Management Unit 14

Ulster County - Town of Shandaken

Cross Section 153 to Weiss Road Bridge

Management Unit Description

This management unit begins between cross section 153 and continues approximately 1,202 ft. to the bridge at Weiss Road. The drainage area ranges from 16.8 mi^2 at the top of the management unit to 16.8 mi^2 at the bottom of the unit. The valley slope is 1.6% and stream water surface slope is 1.3%.

This heavily modified unit benefits from its relative freedom from infrastructure encroachment in the floodplain. Revetment and floodplain plantings should encourage self-recovery of stream functions and improve the compromised aquatic habitat. Because many of the channel modifications are relatively recent, the unit should be monitored for possible bed and bank adjustments.

Summary of Recommendations Management Unit 14	
Intervention Level	Assisted Self-Recovery
Stream Morphology	None
Riparian Vegetation	Riparian planting at two identified planting sites (PS #41-42)
Infrastructure	None
Aquatic Habitat	Enhance overhaed cover by joint planting rip-rap at identified planting site (PS #42)
Flood Related Threats	Resurvey National Flood Insurance Program (NFIP) map to more accurately reflect the active stream channel
Water Quality	None
Further Assessment	Monitor morphological response throughout the unit

Historic Conditions

As the glaciers retreated about 12,000 years ago, they left their “tracks’ in the Catskills. Rubin (1996) mapped the presence of unconsolidated glacial deposits along this entire section of the stream corridor (See Section 2.4, Geology of the Stony Clove Creek, for a description of these deposits). Unconsolidated deposits are not expected to contain significant amounts of clay, which can impair water qua lity.

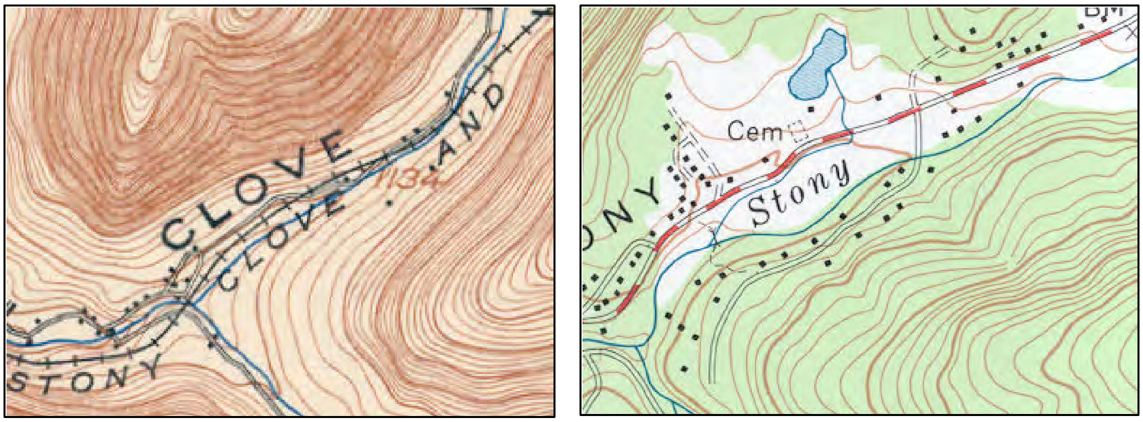


Figure 2 Excerpts from USGS topographic maps, illustrating development between 1903 and 1960

In this management unit the Stony Clove Creek valley begins to broaden slightly as it approaches the confluence of Warner Creek. A comparison of 1903 and 1960 USGS topographic maps show the development of the pond on Sunshine Hill, the roads and bridges of Stony Clove Lane and Weiss Road, and most of the residential development currently evident (Fig. 2).

Figure 3 Historic channel alignments in Management Unit 14

As seen from the historical stream alignments, the *planform* of the stream channel has remained fairly stable over the years (Fig. 3).

At the top of the management unit, on the right, some channel shifting is evident. The channel was realigned to the right following the 1996 flood, to increase its distance from the house. The channel created by the flood flows was filled with the excavated material.

According to available NYS DEC records there have been eight stream disturbance permits issued in this management unit.

Six of these permits were issued in response to damage from the 1996 flood. A permit was issued to Steven David Braff to grade a gravel bar to restore a lawn area, fill an

Figure 4 Bridge At Weiss Road April 24, 2000

overflow channel, and remove trees, roots, and debris from the stream bank. Two permits were issued to Maggie McGibbon & Enid Bloom to install rip-rap and move rocks for a stream crossing. No rip-rap on this property was noted during the stream feature assessment, indicating this rip-rap was never installed or has since failed and washed away. John Chiacchiera was issued a permit to restore his stream bank, install rip-rap, and remove woody debris (Inset C). The Chichester Property Owners Association was issued a permit to repair both bridge abutments at the private bridge on Weiss Road, by placing large rocks to protect the abutments (Inset A). Gravel was collected from the stream channel to use as backfill. Randy Ostrander was issued a permit to remove 500 yd3 of debris obstructing the Weiss Road Bridge.

In 2000, Theodore Crohn, who owns the second property from the top of the management unit on the right, was issued a permit to place eight large rocks on an eroded stream bank.

From 2000-2003, the Chichester Property Owners Association was issued a permit to replace the existing bridge at Weiss Road with a temporary bridge constructed of two steel beams and wood decking, supported by a rip-rap wall (Fig. 4).

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 1,202 ft. of total channel length (Fig. 1). Revetment has been installed on 22% (519 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 16. “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.

The stream morphology, or shape (i.e., slope, width and depth) changes frequently in this unit (Fig. 5), creating small reaches with differing morphologic characteristics, which are classified as different *stream types* (See Section 3.1 for stream type descriptions).

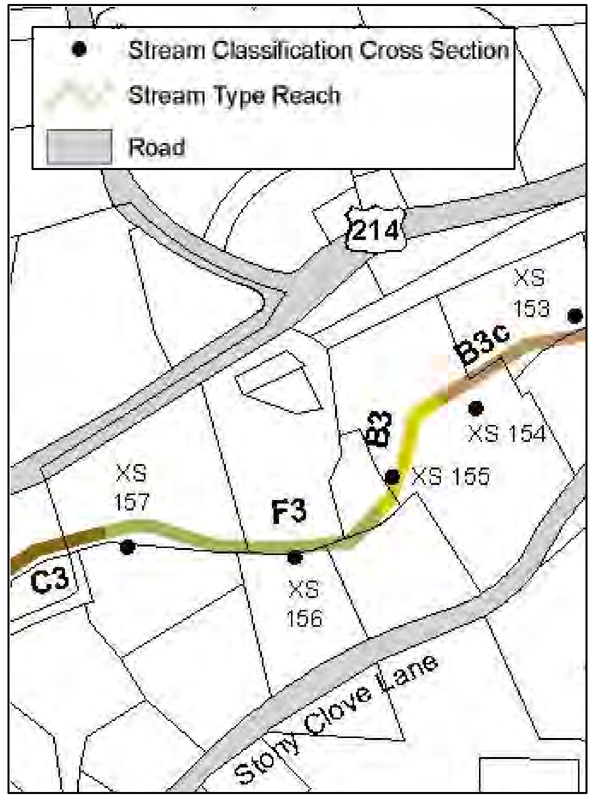


Figure 5 Cross-sections and Rosgen stream types in Management Unit 14

Morphology in this unit has been significantly modified, with extensive channel grading at the top of the reach, and berm-induced entrenchment at the bottom. Despite these disturbances, the unit appears to be recovering. As many of the disturbances are relatively recent, this unit should be monitored for unfavorable response trends, including vertical and lateral adjustments.

Management unit #14 begins with a 362 ft. reach of B3c stream type (Inset D). This stream reach is moderately *entrenched*, or confined within the stream banks during high flow events. Stream channel is very flat with a slope of 0.5% and dominant bed material is small cobble.

This reach is overwide and shallow. Deposition is common in overwide channels because they lose their ability to transport the stream's *bedload*, resulting in *aggradation*, or a rise in stream bed elevation. Overwide channels typically offer poor fish habitat due to warmer water temperatures and filling of deep pools.

Figure 6 Federally Designated Wetlands

At the end of this reach are two federally designated wetlands (Fig. 6). The smaller wetland, on the right stream bank, is 0.4 acres in size. This wetland is classified as palustrine, with emergent persistent vegetation, which is seasonally flooded. The larger wetland, which is 0.8 acres in size, is located on the left stream bank. This wetland is classified as palustrine scrub-shrub, broad-leaf deciduous, and temporarily flooded. 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 2.6 wetland type descriptions and regulations)

As the stream channel widens and becomes steeper, stream type transitions to a B3 (Fig. 7). This 224 ft. reach of stream remains moderately entrenched and overwide with a slope of 2.2%.

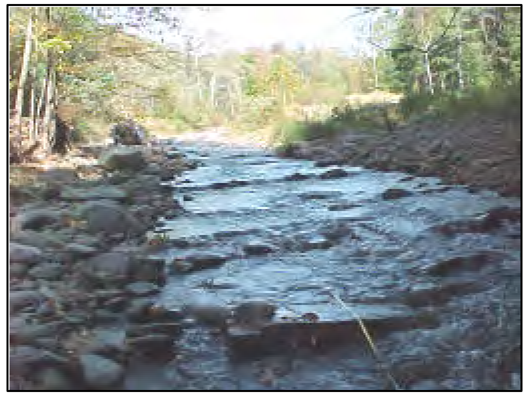


Figure 7 Cross-section 155
Stream Type B3 Looking Upstream

A large gravel bar has formed along the left stream bank. 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 flood water often dissipates its energy by eroding banks and scouring the stream bed. This gravel bar was graded after the 1996 flood to restore the lawn area. The gravel was used fill an overflow channel created during the flood.

Figure 8 Cross-section 157
Stream Type F3

As the channel becomes entrenched, the stream type changes to F3 for the next 572 ft. of stream (Fig. 8). The slope of this reach decreases to 1%.

Figure 9 Cross-section 156, minor toe erosion
Stream Type F3 Looking Upstream

At the top of this reach, the left stream bank has experienced minor toe erosion (Fig. 9). The *shear stress*, or the force of the flowing water, has eroded the toe of this bank during high flow events. As shown in Figure 9, this erosion has compromised some of the existing mature vegetation. Stream bank erosion often occurs on the outside of meander bends where the stream velocity is greatest during high flows.

In the middle of this reach, a berm and rip-rap have been installed along approximately 308 ft. of the left stream bank (Inset C). At the top of this bank is a private residence with a large grass lawn extending to the berm, which has been built around a line of mature trees.

Berms are intended to prevent flood waters from spilling into the floodplain, but in doing so, they can also increase the stream velocity and cause streambed *degradation*. This berm is relatively new, and at the time of the stream feature inventory, did not appear to be causing bed degradation.

Rip-rap has also been installed on 211 ft. of the right stream bank. This rip-rap extends to the end of the management unit.

As the stream approaches the private bridge at Weiss Road, the stream channel begins to narrow (Inset A). For the remaining 44 ft of this management unit, the stream begins to transition into a C3 stream type, but remains entrenched until it passes under this bridge.

Bridges can be highly susceptible to damage or ongoing maintenance problems because they require the stream to pass through a narrow area during flood events. Bridge openings should be sized to eliminate backwater effects through at least bankfull stage, and to convey most larger flood flows without significant damage. Because many bridge approaches are constructed by filling in floodplain areas to raise the roadbed, additional culvert drainage in the floodplain under bridge approaches can also help reduce the risk of bridge failure. Floodplain drainage can also lower flood elevations and minimize sediment deposition upstream of the bridge and bank erosion or scour below the bridge. This bridge has experienced significant damage during flood events. It was most recently upgraded in 2002. This private bridge provides access to the Chichester Country Club and is maintained by the Chichester Property Owners Association.

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).

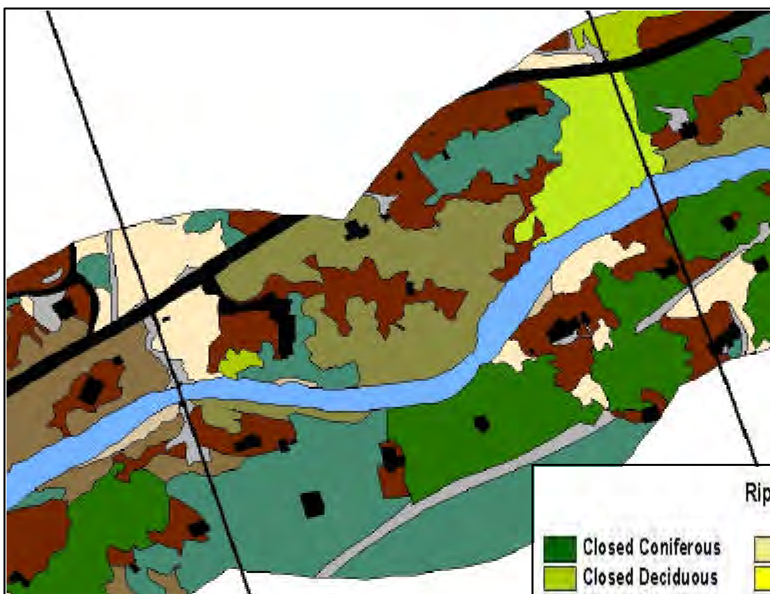
In general, aggradational conditions are evident at the top of the unit, but appear to stabilize as the stream approaches the Weiss Road Bridge. The planform at cross-section 155 appears to have developed an unstable radius of curvature, which may lead to *backwatering* and contribute to the aggradation evident upstream. Indicators of sediment transport imbalances should be monitored in the bermed reach approaching Weiss Road for changes in response to the new berm and bridge installation.

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. 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. 10, Appendix A). Japanese knotweed occurrences were documented as part of the MesoHABSIM aquatic habitat inventory conducted during the summer of 2002 (Appendix B).



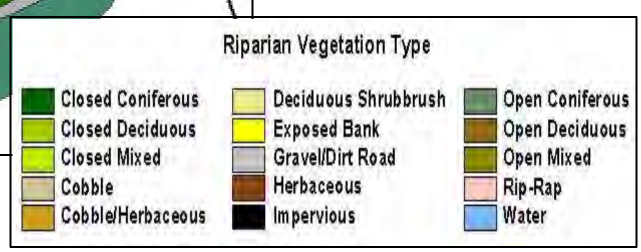


Figure 10 Riparian vegetation map of Management Unit 14

The predominant vegetation type within the 300 ft. riparian buffer is forested (65%) followed by herbaceous (19%) and deciduous shrubbrush (8%). Areas of herbaceous (non-woody) cover present opportunities to improve the riparian buffer with plantings of more flood-resistant species. *Impervious* area (5%) within this unit's buffer is primarily the NYS Route 214 roadway and private residences.

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. 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 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.

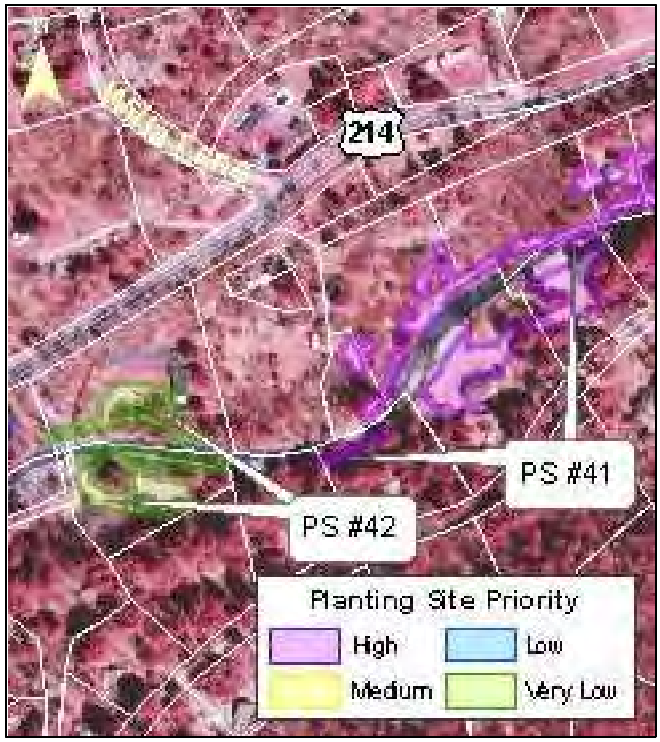


Figure 11 Planting site location map for Management Unit 14

Planting site #41, which includes six properties on both the left and right stream banks, is located at the top of this management unit (Fig. 12).

Figure 12 Planting Site #41 Left Bank

On the right stream bank there is a sparsely vegetated low bench and some upland *old field* areas. On the left stream bank, there is a large gravel bar with extensive upland grass areas. This bank has experienced minor erosion in the past.

On the right stream bank, willows and other native shrubs should be planted on the low bench. Upland plantings of native trees and shrubs in the grass areas will increase the buffer functionality. On the left stream bank, willow *fascines* should be planted along the toe to prevent erosion. Native trees and shrubs should be planted on the stream bank and in upland areas to improve bank stability and buffer functionality.

Planting site #42 is located on two residential properties, on the left and right stream bank, at the end of the management unit (Fig. 13). On the left stream bank a berm and rip-rap (Inset C) has been installed with a few trees along the top of the bank. There is a large grass lawn area behind the berm which extends to the edge of this bank. There is also rip-rap (Inset B) on the right stream bank with some trees and shrubs along the stream bank. At the top of the bank there is a grass area.

Figure 13 Planting Site #42 Left Bank

Recommendations for this site include *joint planting* the existing rip-rap on both banks, by inserting plantings into the soil between the rip-rap rocks. Joint planting will strengthen and increase the longevity of the rip-rap. These plantings will also improve the aquatic habitat by providing shade, which maintains cooler water temperatures. Upland plantings of native trees and shrubs in the grass areas will also improve the stability of these banks and increase the buffer functionality.

<u>Flood Threats</u>

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 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.

Figure 14 100-year floodplain boundary in Management Unit 14

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 are four houses located within the 100-year floodplain boundary in this management unit (Fig. 14). The current NFIP maps are available for review at the Greene and Ulster County Soil & Water Conservation District offices.

Bank Erosion

The stream banks within the management unit are stable, with no major erosion identified during the stream feature inventory. The limited bank erosion within this unit is misleading, as 24% of the stream banks have been hardened with revetment, predominantly in the entrenched reach. There are small areas which seem to have experienced minor erosion.

While rip-rap and other hard controls may provide temporary relief from erosion, they are expensive to install, degrade habitat, and require routine maintenance or transfer erosion problems to upstream or downstream areas. Alternate stabilization techniques should be explored for these stream banks whenever possible.

Infrastructure

Bridges can be highly susceptible to damage or ongoing maintenance problems because they require the stream to pass through a narrow area during flood events. Bridge openings should be sized to eliminate backwater effects through at least bankfull stage, and to convey most larger flood flows without significant damage. Because many bridge approaches are constructed by filling in floodplain areas to raise the roadbed, additional culvert drainage in the floodplain under bridge approaches can also help reduce the risk of bridge failure. Floodplain drainage can also lower flood elevations and minimize sediment deposition upstream of the bridge and bank erosion or scour below the bridge.

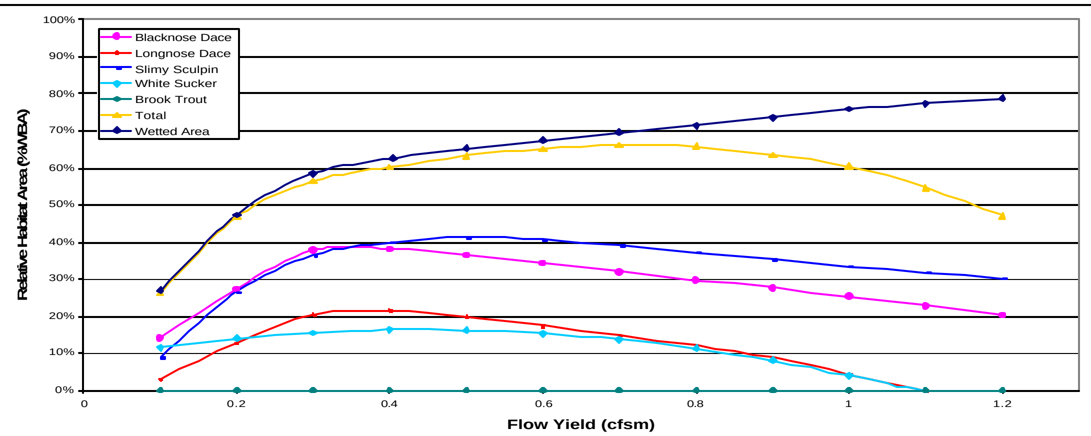
As detailed in the stream disturbance permit section, past flood events have seriously damaged the private bridge at Weiss Road. A new bridge has recently been installed and may help to relieve this threat. The bridge should be evaluated to determine if the new opening is of adequate width to pass bankfull flows without backwatering.

Aquatic Habitat

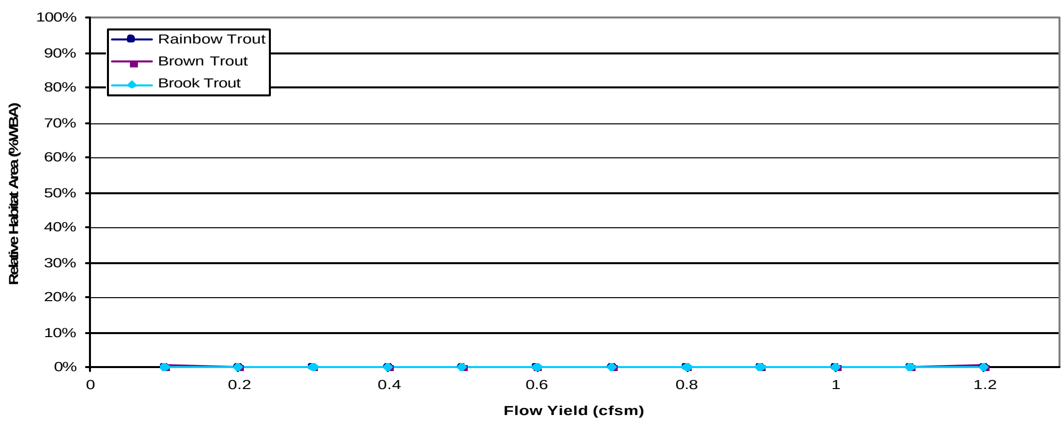
Aquatic habitat was analyzed for each management unit using Cornell University Instream Habitat Program's model called MesoHABSIM. This approach attempts to characterize the suitability of instream habitat for a *target community* of native fish, at the scale of individual stream features (the "meso" 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.

Aquatic habitat was analyzed for each management unit using Cornell University Instream Habitat Program's model called MesoHABSIM (see Section 3.2 for an explanation of methods and analysis).

Management unit #14 has an abundance of shallow margins and should therefore offer good nursery habitat. It also offers some glides along with faster types of units at flows under 1.0 cfsm. With a flow increase above 1.0 cfsm, however, it turns into sizeable ruffle-run sequences only. The *wetted area* covers from one-third to two-thirds of bankfull wetted area, but the largest increase in wetted area occurs between flows of 0.1 cfsm and 0.3 cfsm. This causes a rapid increase in suitable habitat area for low flows, with a gradual decline afterward. Slimy sculpin and blacknose dace have similar levels of habitat with a peak between 0.3 cfsm and 0.8 cfsm and then a gradual decline. Longnose dace and white sucker have half as much habitat available than the other two species with a decline above 0.3 cfsm. Brook trout have no habitat available and the other trout species have only low probability areas. Low flows create twice as many habitat overlaps as higher flows. (See Section 6.6 general recommendations for aquatic habitat improvement)



Rating curve for relative habitat area versus flow for Management Unit 14



Rating curve for trout relative habitat area versus flow for Management Unit 14

Figure 15 MesoHABSIM habitat rating curves for Management Unit 14

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 during 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 are many 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 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). Three homeowners in this management unit made use of this program to replace or repair their septic systems.