Management Unit 3

Greene County - Town of Hunter
Cross Section 34 to Cross Section 65

Management Unit Description

This management unit begins at Cross Section 34 and continues approximately 4,055 ft. to Cross Section 65. The drainage area ranges from 3.7 mi^2 at the top of the management unit to 4.2 mi^2 at the bottom of the unit. The valley slope is fairly steep at 3.2% and water surface slope is 3.1%.

Stream conditions in this management unit are fairly stable due to a generally well-vegetated floodplain, bedrock grade control along significant lengths of the unit, and bank revetment in two reaches. The stream is entrenched at several locations, however, confining flows and increasing potential for bed and bank erosion during large storm events, and there is some evidence of bed scour at constrictions associated with narrow bridge openings. Aggradation is occurring at planting site #9. Replacement or maintenance of bridges in the unit should reflect the *morphological* and sediment transport requirements of the unit. GCSWCD will provide technical assistance for bridge replacement and maintenance in the unit. Aquatic habitat is potentially segmented due to migration barrier at Edgewood Falls. There are no significant water quality impairments.

Summary of Recommendations Management Unit 3	
Intervention Level	Assisted Self-Recovery
Stream Morphology	Encourage narrowing and deepening of channel through plantings at identified site (PS #9)
Riparian Vegetation	Riparian plantings at the ten identified planting sites (PS #7-16)
Infrastructure	Geomorphically appropriate bridge replacement design Assess possibility of abandoned bridge removal near cross-section 54
Aquatic Habitat	Enhance overhead cover by joint planting of rip-rap at identified planting sites (PS #9-10)
Flood Related Threats	Resurvey National Flood Insurance Program (NFIP) maps to more accurately reflect the active stream channel
Water Quality	None
Further Assessment	Ongoing assessment of bank erosion monitoring sites #5, 6, 7 Assessment of turbidity sources at the tributary between cross-sections 51 and 52

Historic Conditions

Along this section of the creek, the F.W. Beers 1867 Greene County Atlas shows four residences, a school, three sawmills, a shingle machine and a chair factory, consisting of numerous buildings, run by Grey and Ingersoll (Fig. 2).

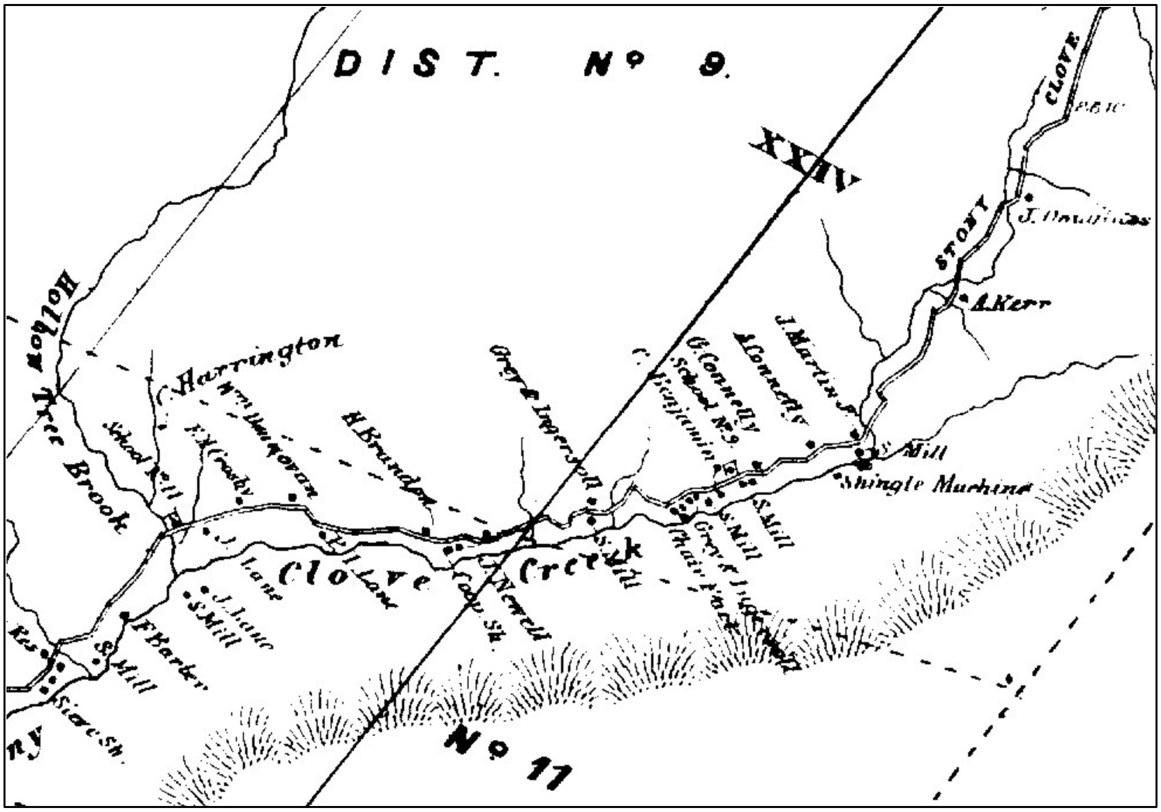


Figure 2 Excerpt from F.W. Beers 1867 Atlas of Greene County

It is not known how the mills impacted the stream, but it can be presumed that there would have been significant clearing in the vicinity of this "neighborhood." Historical stream channel alignments are not available for this management unit. This unit is located near the top of the watershed where the stream is smaller and covered by tree canopy, making its channel difficult to distinguish on aerial photographs.

According to available NYS DEC records there have been five stream disturbance permits issued in this management unit area. Two of these permits were issued after the 1996 flood event. One permit was issued to Audrey Caracci to replace rip-rap on the right stream bank of the property (Inset C). The other permit was issued to William Nowaski to repair damages to a bridge and install rip-rap on the right stream bank upstream and downstream from this bridge (Inset B).

The three other permits were all issued for the bridge which is currently abandoned (Fig. 25). The first was issued in 1980, to Barry McKee, for placement of a stone bed sill with low flow notch on the downstream side of the bridge. This permit was amended in 1987 to allow the landowner to fortify the concrete footing of the bridge because they were being undermined by the stream, attributed by the landowner to an apparent stream bed elevation drop of two ft. The last permit for this site was issued in 1993 to Salvatore Callesano, to construct retaining forms at the base of the bridge abutments, pour concrete in voids for reinforcements, and to place rip-rap at the base of the abutments.

Stream Channel and Floodplain Current Conditions

Revetment, Berms and Erosion

The 2001 stream feature inventory revealed that 3% (264 ft.) of the stream banks exhibited signs of active erosion along 4,055 ft. of total channel length (Fig. 1). Revetment has been installed on 6% (477 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 46 "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. 3), creating small reaches with differing morphologic characteristics, which are classified as different *stream types* (See Section 3.1 for stream type descriptions).

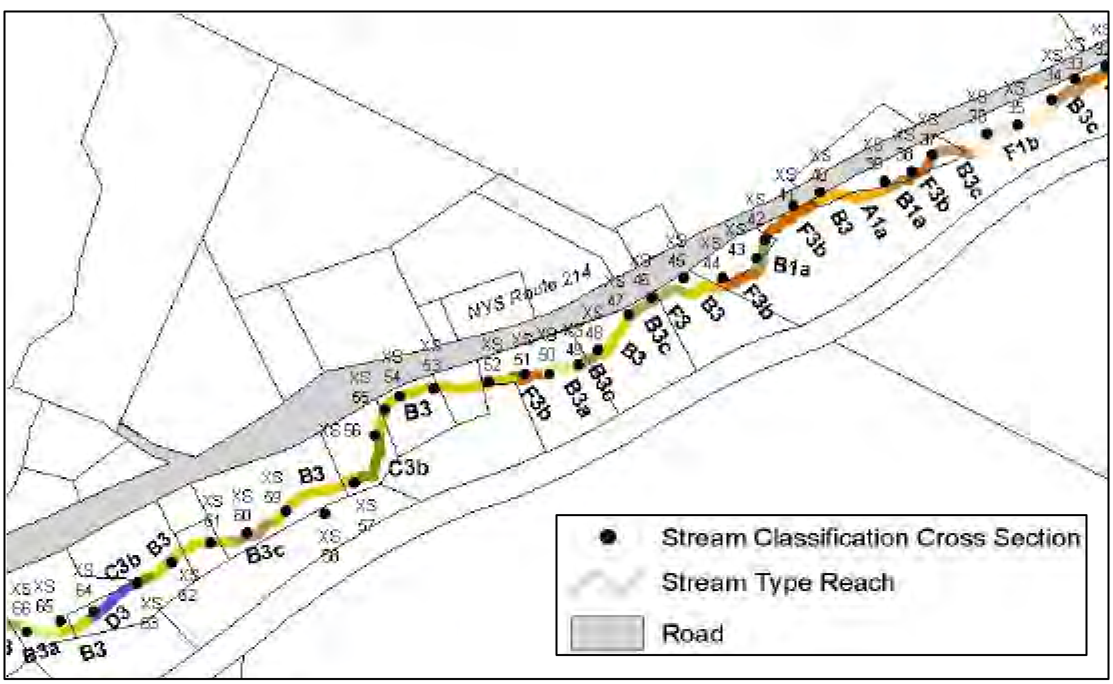


Figure 3 Cross-sections and Rosgen stream types in Management Unit 3

Bedrock dominates bed material in the upper reaches, and ultimately prevents changes in bed elevation from migrating any further upstream. The unit is laterally controlled for much of its length by valley form, with a very constricted stream corridor, exacerbated by encroachment from road and rail embankments.

Management unit #3 begins just downstream of cross-section 34 as the stream is transitioning from a B3c stream type into F1b (Fig. 4). This 280 ft. reach is *entrenched* with a wide bedrock stream channel, which is fast and shallow.

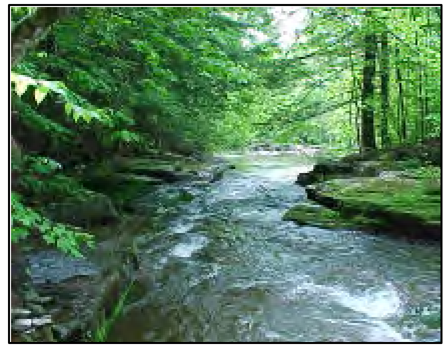


Figure 4 Cross-section 36 Stream Type Flb

Approximately halfway into this reach is a small unnamed tributary which enters from the right bank (Fig. 5). As seen in the photo, this tributary releases *turbid* water into Stony Clove Creek. As this turbid water enters the creek, it is quickly diluted. The source of this turbidity should be investigated. The tributary is not classified under the NYS DEC best usage classification system. At the end of the reach the bedrock channel narrows into a "*sluiceway*" and the flow velocity increases until the stream drops into a large pool.

Figure 5 Tributary

This short 133 ft. B3c stream reach is a deep cobble bottomed pool (Fig.6). The reach is moderately entrenched with gentle 1.9% slope. On the left stream bank is a bedrock ledge and on the right bank, an area along NYS Route 214, formerly a gravel pullout, has recently been vegetated with shrubs. This vegetated area will help to buffer the stream from the effects of stormwater runoff from the roadway.

Figure 6 Cross-section 37 Stream Type B3c

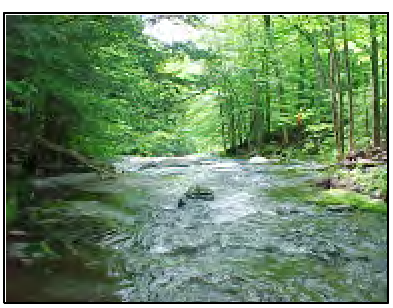


Figure 7 Cross-section 38 Stream Type F3b

As the stream emerges from the pool, it turns slightly, moving away from NYS Rt. 214. Stream type changes to F3b for the next 129 ft. reach (Fig. 7). The stream once again becomes entrenched and the stream widens. The slope increases to 2.6%.

Proceeding downstream, stream type changes to B1a (Fig. 8). This short 63 ft. reach is moderately entrenched with a wide bedrock stream channel. Slope increases dramatically to 4.6%.

Approximately midway through this reach, an unnamed tributary, not classified under the NYS DEC best usage classification system, enters the creek from the right bank.

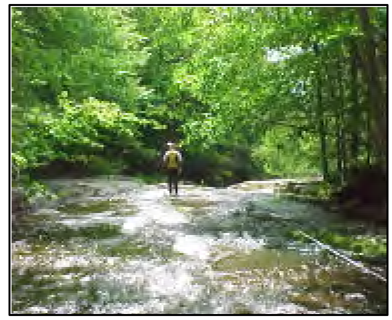


Figure 8 Cross-section 39 Stream Type B1a

Figure 9 Rip-Rap

At the end of this reach the stream flows over a waterfall, known locally as Edgewood Falls (Inset H). This 154 ft. reach of A1a stream type is a bedrock waterfall which drops into a deep pool. As the streams runs out of the pool it meanders closer to NYS Route 214. At the end of this reach, 42 ft. of rip-rap, composed of large stream rocks, have been placed on the right bank (Fig.9).

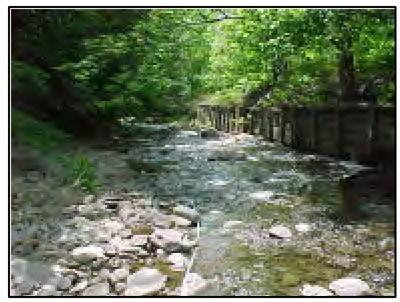


Figure 10 Cross-section 40 Stream Type B3

The next 79 ft. reach of B3 stream type is moderately entrenched and the dominant channel bed material size decreases to cobble (Fig. 10). The stream flows against a high steep right T-wall bank, approximately 200 ft. in length, at the top of which is NYS Route 214 (Inset D). Constructed by the NYS DOT, this wall secures the road embankment toe at a severe constriction point in the stream corridor.

Figure 11 Cross-section 41 Stream Type F3b

As this reach ends, the channel becomes entrenched, changing to an F3b stream type for the next 306 ft. (Fig.11). The T-wall continues along the right bank for half of this reach, where it ends as the stream begins to meander away from NYS Route 214.

Figure 12 Culvert outfall

A stormwater culvert with a concrete headwall outfalls from the right stream bank, dropping stormwater onto a fairly steep slope before entering the stream (Fig. 12). This is normally a cause for concern because it may result in bank erosion but this drainage way has large cobble bed material providing some protection from erosion. Immediately downstream from this culvert a small unnamed tributary enters the creek from the right bank. This tributary is not classified under the NYS DEC best usage classification system.

At the end of this reach, 54 ft. of rip-rap has been placed along the right stream bank on the outside of the meander bend, at a residence (Inset C). Stream bank erosion often occurs on the outer banks of streams where velocity is greatest.

Proceeding downstream, the stream channel and left bank become bedrock. Stream type has changed to B1a for the next 89 ft. of stream. The stream is moderately entrenched and slope increases dramatically to 5.1%. A small unnamed tributary enters the creek from the left bank. This tributary is not classified under the NYS DEC best usage classification system.

The next 84 ft. of stream is classified as F3b (Fig. 13). Although the dominant bed material size changes to large cobble, there is still a significant amount of bedrock in the channel and along the left bank. This stream reach is entrenched and slope decreases to 4%.

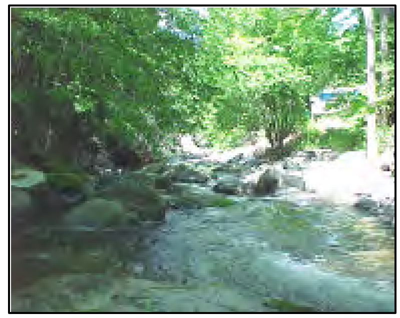


Figure 13 Cross-section 44 Stream Type F3b

At the end of this reach, bedrock ends as the stream type transitions to B3 stream for the next 138 ft. (Fig. 14). This reach is moderately entrenched and slope decreases to 3%. The stream begins to meander back toward NYS Route 214, moving the outside bend to the right bank.

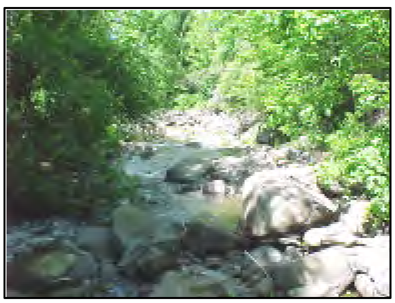


Figure 14 Cross-section 45 Stream Type B3

Once again the stream becomes entrenched, changing stream type to F3, for the next 109 ft. (Fig. 15). The channel slope decreases further to 1.3%. As the stream flows into the right bank, rip-rap has been installed to protect a residence (Inset G). This rip-rap wall extends 162 ft. downstream. At the end of this reach a small unnamed tributary enters the creek from the left bank. This tributary is not classified under the NYS DEC best usage classification system.

Figure 15 Cross-section 46 Stream Type F3

Approximately midway through this rip-rap section, the stream becomes moderately entrenched and slope flattens to 0.3%. The stream type changes to B3c for this 106 ft. stream reach (Fig. 16). Figure 16 illustrates how this flattening of the slope can result in the deposition of sediment and the raising of the stream bed, a process known as *aggradation*. When a stream begins to aggrade, it becomes wider and shallower, causing the stream to become divided into multiple threads with *central bars*. Central bars direct streamflows against both right and left outside banks, frequently resulting in erosion, and potentially exacerbating further the overwide condition.

Figure 16 Cross-section 47
Stream Type B3c

Aggradation also steepens the gradient downstream of the deposition site. This proves true for the next 209 ft. reach of B3 stream type (Fig. 17). The slope of this moderately entrenched reach increases to 3.5%.

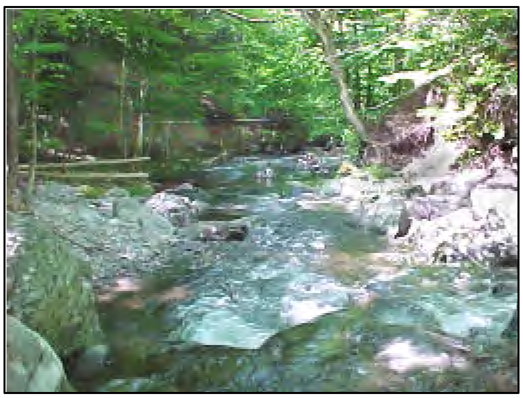


Figure 17 Cross-section 48
Stream Type B3

Bank erosion monitoring site #5 is located on the right bank at the end of this reach (Inset F). The thalweg was probably up against this bank in the past, causing the right bank to undercut. The stream has now migrated away from this bank, reducing the *shear stress* and the imminent threat of erosion.

The Bank Erodibility Hazard Index (*BEHI*) score of site #5 is ranked "High", the third highest prioritization category in terms of its vulnerability to erosion. However, this bank erosion site is considered a low priority for restoration due to its small eroding area (552 ft^2), low shear stress, its lack of significant threat to infrastructure or water quality, and its trend toward self-recovery. Rubin's (1996) stream corridor geology map indicates that the stream cuts through unconsolidated deposits in this reach (See Section 2.4, Geology of the Stony Clove Creek, for a description of these deposits).

As the stream continues, it transitions into a small 84 ft. reach of B3c stream type, due a slope decreases to 1.7%. Immediately downstream channel slope increases again to 5.4%, as the stream type changes to B3a for the next 100 ft (Fig. 18).

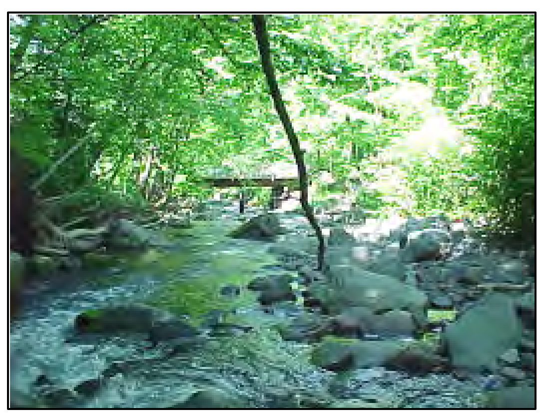


Figure 18 Cross-section 50
Stream Type B3c

The stream becomes entrenched as it approaches a private bridge, and the slope decreases to 3.6% (Inset B). The stream type changes to F3b for the next 131 ft. (Fig. 19).

This private bridge has a plank deck with log abutment. This bridge sustained damage during the 1996 flood event. A DEC permit was issued to repair the bridge and install rip-rap adjacent to the abutments. Bridges are likely erosion sites during high flow events, when *backwater* elevates the water surface upstream of the bridge, increasing slope, depth and shear stress through the bridge opening. Abutments are prone to scour as a result. Downstream of bridges, turbulence called *backeddy scour* can further undermine abutments and adjoining bank revetment.

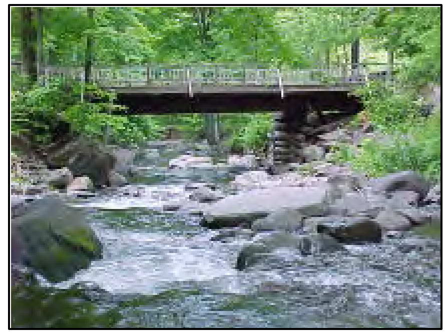


Figure 19 Cross-section 51 Stream Type F3b

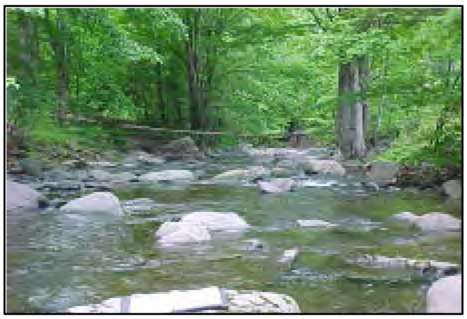


Figure 20 Cross-section 52 Stream Type B3

Downstream of this bridge, stream type transitions into B3 for the next 530 ft. (Fig. 20). This stream reach is moderately entrenched with a 3.1% slope.

An ephemeral tributary runs along the downstream right bridge abutment. This tributary carries turbid stormwater, possibly caused by the gravel mining operation across NYS Route 214. The source of turbidity should be confirmed through further assessment, and mitigation practices promoted.

The residential property owner on the left streambank reports that drainage from NYS DEC owned land above the abandoned railroad upslope from their property directs stormwater flow to the backside of their home. Opportunities for mitigation of this problem should be evaluated in cooperation with NYS DEC.

Approximately 180 ft. downstream, another ephemeral tributary has been piped, and enters the creek from the right bank through a PVC pipe (Fig. 21).

Figure 21 Piped tributary

Continuing downstream, the stream begins to meander to the left. The stream must pass through another bridge abutment (Fig. 22). The permit history indicates repairs at this site following most major floods, in order to address abutment scour. This bridge, which does not have a deck, is currently abandoned. However, the concrete abutments continue to impact stream morphology. Options for removal should be evaluated.

Figure 22 Abandoned Bridge

A corrugated stormwater culvert enters from the right on the outside of the meander bend (Fig. 23). This culvert outlet is lined with large cobbles, is set back from the active stream channel, and enters the stream at a low angle. All these conditions reduce the risk of erosion from stormwater runoff.

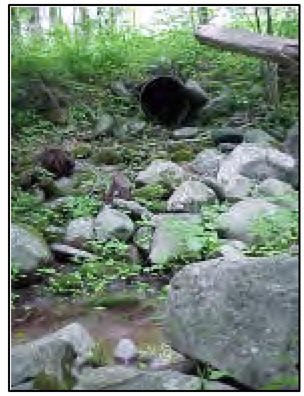


Figure 23 Culvert

As the stream flows out of the meander bend, stream type transitions to C3b (Fig. 24). This 190 ft. reach is only slightly entrenched, indicating the stream's ability to overflow into its floodplain during flood flows. The slope of this reach increases slightly to 3.6%. Bank erosion monitoring site #6 is located on the left outside meander bend of this reach (Inset E). This eroding bank measures 64 ft. in length. Although the face of the bank is bare soil, the top of the bank is well vegetated with trees and shrubs. A small unnamed tributary runs down the face of this bare bank, possibly contributing to the erosion (Fig. 25). Ongoing monitoring of this site should include an evaluation of the upland drainage issue.

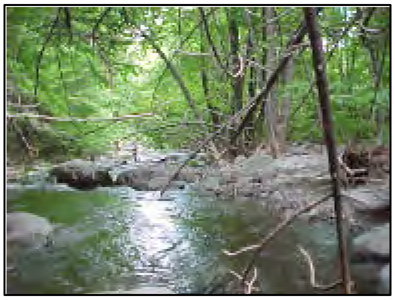


Figure 24 Cross-section 57
Stream Type C3b

The BEHI score of site #6 is ranked "High", the third highest prioritization category in terms of its vulnerability to erosion. However, this bank erosion site is considered a low priority for restoration due to its small eroding area (687 ft^2) and its lack of significant threat to infrastructure or water quality. According to Rubin's 1996 stream corridor geology map, the stream throughout most of this reach is cut through unconsolidated deposits.

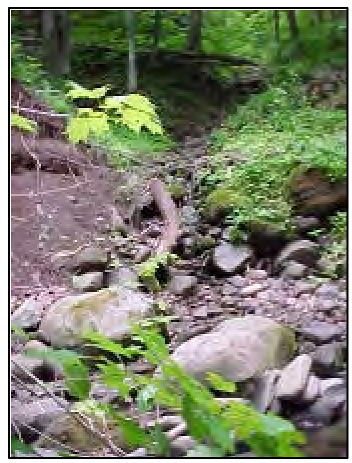


Figure 25 Tributary

As the stream flows out of this meander bend, it becomes moderately entrenched, transitioning into a B3 stream type (Fig. 26). This 332 ft. stable reach has a slope of 3.1%.

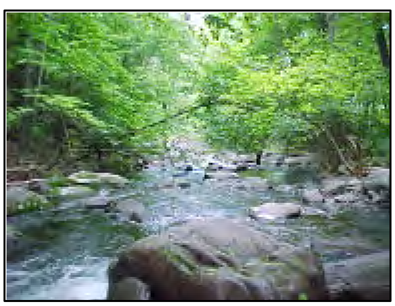


Figure 26 Cross-section 58
Stream Type B3

As the stream slope decreases to 1.2%, the stream type changes to B3c for the next 127 ft. (Fig. 27). Bank erosion monitoring site #7, which is approximately 165 ft. in length, is located along the left outside bank (Inset A). High flows have scoured the vegetation from the face of this bank.

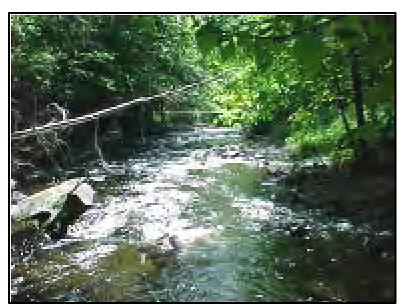


Figure 27 Cross-section 60
Stream Type B3c

The BEHI score of site #7 is ranked "High", the third highest prioritization category in terms of its vulnerability to erosion. Although this bank erosion site has large area (2129 ft^2), it considered a low priority for restoration due to its lack of significant threat to infrastructure or water quality. Rubin (1996) identified unconsolidated deposits here.

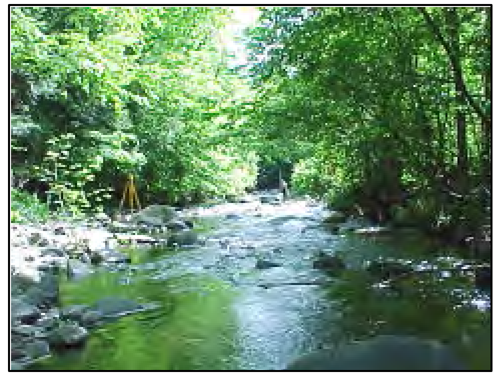


Figure 28 Cross-section 62
Stream Type B3

Downstream of this eroding bank, slope increase to 2.8%, as stream type changes back to B3 (Fig. 28). This 287 ft. reach is moderately entrenched.

Figure 29 Cross-section 63
Stream Type C3b

As the stream reconnects with its floodplain, stream type changes into C3b (Fig. 29). Along this short 37 ft. reach, slope increases to 4.5%.

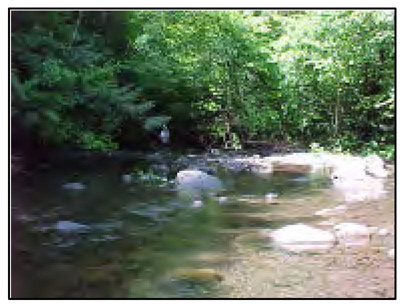


Figure 30 Cross-section 64
Stream Type D3

Continuing downstream, slope decreases to 1.3% and the channel widens. This D3 stream type continues for 193 ft (Fig. 30). While this reach has three channels, it is not a classic, unstable D stream type, with active gravel bars and channels that migrate through aggrading bed material. While this reach appears aggradational, it is exhibiting trends toward self-recovery. As the *side-channels* revegetate, the morphology is stabilizing, developing a floodplain and consolidated channels.

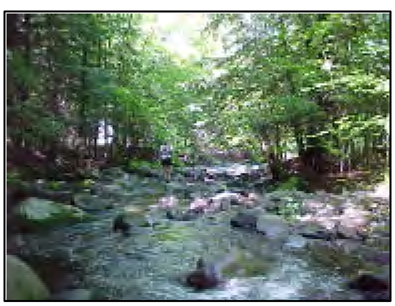


Figure 31 Cross-section 65
Stream Type B3

At the end of this reach, the stream channel narrows, steepens to 3.3% and becomes moderately entrenched (Fig. 31). The stream type has changed into B3 for the remaining 122 ft. of this management unit.

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).

With only minor tributaries in this management unit, most of the sediment supply comes from the main channel upstream, and from bed and banks within the unit. Extensive bedrock reaches at the top of the unit prevent upstream migration of any *headcuts*. Frequent fluctuations in entrenchment throughout the management unit resulting from valley confinement and road encroachment, as well as the effect of the several private stream crossings, manifest their influence in the form of apparent localized aggradation and degradation. While anecdotal evidence indicates bed degradation has occurred in recent decades, this appears to be moderated by the large size of bed material and generally healthy vegetation in the riparian zone. None of the erosion sites appear to contribute significant volumes of *washload* or *bedload* to the stream system.

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

The predominant vegetation type within the 300 ft. riparian buffer is forested (53%) followed by herbaceous (34%). Areas of herbaceous (non-woody) cover present opportunities to improve the riparian buffer with plantings of more flood-resistant species. *Impervious* area (4%) within this unit's buffer is primarily the NYS Route 214 roadway and private residences.

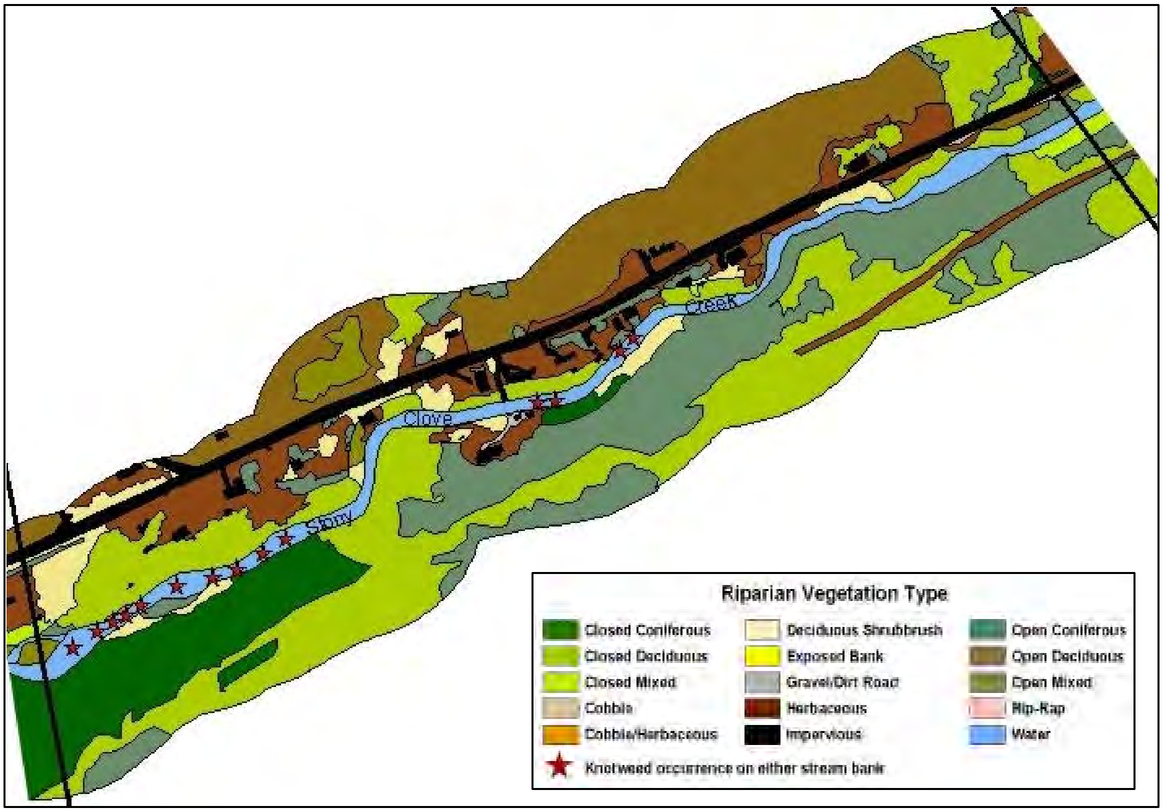


Figure 32 Riparian vegetation map Management Unit 3

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. 33). 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. Ten appropriate planting sites were documented within this management unit.

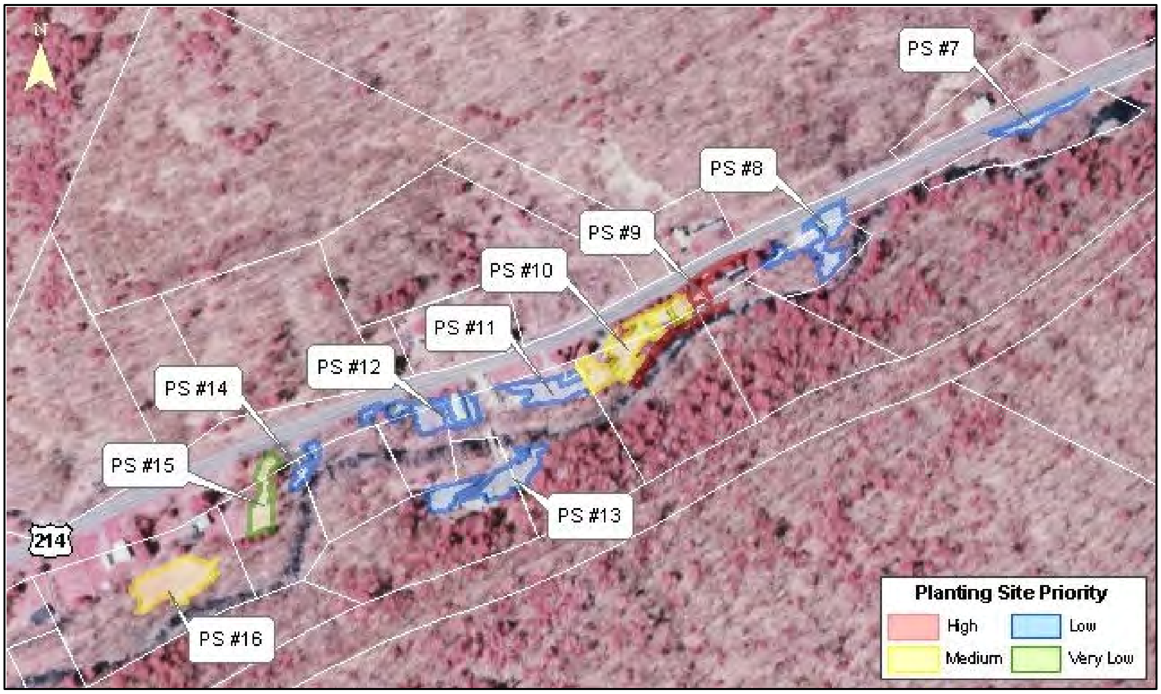


Figure 33 Planting Sites Location Map

Planting site #7 is located on the right bank at Edgewood Falls (Fig. 34). Currently, this area is grass with a few trees at the top of a high bank. To improve this upland buffer, it is recommended to plant this mowed area with native trees and shrubs.

Figure 34 Planting Site #7

Figure 35 Planting Site #8

Planting site #8 is located at a two-family residence (fire#2504) on NYS Route 214 (Fig. 35). There is a large grass lawn area and scattered trees along the steep stream bank. Increasing buffer width by at least 20 ft. could increase buffer functionality while still allowing a significant lawn area.

Planting site #9 is located at a residence (fire#2474) on NYS Route 214 (Fig. 36). There is currently a grass lawn area with a few trees at the top of the stream bank, which is armored with rip-rap.

Inserting plant materials into the soil between rip-rap rocks, or *joint planting,* is recommended at this site.

Figure 36 Planting Site #9 Left Bank

Joint planting will strengthen and increase the longevity of this rip-rap, while adding aesthetic and habitat value. Increasing buffer width by at least 20 ft. could increase buffer functionality and improve stream bank stability while still allowing a significant lawn area. The left bank at this site could also benefit from tree and shrub plantings along the stream bank and upland buffer. The stream channel at this site is over-wide and aggrading. In-channel plantings of sedges and willows could encourage the stream channel to narrow into a more stable morphology.

Figure 37 Planting Site #10

Planting site #10 is located at a residence (fire#2476) on NYS Route 214 (Fig. 38). There is currently a grass lawn area with scattered trees and some Japanese Knotweed on the steep stream bank, which is armored with rip-rap.

Joint planting is recommended at this site to strengthen and increase the longevity of this rip-rap, while adding aesthetic and habitat value. Increasing the buffer at least 10 to 20 ft. could increase the buffer functionality and improve stream bank stability while still allowing a significant lawn area. It is also recommended to remove the Japanese Knotweed, which is an invasive non-native species believed to contribute to bank erosion.

Planting site #11 is located at two mobile home residences (Fig. 39, fire#2456 & #2442). At this site there is a large grass lawn area, with some trees on the steep right stream bank. There is Japanese Knotweed growing on the fill area at the top of the bank.

Increasing the buffer width by at least 20 ft. is recommended to increase buffer functionality and improve stream bank stability while still allowing a significant lawn area. Japanese Knotweed should be removed from this site.

Figure 38 Planting Site #11

Figure 39 Planting Site #12

Planting site #12 is located at the first two residences downstream from the private bridge on the right stream bank (Fig. 40). These residences have some trees along the stream bank and grass lawn areas at the top of the bank.

At this site it is recommend that additional trees and shrubs be planted along the stream bank as well as to increase planting at the top of the bank to create a buffer. This will provide greater bank stability and habitat value for the stream.

Planting site #13 is located at the first residence downstream from the private bridge on the left stream bank (Fig. 41). This residence has some trees along the stream bank and garden area at the top of the bank.

Plantings of native trees and shrubs along the stream bank to increase the density of vegetation on this bank, is recommended. Increasing this buffer will help prevent bank erosion and provide habitat value.

Figure 40 Planting Site #13

Figure 41 Planting Site #14

Planting site #14 is located at the residence (fire# 2406) along NYS Route 214 on the right stream bank (Fig. 42), at the abandoned bridge. This residence has a grass lawn area and scattered trees along the stream bank.

Recommendations include plantings of native trees and shrubs along the stream bank to increase the density of vegetation on this bank. Increasing this buffer will help prevent bank erosion and provide habitat value. Plantings should also be implemented in the upland area.

Planting site #15 is located at the residence (fire# 2384) along NYS Route 214 on the right stream bank (Fig. 43). This site has a large grass lawn area, which is a considerable distance away from the stream, and a well vegetated stream bank. To improve buffer functionality native trees and shrubs should be planted in this upland area.

Figure 42 Planting Site #15

Figure 43 Planting Site #16

Planting site #16 is located at the residence (fire# 2368) along NYS Route 214 on the right stream bank (Fig. 44). This site has a large grass lawn area with trees on the steep stream bank. Increasing buffer width by at least 20 ft. will 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 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.

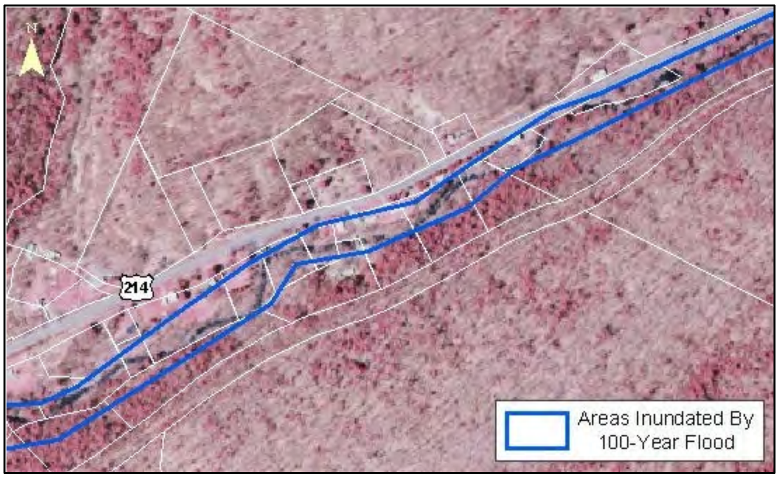


Figure 44 100-year floodplain boundary in Management Unit 3

According to the NFIP maps, there are six houses located within the 100-year floodplain boundary in this management unit (Fig. 44). The current NFIP maps are available for review at the Greene and Ulster County Soil & Water Conservation District offices.

Bank Erosion

The majority of stream banks within the management unit are stable; with only 3% of the stream banks are experiencing erosion. There are three bank erosion sites, totaling 264 ft. in length, in this management unit. These erosion sites are considered a low priority for restoration due to the lack of threat to both infrastructure and water quality.

Infrastructure

The record of stream disturbance permits indicates that both bridges in this management unit have been severely damaged in past flood events. 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.

Although approximately 347 ft. of the stream is located within 50 ft. of NYS Route 214, there are no serious flood threats to this roadway. The one reach at the top of the management unit, where the stream did threaten NYS Route 214 has been heavily armored with a concrete T-wall (Inset D).

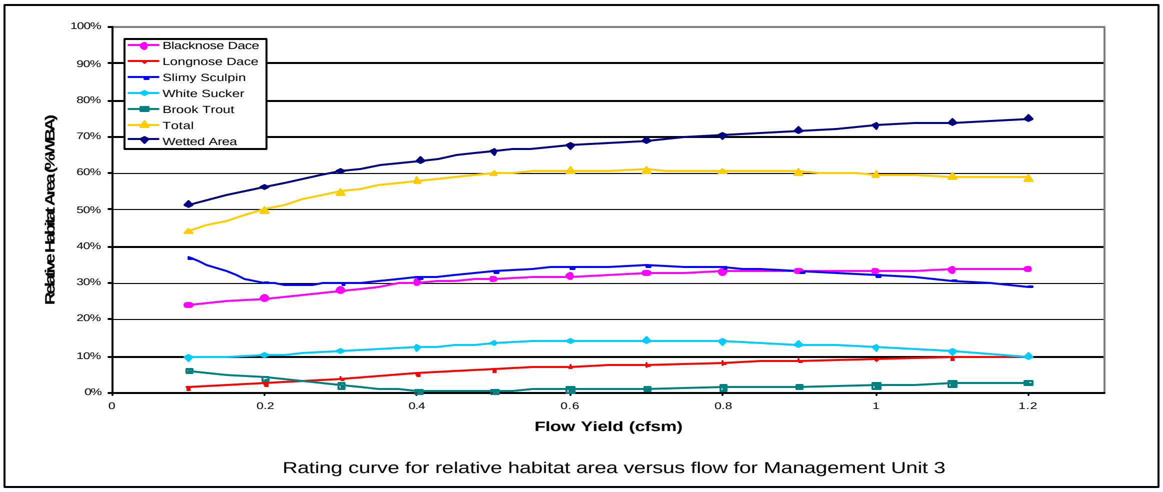
There are two sections of rip-rap (Inset C & D) in this management unit which are protecting residential properties. Both of these banks are located on the outside of meander bends, where stream velocity is greatest during high flow events. While rip-rap and other hard controls may provide temporary relief from erosion, they are expensive to install, degrade habitat, often require ongoing maintenance or transfer erosion problems to upstream or downstream areas. Alternative stream bank protection measures, including *bioengineering* treatments which are self-maintaining and often less costly than hard controls, should be considered if replacement becomes necessary.

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 #3 is dominated by runs and contains several bedrock areas with boulders, large substrate, and some woody debris. It is slightly deeper and faster than management unit #2. At very low flows, *wetted area* is half the size of bankfull wetted area; this proportion increases steadily to 80% of bankfull wetted area at higher flows. At all flows, 80% of the wetted area is prime habitat. The habitat level for all species peaks between 0.5 cfsm and 1.0 cfsm and is relatively stable. The unit has a medium amount of habitat available for slimy sculpin and blaknose dace. The other three species from the target community have habitat levels that comprise less than 15% of the bankfull wetted area. Brown and rainbow trout have more habitat at higher flow levels.

A potential upstream migration barrier occurs at Edgewood Falls at all flows, segmenting the fish habitat. Generally good riparian conditions provide canopy cover to the unit, moderating temperatures during summer low flows.



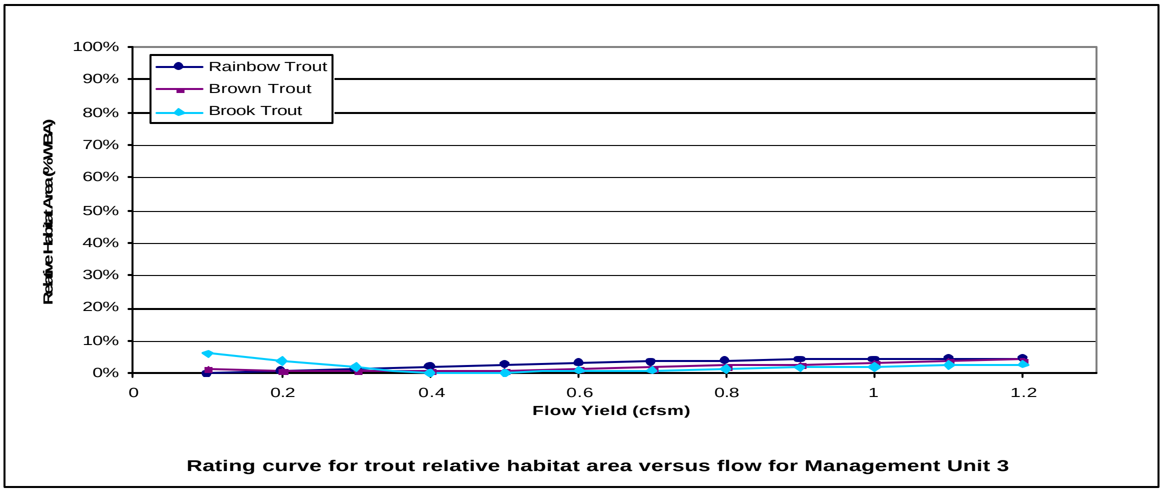


Figure 45 MesoHABSIM habitat rating curve for Management Unit 3

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. There were no clay exposures and only a minimal amount of bank erosion found in this management unit. The apparent absence of glacial lake silts/clays and/or clay-rich lodgement till in the channel bed and banks means this unit is not likely to contribute significantly to suspended sediment loading.

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 two stormwater culverts in this management unit, which drain some road runoff.

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). No homeowners in this management unit made use program to replace or repair their septic system.