Management Unit 8

Greene County - Town of Hunter
Jansen Road to Cross Section 131

Management Unit Description

This management unit begins at the Jansen Rd. Bridge and continues approximately 4,536 ft. to cross section 131. The drainage area ranges from 9.2 mi^2 at the top of the management unit to 15.3 mi^2 at the bottom of the unit. Both valley slope and water surface slope are 1.7%.

This management unit has historically been modified significantly through channelization and revetment. Currently stream morphology is generally aggrading under bankfull flows, with entrenched reaches that pose high risk of channel migration and incision under high flows. Management recommendations for the unit include full restoration of the lower reaches (currently being undertaken in a demonstration project; Section 5) to establish a stable morphology, balanced sediment transport function and bank stabilization at bank erosion monitoring site #17. This project will address suspended sediment threats and enhance aquatic habitat. Riparian plantings at the four planting sites will improve bank and channel stability, buffer function and aquatic habitat quality.

Summary of Recommendations Management Unit 8	
Intervention Level	Full Restoration
Stream Morphology	Encourage narrowing and deepening of channel through plantings at identified sites (PS #31-32)
Riparian Vegetation	Riparian plantings at four identified planting sites (PS #29-32)
Infrastructure	None
Aquatic Habitat	Enhance overhead cover at identified planting sites (PS #30 & #32) Increase low flow pool depths and volumes in demonstration project area
Flood Related Threats	Resurvey National Flood Insurance Program (NFIP) maps to more accurately reflect the active stream channel
Water Quality	Address clay exposures
Further Assessment	Ongoing monitoring of Lanesville Restoration Project Evaluate stormwater treatment options for culvert outfall

Historic Conditions

In management unit #8, the confluence of Hollow Tree Brook in the broad valley flats created by glacial lakes Shandaken and Peekamoose increases the drainage area by 50% (See Section 2.2). As a result, the stream channel enlarges below the confluence to accommodate the additional streamflow and sediment contribution coming from this second largest tributary in the Stony Clove watershed. This increased sediment load has led to channel shifting in the management unit over time, creating a complex geology of glacial lacustrine clays, lodgement tills, outwash and alluvial deposits.

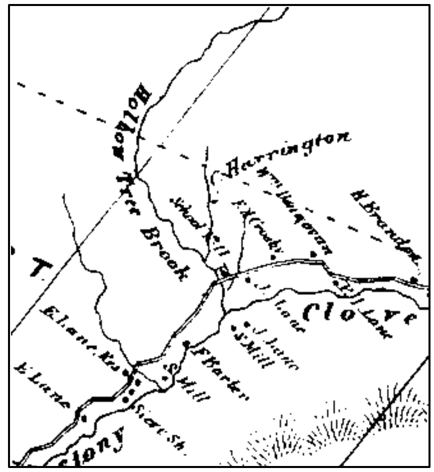


Figure 2 Excerpt from F.W. Beers 1867 Atlas of Greene County

Due perhaps to the penetration to the Lanesville flats by Colonel Edwards bark road through the Stony Clove Notch in the 1840s, this area was settled fairly early. By the mid 1860s, the Lane family had built numerous residences in the valley, and mills and a schoolhouse served the community.

Figure 3 Early 20th century images illustrating land use and stream management practices of the day. Courtesy of the Gale Collection

Logging in the mid-19th and early 20th centuries, as well as land management for recreational and commercial purposes, as seen in Figure 3 above, would have had particular impact on stream form and function in this management unit.

As seen from the historical stream alignments, this management unit's channel has been somewhat unstable historically. There are two particular reaches where channel migration has occurred. The first reach, shown in Figure 4, is located downstream from Jansen Road. Since 1959, the stream's meander pattern has migrated to the left, increasing pressure on the left stream bank.

Figure 4 Historical stream channel alignments at top of

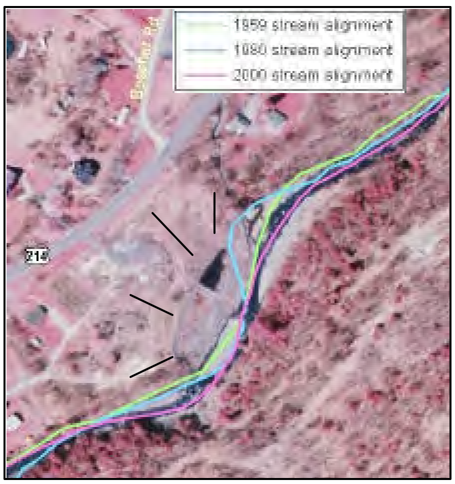


Figure 5 Historical stream channel alignments at bottom of Management Unit 8

The second reach, seen in Figure 5 on the right, is located near the bottom of the management unit, across from Beecher Road. This reach experienced a decrease in its *sinuosity* between 1959 and 1980. This change has pushed the stream channel against the high left bank, undermining the toe of the bank. Following the flood of January 1996, the channel eroded laterally to the right, to approximately where the arrows point in Figure 5. In response to the flood, the landowner bermed and redirected the channel back to roughly its former location.

According to available NYS DEC records there have been twelve stream disturbance permits issued in this management unit area, including four after the 1996 flood event. These permits are described following the stream from the Jansen Rd. Bridge and working downstream. According to available NYS DEC records there have been twelve stream disturbance permits issued in this management unit area, including four after the 1996 flood event. These permits are described following the stream from the Jansen Rd. Bridge and working downstream. In 1995, the GCSWCD in conjunction with the Town of Hunter, was issued a permit to install a stone stream pool digger and dry hydrant intake pipe used for fire prevention. This project was not completed at that time. In 2002, Walter Bono was issued a permit to repair an existing retaining wall by resetting fallen rocks and placing new rocks on the left bank just below the Jansen Rd. bridge(Inset

H). In 1996, Edward Benjamin was issued a permit to install rip-rap on the right stream bank and remove gravel (Inset C). In 1996, Walter Bono was issued a permit to repair rip-rap, restore the left stream bank with deposited stream material, and remove debris (Inset G). In 2000, Walter Bono was issued a permit to rebuild 50 ft. of the existing stacked rock wall (Inset F). In 1996, Robert Johnson was issued a permit to install rip-rap on the right stream bank and excavate 100 yd^3 of gravel. There is currently no rip-rap along this bank, indicating the project was either never completed or the rip-rap has been

Figure 6 1996 Flood at Bono property

Figure 7 Stacked Rock Wall - Bono Property

washed away. In 1994, Millard Ruoff was issued a permit to realign the stream channel by moving accumulated gravel bars and installing rip-rap. There is currently no rip-rap along this bank, indicating the project was never completed or the rip-rap has been washed away. In 1998, Millard Ruoff was issued a permit for a temporary corduroy bridge necessary to access his land on the opposite side of the stream. A corduroy bridge is an old practice of nailing together layers of railroad ties or wood in alternating direction to build a 'floating bridge' used to cross shallow streams. In 1984-1987, Beecher Smith was issued permit to repair an eroding stream bank by relocating 400 ft. of stream into an old stream channel and install 150 ft. of rip-rap on the left stream bank. There is currently no rip-rap along this bank, indicating the project was either never completed or the rip-rap has been washed away. In 1996, Beecher Smith was issued another permit just downstream, to install rip-rap and remove 1000 yd^3 of gravel. In 2000, Beecher Smith in conjunction with the GCSWCD was issued a permit to address a large stream bank failure (Inset A) near the end of the management unit. This project was delayed. In 2003, another permit was issued to Beecher Smith to implement a demonstration project to address this eroding stream bank. The design includes adding a bankfull bench at the toe of the bank with *cross vanes* and *rock vanes* to stabilize $\pm$ 1700 linear foot stream reach (see Section 5 for more details on this demonstration project).

Stream Channel and Floodplain Current Conditions

Revetment, Berms and Erosion

The 2001 stream feature inventory revealed that 2% (219 ft.) of the stream banks exhibited signs of active erosion along 4,536 ft. of total channel length (Fig. 1). Revetment has been installed on 10% (920 ft.) of the stream banks. Berms have been installed on 6% (520 ft.) of the stream banks.

Stream Morphology

The following description of stream morphology references insets in the foldout Figure 29. "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. 8), creating small reaches with differing morphologic characteristics, which are classified as different *stream types* (See Section 3.1 for stream type descriptions).

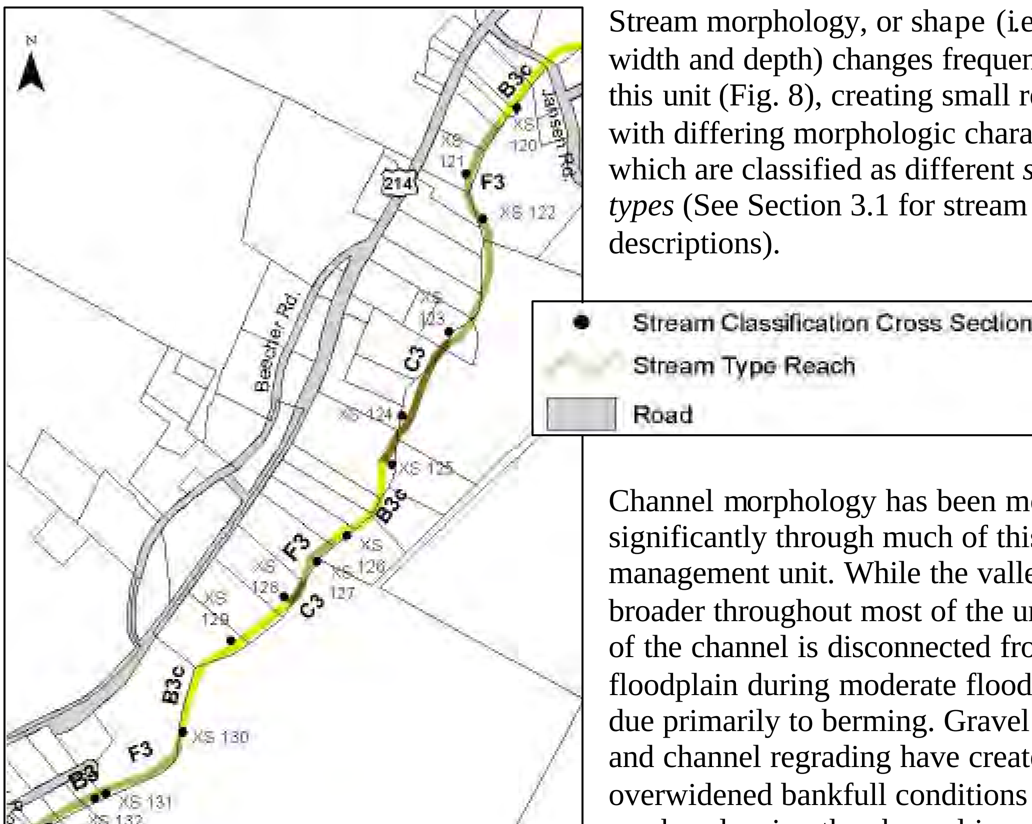


Figure 8 Cross-sections and Rosgen stream types for Management Unit 8

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 primarily to berming. Gravel removal and channel regrading have created overwidened bankfull conditions in some reaches, leaving the channel incapable of passing sediment adequately. As a consequence, several locations where streambank cohesiveness is limited by inadequate riparian vegetation have experienced significant erosion during flood events. This has led to *aggradation* and limited natural recovery potential. Cobble dominates the bed material throughout the unit. Nonetheless, *entrenched* conditions at higher flows predominate this management unit, presenting significant threats under large flood conditions.

Management unit #8 begins downstream from the Jansen Rd. Bridge, with a 188 ft. reach B3c stream type (Fig. 9). This stream reach is moderately *entrenched*, or usually confined within the stream banks during high flow events. Slope of the channel is fairly flat 1.9% and the dominant bed material is cobble.

On the left stream bank there is a 101 ft. long stacked rock wall (Inset H). On the right stream bank, the Hollow Tree Brook tributary enters (Inset D).

Figure 9 Cross-section 120 Stream Type B3c

The headwaters of Hollow Tree Brook are located on steep slopes of West Kill Mountain, the sixth highest peak in the Catskills at an elevation of 3,880 feet, and Hunter Mountain, the second highest peak in the Catskills, at an elevation of 4040. The Brook, which is approximately 3.3 miles long with a drainage area of 4.6 mi.^{2}, runs down Diamond Notch eventually running along Diamond Notch Road, under NYS Rt. 214, flowing into Stony Clove Creek just downstream from Jansen Road. The headwaters of Hollow Tree Brook is classified as C(t) under the NYS DEC best usage classification system, until the last mile of the brook, which is classified as B(t). The B classification indicates a best usage for swimming and other contact recreation, but not for drinking water. The C classification is for waters supporting fisheries and suitable for non-contact activities. The (t) indicates that the waters can sustain trout populations.

Figure 10 Dam

Immediately downstream from the tributary a small dam made from stream material has been constructed across the stream (Fig. 10). 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. In this reach, the blockage could prevent fish migration from downstream up into the Hollow Tree Brook. Construction of these dams is generally not recommended, and requires a stream disturbance permit from the NYS DEC.

There is a 520 ft. long *berm* along the left stream bank made from stream material (Inset G). Berms prevent flood waters from spilling into the floodplain, leading to an increase in stream velocity. *Bed degradation* often results. It is likely that this berm was created after a high flow event, after which cobble and gravel deposited in this reach was pushed up onto the stream bank to form the berm. The land behind this berm is forested, with no residence to protect from flooding. It is recommended that this berm be removed, to allow the stream to spread out into its floodplain during higher flow events. This will help minimize stream power, and reduce erosion along the stream channel. Rubin's mappling (1996) found evidence for the presence of glacial lake clay deposits along this reach and into the following reach down to approximately XS 122 (See Section 2.4, Geology of the Stony Clove Creek, for a description of these deposits).

Continuing downstream, the channel widens as it transitions to a F3 stream type (Fig. 11). Throughout this 1,267 ft stream reach the channel is *entrenched*, or unable to spread out into the flood plain during high flow events, and the slope decreases to 1.5%.

Figure 11 Cross-section 121 Stream Type F3

As the stream begins to *meander* to the left, rip-rap has been placed on the right bank (Inset C). Stream bank erosion often occurs on the outer bank of meander bends, where the stream velocity is greatest during high flows. The landowners have installed 334 ft. of rip-rap here to prevent property loss due to erosion.

Figure 12 Clay Exposure

At the end of the rip-rap, there is a clay exposure in the channel near the right stream bank (Fig. 12). It is very likely that the clay is continuous with the clay upstream mapped by Rubin in 1996 (See Section 2.4). As shown in the photo, deep layers of clay underlie the channel. Clay inputs to a stream are a significant water quality concern because they increase *turbidity*, degrade fish habitat, and can act as a carrier for other pollutants and pathogens.

From here the stream turns to the right, the outside of the meander bend is now against the left stream bank. During the 1996 flood, the original stream channel was abandoned and another stream channel was cut to the left, causing significant property loss at the Bono residence. After this flood, the landowner installed a 791 ft. long stacked rock wall (Inset F), at the cost of $30,000, to prevent erosion in the future.

Figure 13 Cross-section 124 Stream Type C3

Moving downstream, the channel reconnects with its floodplain and the slope decreases to 1.4%, as stream type changes to C3 for the next 726 ft. (Fig. 13). This reach is overwide, shallow, and straight, with no overhanging vegetation. Deposition of bed materials is common in overwide channels because they lose their ability to transport *bedload* supplied from upstream. In this situation streams often *aggrade*, or rise in stream bed elevation due to the excessive deposition. Overwide channels also provide poor fish habitat due to warmer water temperatures and filling of deep pools.

In the middle of this reach are two federally designated wetlands (Fig. 14). The larger wetland, which is 0.9 acres in size, is a riverine upper perennial, with an unconsolidated shore, and is temporarily flooded. The smaller wetland, which is 0.3 acres in size, is classified as palustrine scrub-shrub, broad-leaf deciduous, and temporarily flooded. (See Section 2.6 wetland type descriptions and regulations)

Figure 14 Federally Designated Wetlands

Figure 15 Cross-section 126 Stream Type B3c

As the channel begins to narrow, the stream becomes moderately entrenched, as the stream type changes to B3c for the next 514 ft. (Fig. 15). Channel slope remains fairly flat at 1.4%. At the beginning of the reach is a small unnamed tributary entering from the left stream bank. This tributary is not classified under the NYS DEC best usage classification system.

In the middle of this reach there is a large gravel bar on the right. Gravel bars help maintain channel stability during flood events. During flood events, energy is dissipated as bars are eroded and then rebuilt, instead of eroding the stream bed or banks. This process also helps the stream reestablish its pools and riffles. This stream reach has a number of pools which, while atypical of this management unit, provide high-quality fish habitat. Gravel bars should not be removed from stream systems.

Historical aerial photographs indicate that until 1980, the stream channel was located on the right side of this gravel bar. Sometime after 1980, probably during a flood event, a new channel was cut and the streams path became more *sinuous*.

Continuing downstream, the *thalweg* meanders to the right bank. There is a private residence which was built extremely close to the stream. A 77 ft. long stacked rock wall has been installed along this bend to protect the bank from erosion (Inset B).

The channel then widens, becomes entrenched and steepens to 1.9% slope, for a short 267 ft. reach of F3 stream type (Fig. 16). This stream reach is overwide. A gravel bar is forming on the right, on the inside of the meander bend at the top of this reach. This bar formation may help the stream narrow its channel and produce a more stable stream morphology.

On the right bank at the end of this reach there is a small 14 ft. long stacked rock wall with a large culvert inlet into what used to be Lane's Lake. The culvert, constructed of flagstone, is set back from the active stream channel and received water impounded by a concrete diversion dam. Remnants of the dam protrude from the right bank into the channel, and create a constriction and turbulent scour. Behind this is a 144 ft. long stacked rock and earthen berm structure, which formed part of the impoundment of Lane's Lake.

Figure 16 Cross-section 127
Stream Type F3

Proceeding downstream, the channel reconnects with its floodplain and slope remains constant at 1.9% through this 151 ft. reach of C3 stream. At the end of the top of this reach, there is a clay exposure on the left stream bank in the approximate location mapped by Rubin (1996) as a glacial lake clay deposit (Inset E & See Section 2.4). Clay inputs into a stream are a serious water quality concern because they increases *turbidity*, degrades fish habitat, and can act as a carrier for other pollutants.

Figure 17 Cross-section 129
Stream Type B3c

As the channel entrenchment once again moderates and slope decreases to 1.5%, stream type transitions to B3c for the next 962 ft. reach (Fig. 17).

Near the end of this reach, the stream has been historical unstable, continually adjusting its meander pattern. A small unnamed tributary enters the Stony Clove Creek from the right bank, here. This tributary is not classified under the NYS DEC best use classification system.

Near this tributary confluence is a 1.4 acre federally designated wetland (Fig. 18). This wetland is classified as riverine upper perennial, unconsolidated shore, temporarily flooded. Another 0.6 acres of the same wetland type are mapped a short distance downstream. (See Section 2.6 wetland type descriptions and regulations)

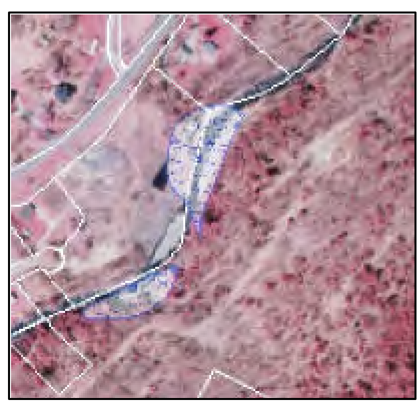


Figure 18 Federally Designated Wetlands

Following the 1996 flood, the landowner built a high berm on the right bank starting near the tributary confluence, intending to restore the channel to pre-flood *planform* and recover lost property. This berm constricted channel flow during flood events, creating a backwater which appeared to have been inducing aggradation in the reach immediately upstream. The stream then proceeded into alternating sections of aggradation and degradation. At its downstream end, the berm directed water into the toe of the failing bank at bank erosion monitoring site #17, described below.

This reach had been repeatedly modified from its natural condition usually in response to damaging flood events. Modifications made to the channel and *riparian* areas disrupted the sediment transport function and floodplain dynamics of the reach. Undesirable trends of bed aggradation and degradation were observed on the site, including one fairly severe headcut. These processes, coupled with lateral extension of the stream's *belt width*, led to toe erosion and mass wasting of a 60+ ft. of high slope at bank erosion monitoring site #17 (Inset A). This slope failure appears to have been extending both upstream and downstream. The channel's disconnection from its floodplain hampered natural recovery of the bank failure. The fine, clay-rich bank materials at the failure make stabilization of the bank a priority from a water quality perspective. Rubin (1996) mapped this as a lodgement till exposure (See Section 2.4). There is also glacial lake clay beneath the channel and in lateral contact with the lodgement till.

The Bank Erodibility Hazard Index (*BEHI*) score of site #17 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 in the watershed because of its serious threat to water quality and large size (11398 ft^2).

This site was chosen as the stream restoration demonstration project in the Stony Clove Creek. During the summer of 2003, this berm was removed in preparation for restoration of the lower portion of the reach in 2004, and the entrenchment was moderated to produce a B3c type channel to the end of the management unit. When completed, this restoration project will tie into the B3 reach of channel at the beginning of Management Unit #9.

In the past, the most common approach to combating stream bank erosion was to apply hard controls such as rip rap, stacked rock walls, sheet piling and check dams, and remove channel irregularities through channelization. Hard controls are expensive to install and maintain, degrade habitat and often fail or transfer erosion problems to upstream or downstream areas. The Greene County Soil & Water Conservation District (GCSWCD) and the New York City Department of Environmental Protection (NYC DEP) have been promoting the use of natural channel design (NCD). This new approach to restoring stream stability aims to create a more natural stream channel and aquatic habitat while also functioning during high flow events.

Natural channel design uses existing stable stream reaches as "blueprints" for restoration work. These stable reaches, called reference reaches, have demonstrated their ability to handle the stream flow and sediment supplied by the watershed. Detailed measurements of the stream dimensions (width, depth, cross section area), slope and meander pattern are collected and used to design the restored reach. NCD also incorporates in-stream rock structures called rock vanes and cross vanes (Fig. 19). These structures provide grade control, reduce erosion by minimizing stream velocities on stream banks, and dissipate stream energy during flood conditions. These structures also improve in-stream habitat by creating scour pools. These structures will provide enough protection to allow vegetation to become established and provide long-term bank stability.

Figure 19 A cross vane at the stream restoration site on Broadstreet Hollow. Notice how the cross vane redirects stream flow into the center of the channel, away from the banks.

Bioengineering is the practice of using planting techniques to stabilize stream banks with plant materials. As the plants take root and produce shoots, the stream bank slope becomes much more resistant to erosion and failure. Establishing streamside vegetation also improves wildlife habitat on the land and in the stream by providing shade, cover and food. Together these techniques will be used to restore the stream to a natural, healthy and stable system.

The Lanesville restoration project will stabilize approximately 1,700 feet of stream. Stabilization of the approaching stream reach is critical to the success of the bank stabilization measures. The new stream channel will follow a natural meander or curving pattern, which slows stream flow as the stream moves around each bend and reduces the slope. The design includes the construction of four cross vanes and five rock vanes to deflect the stream away from the banks. After construction of the new stream channel is completed, streamside planting will begin. A combination of dormant plant materials, conservation seed mixtures, and plantings of live trees and shrubs will be planted on the floodplain. Native willow and dogwood species will be planted on the streambanks.

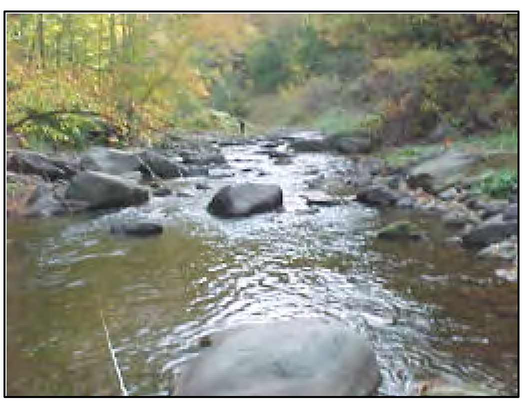


Figure 20 Cross-section 131 Stream Type F3, looking upstream

Construction of this project began in August 2003. Construction completion was originally scheduled for November 2003, but heavy rains caused high stream flows and forced construction completion until Summer 2004. A detailed report of this stream restoration project is located in Section 6 of this management plan.

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).

As stated above, this management unit exhibits evidence of sediment transport imbalances, with most sections aggrading. Hollow Tree Brook has historically delivered significant sediment inputs to Stony Clove Creek during flood flows. Bank erosion at several locations yields excess sediment supply.

In several locations, berms have confined channel flow and created backwater conditions impairing sediment transport. In other locations, the confinement has resulted in increased bed scour at high flows, resulting in incision and headcuts. Traditional management practices have frequently disrupted natural recovery processes that would tend to correct these sediment transport imbalances.

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. 21 & 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 (59%) followed by herbaceous (22%). Areas of herbaceous (non-woody) vegetation 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.

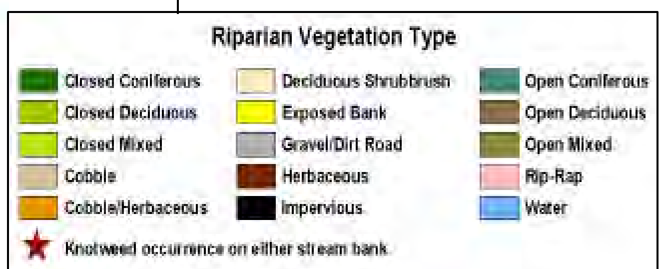


Figure 21 Riparian vegetation map of Management Unit 8

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. 22). 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. Four appropriate planting sites were documented within this management unit.

Planting site #29 on eight separate properties on the right stream bank, beginning downstream from Jansen Road (Fig 23). Presently there is a small buffer along the stream and upland grass lawn areas on these properties. There is small amounts of Japanese Knotweed present. It is recommended to plant trees and shrub along the stream bank to increase the density of vegetation on the bank. It is also recommended to increase the upland buffer width by at least 20 ft. This will increase buffer functionality and improve stream bank stability while still allowing a lawn area. Japanese Knotweed, which is an invasive non-native species, should be removed. Japanese Knotweed does not provide adequate erosion protection because it has a very shallow rooting system. For the upland area, tree and shrub plantings are recommended to increase the density and functionality of the upland stream buffer.

Figure 22 Planting sites location map for Management Unit 8

Figure 23 Planting Site #29

Planting site #30 is located on the right bank of the Bono property (Fig. 24). Along this stream bank is a 393 ft. long stacked rock wall (Inset F). At the top of this stacked rock wall is a large grass area.

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 this wall. These plantings will also improve the aquatic habitat by providing shade, thereby cooling water temperatures. It is also recommended to increase the stream buffer width at the top of the bank.

Figure 24 Planting Site #30

Figure 25 Planting Site #31

Planting site #31 is located in the stream channel along a streach of overwide stream at the downstream end of the Bono property (Fig. 25). This channel is overwide, aggrading, and has little overhead vegetation to provide stream shading.

Native willow plantings along both side of the stream is recommended. These plantings may encourage the stream channel to narrow. These plantings will also improve the aquatic habitat by providing shade, thereby cooling water temperatures.

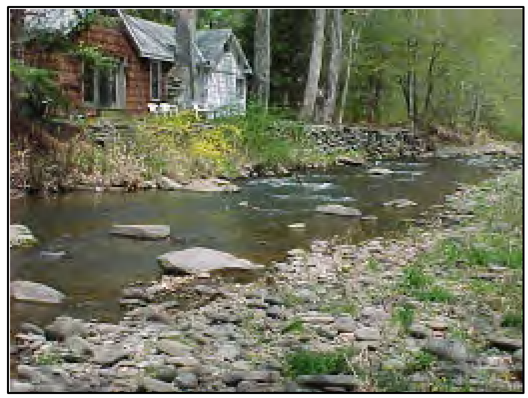


Figure 26 Planting Site #32

Planting site #32 is located in the stream channel beginning at the Whitelaw property (Fig. 26). This reach of stream is overwide and aggrading. Gravel bar development on the left streamside is forcing the streambank and *thalweg* to the right streambank.

In-channel plantings of native willows, along the right stream bank, is recommended. These plantings may encourage gravel depsition along the toe of the rock wall leading to a reduction *shear stress* on this streambank. These plantings will also improve the aquatic habitat by providing shade, thereby cooling water temperatures. Willow fascines should be installed at the toe of the stacked rock wall (Inset B). This planting will strengthen and increase the longevity of the wall.

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.

According to the NFIP maps, there are fourteen houses located within the 100-year floodplain boundary in this management unit (Fig. 27). The current NFIP maps are available for review at the Greene and Ulster County Soil & Water Conservation District offices.

Figure 27 100-year floodplain boundary in Management Unit 8

Bank Erosion

The majority of the stream banks within the management unit are stable, only 2% of the stream banks are experiencing erosion. There are one bank erosion sites, totaling 219 ft. in length, in this management unit.

Bank erosion monitoring site #17 is considered a high priority because of its threat to water quality (Inset A). This site is contributing clay inputs into the stream.

Infrastructure

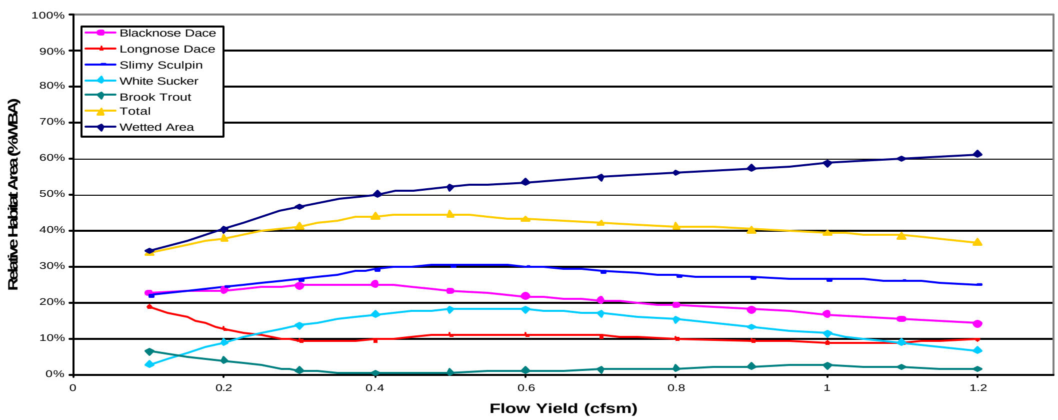
There are no infrastructure apparent threats to roadways or bridges in this management unit.

There is one stacked rock wall in this management unit which is protecting a residential property. This bank is located on the outside meander bend of the stream, where stream velocity is greatest during high flow events (Inset B). While rip-rap and other hard controls may provide temporary relief from erosion, they are expensive to install, degrade habitat, and often fail or transfer erosion problems to upstream or downstream areas. Planting recommendations for this site should be taken into serious consideration.

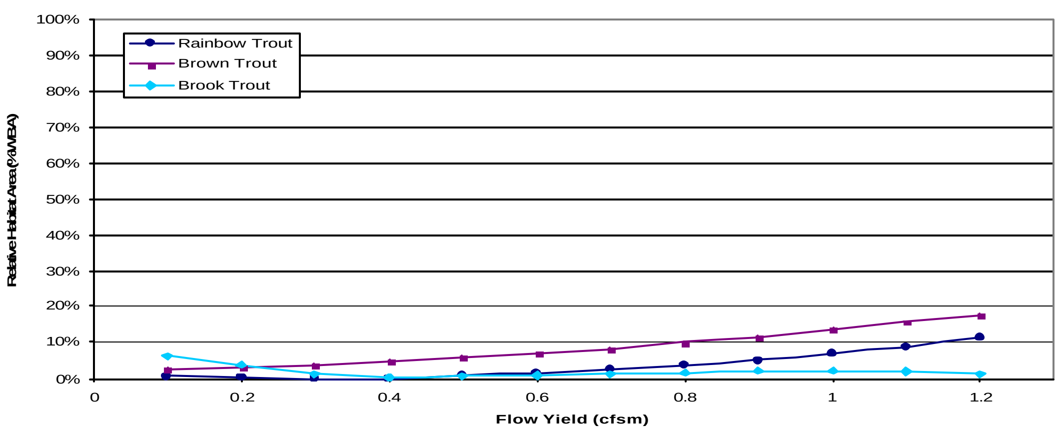
Aquatic Habitat

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 #8 runs between two roads and is shallow and faster than the unit upstream. It consists mostly of fast-flowing shallow habitats (riffles and runs) with many shallow margins. The dominant substrate in this unit is smaller in size than that in management unit #7. It changes into mostly fast *runs* and *ruffles* when flow increases. At mapped flows, the *wetted area* increases from 30% to 70% of the bankfull wetted area, with an inflection point between 0.4 cfsm and 0.8 cfsm. At this point, the overall habitat begins to decline. Almost the entire wetted area is suitable for the target fauna at low flow. Slimy sculpin, blacknose dace, and longnose dace have the best habitat conditions under these circumstances. Interestingly, the levels of suitable habitat for blacknose and longnose dace cross at higher flows. White sucker habitat peaks between 0.4 cfsm and 0.8 cfsm and then proceeds to decline towards zero. Again, brook trout has very low habitat levels in this unit, even low quality habitat is scarce. Brown and rainbow trout have very low levels of excellent habitat and moderate levels of usable habitat. (See general recommendations for aquatic habitat improvement in Section 6.6)



Rating curve for relative habitat area versus flow for Management Unit 8



Rating curve for trout relative habitat area versus flow for Management Unit 8

Figure 28 MesoHABSIM habitat rating curves for Management Unit 8

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 are currently two clay exposures in this management unit.

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 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). Six homeowners in this management unit made use of this program to replace or repair their septic systems.