Management Unit 20

Ulster County - Town of Shandaken

Between Cross Section 186 & 187 to Cross Section 189

Management Unit Description

This management unit begins between cross section 186 and 187, continuing approximately 1,294 ft. to cross section 189. The drainage area ranges from 31.8 mi^2 at the top of the management unit to 31.9 mi^2 at the bottom of the unit. The valley slope is 1.7% and stream water surface slope is 1.3%.

Stream conditions in this management unit are generally unstable, as evidenced by historical channel shifts and symptoms of aggradation. Excessive bar development is causing bank erosion. These conditions are also compromising aquatic habitat quality and diversity. Potential for self-recovery here appears high, due to the presence of vigorous riparian vegetation and favorable morphological setting. Management efforts here should focus on assisting these self-recovery processes through bioengineered bank and channel treatments, which will also improve aquatic habitat.

Summary of Recommendations Management Unit 20	
Intervention Level	Assisted Self-Recovery
Stream Morphology	Encourage narrowing and deepening of channel through plantings at identified site (PS #55)
Riparian Vegetation	Riparian plantings at three identified planting sites (PS #53-55)
Infrastructure	None
Aquatic Habitat	Enhance overhead cover by joint planting of rip-rap at identified planting sites (PS #53-54)
Flood Related Threats	Resurvey National Flood Insurance Program (NFIP) maps to more accurately reflect the active stream channel
Water Quality	None
Further Assessment	Monitor aggradation and associated erosion

Historic Conditions

As the glaciers retreated about 12,000 years ago, they left their "tracks' in the Catskills. According to Rubin's (1996) mapping glacial lake silt/clay deposits are exposed, or near the surface, along the entire management unit, though there were no observations of exposed clay reported during the watershed assessment (See Section 2.4, Geology of the Stony Clove Creek, for a description of these deposits). Where streams are incised into the glacial lake deposits there is strong potential for channel instability by excessive scour in the stream bed or rotational failures (slumping) along adjacent hillslopes.

Figure 2 Historical stream channel alignments in Management Unit 20

As seen from the historical stream alignments, the channel has shifted significantly over the years (Fig. 2).

Between 1959 and 1980 the channel migrated to the left in this management unit, toward NYS Route 214. This migration most likely occurred during a single large flood event. This channel shift has caused many erosion problems at the residential properties in the unit.

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

An emergency permit was issued to Drew VanNorstrand after the 1996 flood to install 250 ft. of rip-rap along an eroding stream bank (Inset F, and Fig. 3). In 2000, Johanna and Philip Byron were issued a permit to install 136 ft. of rip-rap and log cribbing with trees and shrubs along the top of the bank (Inset E). This project was not completed.

Figure 3 Erosion from 1996 Flood at VanNorstrand Property, looking upstream

Stream Channel and Floodplain Current Conditions

Revetment, Berms and Erosion

The 2001 stream feature inventory revealed that 11% (278 ft.) of the stream banks exhibited signs of active erosion along 1,294 ft. of total channel length (Fig. 1). Revetment has been installed on 18% (459 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 14. “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. 4), creating small reaches with differing morphologic characteristics, which are classified as different *stream types* (See Section 3.1 for description of stream types).

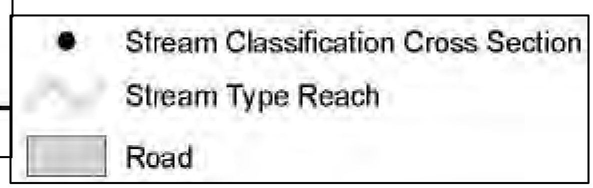


Figure 4 Cross-sections and Rosgen stream types in Management Unit 20

This unit is characterized by aggradation and lateral adjustment. Sediment deposition is leading to excessive bar development and associated bank erosion. These processes are confirmed by the high percentage of revetted banks and the minor erosion sites in the unit.

Management unit #20 begins with a 281 ft. reach of B3c stream type (Inset D). This reach is moderately *entrenched*, or confined within the stream banks during high flood events. Channel slope is fairly flat at 0.8% and the bed material is dominated by cobble.

This reach is overwide. Deposition of bed materials is common in overwide channels because they lose their ability to transport the stream’s *bedload*. Under these conditions streams often *aggrade*, or rise in stream bed elevation, due to excessive deposition. Overwide channels also provide poor fish habitat due to warmer water temperatures and the filling of deep pools.

As stream type transitions into C3 for the next 503 feet, the stream gains access to its floodplain and channel slope increases to 1.7%. The channel remains overwide at the top but begins to narrow toward the end of this reach. The stream splits into two channels, flowing around both sides of a mid-channel bar, and forces the *thalweg*, or deepest part of the stream channel, to flow against the left stream bank, undermining the toe of the bank. Approximately 197 ft. of rip-rap has been installed to prevent erosion on this stream bank.

Native sedges have begun to vegetate this bar. Revegetation of mid-channel bars is often the initial stage of floodplain development, as the stream begins to rebuild a stable morphology after catastrophic disturbance, such as a large flood. A relic channel, which still conveys high flows, is evident on the right, following the 1959 channel alignment shown in Figure 2.

Proceeding downstream the channel narrows (Inset C). The left bank is experiencing some minor erosion. Immediately downstream, the landowner has installed 107 ft. of stacked rock wall and log cribbing (Inset G). Just downstream of this wall, a small section of the stream bank is eroding (Inset B).

As the channel becomes entrenched, stream type transitions to F3 for the remaining 510 ft. of this management unit. At the top of this reach, the landowner has installed 156 ft. of rip-rap along the left stream bank (Inset F). This rip-rap has begun to fail at the toe of the revetment. At the downstream end of this rip-rap, a 242 ft. stretch of eroded, devegetated bank begins (Inset E). If not treated, this bank will continue to erode, possibly undermining trees in the mature forest on the terrace beyond the bank (Fig. 5).

Figure 5 Stream bank erosion, looking upstream

A bedrock outcrop emerges along the last 100 ft. of the right stream bank in this management unit (Inset A). A small *ephemeral* drainage, following the course of the relict channel discussed above, confluences with Stony Clove Creek along the base of this bedrock.

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).

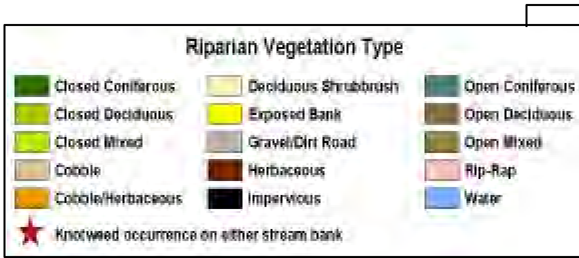
This management unit is characterized by generally aggrading conditions. Valley form and historically unstable channel alignments suggest that this unit is a sediment storage zone, supplied by both upstream and adjacent upland sources. Valley confinement just downstream of this management unit contributes to these processes by creating backwater conditions in this unit during flood flows.

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



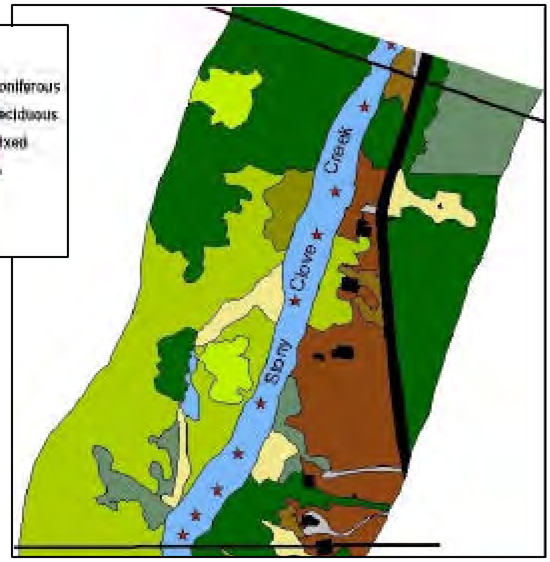


Figure 6 Riparian vegetation map for Management Unit 20

The predominant vegetation type within the 300 ft. riparian buffer is forested (76%) followed by herbaceous (14%). Impervious area (4%) within this unit's buffer is primarily the NYS Route 214 along with private residences. Woody adelgid, a parasitic insect which infests Eastern Hemlock (Tsuga canadensis) was identified in hemlock stands in this management unit (See Section 2.8). Hemlocks are playing a critical role in the stabilization of stream banks throughout this unit, and if significantly weakened by the adelgid infestation, bank stability may be compromised.

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. 7). 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. There were three appropriate planting sites documented within this management unit.

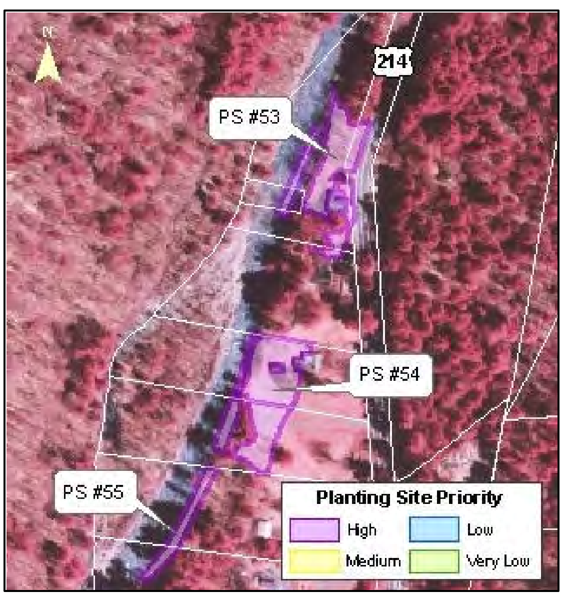


Figure 7 Planting site location map for Management Unit 20

Planting site #53 is located at the first revetment described in this management unit (Fig. 8). The stream bank is approximately 5 ft. in height with a few shrubs, sloping back to a grass lawn. Woody debris has been dumped on the stream bank.


Figure 8 Planting Site #53

Joint planting of the existing rip-rap, by inserting plantings into the soil between the openings in the rip-rap rocks, is recommended at this site. Joint planting will strengthen and increase the longevity of this rip-rap. These plantings will also improve the aquatic habitat by providing shade, resulting in cooler water temperatures. Willow *fascines* should be planted along the toe of the stream bank to provide protection against toe erosion.

The practice of dumping yard clippings, including loose brush, on the stream bank can kill existing bank stabilizing vegetation, inhibit growth of new vegetation and contribute to bank instability. As grass clippings and leaves decompose they input unnecessary nutrients into the stream causing the depletion of the dissolved oxygen needed by fish and other aquatic organisms. As a result, this practice is not recommended.


Figure 9 Planting Site #54

Planting site #54 is located on the left stream bank of two residential properties near the middle of the management unit (Insets B,F,G). This planting site consists of a stream bank which has a length of rip-rap, then an eroding section, followed by more rip-rap (Fig. 9). The upland area is mowed lawn (Fig. 10). Woody debris has been dumped on the sections of the stream bank.


Figure 10 Planting Site #54 upland area

Joint planting the rip-rap and log cribbing is recommended. To provide protection against toe erosion, willow *fascines* and sedges should be planted along the toe of the bank throughout the site. This treatment is critical along the eroding section, the face of which should also be planted with native trees and shrubs. Native trees and shrubs should be planted throughout the upland area. Increasing the riparian buffer width by at least 20 feet will improve bank stability and buffer functionality while still allowing a significant lawn area. Again, the practice of dumping yard clippings and loose brush on the stream bank is not recommended.

Planting site #55 is located on two residences near the downstream end of the management unit (Fig. 11), where the left stream bank is experiencing erosion (Inset E). The upstream residence has some trees atop the stream bank, while the downstream residence has a dense riparian buffer.

Figure 11 Planting Site #55

Installation of willow *fascines* and sedges along the toe of the bank is recommended to provide protection against toe erosion. Native trees and shrubs, including willows should be planted on the face of stream bank. On the upstream property the stream buffer should be denser and the width should be increased by at least 20 feet to improve stream bank stability and buffer functionality.

In-channel plantings of sedge species at the toe of the right bank throughout the unit is recommended to encourage narrowing and deepening of the channel and increase sediment transport effectiveness.

<u>Flood Threats</u>

Inundation

As part of its National Flood Insurance Program (NFIP), the Federal Emergency Management Agency (FEMA) performs hydrologic and hydraulic studies to produce Flood Insurance Rate Maps (FIRM), which identify areas prone to flooding. Initial identification for these maps was completed in 1976. Some areas of these maps may contain errors due to stream channel migration or infrastructure changes over time.

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 12 100-year floodplain boundary in Management Unit 20

According to NFIP maps, there is one house located within the 100-year floodplain boundary in this management unit (Fig. 12). The current NFIP maps are available for review at the Greene and Ulster County Soil & Water Conservation District offices.

Bank Erosion

The majority of the stream banks within the management unit are considered stable, with only 11% (278 ft.) experiencing major erosion. Both of this erosions sites (Insets B & E) are good candidates for *bioengineering* stabilization techniques, which use plantings to bind stream bank soils. Planting recommendations for these sites discussed above should be implemented.

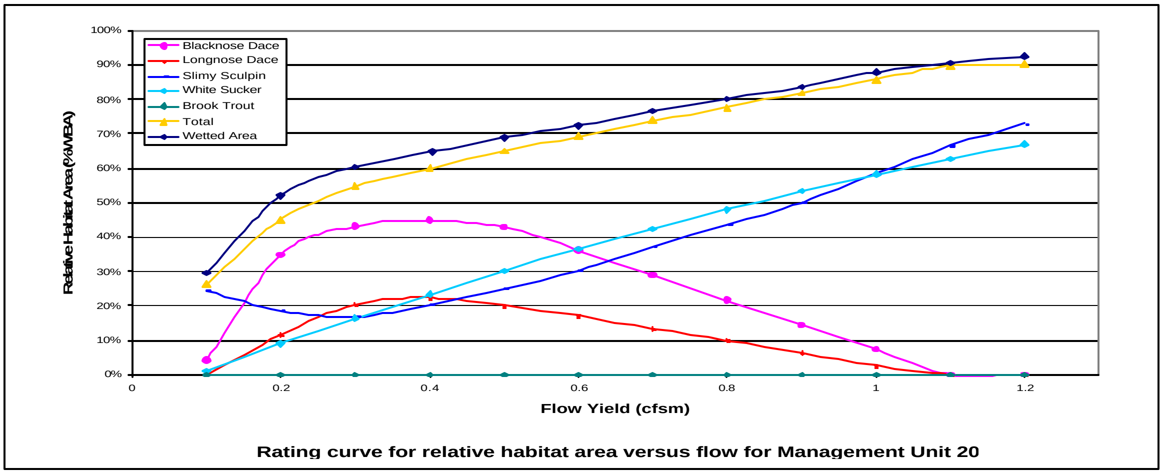
Infrastructure

There are no immediate threats to roadways, as NYS Route 214 is situated at least 50 ft. from the stream throughout this management unit. There are three sections of revetment (Insets F,G,H) protecting residences and yard areas. While rip-rap and other hard controls may provide temporary relief from erosion at these locations, they are expensive to install, degrade habitat, and often fail or transfer erosion problems to upstream or downstream areas. As discussed above, joint planting at revetment sites will strengthen and increase the longevity of the rip-rap. Planting recommendations for these sites should be implemented.

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 #20 has numerous shallow margins, with rip-rap and boulders. It is much shallower than management unit #19, with little hydraulic diversity (Fig. 14). *Wetted area* increases from 30% to 90% of bankfull wetted area with flow. Nevertheless, the *hydro-morphological units* (HMUs) become much larger above 1.0 cfsm. The habitat for slimy sculpin and white sucker increases rather consistently with flow. Similar to management unit #19, both dace species experience a reduction in habitat quality at higher flows, and have the best habitat between 0.3 cfsm and 0.6 cfsm. None of the salmonids have excellent habitat available, although brown and rainbow trout have some suitable low-quality habitat available. (See Section 6.6 general recommendations for aquatic habitat improvement)



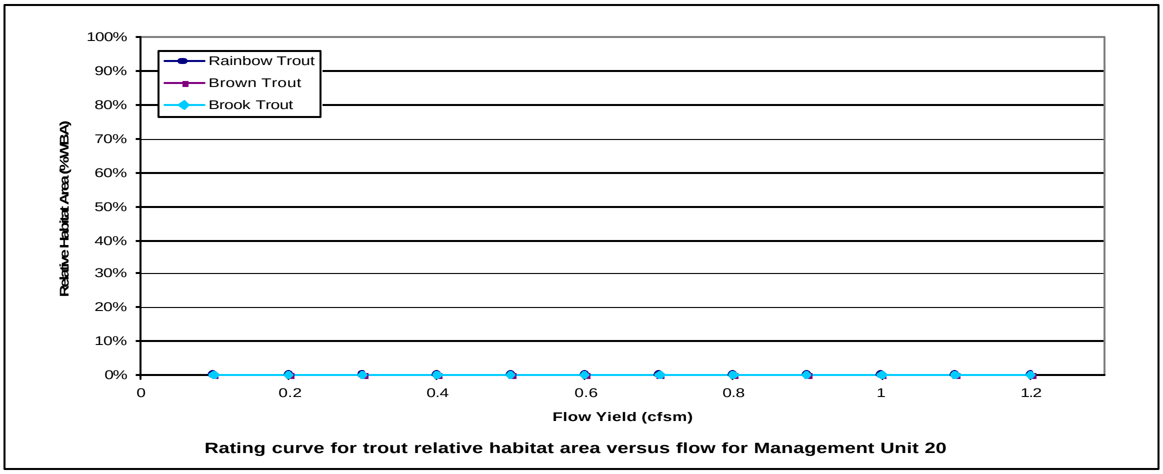


Figure 13 MesoHABSIM habitat rating curves for Management Unit 20

Water Quality

Clay exposures and sediment from stream bank and channel erosion pose a significant threat to water quality in Stony Clove Creek. Clay and sediment inputs into a stream may increase *turbidity* and act as a carrier for other pollutants and pathogens. No clay exposures were identified in this management unit at the time of the stream feature inventory.

Stormwater runoff can also have a considerable impact on water quality. When it rains, water falls on roadways and flows untreated directly into Stony Clove Creek. The cumulative impact of oil, grease, sediment, salt, litter and other unseen pollutants found in road runoff can significantly impact water quality. There are no stormwater culverts in this management unit.

Nutrient loading from failing septic systems is another potential source of water pollution. Leaking septic systems can contaminate water making it unhealthy for swimming or wading. There are many houses located in close proximity to the stream channel in this management unit. These homeowners should inspect their septic systems annually to make sure they are functioning properly. Each household should be on a regular septic service schedule to prevent over-accumulation of solids in their system. Servicing frequency varies per household and is determined by the following factors: household size, tank size, and presence of a garbage disposal. Pumping the septic system out every three to five years is recommended for a three-bedroom house with a 1,000-gallon tank; smaller tanks should be pumped more often.

The New York City Watershed Memorandum of Agreement (MOA) allocated 13.6 million dollars for residential septic system repair and replacement in the West-of-Hudson Watershed through 2002. Eligible systems included those that were less than 1,000-gallon capacity serving one- or two-family residences, or home and business combinations (CWC, 2003). No homeowners in this management unit made use of this program to replace or repair their septic system.