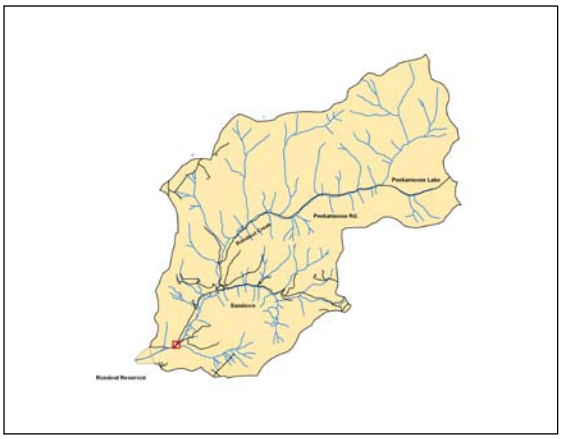
Rondout Creek Management Unit 4



Stream Feature Statistics

0 % of stream length is experiencing erosion

34.71 % of stream length has been stabilized

0.31 acres of inadequate vegetation within the 100 ft. buffer

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

2 houses located within the 100-year floodplain boundary

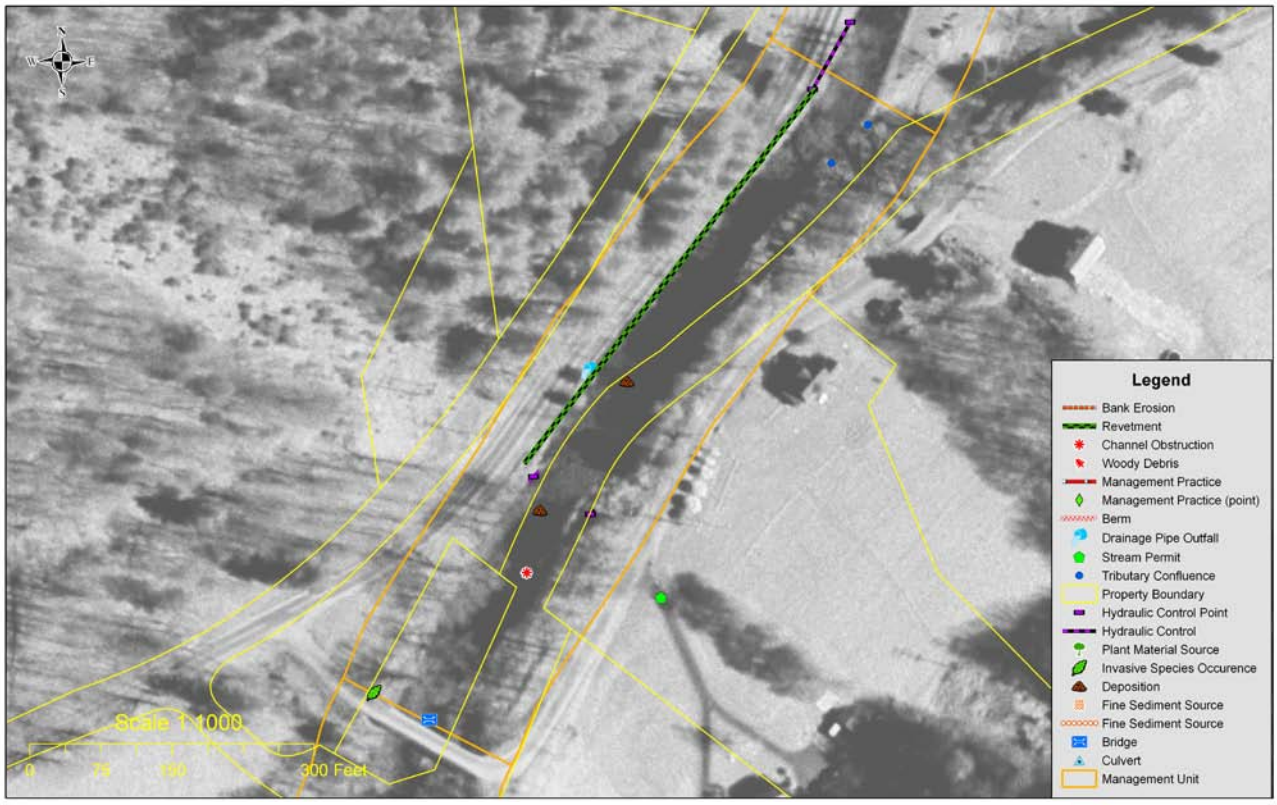


Figure 1 Stream feature inventory, MU4

Management Unit 4
Between Station 7900 and Station 7100

Management Unit Description

This management unit begins at the confluence with East Mountain Brook, continuing approximately 808 ft. to the East Mountain Road bridge crossing. The drainage area ranges from 38.5 mi^2 at the top of the management unit to 36.0 mi^2 at the bottom of the unit. The valley slope is 1.2 %. The average valley width is 796.0 ft.

Summary of Recommendations Management Unit 4	
Intervention Level	Assisted restoration in restoration of bank stabilization along Sundown Road
Stream Morphology	None
Riparian Vegetation	Develop and implement plan to eradicate Japanese knotweed
Infrastructure	Restore failing concrete cribbing
Aquatic Habitat	Conduct fish study of Rondout Creek
Flood Related Threats	Support development and adoption of new FIRMs
Water Quality	Evaluate possible sources of fine sediment through a stream feature inventory of East Mountain Brook; improve riparian buffer
Further Assessment	Monitor bed aggradation processes upstream of channel constrictions

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 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.

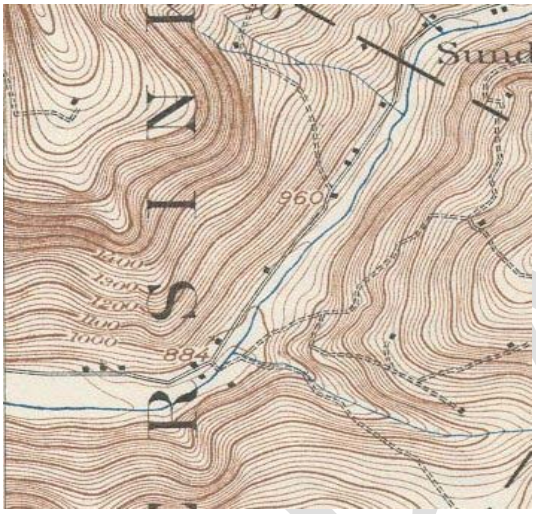


Figure 2 Excerpt of 1905 USGS topographic map MU4

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. Additionally, East Mountain Road has had a bridge crossing of Rondout Creek in this management unit for over a hundred years (see Fig 2); because they often restrict channel or floodplain flows, bridge crossings can also cause upstream backwater and sediment deposition (and downstream scour). The historic bridge abutments for a covered bridge, which remain in place upstream of the current crossing, encroached approximately ten feet into the bankfull channel, so even channel forming flows are restricted. The channel in MU4 has been extensively managed through the 20th century to maintain the crossing and protect the roadways, which encroach on the right and left floodplains.

Stream Channel and Floodplain Current Conditions

Revetment, Berms and Erosion

The 2009 stream feature inventory revealed that 0% (0 ft.) of the stream length exhibited signs of active erosion along 808 ft. of total channel length (Fig. 1). Revetment has been installed on 34.71% (562 ft.) of the stream length. No berms were identified in this management unit at the time of the stream feature inventory.

Stream Morphology

The following description of stream morphology references insets in the foldout Figure 11. "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.

Management Unit 4 consists of a short, straight run of channel, laterally controlled on either side by encroaching roadway, and at its downstream end by the abutments of the bridge carrying East Mountain Road across the creek. MU4 begins just upstream of the confluence East Mountain Brook with Rondout Creek on the left at Station 7800 (Fig. 4).

Figure 3 Management Unit 4

Just opposite the confluence, on the right, the concrete crib-wall revetment protecting Sullivan County Rte 153/Sundown Road has been battered by the flows coming out of the tributary, and large rock has been dumped to protect the embankment for a length of approximately 100 ft. where the cribbing is failing. Cribbing begins to be functional, although still in poor condition, around Station 7700, and continues to Station 7400.

Figure 4 Confluence of East Mountain Brook, left

Figure 5 Stn 7700, functional crib wall begins again

Deposition evident in the bed here indicates a possible sediment transport problem, likely created in part by two pairs of bridge abutments downstream that encroach on larger flows, causing the Rondout to backwater and lose its ability to effectively convey sediment through the reach (Fig. 6). Road drainage is received on the right at Station 7500 via a piped outfall (Fig. 7).

Figure 6 Bed aggradation, Stn 7500

Figure 7 Steel pipe outfall, right bank

Narrow vegetated strips emerge on both banks downstream of these abutments. Approaching the East Mountain Road abutments, a transverse bar crosses from right to left, ending in a lateral bar on the left, downstream of a large rootball snagged on the bed and bank. On the opposite bank, at the right approach to the crossing, a large stand of the invasive plant, Japanese knotweed was observed.

The first set of abutments is the historical stacked rock foundations for the covered bridge crossing at Station 7400 (Fig 8). A USGS gage is located adjacent to the right abutment.

Figure 8 USGS stream gaging station located atop an old bridge abutment on the right bank

Figure 9 Transverse bar, transitioning to lateral bar

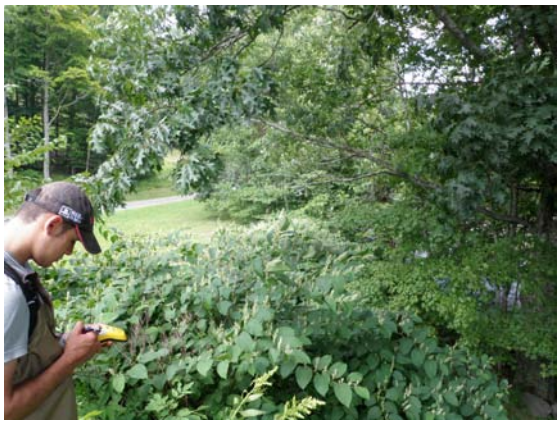


Figure 10 Japanese knotweed stand

Management Unit 4 ends at the single span bridge, Sullivan County # CD361

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*, for more details).

As described above, the sediment dynamics in MU4 are governed by the lateral hydraulic controls: historical and current bridge abutments right and left, the long stretch of concrete cribbing and dumped rock on the right, and vegetated embankments in the lower portion of the unit. Because the reach is moderately *entrenched,* with bank heights that confine flows above bankfull discharge, The constriction of higher flows caused by the abutments produces moderate backwatering upstream, slowing velocities and encouraging deposition, but deeper, faster flows through the constrictions resulting in contraction scour. Just upstream of the bridge, on the left, a large woody debris obstruction appears to be contributing to the development of a lateral bar in its lee. The effect on these dynamics of historical channel management of the reach –e.g., gravel extraction, channel widening-- aren't clear, but numerous stream disturbance permits have been issued 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 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. A large stand of Japanese knotweed was

observed in Management Unit 4, likely carried in road fill used in constructing the bridge approach on the right.

An analysis of vegetation was conducted using aerial photography from 2001 and field inventories (Fig. 12).

In this management unit, the predominant vegetation type within the 100 ft. riparian buffer is deciduous-open tree canopy (36%) followed by herbaceous vegetation (13%). *Impervious* area (22%) within this unit's buffer is primarily County Route 153/Sundown Rd. and East Mountain Road. 0 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). 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.

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. 13). 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*.

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. Two houses are 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

There was no bank erosion in this management unit at the time that the stream feature inventory was conducted.

Infrastructure

Approximately 35% percent of the stream length in this management unit has been treated with some form of revetment, with stacked rock being the dominant material used.

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). Management Unit 1 has been given an "A" class designation, supporting drinking water, swimming and fishing.

Historical channel and floodplain management, however, have modified the physical structure of the stream throughout this management unit, 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 6 is carried by smaller channels and one piped outfall that enter 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. Some turbidity at summer low flow was observed at East Mountain Brook on several occasions; it is recommended that a stream feature inventory be conducted of this tributary, and possible fine sediment sources be identified.

Excess nutrients can enter the stream from agricultural areas, including livestock paddocks and fertilized fields, or from failing septic systems. Excess nutrients cause a chain reaction of growth in microorganisms in the stream, resulting in a lack of oxygen for fish. Maintaining a healthy forest buffer between potential agricultural source areas and streams can reduce the likelihood of contaminated runoff entering the stream. Leaking septic systems can contaminate water making it unhealthy for swimming or wading. There are two houses 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