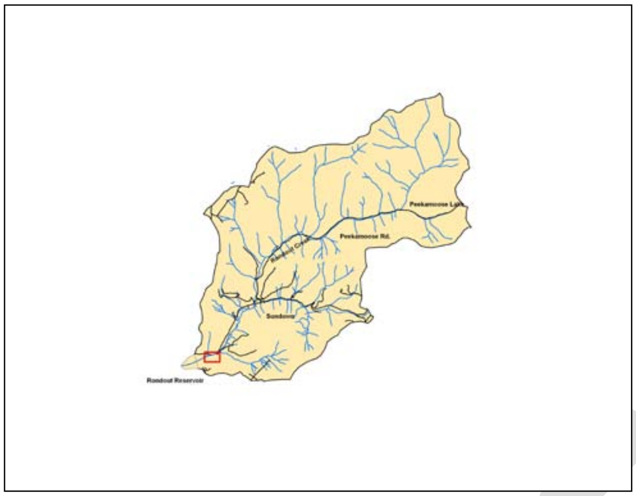
Rondout Creek Management Unit 3



Stream Feature Statistics

Less than 1% of stream length is experiencing erosion

2.24 acres of inadequate vegetation within the 100 ft. buffer

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

2 houses located within the 100-year floodplain boundary

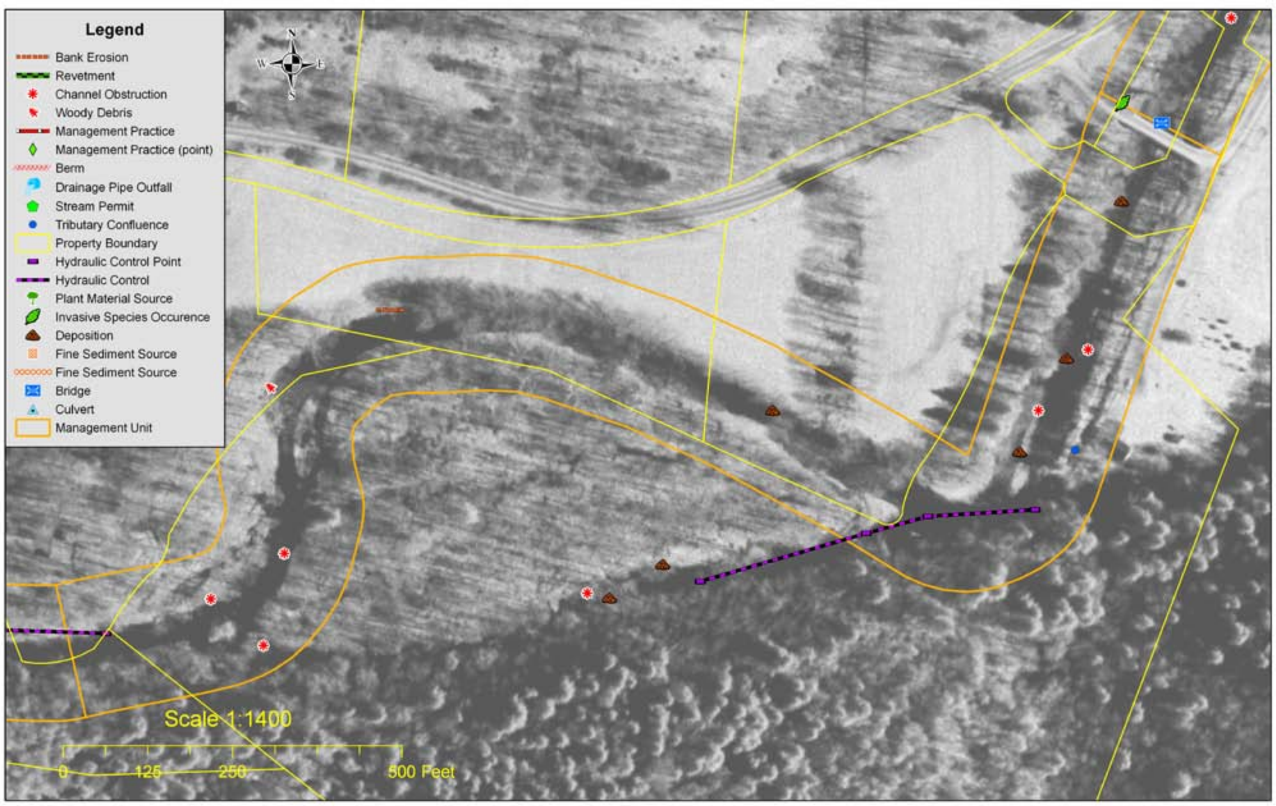


Figure 1 Stream feature inventory, MU3

Management Unit 3
Between Station 7100 and Station 4700

Management Unit Description

This management unit begins at the East Mountain Road bridge crossing, continuing approximately 2,386 ft. to a confluence with an unnamed tributary. The drainage area ranges from 39.1 mi^2 at the top of the management unit to 38.5 mi^2 at the bottom of the unit. The valley slope is 0.70 %. The average valley width is 801.7 ft.

Summary of Recommendations Management Unit 3	
Intervention Level	Assisted restoration of back eddy scour at Stn 6600
Stream Morphology	None
Riparian Vegetation	Bioengineering treatment and riparian buffer improvement at bank erosion site Stn 5500
Infrastructure	None
Aquatic Habitat	Watershed fisheries habitat study
Flood Related Threats	Reduce sheet flow potential through floodplain at Stn 5300
Water Quality	None
Further Assessment	Monitor debris jams, aggradation

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.

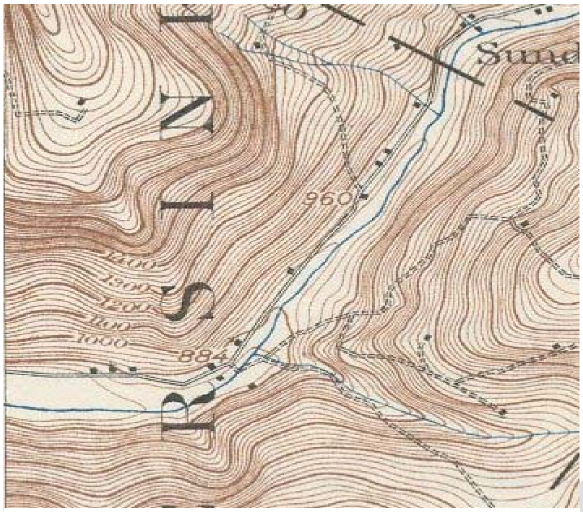


Figure 2 Excerpt of 1905 USGS topographic MU3

The somewhat narrow valley floor at the beginning of Management Unit 3 is the continuation of 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; average channel slope for MU3 is 0.69%.

At the southern extent of the alluvial fan, the valley floor bends to the right, turned by the valley wall, and begins to broaden as it approaches the Rondout Reservoir a mile down valley. 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 narrow valley floor floodplain numerous times. Until recently, the channel has been shown as a single thread, although the 1905 USGS topo map (Fig. 2) shows the channel hugging the left valley wall, while the later USGS maps show the channel looping counterclockwise around the Sycamore floodplain forest from Stations 6400 to 5000 (Fig. 3). The channel currently splits at the hard right turn, taking both courses.

Figure 3 Management Unit 3

There is no record of Article 15 stream disturbance permits being issued for work in this reach, beyond that for the installation of the East Mountain Road bridge. The advanced age of individual trees in the floodplain forest mentioned above would suggest that, while experiencing significant disturbance from floodplain flows of water and sediment, this unique vegetation community is adapted to the disturbance regime, and has maintained its present structure for decades.

<u>Stream Channel and Floodplain Current Conditions</u>
Revetment, Berms and Erosion

The 2009 stream feature inventory revealed that 1% (41 ft.) of the stream length exhibited signs of active erosion along 2,386 ft. of total channel length (Fig. 1). No revetment is present in this management unit. 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 stationing in the foldout Figure 16. "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 4 90 degree right turn in stream channel

Downstream of the East Mountain Road bridge, the Rondout has a narrow band of forest buffer on both banks, with mowed field beyond the buffer on the right, and a driveway to a residence on the left. The lateral bar on the left that began upstream of the bridge continues under and downstream of the bridge, crossing the channel toward the right around Station 6700. At Station


Figure 5 Woody debris collected on center bar

Figure 6 Perennial spring, unnamed. left

6600 it becomes a center bar, evidence of bed *aggradation* resulting from backwater effects created by the hard right turn forced as the channel hits the valley wall. The center bar has collected woody debris (Fig. 5). A perennial spring (Fig. 6) enters the channel from the left at Station 6600 near the residence, and some back eddy scour was evident associated with this confluence, which the homeowner appears to be trying to mitigate with dumped block. It is recommended that potential bioengineering treatments be investigated to address the scour problems.

As the channel approaches the valley wall, the bed is scoured to bedrock on the left beginning at a deep pool around Station 6500 (Fig. 7). The channel splits here, with the left channel continuing over bedrock bed for 500 ft. along the base of the valley wall, and the right channel continuing around a low-elevation floodplain forest largely comprising mature Sycamore (Fig.8).

Figure 7 Bed scoured to bedrock at bend

Figure 8 Channel divergence, Stn 6500

Figure 9 Mature Sycamore floodplain forest, note person for scale

This floodplain forest appears to be fairly unique in terms of its structure, disturbance regime and biodiversity; it is recommended that the vegetation community be assessed and, if warranted, steps be taken to ensure its protection.

Figure 10 Bedrock hydraulic control, left

Continuing down the left thread, the channel runs along base of the valley wall, controlled for much of its length by bedrock in the bank and left edge of bed (Fig. 10). The mature canopy nearly encloses the channel (Fig. 11).

Figure 11 Mature tree canopy shading channel

Aggradation is evident to Station 5500 (given as approximate stationing, downvalley equivalent of right channel stationing), where an obstruction comprising a large mass of woody debris is backwatering higher flows. The aggradation resulting from this debris jam has created a hydraulic drop through the jam that has the potential to headcut up through the left channel if the obstruction is disintegrated by a large flow.

Figure 12 Multiple channels on island created by extensive woody debris obstructions

On the island to the right of this channel, multiple channel threads course through the forested floodplain and the extensive collection of woody debris caught among the trees (Fig. 12).

Down the right thread, looping counterclockwise around the island, aggradation is also evident, and a short stretch of bank erosion (approximately 44 ft.) was observed at Station 5500, creating a break in the single line of trees protecting the right bank. It is recommended that bioengineering practices be installed at this location, and the possibility of reestablishing a wider woody buffer along the outside of this meander be explored, to increase bank resistance to erosion in the future.

Figure 13 Erosion of the right bank, right channel

At Station 5400, the channel curves tightly to the left, with lateral and point bars and woody debris snags on both sides of the channel. The small channels crossing the island converge with the main channel on the inside of this tight bend as the stream bends back to the right.

Figure 14 Lower end of island, channels converge

The direction of channel flow is nearly perpendicular to the valley fall here (Fig. 14); consequently, the floodplain and grounds of the residence down-valley of these tight bends show evidence of frequent overbank flows.

Around Station 4900 the left and right channels converge as a single thread channel, again running along the base of the left valley wall, and at Station 4700, the left bank is again controlled by rock ledge (Fig. 15) as Management Unit 3 ends.

Figure 15 Bedrock hydraulic control, left bank

A small unnamed tributary crosses the floodplain from the west side of Sundown road, paralleling the Rondout Creek for approximately 750 ft. before confluencing with the Rondout at Station 4250. The tight radius of the meander in the right channel from Stations 5500 to 5200 presents a risk of developing a chute cutoff through the floodplain and adopting the course of this small tributary; only 200 ft separates the two. It is recommended that the potential for floodplain gullying in this area be evaluated, and if appropriate, steps be taken to increase surface protection and resistance to high velocity sheet flow.

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).

In the upstream section of Management Unit 3, backwater resulting from the obstruction posed by the left valley wall and the hard turn it forces is causing bed aggradation. In lower reaches, the channel split reduces the conveyance capacity of the stream in each channel, resulting in ineffective sediment transport and aggradation. Aggradation reduces slope upstream and increases it downstream, creating further sediment transport discontinuities that can result in headcuts and channel incision. Currently sediment dynamics are being influenced significantly by the large debris jam in the left branch just upstream of the confluence of the two channels. The aggradation in this channel could, over time, result in the complete filling and revegetation of this channel. This unique reach, with its unusual Sycamore floodplain island, should be monitored for potential catastrophic shifts. The potential for the development of a chute cutoff across the floodplain down-valley of the tight meander bends from Station 5400 to 5200 suggests that proactive floodplain bioengineering might be warranted, and should be investigated.

<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 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. 17). In this management unit, the predominant vegetation type within the 100 ft. riparian buffer is deciduous-open tree canopy (49%) followed by herbaceous vegetation (27%). *Impervious* area makes up approximately 1% of this management unit. 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). 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. 18). 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*.

Recommendations for this unit include improvement of the buffer of mature trees along the hayfield from Stations 6000 to 5400. 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. 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

Most of the stream banks within the management unit are considered stable, but 1 % (41 ft.) of the stream length is experiencing erosion.

Infrastructure

This management unit has not been treated with any form of revetment.

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). The left channel thread, in particularly has excellent canopy cover for its entire length on both banks. Management Unit 3 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 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 these 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 3 is carried by smaller channels that enter into the Rondout Creek at the bottom of 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 MU3, however, are largely comprised of alluvial deposits, which in general contain a lower proportion of fine sediments than glacial till or lacustrine deposits, and represent a relatively insignificant water quality concern.

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 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

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