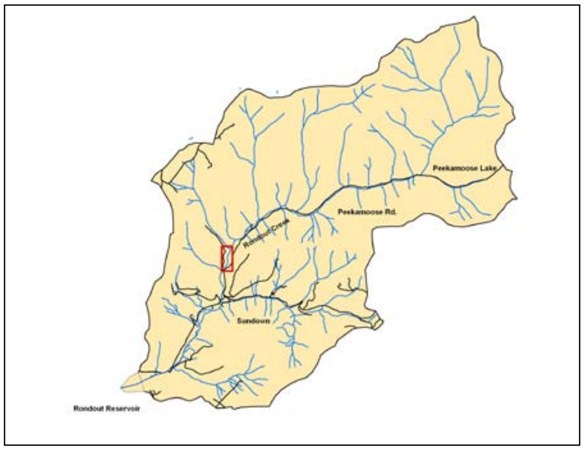
Rondout Creek Management Unit 9



Stream Feature Statistics

0% of stream length is experiencing erosion

0% of stream length has been stabilized

1.59 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

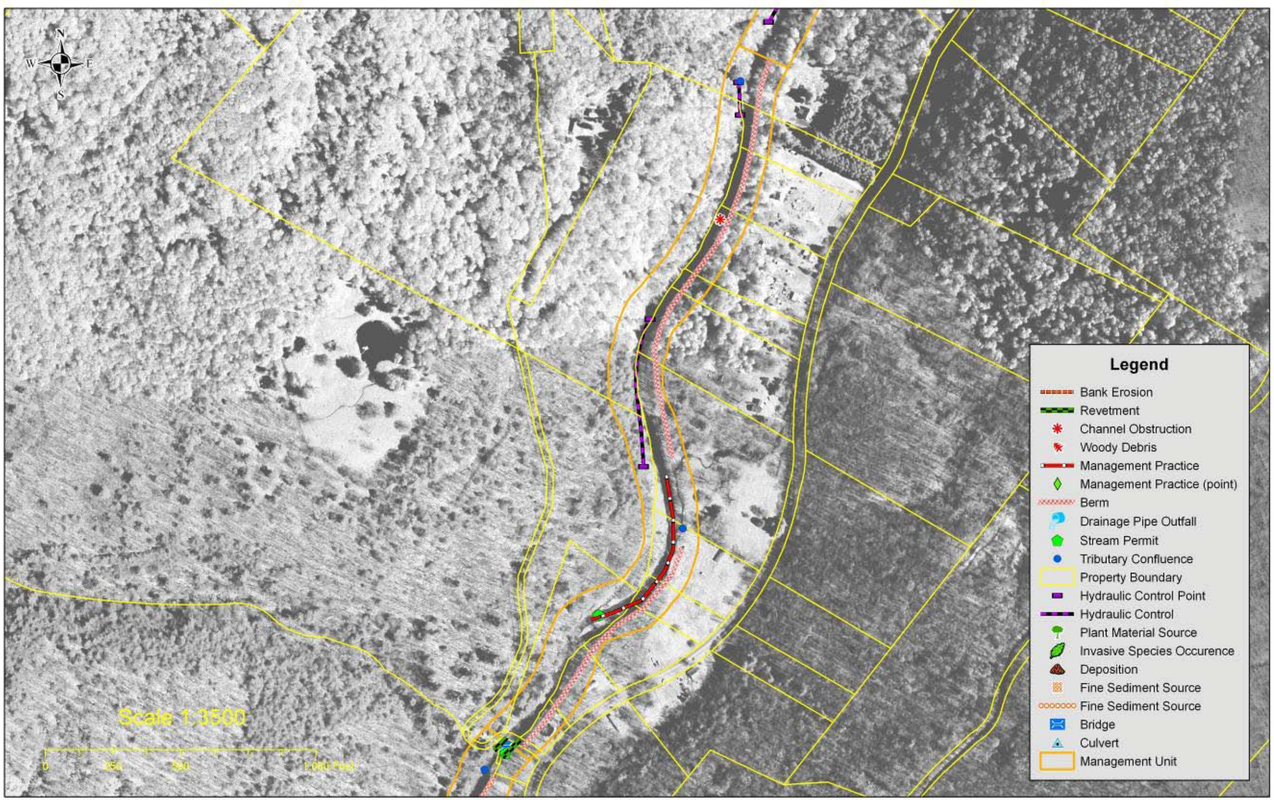


Figure 1 Management Unit 9 Stream feature inventory

Management Unit 9
Between Station 22,300 and Station 25,300

Management Unit Description

This management unit begins at the confluence of High Falls Brook and runs approximately 2,943 ft. to the bridge crossing at Balace Road. The drainage area ranges from 25.1 mi^2 at the top of the management unit to 22.3 mi^2 at the bottom of the unit. The valley slope is 1.4%. The average valley width is 621.1 ft.

Stream conditions in MU9 are generally stable, owing in large measure to extensive bedrock controls on channel right and in the bed and a recent stream stabilization project upstream of the Balace Road bridge; there is little evidence of bank erosion at this time. Berming has created moderately entrenched conditions, but these are not particularly effective in keeping the floodplain free of inundating flows due to numerous breaches of the berm, contributing watercourses from the left side of the valley and a somewhat flashy, high runoff watershed; periodic flood flows have repeatedly damaged the county road. Habitat quality is generally high, and despite surburban-like residential development densities, water quality concerns are low.

Summary of Recommendations Management Unit 9	
Intervention Level	Assisted self-recovery, evaluate benefits of installing additional bioengineering treatments.
Stream Morphology	Monitor project at Balace Road, evaluate sediment transport dynamics throughout reach.
Riparian Vegetation	Monitor establishment of woody vegetation in the floodplain at the recently installed Balace Road project. Additional buffer plantings as appropriate.
Infrastructure	Monitor changes in channel profile through Balace Road bridge. Evaluate possibility of relocation of berms to maximize set-back from channel.
Aquatic Habitat	Watershed fish population and habitat study
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	Monitor recent installation of management practices upstream of Balace Road (Stn 23000 to 23500). Investigate stability of pond upslope from waterfall at Stn 24160.

Historic Conditions

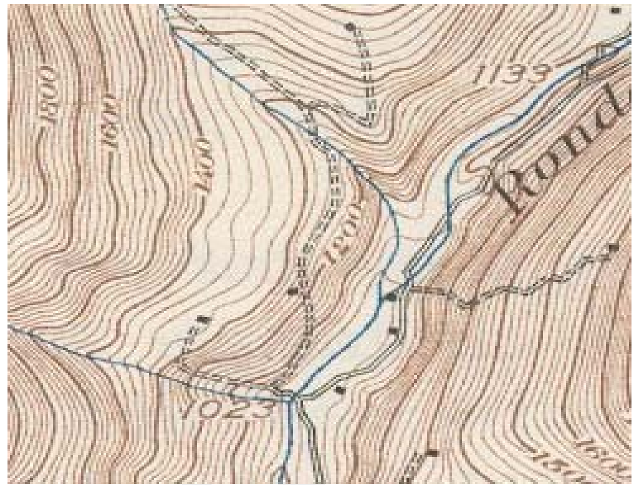


Figure 2 Excerpt of 1905 USGS topographic map

As the glaciers retreated about 12,000 years ago, they left their "tracks" in the Catskills. See Section 2.5 *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.

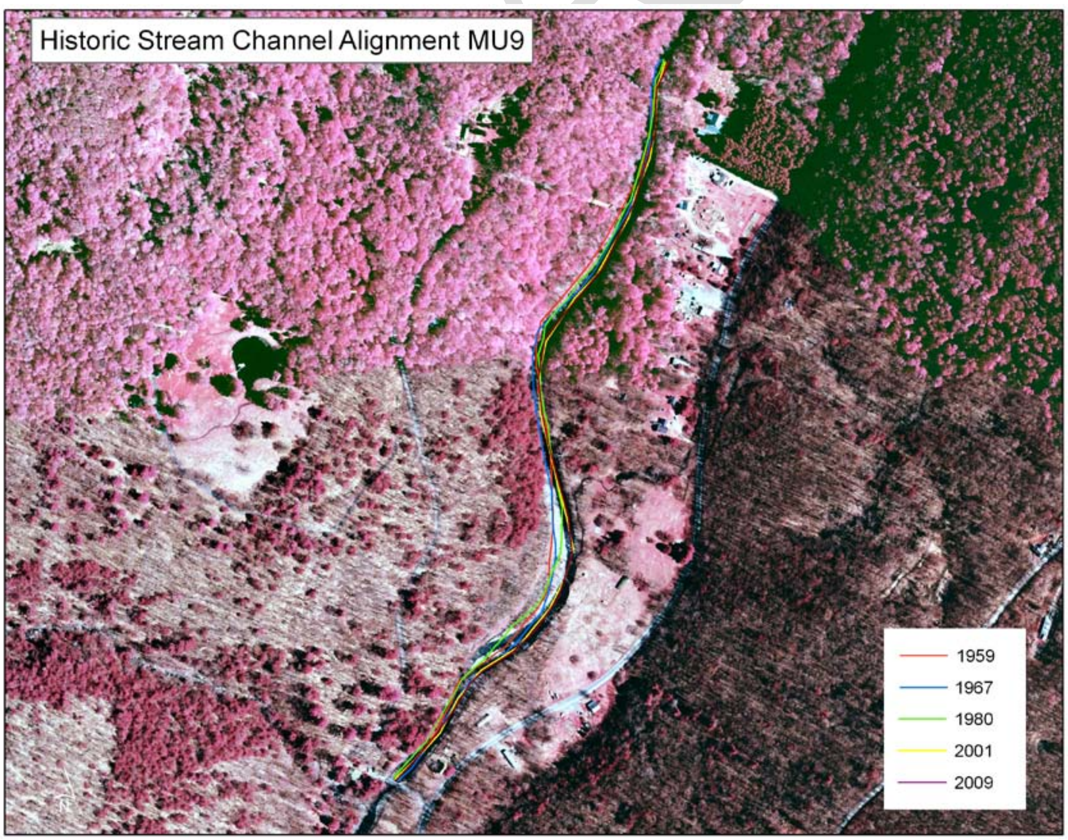


Figure 3 Historical channel alignments, MU9

Stream Channel and Floodplain Current Conditions

Revetment, Berms and Erosion

The 2009 stream feature inventory revealed little sign of active erosion along 2,943 ft. of total channel length (Fig.1). Revetment has been installed on 0.88% (52 ft.) of the stream length. Flow deflector and grade control vanes were installed in 2009 on approximately 20% of the stream length. Berms, in various states of repair are evident along 95% of the stream length.

Stream Morphology

The following description of stream morphology references stationing in the foldout Figure 6. "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.

Throughout much of this unit, 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. The channel generally runs along the right valley wall, receiving waterfalls from contributing tributaries, including one recently formed at Station 24160 when a pond upslope breached its embankments; current conditions at this pond should be evaluated as part of future assessments. Several smaller channels bring tributary flow from the left valley wall across the floodplain through the numerous private properties between the channel and the road. While historic channel management disconnected much of the floodplain on the left except during larger flows, the berms –installed after the flooding of the mid-1950s-- have been breeched in numerous locations. The channel is largely stable here due to the hydraulic controls provided by the bedrock in the channel bottom and right bank, and mature woody vegetation in the riparian corridor on the left through much of the unit, and it is recommended that the upstream section be surveyed and monitored to evaluate its appropriateness for providing reference morphology for future channel work. The section upstream of the Balace Road bridge, however, between Station 22800 and 23500, has been the site of instability in recent decades, with an inadequate bridge span at Balace Road producing backwatering at bankfull flows, and resulting in aggradation and channel shifting upstream (Fig 4).

Figure 4 Historic aggradation, channel shifting upstream of Ballace Road Bridge, MU9

In recent years the site had been mowed to the edge of stream on the left, compromising the strength of the bank, resulting in migration of the meander there into the field, and setting up conditions for the stream to jump the bank and flow downvalley into Peekamoose Road (UC Rte 42), threatening the cottage at the corner of Balace Road and damaging the county road.

Following repeated failure of berms, gabion baskets and rip-rap placements installed to keep the channel in place, the bridge was replaced with a longer span and greater capacity between the abutments, and in 2009 a FEMA-financed project ("the Balace Road project") installed rock vanes to check the channel migration, and rebuilt the berm. Vegetation was installed in the floodplain. It is recommended that this project be monitored for its structural and functional performance following major flow events. The bridge approach on channel left still represents an obstruction to flows in the floodplain.

Figure 5   Ballace Road Bridge, with approach from Peekamoose Rd

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).

Stream channels which are able to use their floodplains to convey moderately large flows, and which exhibit the slope of this part of the Rondout tend to be sinuous, have well-developed point bars on the inside of meanders, and act as *storage reaches*, collecting bedload during large flood events and then transporting it out gradually through a succession of smaller flows in the years between large floods.

In MU9, inadequate channel sinuosity and berms result in a deficit of bedload storage capacity that this valley type probably exhibited historically. However, the somewhat overwidened conditions and floodplain obstruction represented by the Balace Road bridge probably result in less effective sediment conveyance than typically found in a *transport reach*, which passes in each flow event the bedload delivered from upstream. The result is that beds and bars in MU9 probably aggrade during high flows as bedload is supplied from the tributaries, and then this material is transported out during relatively lower flows.

Recommendations for this reach begin with a hydraulics study of the management unit (and to also include MUs 7, 8 and 10), 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 critical property.

The capacity of the channel to transport the significant bedload volumes currently stored in depositional features in the state land upstream should be evaluated, as MU9 has only moderate capacity for storing sediment, and therefore generally 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, Rondout Creek Ecosystem Health), including increased risk to residences and public infrastructure in the valley. Sediment transport dynamics should be monitored in the FEMA project area.

<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 digital orthophotography and field inventories (Fig. 7). In this management unit, the predominant vegetation type within the 100 ft. riparian buffer is deciduous-closed tree canopy (61%) followed by herbaceous vegetation (11%). *Impervious* area (<1%) within this unit's buffer is primarily unpaved roads. No occurrences of Japanese knotweed were documented in this management unit during the 2008 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 droughts (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. Riparian improvement planting sites were identified through a watershed-wide remote evaluation of current riparian buffer conditions and existing stream channel morphology (Fig. 8). 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.

It is recommended that the floodplain plantings at the Balace Road project site be monitored for survival and vigor, and that unsuccessful plants be replaced. 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 in MU9 lie within the 100-year floodplain as identified on the FIRM maps. Due to the relatively steep watershed contributing to this section of narrow valley, the risk of flood inundation eventually affecting more of the numerous households in this management unit is relatively high.

Bank Erosion

Most of the stream banks within the management unit are considered stable; with the completion of the Balace Road project, the only area of significant erosion in the management unit was mitigated. Low density residential development up the right valley wall also creates the potential for damage downslope by concentrating stormwater and altering drainage patterns, as happened when a pond embankment failed in recent years, creating a new watercourse and waterfall at Station 24160.

Infrastructure

Only 0.88% percent of the stream length in this management unit has been treated with some form of revetment, primarily rip-rap along the upstream wing walls of the Balace Road bridge abutments. Large rock flow deflector and grade control vanes have been installed as part of the Balace Road project. While Ulster County Rte 42 generally runs along the left valley wall, it periodically carries flows when the Rondout is in flood stage and overbank flows find new courses across the floodplain.

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 9 has been identified as supporting trout spawning, one of the highest use designations possible for waters in New York, affording it a high level of protection.

While much of the riparian corridor on the left has been developed in low density residential lots in MU9, the right side of the channel is in generally fairly undisturbed forest cover. 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.

<u>Water Quality</u>

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 road salts, oil, grease, sediment, litter and other unseen pollutants found in road runoff can significantly degrade water quality and affect the health of the organisms living in streams and floodplains. There are numerous small channels that receive road runoff in MU9 and deliver it to the Rondout; 150 ft. of the stream lies within 50 ft. of the road, and Balace Road drainage ditches outfall into the creek as well.

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 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