Management Unit 10

Greene County - Town of Hunter
Cross Section 135 to Bank Erosion Monitoring Site #18

Management Unit Description

This management unit begins at cross section 135 and continues approximately 1,955 ft. to slightly above bank erosion monitoring site #18. The drainage area ranges from 15.4 mi^2 at the top of the management unit to 16.1 mi^2 at the bottom of the unit. The valley slope is 1.6% and stream water surface slope is 1.3%.

Stream conditions in this management unit are somewhat unstable, characterized by overwide bankfull channels, compromised riparian vegetation and evidence of aggradation. Despite these factors, recovery potential in the unit remains high, and could be accelerated through riparian plantings. A headcut near the middle of the unit should be monitored for changes in location, slope and extension. Currently this management unit has minimal canopy cover. The revetment at the NYS Route 214 road embankment should be augmented with vegetative treatments to enhance aquatic habitat and minimize maintenance costs.

Summary of Recommendations Management Unit 10	
Intervention Level	Assisted Self-Recovery
Stream Morphology	Encourage narrowing and deepening of channel through plantings at identified site (PS #34)
Riparian Vegetation	Riparian plantings at the two identified planting sites (PS #33-34)
Infrastructure	None
Aquatic Habitat	Enhance overhead cover by joint planting of rip-rap at identified planting site (PS #34)
Flood Related Threats	Resurvey National Flood Insurance Program (NFIP) map to more accurately reflect the active stream channel
Water Quality	None
Further Assessment	Monitor headcut

Historic Conditions

As the glaciers retreated about 12,000 years ago, they left their "tracks' in the Catskills. Rubin (1996) mapped the presence of glacial lake clay along this entire section of the stream corridor, either in the stream bank or beneath a thin layer of alluvial deposits in the stream bed. (See Section 2.4, Geology of the Stony Clove Creek, for a description of these deposits) Clay exposures were not observed here, however, at the time of the stream feature inventory.

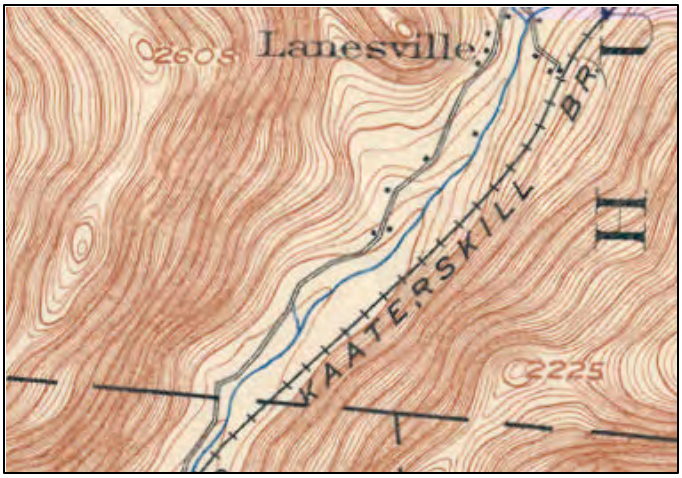


Figure 2 Excerpt from USGS 15' topo, 1903

In most of this management unit, just upstream of the county line, there were no buildings indicated on the Geological Survey's 1903 15' topographic map, despite the fairly broad, flat valley bottom landform (Fig. 2). A map of forest cover also indicates that the floodplain here remained forested until that same date. The rail line hugs the southeast valley wall. This evidence suggests that much of the floodplain in this unit may have historically been forested wetland.

As seen from the historical stream alignments, this management has experienced significant lateral channel migration since 1959 (Fig. 3). In that year, the stream channel split into two channels near the middle of the management unit. By 1980 the channel to the far left was abandoned in favor of the stream channel which flows closer to NYS Route 214. This channel migration has caused a serious threat to this roadway. After the January 1996 flood, the roadway was undermined, requiring significant repair. By 2000, the stream channel became less *sinuous* and currently flows at the toe of the NYS Route 214 road embankment in the lower half of the management unit.

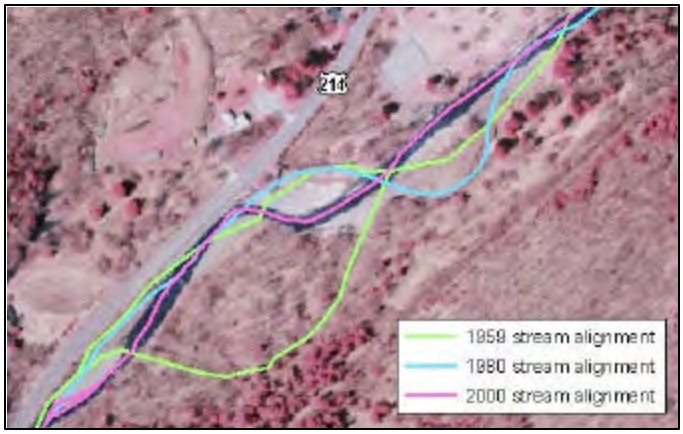


Figure 3 Historical stream channel alignments of Management Unit 10

According to available NYS DEC records there has been one stream disturbance permit issued in this management unit area. A permit was issued to Millard Ruoff to skid trees through the creek using an existing ford, and to cross the creek with a tractor to transport cut firewood and collect maple sap, between the years 1992 to 1995.

Stream Channel and Floodplain Current Conditions

Revetment, Berms and Erosion

The 2001 stream feature inventory revealed that 0% of the stream banks exhibited signs of active erosion along 1,955 ft. of total channel length (Fig. 1). Revetment has been installed on 8% (305 ft.) of the stream banks. 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 18. "Left" and "right" references are oriented looking downstream, photos are also oriented looking downstream unless otherwise noted. Italicized terms are defined in the glossary. This characterization is the result of a survey conducted in 2001.

Stream morphology, or shape (i.e., slope, width and depth) changes several times in this unit (Fig. 4), creating reaches with differing morphologic characteristics, which are classified as different *stream types* (See Section 3.1 for stream type descriptions).

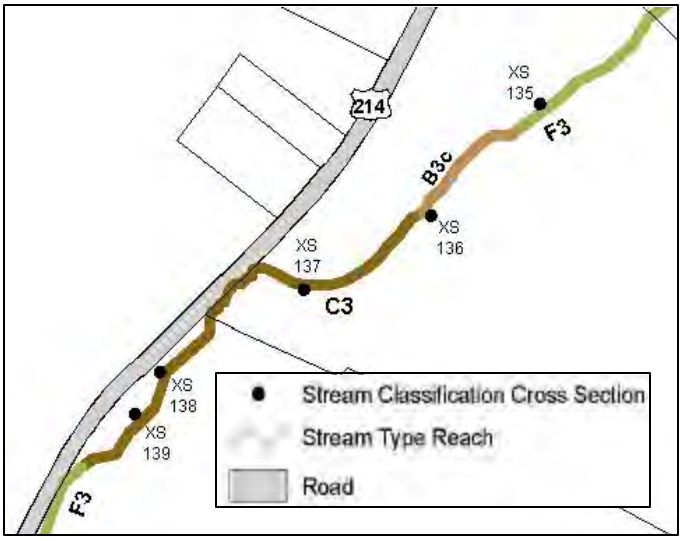


Figure 4 Cross-sections and Rosgen stream types in Management Unit 10

The morphological overall setting in the unit appears to be aggradational, characterized by overwide channels and generally low to moderate entrenchment. Bed material is cobble-dominated. Planform is truncated by NYS Route 214 resulting in sediment transport imbalances. While there is minimal evidence of bank erosion, the historical channel migration indicates a tendency for lateral adjustment, as would be expected with the low channel gradient of the unit.

Management unit #10 begins slightly upstream from cross section 135, with a 171 ft. reach of F3 stream type (Fig. 5 & Inset D). This reach is *entrenched*, or confined within the stream banks during high flow events. Channel slope is fairly flat at 1.4%, and the dominant bed material is cobble. The channel is wide, shallow and straight. Despite entrenched conditions, the toe of the stream banks remains fairly

Figure 5 Cross-section 135 Stream Type F3

stable as a result of the presence of densely-rooted native sedges (*Carex torta*).

Figure 6 Cross-section 136
Stream Type B3c

Continuing downstream, channel slope flattens to 0.9%, as stream type transitions to B3c for the next 410 ft. of stream (Fig. 6). This stream reach remains wide, shallow and straight but does gain limited access to its floodplain on the left.

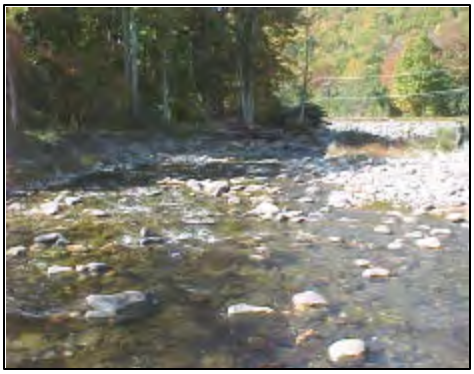


Figure 7 Cross-section 137
Stream Type C3

For the last 1,374 ft. of channel in this management unit, stream type changes to C3, becoming fully connected with its floodplain (Fig. 7). The channel begins to meander and slope increases to 1.4%.

On the left stream bank, at the outside of the first meander bend, the stream has experienced minor undercutting. As evidenced in the historic channel alignments (Fig. 3), the stream had split into two channels at this location. Approximately 140 ft. of rip-rap has been installed further downstream on this bank (Inset C). This lower bank is exposed to high *shear stress* during high flow events. As a result, the rip-rap has been compromised.

Figure 8 Gravel Bar

On the right stream bank, a large gravel bar has formed. Gravel is often deposited on the inside of meander bends, where flow velocities are lower. Gravel bars help maintain channel stability during flood events. In stable streams, the bars will erode away while the channel is in flood stage. The bars then are rebuilt as flow decreases, helping the stream maintain its stability by reestablishing its pools and riffles. If gravel bars are removed, these processes do not occur and instead, the stream often dissipates its energy by eroding banks and scouring its bed.

In 2000, Trout Unlimited participated in a project to plant willows on this gravel bar. Vegetation encourages deposition of sediment leading to the rebuilding of the stream's floodplain. These willows are currently thriving and spreading, contributing to the stability of this gravel bar.

There are two federally designated wetlands in this reach, totaling 2.8 acres (Fig. 9). These wetlands are characterized as riverine upper perennial with an unconsolidated shore, and are temporarily flooded. Wetlands are recognized as important features in the landscape that provide numerous beneficial services for people and for fish and wildlife. These functions include protecting and improving water quality, providing fish and wildlife habitat, storing floodwaters, and maintaining surface water flow during dry periods. (See Section 2.6 for wetland type descriptions and regulations)

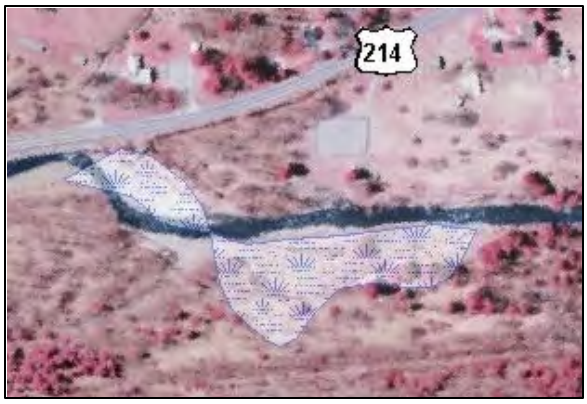


Figure 9 Federally Designated Wetlands

Figure 10 Rip-rap along NYS Route 214

As the stream flows directly towards NYS Route 214, there is a significant *headcut*. As the stream comes out of the headcut, it drops into a deep pool and turns sharply to the left. The stream then flows along the toe of the road embankment. In efforts to protect this embankment, the NYS Department of Transportation (DOT) installed 305 ft. of rip-rap on the right stream bank following the January 1996 flood (Fig. 10 & Inset B). On the left stream bank, approximately 268 ft. of rip-rap has been installed (Inset A). A smaller gravel bar has formed at the toe of the rip-rap along the inside of this meander bend (Fig. 11). At the downstream end of this gravel bar, the stream channel widens significantly for approximately 300 ft..

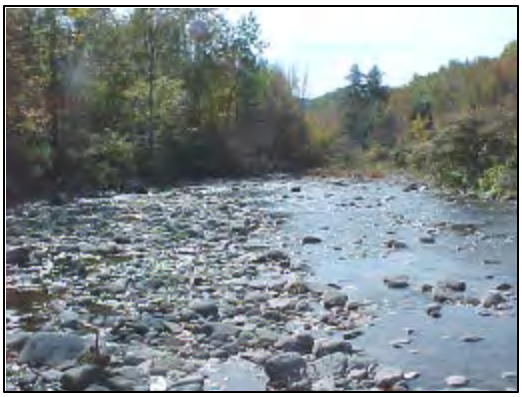


Figure 11 Gravel bar at cross-section 138

As this management unit comes to an end, a gravel bar on the right stream bank has contributed to the narrowing of the stream channel. Herbaceous vegetation has become established on this bar and has begun to rebuild the floodplain.

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 3.1 for more details on Stream Processes).

The meander geometry of this reach is *truncated* by NYS Route 214, resulting in sediment transport imbalances. Generally overwide conditions in the upper reaches appear to be causing bed aggradation, while in the middle of the unit a headcut has formed and is likely to migrate upstream under repeated flood flows. The overwide conditions here may be partially self correcting with the spread of willow and sedge vegetation, which can result in channel narrowing and floodplain development. The lower reach is also overwide, perhaps as a result of channel grading during repair of flood damages.

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 feet 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. Grass does not provide adequate erosion protection on stream banks because it 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. Native species are adapted to regional climate and soil conditions and typically require little maintenance following installation and establishment.

Plant species that are not native can create difficulties for stream management, particularly if they are invasive. Japanese knotweed (*Polygonum cuspidatum*), 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 increased surface runoff impacts.

An analysis of vegetation was conducted using aerial photography from 2001 and field inventories (Fig. 12, Appendix A). Japanese knotweed occurrences were documented as part of the MesoHABSIM aquatic habitat inventory conducted during the summer of 2002 (Appendix B).

The predominant vegetation type within the 300 ft. riparian buffer is forested (50%) followed by herbaceous (20%) and deciduous shrubbrush (17%). Areas of herbaceous (non-woody) cover present opportunities to improve the riparian buffer with plantings of more flood-resistant species. *Impervious* area (6%) within this unit's buffer is primarily the NYS Route 214 roadway and private residences.

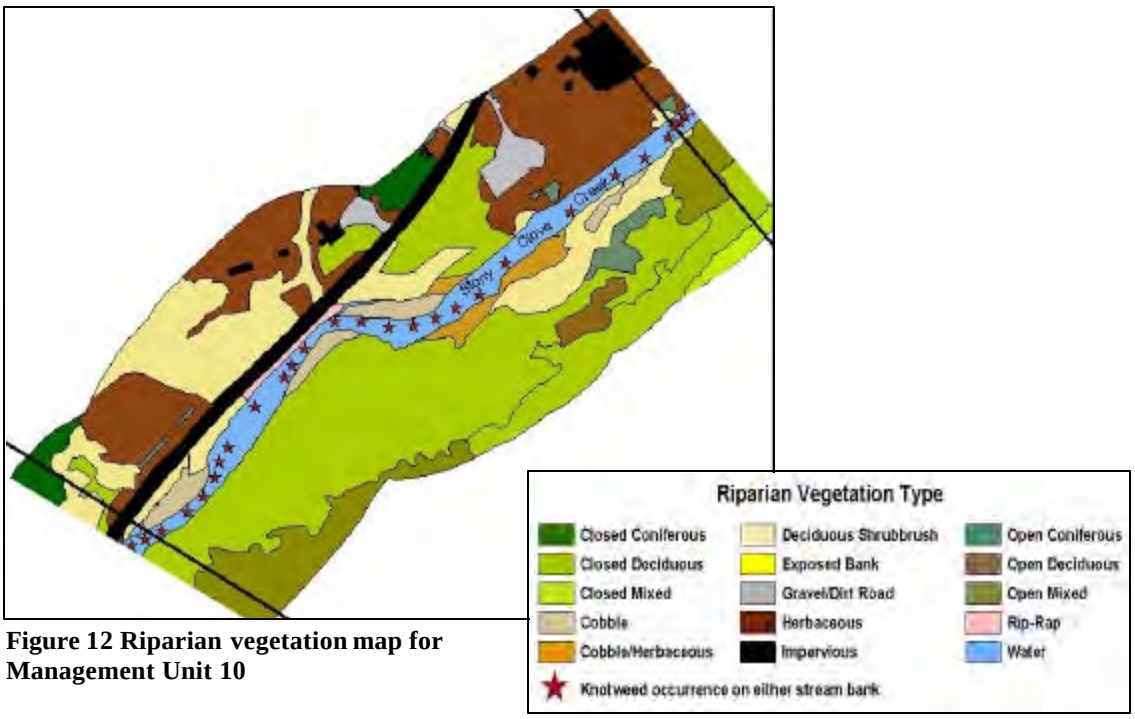


Figure 12 Riparian vegetation map for Management Unit 10

In June 2003, suitable riparian improvement planting sites were identified through a watershed-wide field 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 stream channel stability in the long-term, as well as biological integrity of the stream and floodplain. Areas with serious erosion problems where the stream channel requires extensive reconstruction to restore long-term stability have been eliminated from this effort. In most cases, these sites can not be effectively treated with riparian enhancement alone, and full restoration efforts would include re-vegetation components. Two appropriate planting sites were documented within this management unit.

Figure 13 Planting site location map for Management Unit 10

The section of planting site #33 in this management unit is located on the Ruoff property on the right stream bank (No photo available). Presently there are a few trees and shrubs along the stream bank and the upland area serves as a horse pasture. Planting of native trees and shrub along the stream bank to increase the density of vegetation on the bank is recommended. Upland buffer width should be increased as much as is agreeable to the landowner.

Planting site #34 is also located on the Ruoff property, across road from The Stony Clove Rod & Gun Club (Fig. 14 & 15). The left stream bank has experienced some minor erosion, leaving either grass or exposed soil on the stream bank. The top of this bank is covered with a mix of cobble and herbaceous vegetation. In the downstream half of this planting site there are two gravel bars and a two reaches of rip-rap (Inset A&B).

Figure 14 Left stream bank at middle of planting site #34, looking upstream

Existing willows should be augmented with native sedges here with additional plantings along the left stream bank. These plantings will help to stabilize this stream bank, and improve aquatic habitat function. To improve the upland buffer function, trees and shrubs should be planted. Willow and sedge species should also be considered for gravel bar plantings throughout the unit.

Figure 15 Planting Site #34
Rip-rap on right stream bank

Inserting plant materials into the soil between rip-rap rocks, or *joint planting,* is recommended. Joint planting will strengthen and increase the longevity of this rip-rap. These plantings will also improve the aquatic habitat by improving shading, resulting in cooler water temperatures. Planting of the rip-rap on the right stream bank would require coordination with the NYS DOT, as they are responsible for the maintenance of this rip-rap.

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. Initial

Figure 16 100-year floodplain boundary of Management Unit 10

identification for these maps was completed in 1976. Some areas of these maps may contain errors due to stream channel migration or infrastructure changes over time.

To address the dated NFIP maps, the NYS DEC Bureau of Flood Protection is currently developing floodplain maps, using a new methodology called Light Detection And Ranging (LIDAR). LIDAR produces extremely detailed and accurate maps, which will indicate the depth of water across the floodplain under 100-year and other flood conditions. These maps should be completed for the Stony Clove Watershed in 2004.

According to the NFIP maps, there is one house located within the 100-year floodplain boundary in this management unit (Fig. 16). The current NFIP maps are available for review at the Greene and Ulster County Soil & Water Conservation District offices.

Bank Erosion

Most of the stream banks within the management unit are stable, with no stream banks identified as experiencing significant erosion at the time of the stream feature inventory.

The left stream bank upstream from the rip-rap, in the middle of this management unit, shows evidence of minor erosion at the location of the historical channel divergence (Inset C). Implementation of the recommendations for planting site #34 should help mitigate this problem. This relic channel is still defined, and is likely to convey floodwater. Concentration of flows in the relic channel may result in significant erosion at its outfall in Management Unit #11.

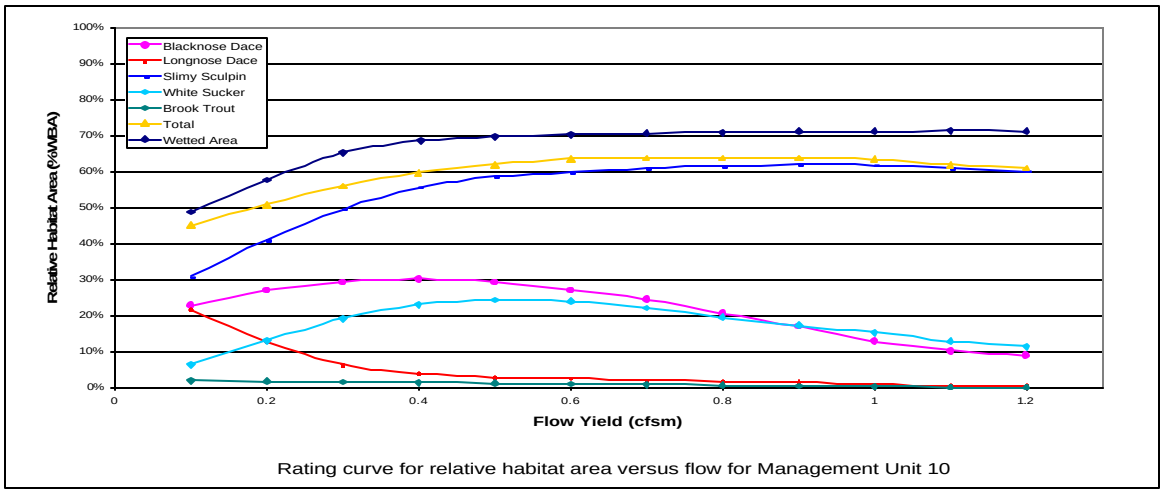
Infrastructure

There is one section of rip-rap in this management unit which is protecting NYS Route 214 road embankment (Inset B). While rip-rap and other hard controls may provide temporary relief from erosion, they are expensive to install, degrade habitat, and require ongoing maintenance or transfer erosion problems to upstream or downstream areas. *Joint planting*, as recommended for planting site #34, will strengthen and increase the longevity of this rip-rap, reducing long-term maintenance costs.

Aquatic Habitat

Aquatic habitat was analyzed for each management unit using Cornell University Instream Habitat Program's model called MesoHABSIM. This approach attempts to characterize the suitability of instream habitat for a *target community* of native fish, at the scale of individual stream features (the "meso" scale), such as riffles and pools. Habitat is mapped at this scale for a range of flows. Then the suitability of each type of habitat, for each species in the target community, is assessed through electrofishing. These are combined to predict the amount of habitat available in the management unit as a whole. The habitat rating curves in the figure below depict the amount of suitable habitat available at different flows. See Appendix B for a more detailed explanation of methods.

Management unit #10 is channelized through much of its length. The substrate found in this unit is smaller in size than that found upstream. Some woody debris and shallow margins are present. *Wetted area* increases sharply until 0.4 cfsm, above which it stays constant at a 70% level. The fluctuations in habitat levels with flow are less dramatic than those found in management unit #9. Hydro-morphological units (HMUs) are fewer and larger in area. Both dace species and white sucker lose their habitat with increasing flow. Brook trout habitat is very low, whereas the remaining two trout species have some usable habitat available.



Rating curve for relative habitat area versus flow for Management Unit 10

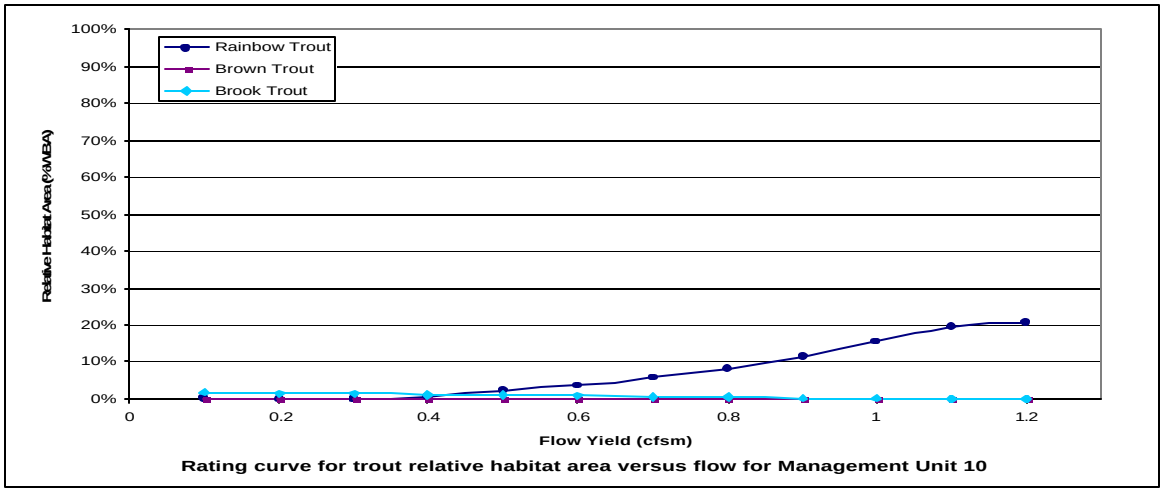


Figure 17 MesoHABSIM habitat rating curves for Management Unit 10

Water Quality

Clay exposures and sediment from stream bank and channel erosion pose a significant threat to water quality in Stony Clove Creek. Clay and sediment inputs into a stream may increase *turbidity* and act as a carrier for other pollutants and pathogens. No clay exposures were identified in this management unit at the time of the stream feature inventory.

Stormwater runoff can also have a considerable impact on water quality. When it rains, water falls on roadways and flows untreated directly into Stony Clove Creek. The cumulative impact of oil, grease, sediment, salt, litter and other unseen pollutants found in road runoff can significantly impact water quality. There are no stormwater culverts in this management unit.

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 is one house located in close proximity to the stream channel in this management unit. This homeowner should inspect the 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 by 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 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. Eligible systems included those that were less than 1,000-gallon capacity serving one- or two-family residences, or home and business

combinations (CWC, 2003). No homeowners in this management unit made use of this program to replace or repair a septic system.