Management Unit 7

Greene County - Town of Hunter
Cross Section 107 to Cross Section 116

Management Unit Description

This management unit begins at cross section 116 and continues approximately 1,655 ft. to the bridge at Jansen Road. The drainage area ranges from 8.8 mi^2 at the top of the management unit to 9.2 mi^2 at the bottom of the unit. The valley slope is 1.6% and water surface slope is 1.8%.

Generally, stream conditions in this management unit reflect the consequences of its intensive management history. The unit is laterally controlled for much of its length by revetment and berms, with entrenched channel conditions. Residential encroachment on the stream corridor has degraded riparian function in certain locations. Management efforts here should focus on restoring bank erosion monitoring site #15.5 and enhancing the integrity of the riparian zone at planting sites #27 and #28. Bank erosion monitoring site #16 can be addressed with vegetated bank treatments. Streamside plantings to increase overhead cover also address the most critical habitat impairment.

Summary of Recommendations Management Unit 7	
Intervention Level	Full Restoration / Assisted Self-Recovery
Stream Morphology	Remove berm
Riparian Vegetation	Riparian plantings at two identified planting sites
Infrastructure	Natural channel design restoration at bank erosion monitoring site #15.5 to protect private residence
Aquatic Habitat	Enhance overhead cover by joint planting of rip-rap revetments (PS #27b-28b)
Flood Related Threats	Resurvey National Flood Insurance Program (NFIP) maps to more accurately reflect the active stream channel
Water Quality	None
Further Assessment	Ongoing monitoring of bank erosion monitoring sites #15.5 & 16 Investigation of turbidity sources

Historic Conditions

Entering into the floodplain created by the bed of glacial lake Peekamoose, we begin to see the evidence of lake sediments in the channels in this unit, according to Rubin's (1996) mapping (See Section 2.4, Geology of the Stony Clove Creek).

Col. Edwards' "bark road" through the gap to Tannersville, built in the 1840s to tap the hemlock stands in the Lanesville flats, eventually also facilitated settlement of this area, as evidenced in the number of houses, commercial buildings, and school depicted by Beers in 1867 (Fig. 2).

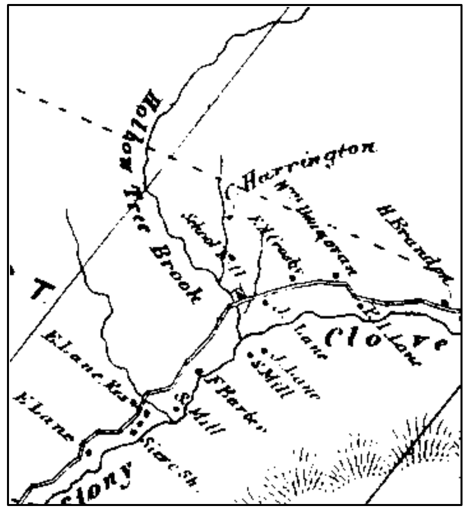


Figure 2 Excerpt of F.W. Beers 1867 Atlas of Greene County

The Lane residence and mill on the south east side of the creek indicates that there must have been a stream crossing that could accommodate wagons, but it may have been a ford,; no bridge is indicated.

Edwards' wagon path was widened significantly in the 1870s into the Stoney Clove Turnpike, perhaps with the help of recently invented dynamite (Evers, 1972).

The Stony Clove and Catskill Mountain branch of the Ulster and Delaware railroad was completed in 1883, and upgraded from narrow to standard gauge in 1899. By 1892, the year of the first USGS survey of the area, there was a train station at Lanesville to serve the Lanes' resort business, but not many more houses than in 1867 (Fig. 3).

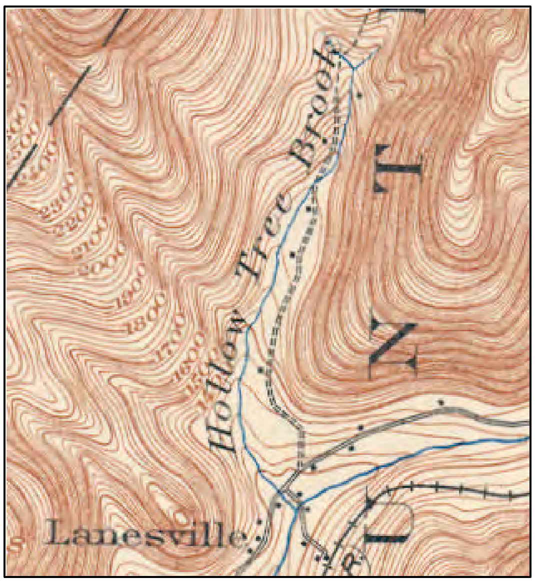


Figure 3 Excerpt of USGS 1903 15' Katterskill Topographic Map, from a survey made in 1897

The impact on the Stony Clove Creek of intensive logging and blasting and grading for the turnpike and railroad is not clear, but is likely significant. With the onset of intensive hardwood logging in the area during the first two decades of the 20th Century, the watershed

Figure 4 Aggrading reach of the Stony Clove in the vicinity of Lanesville, early 20th Century Courtesy of the Gale Collection

hydrology would have been altered in this area, and vast amounts of slash and additional sediment eroded from small tributary channels on steeper slopes would have made its way into the stream system.

By the 1920s, the roads and bridges in Lanesville needed to accommodate automobile traffic, and the valley was extensively cleared. It is likely that the Jansen road bridge had to be replaced after the floods of 1910 and 1927 (Fig. 5).

Figure 5 NYS Route 214 in Lanesville Courtesy of the Gale Collection

As seen from the historical stream alignments, this management unit has experienced significant channel migration/manipulation over the years (Fig. 6). The most dramatic change evident in the period for which we have aerial photography appears to have taken place at the top of the management unit, sometime between 1959 and 1980. In 1959, the stream is shown as following a different *meander* pattern, approximately 150 ft. to the right of where the channel is presently located. In the middle of this unit, the channel was split into two channels and rejoined roughly 300 ft. downstream.

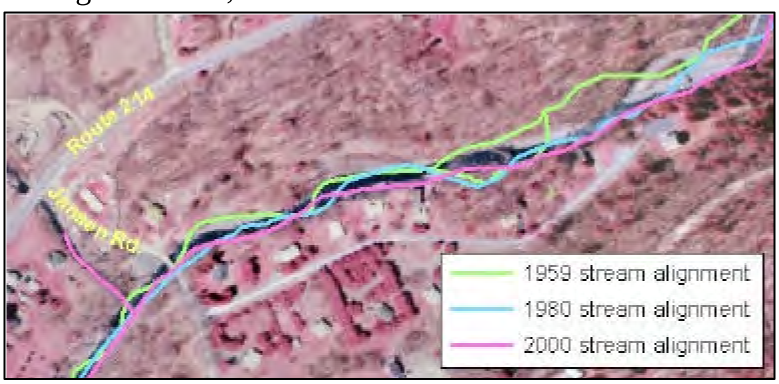


Figure 6 Historical stream alignments of Management Unit 7

According to available NYS DEC records there have been five stream disturbance permits issued in this management unit area. All of these permits were issued at the bottom of the management unit as it approaches the bridge at Jansen Road. The first was issued in 1980 to the Town of Hunter, to remove gravel bar obstructions from 1,500 ft. of stream, upstream from the bridge. This gravel, which had been deposited by a high flow event on 3/21/80, was pushed onto both stream banks, forming berms. The next permit was issued in 1993, to Jean-Paul LePuil, to install rip-rap on the eroded, right stream bank located just upstream from the bridge. After the flood of 1996, the Greene County Highway department was issued a permit to repair rip-rap at the bridge. After another high flow event in 1999, the Greene County Highway department was issued a permit to construct a concrete scour wall to repair the undermined bridge abutment. Finally, in 2000 the existing bridge superstructure was replaced.

Stream Channel and Floodplain Current Conditions

Revetment, Berms and Erosion

The 2001 stream feature inventory revealed that 6% (210 ft.) of the stream banks exhibited signs of active erosion along 1,655 ft. of total channel length (Fig. 1). Revetment has been installed on 14% (458 ft.) of the stream banks. Berms have been installed on 12% (383 ft.) of the stream banks.

Stream Morphology

The following description of stream morphology references insets in the foldout Figure 22. "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. 7), creating small reaches with differing morphologic characteristics, which are classified as different *stream types* (See Section 3.1 for stream type descriptions).

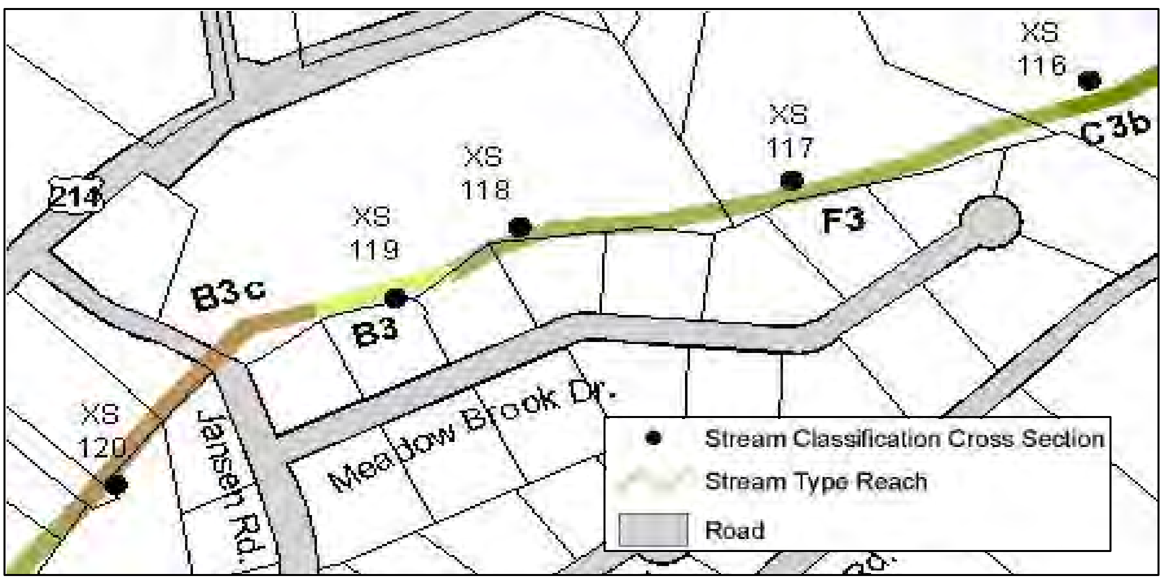


Figure 7 Cross-sections and Rosgen stream types for Management Unit 7

Channel morphology has been modified significantly through much of this management unit. While the valley is broader throughout most of the unit, much of the channel is disconnected from its floodplain during moderate flood flows due to berming and/or apparent channel incision. Most of the reaches are laterally controlled by bedrock or rip-rap revetment. Gravel removal and channel regrading have created overwidened conditions in some reaches, resulting in bed aggradation. A bedrock channel bed provides grade control at the top of the unit, while bankfull channel width is constricted by the Jansen Road bridge abutments at the bottom of the unit. Cobble dominates the bed material throughout the unit.

Management unit #7 begins with a short 75 ft. reach of C3b stream type (Fig. 8). Channel slope is fairly steep at 2.4%. A large gravel bar has formed on the right bank which is an active part of the stream's floodplain. The left bank is fairly high, with a house just downstream on the first terrace. Bedrock at the bottom of the slope extends into part to the channel invert, and probably continues to the right under the bar, maintaining grade control (Inset D). Although part of the stream bed and bank is bedrock, the dominant channel material is cobble due to the inclusion of the bar within the bankfull channel. This bedrock stretches 264 ft. downstream.

Figure 8 Cross-section 116
Stream Type C3b

Figure 9 Cross-section 117
Stream Type F3

Continuing downstream, the channel becomes *entrenched*, or confined within the stream banks during high flood events, which often results in channel *incision*. The slope decreases to 1.6% over this entire 1,059 ft. reach of F3 stream type (Fig. 9 & Fig. 11).

At the top of this reach is a large deep pool with half bedrock, half cobble bed material. As the bedrock ends, the stream begins to widen and *meanders* to the left. Bank erosion monitoring site #15.5 is located here on the left bank (Fig. 10 & Inset H).

The *shear stress*, or the force of flowing water, is eroding the toe of this bank during high flow events. This erosion has caused a 99 ft. long bank failure and left the bank raw and vulnerable. At the top of this 17 ft. high bank sits a private residence which is seriously threatened, as the bank continues to erode. According to the landowner, rip-rap was installed on this bank in the early 1980's, but has since been washed away. The landowner has also noted a significant lowering of the stream bed elevation since the 1980's. This observation is consistent with incision of entrenched stream systems, particularly downstream of bedrock controls, as in this setting.

Figure 10 BEMS site #15.5

The Bank Erodibility Hazard Index (BEHI) score of site #15.5 is ranked "Very High", the second highest prioritization category in terms of its vulnerability to erosion. This bank erosion site is considered a high priority for restoration because of its imminent threat to the residence.

Recommendations to restore this site include moving the active stream channel away from the left stream bank, and installing a *rock vane* and a well vegetated bench and bank. Rock vanes are often used in stream restoration projects to direct stream flows away from the banks. In-depth survey and design would be required to plan a stream restoration project at this site.

From here the stream channel begins to straighten, and meanders very little for the remainder of the management unit. Approximately 200 ft. downstream, on the right stream bank, is bank erosion monitoring site #16 (Inset C). This erosion site is 108 ft. long with a 6 ft. high bank. The top of the stream bank is vegetated with trees but the face has been stripped of vegetation.

The BEHI score of site #16 is ranked "Very High", the second highest prioritization category in terms of its vulnerability to erosion. This bank erosion site is considered a medium priority for restoration because of its small size (691 ft^2) and the absence of water quality or infrastructure threats.

This site may be able to be restored with vegetative measures. This would involve introducing topsoil to the stream bank and stabilization of the stream edge with plantings, such as native willows and sedges. Detailed site inspection and design would be required to plan a stream restoration project at this site, and consideration should be given to treating erosion sites # 15.5 and #16 together as a single project.

Immediately downstream from this erosion site, rip-rap has been installed on the 238 ft. of the left stream bank (Inset G). This rip-rap is protecting two private residences which are located extremely close to the top of the stream bank. At the upstream end of this rip-rap, large stream rocks have been placed across the channel to create a pool. These small dams are commonly built to create swimming or wading areas. This practice can be detrimental to aquatic habitat if they block fish passage. Construction of these dams is generally not recommended, and requires a stream disturbance permit from the NYS DEC.

Figure 11 Cross-section 118 Stream Type F3

There is 240 ft. *berm* along the right stream bank in this reach (Inset B). Berms prevent flood waters from spilling into the floodplain, which increases the stream velocity and can cause *degradation* of the stream bed. It is likely this berm was created following a high flow event, after which cobble and gravel deposited in this reach was *sidecast* onto the stream bank to form the berm. The land behind this berm is forested. Insofar as no infrastructure would be threatened here by floodplain inundation, it is recommended that this berm be removed, to allow the stream to spread out into its floodplain during high flow events. This would help decrease bank and bed erosion along the stream channel.

As stream type transitions to B3, the channel narrows and the entrenchment moderates, allowing some floodplain access (Fig. 12). This 229 ft. reach steepens to a 2.4% slope. At the top of this reach, along the left bank, there is a residence inside the 100-year floodplain, protected by another cobble berm (Inset F). Removal of the berm on the right bank upstream would allow the stream sufficient floodplain in this reach to lower flood elevations, without requiring the removal of the berm protecting this residence.

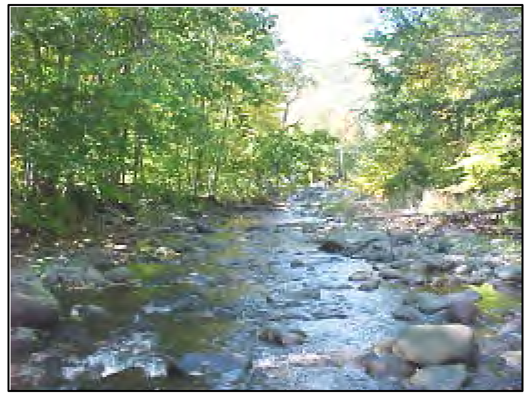


Figure 12 Cross-section 119 Stream Type B3

Figure 13 Stream type B3c

As the stream's slope decreases to 1.9%, stream type changes to B3c for the remaining 292 ft. of the management unit (Fig. 13). The stream meanders gently to the left towards the bridge at Jansen Road. On the right bank, 117 ft. of rip-rap has been installed to protect the lawn and driveway at a residence, as well as the right bridge abutment (Inset A).

At the end of this rip-rap, the stream passes under the Jansen Road Bridge (Inset E). Both this bridge and the confluence of Hollow Tree Brook just downstream are causing *aggradation* upstream of the bridge. Gravel and cobble deposits upstream of bridges are commonly caused by inadequate sizing of bridge openings. An undersized bridge opening causes water to back up upstream of the bridge, reducing stream velocity, which results in sediment deposition. Tributary confluences can also disrupt *sediment transport* effectiveness, as appears to be happening here.

Though not directly observed during the watershed assessment, Rubin (1996) mapped the presence of glacial lake clay and lodgement till in this management unit (See Section 2.4). It is possible that some of the rip rap placed along banks in the lower half of unit conceal the presence of the glacial lake clay that could otherwise be entrained as suspended sediment.

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).

This management unit begins with a reach stabilized vertically by its bedrock grade control, proceeds through reaches characterized by entrenched conditions that apparently have caused bed degradation, alternating with overwidened reaches that appear to be aggrading, and ends with a reach aggrading due to backwater conditions.

Poor channel management practices can result in severe sediment transport problems. After major floods, channels are sometimes regraded to remove sediment deposits, which are often sidecast and form berms. If the channel is also overwidened with the intention to increase flood conveyance, the new, shallower stream channel will be unable to transport the sediment delivered to it from upstream. The conditions are then set for short-term aggradation and long-term degradation of the channel bed, as appears to be the case in this management unit.

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

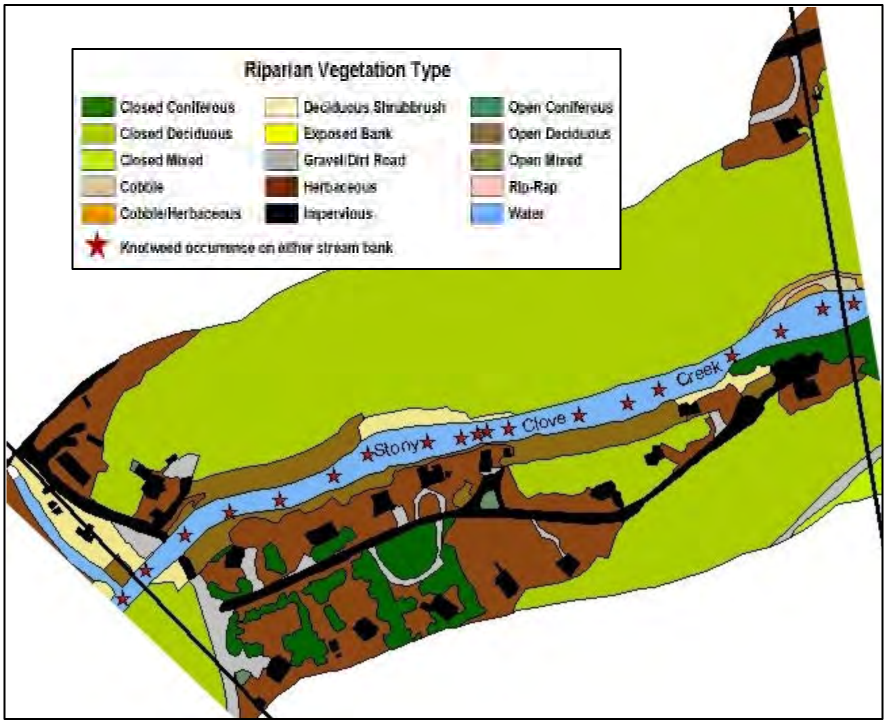


Figure 14 Riparian vegetation map of Management Unit 7

The predominant vegetation type within the 300 ft. riparian buffer is forested (69%) followed by herbaceous (19%). Areas of herbaceous (non-woody) cover present opportunities to improve the riparian buffer with plantings of more flood-resistant species. *Impervious* area (7%) within this unit's buffer is primarily the NYS Route 214 and other roadways, as well as paved and built areas associated with 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. 15). 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.

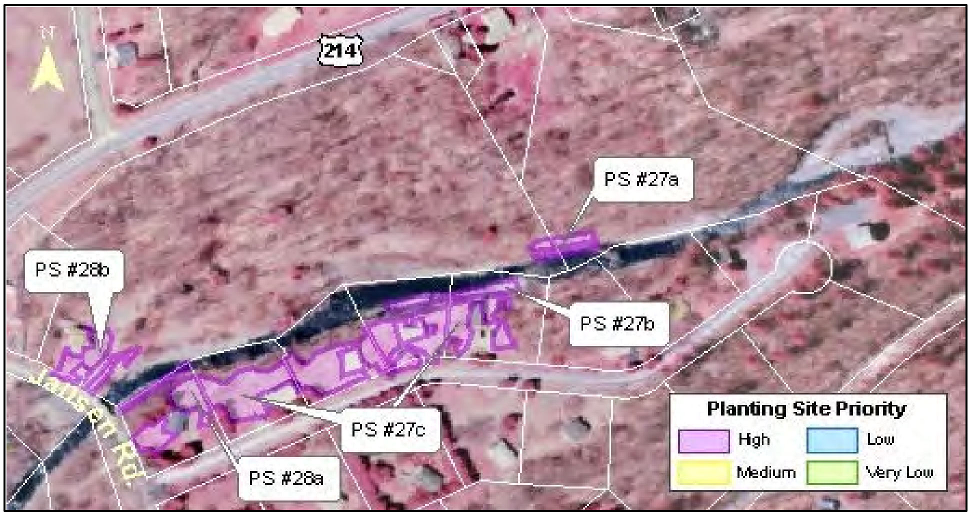


Figure 15 Planting sites location map for Management Unit 7

Planting site #27a is located at bank erosion site #16 (Fig. 16 & Inset C). This erosion site is 108 ft. long with a 6 ft. high bank. The top of the stream bank is well vegetated with trees but the face has been stripped of vegetation.

Figure 16 Planting Site #27a

Recommendations for this site include stabilizing the toe of the bank with willow *fascines*. It will be necessary to prepare the stream bank for plantings by either importing topsoil or scalping topsoil from the top of the bank. The stream bank should be vegetated with native willows and shrubs, and the water's edge with native sedges.

Figure 17 Planting Site #27b

Planting site #27b is located along 490 ft. of rip-rap (Fig. 17 & Inset G). Inserting plant materials into the soil between rip-rap rocks, or *joint planting*, is recommended at this site. Joint planting will strengthen and increase the longevity of the rip-rap. These plantings will also improve the aquatic habitat by cooling water temperatures through providing shade.

Planting site #27c is located in the upland areas of the residential properties along Meadow Brook Drive. These residences have grass lawn areas and scattered trees along the stream bank. Recommendation at these residences include, adding trees and shrub along the stream bank to increase the density of vegetation on the bank and increasing the forested *stream buffer* width by at least 20 ft. This will increase buffer functionality and improve stream bank stability while still allowing a significant lawn area.

Planting site #28a is located at the residence on the left bank, just upstream from Jansen Road Bridge (Fig. 18). The stream bank is comprised of exposed cobble and soil with a few trees and lawn area at the top of the bank. Native trees and shrubs should be planted along the stream bank to increase vegetation density and buffer width. Native sedge plantings near the water's edge would add both stability and esthetic benefits.

Figure 18 Planting Site #28a

Figure 19 Planting Site #28b

Planting site #28b is located at the residence on the right bank, just upstream from the Jansen Road Bridge (Fig. 19). Rip-rap has been installed on this bank, beyond which is a grass lawn area.

Joint planting, the existing rip-rap, is recommended to strengthen and increase the longevity of this revetment. These plantings will also improve aquatic habitat by providing shade, resulting in cooler water temperatures. Planting trees and shrubs, is also recommended, to create a riparian buffer. This planting can be designed to allow the landowner access to the stream.

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 20 100-year floodplain boundary map in Management Unit 7

According to the NFIP maps, there are no houses located within 100-year floodplain boundary in this management unit (Fig. 20). The current NFIP maps are available for review at the Greene and Ulster County Soil & Water Conservation District offices.

Bank Erosion

While only 6% of the stream banks are experiencing active erosion, the relatively high percentage of reveted banks is indicative of extensive past bank instability. The channel morphology of this unit will likely lead to significant bed scour during high flows, with the strong probability of revetment failure throughout the unit as a result. Reducing the entrenched conditions at several points in the unit would substantially mitigate this threat.

Bank erosion monitoring site #15.5 represents an immanent threat to a residential structure. While a *natural channel design* remediation of the failing bank here would require in-depth survey and design, the size and scope of this project make the project feasible. Natural channel design treatment would be more effective than revetment at this location.

Infrastructure

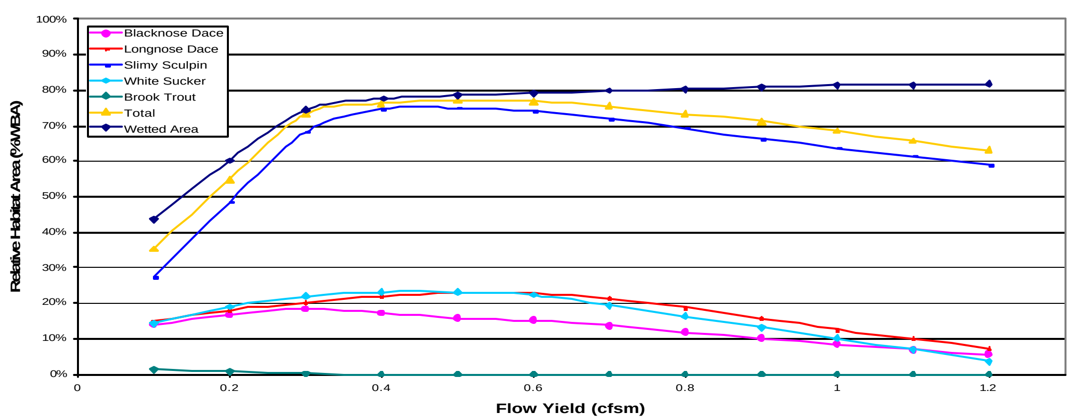
The Jansen Road Bridge (BIN #3201060) is maintained by Greene County. The current bridge was built in 1968 and has sustained repeated damage in flood events. After the 1996 flood, $24,324 was received from the Federal Emergency Management Agency (FEMA) to repair scour damage and rip-rap. In 2000 the bridge superstructure was replaced.

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. Due to the entrenchment of the channel upstream, there do not seem to be opportunities to use floodplain drains at the Jansen Road Bridge.

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.

This management unit runs for through a residential development. It is shallow and slightly faster than management unit #6, consisting mostly of fast-flowing habitats (riffles and runs) with numerous shallow margins. The habitat changes into mostly fast runs when flow increases. At flows between 0.1 cfsm and 0.4 cfsm, the *wetted area* increases dramatically from about 40% to 80% of the *bankfull wetted area*. Following this increase, the wetted area remains constant. Almost the entire wetted area is suitable for the target fauna, but predominantly for slimy sculpin. Sculpin habitat emulates the overall habitat-rating curve and declines above 0.6 cfs m. There is no prime habitat for brook or brown trout in this unit, and even rainbow trout only has low to moderate habitat levels, peaking around 0.5 cfsm, then declining toward zero at 1.0 cfsm. (See general recommendations for aquatic habitat improvement in Section 6.6)



Rating curve for relative habitat area versus flow for Management Unit 7

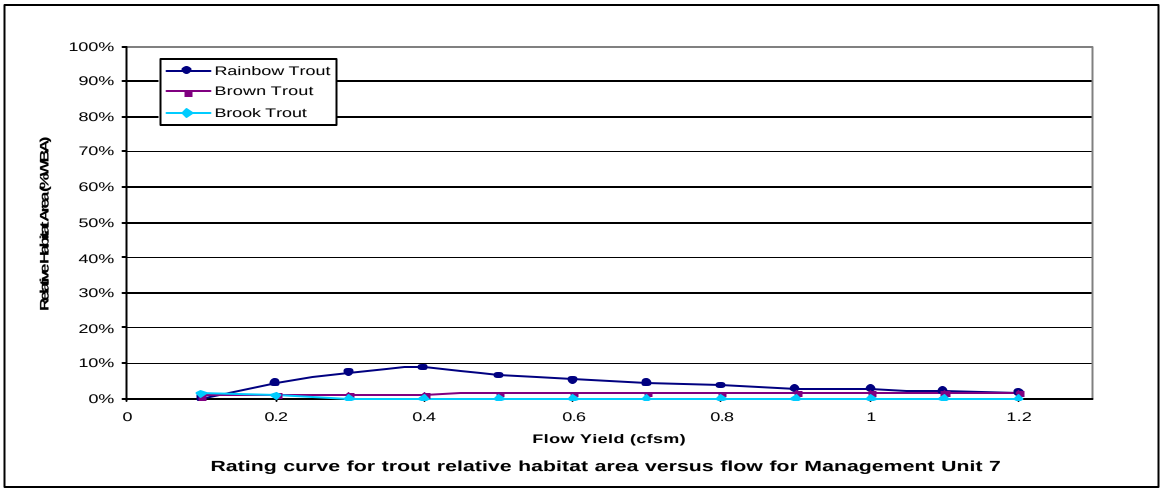


Figure 21 MesoHABSIM habitat rating curves for Management Unit 7

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; however Rubin (1996) mapped the presence of clay in the unit. Further investigation is recommended to determine if significant turbidity sources are indeed present here.

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. No stormwater culverts outfall 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). One homeowner in this management unit made use of this program to replace or repair a septic system.