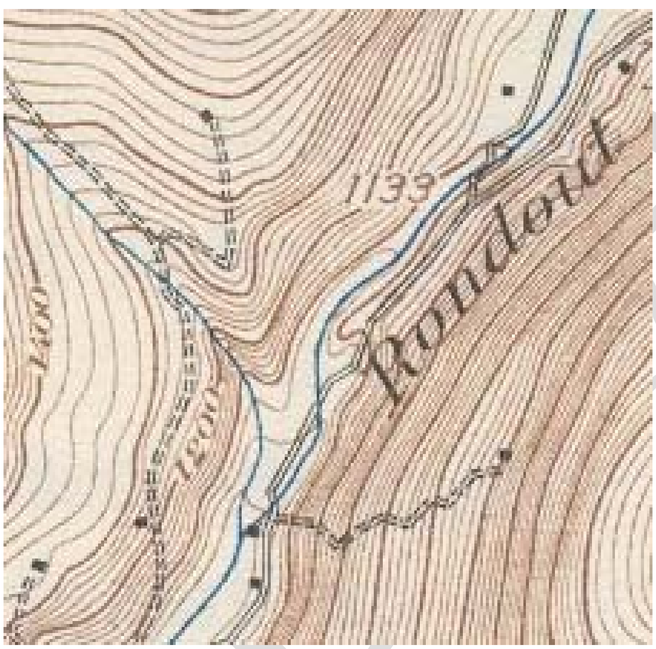


Figure 2 Excerpt of 1905 USGS topographic map MU10

Stream Channel and Floodplain Current Conditions

Revetment, Berms and Erosion

The 2009 stream feature inventory revealed that 12% (455 ft.) of the stream length exhibited signs of active erosion along 1,892 ft. of total channel length (Fig.1). Revetment has been installed on 0% (0 ft.) of the stream length. 5% (95 ft.) of the stream banks had been bermed in this management unit at the time of the stream feature inventory.

Stream Morphology

The following description of stream morphology references stationing in the foldout Figure 9. "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.

Figure 3 Looking upstream at the beginning of MU10

As the Rondout Creek enters the upstream end of MU10, the channel runs along a high ledge on the left, with the bed elevation also controlled by bedrock. The valley floor is relatively pinched at this location, although the channel has a narrow but well-connected alluvial floodplain on the right (Figure 2), part of the historical deposition created by sediment supply and backwater from the confluence of High Falls Brook just downstream. Between Stations 26700 and 26400, the channel moves across this floodplain to the right valley wall. The 1905 USGS topo map (Figure 1) indicates that at that time, the channel remained against the left valley wall, hugging a knob of bedrock and then crossed Peekamoose Road to the left for some 1000 ft., allowing High Falls Brook to enter the valley floor and run along it for a similar distance before confluencing with the Rondout. Whether the elimination of these road crossings occurred following the major floods of 1928 or 1938, or during the major channel excavations following the mid-fifties flooding, is not certain. The berming of the left bank, however, begins here and continues off and on throughout MU10, MU9 and into MU8.

Figure 4 Moderate erosion, right bank

The right bank exhibits moderate erosion in this reach, undermining trees on the bank and creating temporary channel obstructions (Fig. 4). It is recommended that this erosion be monitored and allowed to revegetate on its own.

Once it hits the right valley wall, the reach straightens and widens into what is apparently a historically excavated channel, with evidence of the berming and channel widening that followed major flooding in the mid-1950s. Throughout the remainder of MU10, moderately entrenched conditions are created by ledge and bedrock along right valley wall and in the streambed, and by berm remnants of varying elevation and functional integrity along the left bank (Figure 2).

Figure 6 Berm, left floodplain

This berming and channel widening has resulted in conditions conducive to bank erosion, and a fairly significant eroding bank runs from Station 25700 to Station 26000, despite a healthy forested riparian zone.

Figure 5 Bank erosion, Stn 25700, left

Recommendations for this reach begin with a hydraulics study of the management unit (and MUs 7, 8 and 9 as well), to include an evaluation of the condition of the berms on the left bank and their effect on channel stability, and an assessment of the sediment transport dynamics within the channel. When berms are structurally sound, they increase velocities in the channel and shear stresses at the margins, resulting in greater probability of bank erosion. However, berms often fail during large flows, with the stream taking unpredictable new courses across the floodplain and threatening residences and infrastructure. If appropriate, *setback berms* should be considered to replace the existing berms. Setback berms, installed some distance back from the channel, allow the stream to use some of the floodplain to carry overbank flows, reducing stream velocities and the likelihood of berm failure, but still keeping floodwaters away from vulnerable property. The capacity of the channel to transport the significant bedload volumes, currently stored in depositional features on the state land upstream, should be evaluated, as MU10 has very little capacity for storing sediment, and therefore must function effectively as a sediment transport reach if it is to remain stable. This study should also address the likely consequences of changes in hydrology predicted by the downscaled global climate models for this region (See Section 3.1 Ecosystem Health), including increased risk to residences and public infrastructure in the valley.

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Following this study, and as appropriate, it is recommended that the larger eroding bank be addressed with soil bioengineering treatments. See Section 2.6 for resources available for this work through the Catskill Stream Buffers Initiative.

The channel receives several waterfalls and springs from tributaries (Fig. 7) on the right, the largest of which is High Falls Brook, marking the downstream end of MU10.

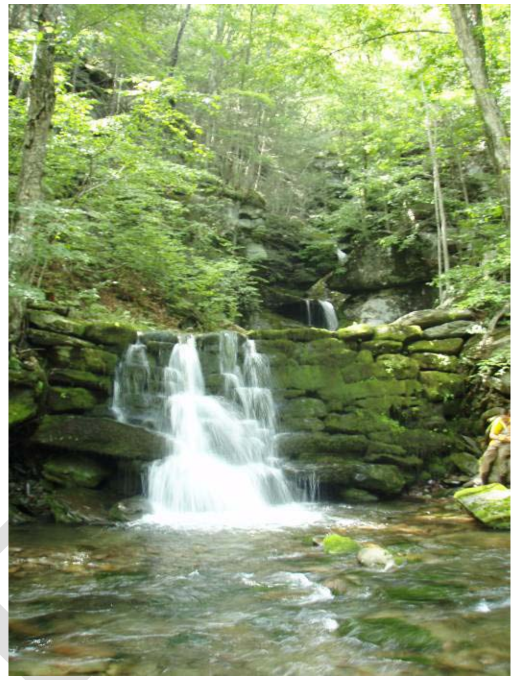

Figure 7 Waterfall at High Falls Brook

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 for more details on Stream Processes).

The channel in much of MU10 appears to have been excavated, evidenced by its lack of *sinuousity*. In general, sediment transport in MU10 seems to be effective, with the few signs of significant deposition associated with flow obstructions created by trees undermined by bank erosion. Bedrock controls in the streambed limit the possibility of channel incision. Bank erosion within the management unit represents a minor source of sediment supply to the reach during large flow events as mentioned above, due to the aging of the berms throughout this management unit and expected changes in hydrology resulting from global climate change, it is recommended that sediment transport capacity and associated flood risks be evaluated.

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 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.

An analysis of vegetation was conducted using aerial photography from 2001 and field inventories (Fig. 10). In this management unit, the predominant vegetation type within the 100 ft. riparian buffer is deciduous-closed tree canopy (99%) followed by mixed-closed tree canopy (<1%). *Impervious* area (<1%) within this unit's buffer is primarily Peekamoose Road. No occurrences of Japanese knotweed were documented in this management unit during the 2009 inventory.

There are no 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). A small wet meadow was noted along the right bank around Station 26700.

Figure 8 Wet meadow, Stn 26700

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).

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. 11). 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*.

In general, the riparian corridor in MU10 is largely forested, moderately disturbed on the left floodplain by residential use. Recommendations for this unit include possible bioengineering treatments of eroding streambanks at Station 25700 to Station 26000. The presence of invasive Japanese barberry (*Berberis thunbergii)* on the floodplain, while not directly affecting conditions within the channel, reduces the biodiversity and ecological integrity of the floodplain. 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. While no homes appear to lie within the FEMA 100-yr floodplain in MU10, this boundary assumes unchanging channel and floodplain morphology, and channel shifting or breaching of the floodplain berms could significantly increase the probability of inundation of the existing structures and roadway.

Bank Erosion

Most of the stream banks within the management unit are considered stable, but 12 % (455 ft.) of the stream length is experiencing erosion, at two sites. It is recommended that these sites be surveyed and monitored, and that the erosion at 25800 be treated with soil bioengineering practices.

Infrastructure

This management unit has not been treated with any form of revetment. The functionality of the berms should be evaluated.

Aquatic Habitat

Aquatic habitat is one aspect of the Rondout Creek ecosystem. While ecosystem health is 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). It is no surprise then that Management Unit 10 has been classified as supporting trout spawning, one of the highest use designations possible for waters in New York, affording it a high level of protection.

Historical channel and floodplain management, however, have modified the physical structure of the stream in some locations, resulting in 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 also 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. Although the Rondout is separated from Ulster County Rte 42, smaller channels carrying springs from the left valley wall running along and under the road receive its runoff, and these eventually outfall into the Rondout.

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 sites in MU10, however, are largely comprised of alluvial deposits, which in general contain a lower proportion of fine sediments than glacial till or lacustrine deposits.

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. There are no houses located in relatively close proximity to the stream channel in this management unit. Homeowners who live near the stream channel 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