Management Unit 15

Ulster County - Town of Shandaken
Weiss Road Bridge to Warner Creek Confluence

Management Unit Description

This management unit begins at the Weiss Road bridge and continues approximately 1,156 ft. to the confluence with Warner Creek. The drainage area ranges from 16.8 mi^2 at the top of the management unit to 17.4 mi^2 at the bottom of the unit. The valley slope is 1.6% and stream water surface slope is 1.9%.

This management unit, while highly confined by infrastructure/residential encroachment and valley form, appears fairly stable. While minor aggradation was noted at one reach, channel conditions throughout most of this management unit appear stable. Management strategies should focus on preservation of channel conditions and enhancement of bank stability and upland buffer function. Potential water quality impacts of stormwater inputs should be evaluated. The steep embankment of NYS Route 214 adjacent to Chichester Country Club should be monitored for possible instability in the future.

Summary of Recommendations Management Unit 15	
Intervention Level	Assisted Self-Recovery / Preservation
Stream Morphology	None
Riparian Vegetation	Riparian plantings at identified planting sites (PS #43-44)
Infrastructure	Monitor embankment of NYS Route 214 for acceleration of erosion trends
Aquatic Habitat	Enhance overhead cover by joint planting rip-rap at identified planting site (PS #43)
Flood Related Threats	Resurvey National Flood Insurance Program (NFIP) map to more accurately reflect the active stream channel
Water Quality	None
Further Assessment	Evaluate potential contamination from storm drainage at culvert outfall

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 in this unit (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 quality. Beginning around XS160, Rubin mapped the presence of lodgement till along the stream corridor. Lodgement till exposures were not noted at the time of the stream feature inventory, though the very bouldery nature of the stream bed below XS160 may reflect the underlying bouldery composition of glacial till.

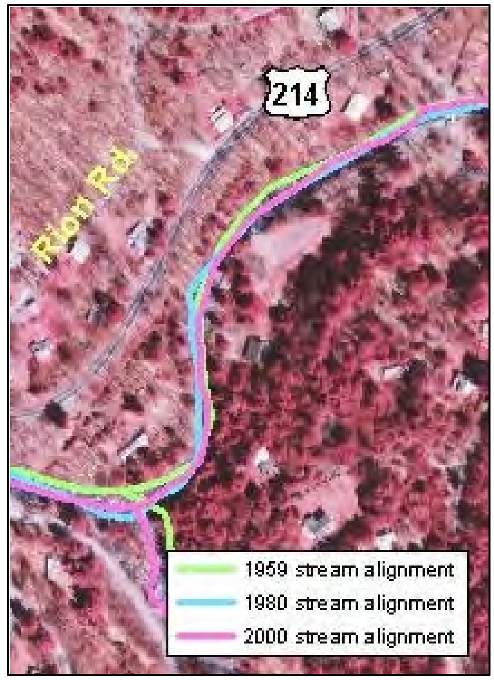


Figure 2 Historic stream alignments in Management Unit 15

As seen from the historical stream alignments, the planform of the stream channel has remained relatively stable since 1959 (Fig. 2).

Figure 3 Temporary Pool Digger

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

All six of these permits were issued to the Chichester Property Owners Association. The first permit was issued in 1992, for the movement of seven large stream boulders to facilitate placement of logs to form a temporary pool digger (Inset B). Permits were issued in 1993, 1997, 1999, 2000, and 2001 to repair this pool digger by repositioning stream boulders that had been moved by high flow events (Fig. 3).

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 1,156 ft. of channel. Revetment has been installed on 6% (141 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 20. "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 frequently in this unit (Fig. 4), creating small reaches with differing morphologic characteristics, which are classified as different *stream types* (See Section 3.1 for stream type descriptions).

The upstream half of this management unit is well connected to its floodplain, and becomes more entrenched moving downstream. Channel slope increases dramatically approaching the downstream end of the management unit. The high channel gradient in the downstream half of the management unit is reflected in the coarsening of bed material. Entrenched channels with high gradients are often prone to incision, or degradation of the bed elevation. However, the large particle sizes found in the downstream reaches of the unit have resulted in a very stable *step-pool morphology*, where large boulders control the bed elevation, and armor the channel against incision.

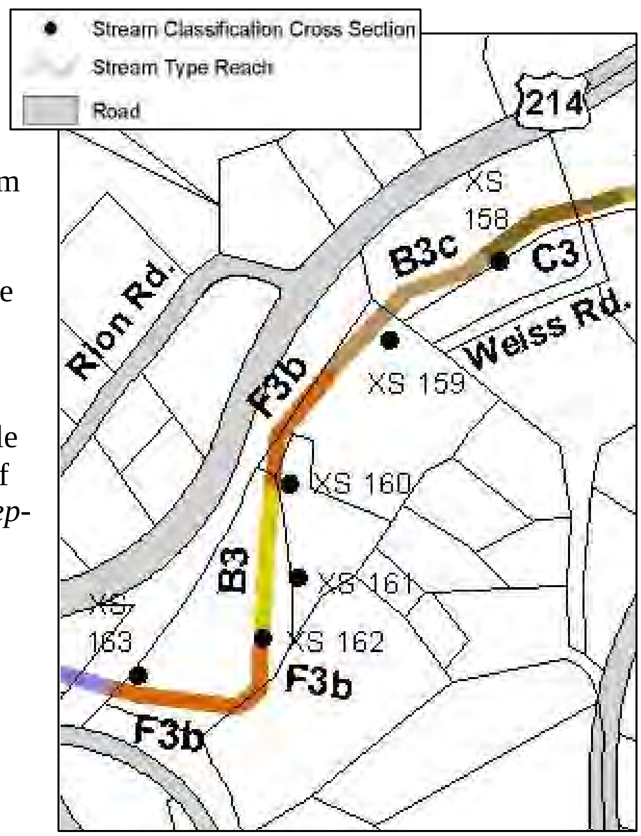


Figure 4 Cross-sections and Rosgen stream types in Management Unit 15

Management unit #15 begins as the stream emerges from underneath the Weiss Rd. Bridge, with a 210 ft. reach of C3 stream type (Fig. 5). This stream reach is only slightly *entrenched*, or usually able to spill into its floodplain during high flow events. Stream channel slope is quite flat at 1.1% and the dominant by cobble sized bed material.

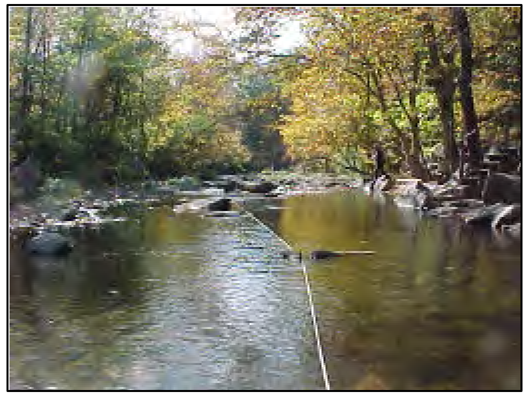


Figure 5 Cross-section 158 Stream Type C3

Figure 6 Rip-rap on right bank looking upstream

Rip-rap has been installed on the first 50 ft. of the right stream bank downstream of the Weiss Rd. Bridge (Fig. 6). Located along this rip-rap is a small stormwater culvert (Inset D). The culvert outfall, lined with large rock material, is set back from the active stream channel, and enters the stream at a low angle. All of these culvert conditions reduce the risk of erosion from stormwater runoff.

As the channel begins to widen and becomes more entrenched, stream type transitions to a B3c (Fig. 7). This 310 ft. reach becomes steeper, with a 1.6% slope.

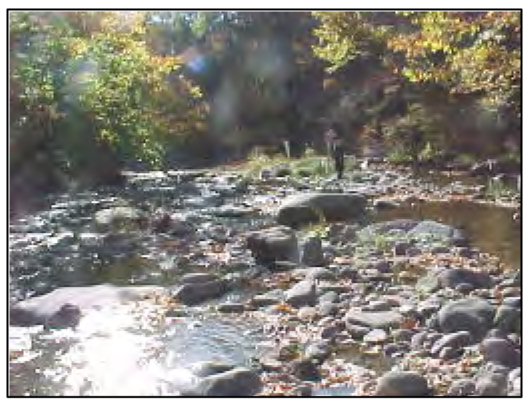


Figure 7 Cross-section 159 Stream Type B3c

This stream reach is overwide. Deposition of bed materials is common in overwide channels because they lose their ability to transport the stream's *bedload*. Under these conditions, streams often *aggrade*, or rise in stream bed elevation, due to excessive deposition. As seen in the Figure 7, aggradation in this reach is causing the stream to become divided into multiple threads. Aggradation also steepens stream channel gradient downstream of the deposition site, by raising the elevation of the channel.

At the top of this reach on the left stream bank, is a federally designated wetland (Fig. 8). This wetland, which is 0.7 acres in size, is classified as palustrine, scrub-shrub, broad-leaf deciduous, temporarily flooded (PSS1a). Wetlands are important features in the landscape, providing 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 for wetland type descriptions and regulations)

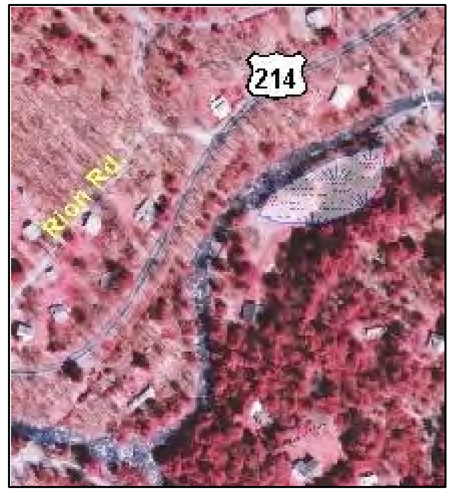


Figure 8 Federally Designated Wetland

As the stream turns to the left, the channel begins to narrow, the stream type changes to F3b (Fig. 9). This 233 ft. reach becomes *entrenched*, or confined within the stream banks during high flow events. This reach steepens to a 2.8% slope. Although there is an abundance of boulders in this reach, dominant bed material is cobble.

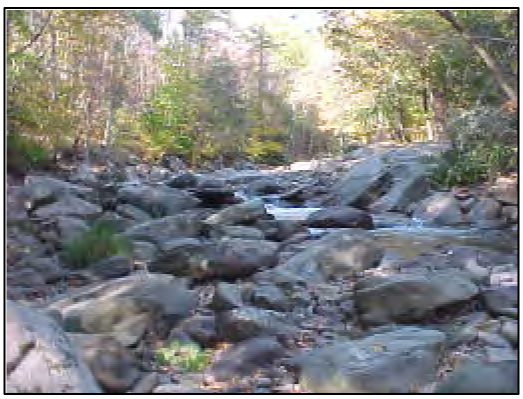


Figure 9 Cross-section 160
Stream Type F3b looking upstream

The *thalweg*, or deepest part of the channel, is pushed against the outside of the meander bend, on the right stream bank. Stream bank erosion often occurs on the outside of meander bends where the stream velocity is greatest during high flows.

To protect this stream bank from erosion, rip-rap has been installed on 141 ft. of the bank (Inset C). NYS Route 214, located at the top of this high stream bank, could become undermined if this stream bank were exposed to severe erosion.

On the left stream bank is the Chichester Country Club, owned and maintained by the Chichester Property Owner's Association. The Country Club consists of a clubhouse with a deck immediately adjacent to the stream bank, and a large grass parking area.

In 1991, The Association installed a temporary pool digger to create a swimming area at the club (Fig. 10). After a large deep pool was created, stream boulders were placed across the


Figure 10 Pool Digger August 18, 1992

stream to hold the grade and maintain the pool (Inset B). As detailed in the stream disturbance permit section, many permits have been issued over the years to reposition the stream boulders, which have been moved during high flow events. These stream maintenance activities do not appear to have significantly disturbed the reach.

As the channel becomes moderately entrenched, stream type changes to B3 (Fig. 11 & Inset A). This 231 ft. stream reach remains fairly steep, with a slope of 2.1%. Although this reach also has an abundance of boulders, the dominant bed material is still cobble. This reach is characterized by numerous cascades followed by plunge pools.

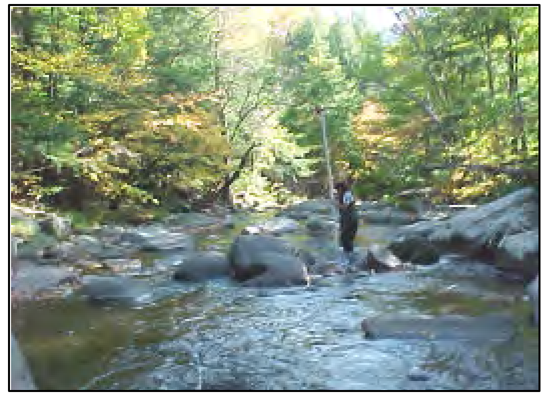


Figure 11 Cross-section 161
Stream Type B3

As the stream *meanders* to the right, the channel becomes entrenched and slope increases, changing stream type to F3b for the last 172 ft. of this management unit (Fig. 12). This reach is extremely steep, with a slope of 4.1%. This reach also has numerous boulders, but the dominant bed material remains cobble.

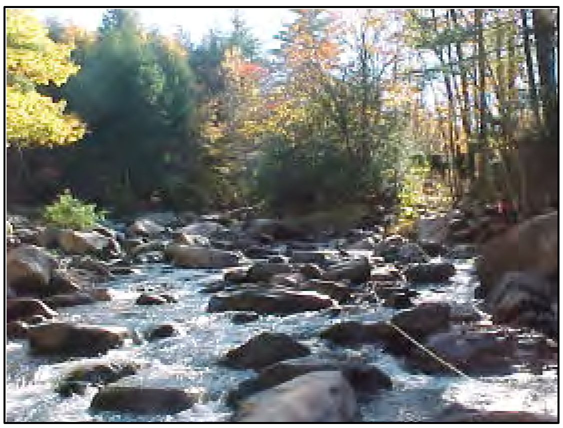


Figure 12 Cross-section 163
Stream Type F3b looking upstream

Sediment Transport

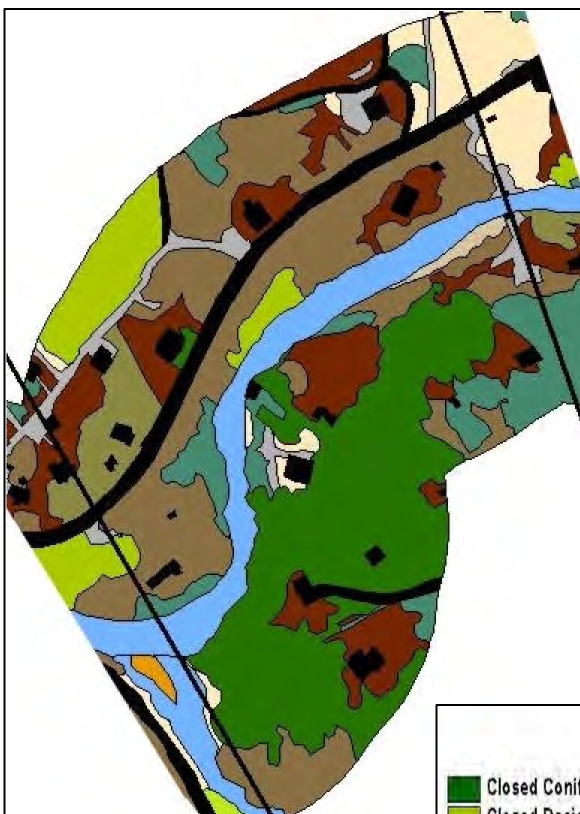
Streams move sediment as well as water. Channel and floodplain conditions determine whether the reach aggrades, degrades, or remains in balance over time. If more sediment enters than leaves, the reach aggrades. If more leaves than enters, the stream degrades (See Section 3.1 for more details on Stream Processes).

The upstream half of this management unit is well connected to its floodplain, and under the current flow and sediment regime, appears somewhat aggradational. Bar development in these reaches has begun to improve sediment transport capacity at bankfull flows. The channel becomes more entrenched and channel slope increases dramatically approaching the downstream end of the management unit. The high channel gradient in the downstream half of the management unit is reflected in the large particle sizes commonly found in the bed. Extremely high shear stresses generated in these reaches are capable of moving even the largest of the boulders found in the bed under flood conditions.

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. 13, 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 (71%) followed by herbaceous (14%) and deciduous shrubbrush (3%). Areas of herbaceous (non-woody) cover present opportunities to improve the riparian buffer with plantings of more flood resistant species. *Impervious* area (8%) within this unit's buffer is primarily the NYS Route 214 roadway and residences.

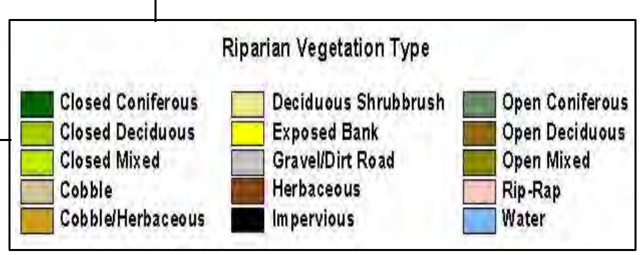


Figure 13 Riparian vegetation map of Management Unit 15

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. 14). 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. Three appropriate planting sites were documented within this management unit.

Figure 14 Planting sites location map for Management Unit 15

Planting site #43 is located on the right stream bank, at the first residence downstream from the Weiss Rd. bridge (Fig. 15). Rip-rap, which has a few mature trees growing through it, has been installed along the stream bank. At the top of the bank is a residence whose grass lawn extends to the edge of the bank.

Figure 15 Planting Site #43

Recommendations for this site include *joint planting* the existing rip-rap, by inserting plantings into the soil between the rip-rap rocks. Joint planting will strengthen and increase the longevity of this rip-rap. Upland plantings of native trees and shrubs in the grass area should be installed to improve bank stability and buffer functionality.

Planting site #44 is located on the left bank at The Chichester Country Club (Fig. 16). This upland area is maintained as a grass parking area, with only a few trees along the edge of the stream bank. As the reach of stream adjacent to the parking area appears aggradational, bank stability is a primary concern at this site. Healthy stream side vegetation helps bind soils in the bank, increasing its resistance to erosion. Recommendations for this site include planting native trees and shrubs along the stream bank in the upland grass area. Increasing the streamside buffer by at least 20 ft. could reduce the risk of erosion to the parking facilities, while improving buffer functionality.

Figure 16 Planting Site #44

Figure 17 Planting Site #45

Planting site #45 is located on right stream bank at the residence near the end of this management unit (Fig. 17). This upland area is maintained as grass with a few trees along the edge of the stream bank.

Plantings of native trees and shrubs within the upland grass area is recommended at this site. Increasing the buffer width by at least 20 ft. could improve buffer functionality and stream bank stability while still allowing a significant lawn area.

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 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

Figure 18 100-year floodplain boundary in Management Unit 15

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 NFIP maps, there is one house located within the 100-year floodplain boundary in this management unit (Fig. 18). 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 fairly stable, with no major bank erosion identified at the time of the stream feature inventory. Implementation of the recommended planting treatments in the unit would help ensure that bank stability is not compromised in the future.

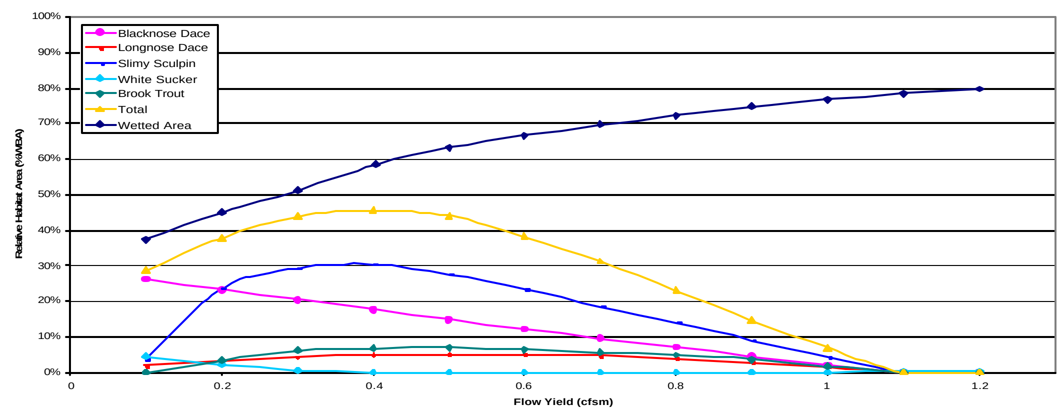
Infrastructure

There were no serious threats to infrastructure identified in this management unit at the time of the stream feature inventory. However, NYS Route 214 is perched high upon the right stream bank near The Chichester Country Club (Inset C). Currently showing signs of minor disturbance, this bank should be monitored for erosion. If the toe of this bank were further compromised, catastrophic failure of NYS Route 214 could result.

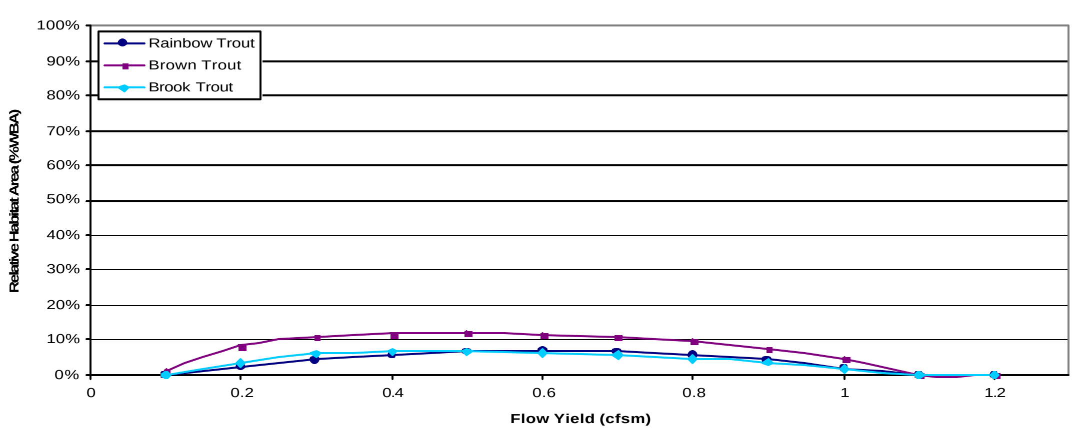
Aquatic Habitat

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 #15 has numerous boulders, shallow margins, good canopy cover shading, and some riprap (Fig. 19). Similar to management unit #14, the wetted area increases quickly between 0.1 cfsm and 0.3 cfsm. Suitable habitat also increases in this range, but it then drops to zero after 1.0 cfsm for all species. This situation could indicate low-flow channel entrenchment. Slimy sculpin and blacknose dace have the highest habitat levels. Brook trout habitat is concentrated in one run and sidearm, with some small usable areas in cascade regions. Brown and rainbow trout also show higher amounts of habitat availability, especially at 0.3 cfsm. Nevertheless, habitat declines rapidly for these two species at higher flows. (See Section 6.6 general recommendations for aquatic habitat improvement)



Rating curve for relative habitat area versus flow for Management Unit 15



Rating curve for trout relative habitat area versus flow for Management Unit 15

Figure 19 MesoHABSIM habitat rating curves for Management Unit 15

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 is one stormwater culvert at the top of this management unit, which drains overflow from the sizable pond on the northwest side of NYS Route 214. Running under and along the highway for some distance, the drainage channel probably also receives road runoff during storm events. As several residences have been established around the pond, outflow should be evaluated for nutrient loading and other possible contamination from household and road sources.

Nutrient loading from failing septic systems is a 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 and other contributing surface waters in this management unit. 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). One homeowner in this management unit made use of this program to replace or repair a septic system.