East Kill Management Unit 10

Town of Jewett – Mill Hollow Road Bridge # 3201140 (Station 11254) to Mill Hollow Road Bridge # 3201130 at County Route 17 (Station 6699)

This management unit began at Mill Hollow Road Bridge (#3201140), and continued approximately 4,555 ft. to Mill Hollow Road Bridge (#3201130) at County Route 17.

Management Unit 10 location
see Figure 4.0.1 for more detailed map

Stream Feature Statistics

21% of stream banks experiencing erosion
2.4% of stream banks have been stabilized
0% of stream banks have been bermed
493 feet of clay exposures
24.5 acres of inadequate vegetation
4,696 feet of road within 300ft. of stream

Summary of Recommendations Management Unit 10	
Intervention Level	Assisted Self-Recovery
Stream Morphology	No recommendations at this time
Riparian Vegetation	Treat, remove and prevent the spread of Japanese knotweed where feasible. Monitor Japanese knotweed and eradicate new introductions. Increase width of riparian buffer in appropriate locations.
Infrastructure	Interplant revetment
Aquatic Habitat	Watershed Aquatic Habitat Study
Flood Related Threats	No recommendations at this time
Water Quality	No recommendations at this time
Further Assessment	Establish a Bank Erosion Monitoring Site for erosion (Stations 8794 - 8505). Consider hydraulic analysis of private bridge openings.

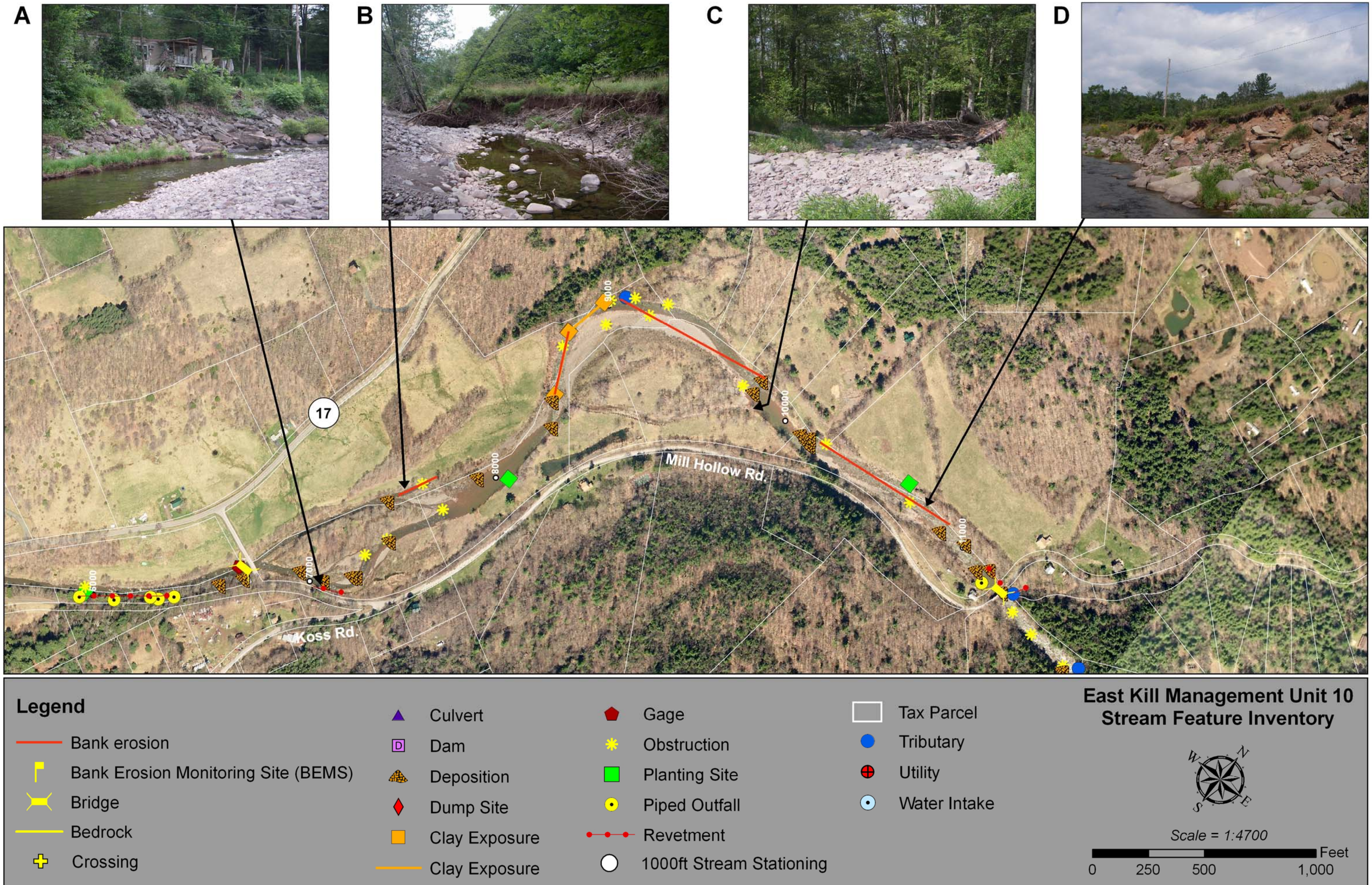
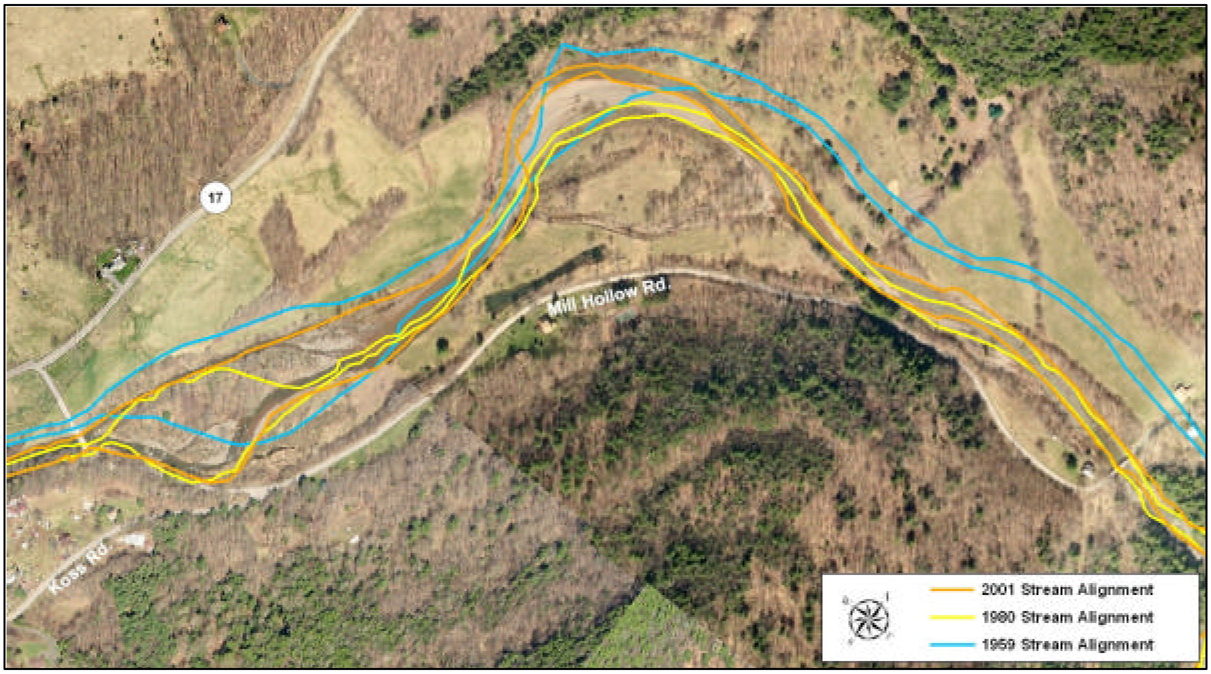


Figure 4.10.1 Management Unit 10 - 2006 aerial photography with stream feature inventory

Historic Conditions



Historic stream channel alignments overlayed with 2006 aerial photograph

To digitally create the stream channel alignments (above), the aerial photos for 1959, 1980 and 2001 were georeferenced, or given a geographic location by matching control points on images with a known coordinate system. Although it appears as though the channel has moved significantly since 1959, this apparent movement can be primarily attributed to the georeferencing process. The stream channel has experienced some lateral migration over the years along this management unit. Lateral migration is the movement of a channel across its floodplain, which results in extensive bank erosion. The outside banks of meander bends tend to move laterally across the valley floor and down the valley. Generally, the *planform* of the channel alignment has not changed significantly over the years along this management unit; the channel has remained fairly stable.

As of 2006, according to available NYS DEC records dating back to 1996, no stream disturbance permits have been issued in this management unit.

Stream Channel and Floodplain Current Conditions (2006)

Revetment, Berms and Erosion

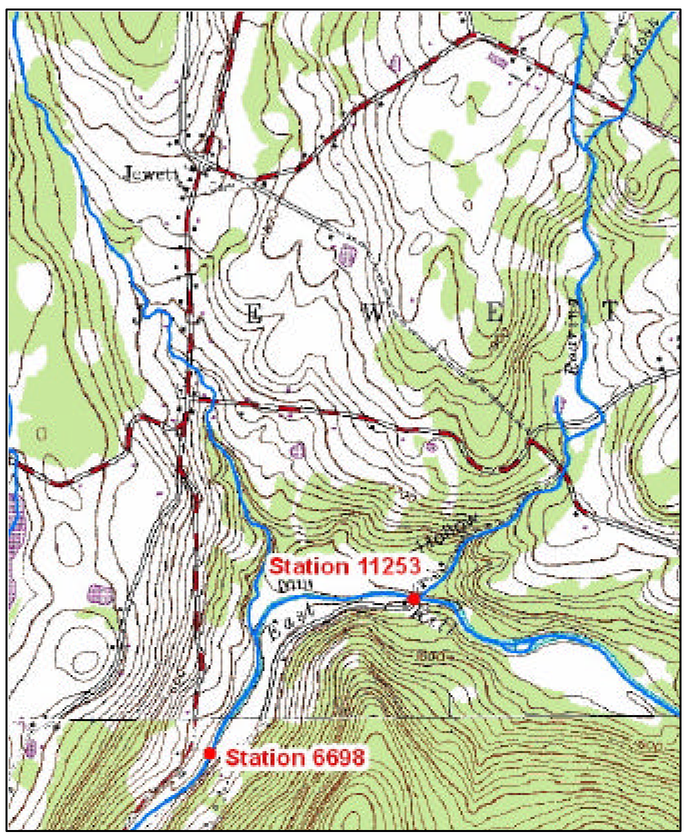
The 2006 stream feature inventory revealed that 21% (1,909 ft.) of the stream banks exhibited signs of active erosion along the 9,110 ft. of total channel length in the unit (Figure 4.10.1). *Revetment* has been installed on 2.4% (218 ft.) of the stream banks. No berms were identified in this management unit at the time of the stream feature inventory.

Stream Channel Conditions (2006)

The following description of stream channel conditions references insets in foldout, Figure 4.10.1. Stream stationing presented on this map is measured in feet and begins at the confluence with the Schoharie Creek at Jewett. “Left” and “right” stream bank 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 an assessment conducted in 2006.

Management unit #10 began at the Mill Hollow Road Bridge. The drainage area ranged from 30.34 mi^2 at the top of the management unit to 35.86 mi^2 at the bottom of the unit. The valley slope was 1.12%.

Valley *morphology* in this management unit was relatively unconfined with a broad glacial and *alluvial* valley flat. Generally, stream conditions in this management unit were somewhat unstable. There were four eroding banks documented in this management unit. Management efforts in this unit should focus on preservation of existing wetlands and



1980 USGS topographic map – Hunter Quadrangle contour interval 20 ft forested areas and improvements to the riparian buffer by planting *herbaceous* areas and revetted stream banks with native trees and shrubs.

Mill Hollow Road Bridge at Station 11254

The management unit began as the stream flowed under the Mill Hollow Road Bridge (Station 11254, Bridge # 3201140). Land cover upstream of the bridge was forested along both sides of the stream channel, as it passed through the bridge and continued downstream, there was a mix of forested vegetation and residential and agricultural land use with herbaceous vegetation. At the time of the assessment, sediment deposits upstream and downstream of the bridge were noted. Deposits such as these are commonly caused by inadequate sizing of the bridge opening. An undersized bridge opening causes water to back up upstream of the bridge, reducing stream velocity, which results in sediment deposition. While bankfull flows may flow freely through this bridge, higher flows may backwater, resulting in stream channel aggradation. If this bridge is replaced in the future, it is recommended that a hydraulic analysis be conducted in order to determine the appropriate bridge width that will provide the capacity to convey flood flows through the opening.

Just downstream of the bridge, there was a small piped outfall (Station 11169) that entered along the left stream bank. The pipe appeared to provide drainage for the nearby residence, there was no outfall protection present and flow was not observed at the time of the assessment. As mentioned previously, there was aggradation downstream of the bridge including side bars along the right (Stations 11158 – 11000) and left (Stations 11125 – 10884) channel bed. The right

Rock wall at Stations 11231 - 11144

stream bank, just downstream from the bridge, was reinforced with a stacked rock wall (Stations 11231 – 11144). The rock wall was in poor functional condition and had failed structurally. Some herbaceous and shrubby vegetation had become established intermittently along the rock wall. Interplanting the rock wall and reinforcing the toe of this stream bank with additional native shrub and sedge species is recommended. This planting will help to strengthen the revetment, while enhancing aquatic habitat.

Erosion at Stations 10888 - 10200

Continuing downstream, there was an erosion site (Stations 10888 – 10200, Figure 4.10.1 Inset A) along approximately 688 feet of the right stream bank. Along the upstream and downstream portions of the erosion site, there was a narrow buffer of trees on the top of the bank. Along a significant portion of the erosion site there was an open field of herbaceous vegetation on the top of the bank, and the face of the bank had minimal vegetation. During the field assessment, a proposed riparian plating site (Station 10637, Figure 4.10.1 Inset A) was identified along this eroding stream bank. A vigorous buffer with mature trees is important at this site because it may also filter nutrients and pollutants, if any, from the adjacent fields. Recommendations for this site include augmentation of existing buffer and establishing a wooded buffer where herbaceous vegetation is maintained to the top of the stream bank. Buffer width should be increased by the greatest amount agreeable to the landowners. Increasing the buffer width to at least 100 feet will increase the buffer functionality. To improve the riparian zone, native trees and shrubs should be planted along stable portions of the stream bank and the upland area. The erosion site may need to be

Riparian planting site at Station 10637 reinforced using a combination of stabilization techniques including *bioengineering* to minimize loss of planted materials. Bioengineering involves the use of live vegetation, either alone or in combination with harder materials such as rock or (dead) wood, to stabilize soils associated with stream banks or hillslopes. Roots stabilize the soil, while stems, branches and foliage slow high *velocity* water, reducing erosion and encouraging deposition of fine sediment. Prior to proceeding with any vegetative plantings this site may require a more detailed site assessment and erosional conditions should be given careful consideration when identifying the appropriate species and locations for plantings. Along the downstream portion of this erosion site, small young trees have been compromised, with one fallen tree (Station 10218) causing a minor obstruction at low flow.

Woody debris at Station 10218

Continuing downstream, aggradational conditions persisted including a center bar, side bars and *point bars*, or depositional features caused by a decrease in sediment transport capacity usually located on the inside of a meander bend, and a transverse bar, or a diagonal bar that stretches across much of the stream channel. Just before the stream meandered to the left, there was a channel *divergence* (Station 9815, Figure 4.10.1 Inset C) where a flood chute split off from the main channel. Flood chutes convey flow through a secondary channel during periods of high flows; this flood chute converges (Station 8467) with the main channel approximately 892 feet downstream. At the time of the assessment, flow was subsurface at the divergence; further downstream along the flood

Flood chute at Stations 9815 - 8467

Erosion at Stations 9800 - 9059

chute, flow proceeded along this secondary channel at the surface and continued to the confluence with the East Kill.

As the stream meandered to the left, there was erosion (Station 9800 – 9059) along approximately 741 feet of the right stream bank. Stream bank erosion often occurs on the outside of meander bends where the stream velocity is greatest during high flows. The face of the stream bank had little to no herbaceous vegetation and there was a maintained field at the top of the bank with some woody vegetation interspersed. Along the erosion site there were young trees (Stations 9269 and 9128) that had been compromised and fallen along the bank in two locations, causing only minor obstructions at low flow. This erosion site may be a good candidate for remediation using vegetative toe and bank protection. Prior to proceeding with any work, this site may require a more detailed site assessment. To help stabilize the bank, recommendations for this site include establishing a woody buffer with the planting of native trees and shrubs along the stream bank and the upland area. Buffer width should be established for the greatest amount agreeable to the landowners. Increasing the buffer width to at least 100 feet will increase the buffer functionality, help to improve stream bank stability and protect water quality by filtering pollutants associated with the nearby land use.

Wetland boundary approximately delineated by NWI (Stations 9458 - 8376)

Along this meander bend, there was a wetland complex comprised of a 2.3 acre riverine wetland (Stations 9458 – 8376) and a 1.3 acre palustrine wetland (Stations 9140 – 8750).

These wetlands were classified as R3USA and PEM1A, respectively (see Section 2.6 for detailed wetland type descriptions). Wetlands are important features in the landscape that provide numerous beneficial functions including protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters, and maintaining surface water flow during dry periods.

Aggradation at tributary confluence Station 9065

Continuing along this meander bend, an unnamed tributary entered from the right stream bank (Station 9065). At the time of the assessment, flow was subsurface. This tributary drains the slopes of Tower Mountain before it reaches the flatter topography of the valley floor where it enters the East Kill. As a result of this stream slope change, the tributary lost its ability to transport sediment gathered from the mountain slopes, and began to deposit sediment at its mouth and into the more gently sloped East Kill. This is a common feature of confluence areas, which often contain extensive sediment bars, function as important sediment storage areas, and are typically among the most dynamic and changeable areas in the stream system. Aggradational conditions persisted along this meander bend. The New York State Department of Environmental Conservation classifies streams and rivers based on their "best use" (NYSDEC, 1994). This tributary was classified C(ts) by the NYS DEC, indicating that the best uses for this stream are supporting fisheries and other non-contact activities, including trout spawning.

Japanese knotweed at Station 9070

Near the confluence of this tributary, there was a patch of Japanese knotweed (Station 9070) on the right bank. Japanese knotweed is an invasive non-native species which does not provide adequate erosion protection due to its very shallow rooting

Clay exposure at Stations 9000 - 8794

system, and also grows rapidly to crowd out more beneficial streamside vegetation. Removal of this Japanese Knotweed stand is recommended to prevent the spread if this invasive specie (See Section 2.7 Riparian Vegetation).

Further downstream, along the same meander bend, there was a lacustrine clay exposure (Stations 9000 – 8794) along the right stream bank and channel bed. Clay inputs into a stream are a serious water quality concern because they increase *turbidity,* degrade fish habitat, and can act as a carrier for other pollutants and pathogens.

The clay exposure was followed by a significant erosion site (Stations 8794 – 8505) that had an erosional area of approximately 5,772 ft^2, and had compromised some woody vegetation causing it to fall along the stream bank. The woody debris appeared to contribute to some localized scour exacerbating the erosion along this bank. The face of the stream bank was bare and lacustrine clay (Stations 8794 – 8505) had been exposed along the length of the eroded bank. During high flows and times of active erosion, a significant amount of clay may enter the stream from this bank; this poses a water quality threat due to the turbidity associated with clay exposures. There was mown lawn to top of the stream bank. The risk to bank stability can be minimized by maintaining mature trees along the critical 100 foot buffer zone. However, due to the active erosion along this high and steeply sloping stream bank, establishing and maintaining a deep-rooted wooded buffer may not be feasible. Improving the riparian buffer along this site is important, however, other stream bank stabilization techniques may be required to reinforce the bank prior to establishing a buffer planted with native shrubs and trees.

Erosion at Stations 8794 - 8505

Wetland boundaries approximately delineated by NWI (Stations 8342 - 6528)

During the field assessment, this bank was identified as a proposed Bank Erosion Monitoring Site (BEMS) to study erosion along this reach. To monitor the BEMS, a cross-section and long profile may be conducted for the collection of baseline data. Once the baseline data has been collected, this cross-section can be resurveyed in the future to calculate the bank's erosion rate.

Continuing downstream, there is a 0.2 acre palustrine wetland (Stations 8342 – 8154) classified as PUBHx, followed by a wetland complex comprised of 2 riverine wetlands and a palustrine wetland. The first riverine wetland (Stations 8200 – 7543) is 1 acre in size and classified as R3USA, the palustrine wetland (Stations 7543 – 6528) is 4.6 acres and classified as PFO1A, and the second riverine wetland (Stations 7328 – 7145) is 0.3 acres in size and is also classified as R3USA (see Section 2.6 for detailed wetland type descriptions).

Riparian planting site at Station 8037

Downstream of the first wetland, there was a proposed riparian planting site on the left stream bank (Station 8037) that was identified at the time of the assessment. There was mowed lawn to the top of the bank, while the face of the bank was vegetated with herbaceous and shrubby vegetation. Recommendations for this site include augmentation of existing buffer with the planting of additional native trees and shrubs along the stream bank and the upland area. Buffer width should be increased by the greatest amount agreeable to the landowners. Increasing the buffer width to at least 100 feet will increase the buffer functionality.

Channel divergence at Station 7926

Continuing downstream, there was a channel divergence (7926) along the right, forming a secondary channel around an island that had herbaceous and shrubby vegetation and an accumulation of gravel deposits and woody debris. Further downstream, there was erosion along approximately 191 feet of the right bank of the secondary channel (Stations 7770 – 7579, Figure 4.10.1 Inset B). The erosion had exposed the roots of woody vegetation and caused some trees to fall along the bank. The fallen woody debris appeared to cause localized scour upstream and downstream of the debris, exacerbating the erosion along this bank.

Continuing along the main channel, there was a second channel divergence (Station 7700) along the right, forming another secondary channel for approximately 239 feet until its confluence (Station 7532) with the first secondary channel at the downstream end of the vegetated island, approximately 179 feet from its divergence from the main stem. There was an accumulation of woody debris at the second channel divergence that appeared to contribute to excessive sediment deposition, causing flow to move subsurface for a portion of this secondary channel. At the confluence of the two secondary channels, flow continued through the first secondary channel along the right side of another more substantial vegetated island for approximately 224 feet until its confluence with the main stem of the East Kill. The island was vegetated with successional forest, shrubs and herbaceous vegetation, and there was excessive sediment deposition in multiple locations along the left side of the island. The total length of the first

Channel convergence at Station 6747

secondary channel was approximately 403 feet, from the divergence to its confluence with the main channel. There was abundant woody debris accumulated in two locations (Stations 7437 and 7320) along the right side of the main channel, which was the left side of the center island. Both accumulations of woody debris caused minor obstructions at low flow, the first obstruction appeared to contribute to deposition upstream and localized scour downstream of the debris, while the second appeared to contribute to aggradational conditions.

Woody debris at Station 7320

Along this section of the stream, Mill Hollow Road encroached upon the stream channel along the left stream bank. The embankment has been reinforced with rip-rap (Stations 7142 – 7010, Figure 4.10.1 Inset A) along approximately 132 feet of the stream channel. The rip-rap was in good structural and functional condition. A medium sized stand of Japanese knotweed (Station 7142) had become established along the upstream portion of the rip-rap. Removal of this Japanese knotweed stand is recommended to prevent the spread of this invasive species (See Section 2.7 Riparian Vegetation). Interplanting the rip-rap and reinforcing the toe of this stream bank with native shrub and sedge species is also recommended. This planting will help to strengthen the revetment, while enhancing aquatic habitat.

This management unit ended at the Mill Hollow Road Bridge at County Route 17 (Station 6699, Bridge # 3201130). At the time of the assessment excessive aggradational conditions were observed upstream of the bridge. While the bridge opening seemed to provide an adequate span for low flows, higher flows appear to backwater, reducing stream velocity, which

Mill Hollow Road Bridge at Station 6699 results in upstream aggradation. If this bridge is replaced in the future, it is recommended that a hydraulic analysis be conducted in order to determine the appropriate bridge width that will provide the capacity to convey flood flows through the opening.

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).

Sediment transport in this unit is influenced by valley morphology. The unconfined valley form and topography suggest that this unit is a sediment storage zone. This unit has experienced wide-spread sediment transport deficiencies. Bed load transported by the stream channel exceeds the transport capacity of management unit #10, resulting in channel aggradation and lateral migration. Sediment storage areas can benefit the general health of the stream system by limiting bed load delivered to downstream reaches during large storm events. Sediment sinks such as this throughout the watershed should be preserved where adjacent land uses permit. Mature riparian vegetation will be important in such settings to limit the extent of lateral channel migration and bank erosion. The ability of the channel to convey sediment was also affected by two bridges that appeared to be contributing to backwater conditions and upstream channel aggradation.

Riparian Vegetation

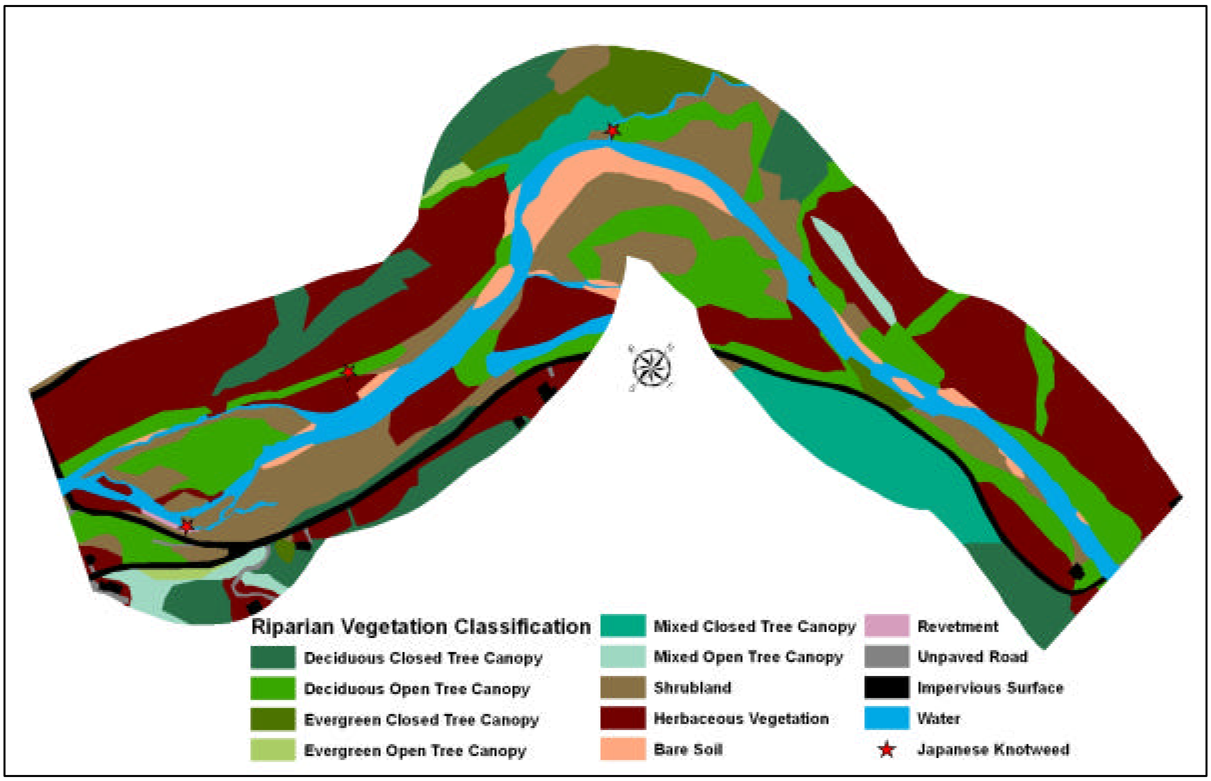
One of the most cost-effective and self-sustaining methods for landowners to protect streamside property is to maintain or replant a healthy buffer of trees and shrubs along the banks and floodplains, especially within the first 50 to 100 ft. of the stream. A dense mat of roots under trees and shrubs binds the soil together, making it much less susceptible to erosion. Mowed lawn (grass) does not provide adequate erosion protection on stream banks because it typically has a very shallow rooting system and cannot reduce erosive forces by slowing water velocity as well as trees and shrubs. One innovative solution is the interplanting of revetment with native trees and shrubs which can significantly increase the working life of existing rock rip-rap, while providing additional benefits to water, habitat, and aesthetic quality. *Riparian*, or streamside, forest can buffer and filter contaminants coming from upland sources, shallow groundwater or overbank flows, and slow the velocity of floodwaters causing sediment to drop out while allowing for *groundwater recharge*. Riparian plantings can include a great variety of flowering trees, shrubs, and sedges native to the Catskills. Native species are adapted to our regional climate and soil conditions and typically require less maintenance following planting and establishment. Two suitable riparian improvement planting sites were documented within this management unit. There were also locations within this unit that would benefit from interplanting of the revetted embankment and enhancing riparian buffer width.

Some plant species that are not native can create difficulties for stream management, particularly if they are invasive. Japanese knotweed (*Fallopia japonica*), for example, has become a widespread problem in recent years. Knotweed shades out other species with its 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 stream banks. The result can include rapid stream bank erosion and increased surface runoff leading to a loss of valuable topsoil. Japanese knotweed locations were documented as part of the stream feature inventory conducted during the summer of 2006 (Riparian Vegetation Mapping, Appendix B). The first appearance of Japanese knotweed on the East Kill mainstem does not occur until management unit #7. In total, 3 Japanese knotweed occurrences along an estimated length of 36 ft were documented in this management unit during the 2006 stream feature inventory.

Japanese knotweed at Station 7142

The best means for controlling knotweed is prevention of its spread, therefore, efforts should be made to ensure that all fill brought into the area is clean and does not have fragments of knotweed or other invasive plants. If Japanese knotweed sprouts or small stands are observed, they should be eradicated immediately to avoid further spread within this unit and downstream management units. The Japanese knotweed patches that were observed in this unit may be removed to prevent further spread, see Section 2.7 Riparian Vegetation for more information on knotweed removal methods.

An analysis of vegetation was conducted using aerial photography from 2001 and field inventories (see map below and Riparian Vegetation Mapping, Appendix B). In this management unit, the predominant vegetation type within the 300 ft. riparian buffer was forested (42 %) followed by herbaceous (33%). *Impervious* area (3.6 %) within this unit's buffer was primarily the local and private roadways, and residential structures. Areas of herbaceous (non-woody) cover may present opportunities to improve the riparian buffer with tree plantings in order to promote a more mature vegetative community along the stream bank and in the floodplain.



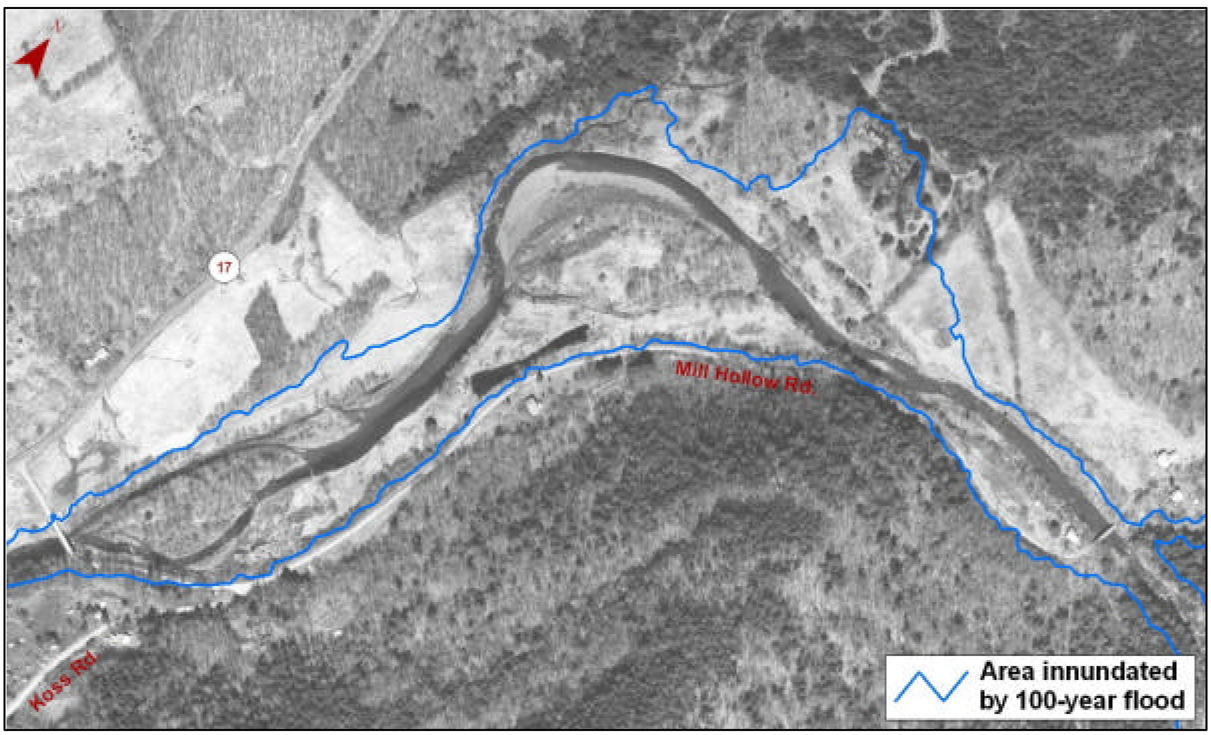
Riparian vegetation classification map based on aerial photography from 2001

Flood Threats

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. The NYS DEC

Bureau of Program Resources and Flood Protection has developed new floodplain maps for the East Kill on the basis of recent surveys. The new FIRM hardcopy maps are available for viewing at the Greene County Soil & Water Conservation District Office and the Jewett Municipal Building. The FIRM maps shown in this plan are in draft form and currently under review. Finalization and adoption is expected by the end of 2007.

According to the current floodplain maps (below), one existing structure in this unit appeared to be situated within the estimated 100-year floodplain. The 100-year floodplain is that area predicted to be inundated by floods of a magnitude that is expected to occur once in any 100-year period, on the basis of a statistical analysis of local flood record. Most communities regulate the type of development that can occur in areas subject to these flood risks.



100-year floodplain boundary map

Aquatic Habitat

Generally, habitat quality appeared to be good throughout this management unit. Canopy cover was adequate along much of both stream banks. Woody debris within the stream channel was observed throughout the unit. This woody debris was providing critical habitat for fish and insects, and added essential organic matter that will benefit organisms downstream.

It is recommended that an aquatic habitat study be conducted on the East Kill with particular attention paid to springs, tributaries and other potential thermal refuge for cold water fish, particularly trout. Once identified, efforts should be made to protect these thermal refugia locations in order to sustain a cold water fishery throughout the summer.

Water Quality

Clay/silt exposures and sediment from stream bank and channel erosion pose a potential threat to water quality in the East Kill. Fine sediment inputs into a stream increase *turbidity* and can act as a transport mechanism for other pollutants and pathogens. There were two significant 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 parking areas before flowing untreated directly into the East Kill. The cumulative impact of oil, grease, sediment, salt, litter and other unseen pollutants found in road runoff can significantly degrade water quality. There was one stormwater culvert in this management unit in 2006.

Nutrient loading from failing septic systems is another potential source of water pollution. Leaking septic systems can contaminate water with nutrients and pathogens making it unhealthy for drinking, swimming, or wading. There were a few buildings located in close proximity to the stream channel in this management unit. These building owners should inspect their septic systems annually to make sure they are functioning properly. Servicing frequency varies per household and is determined by 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. To assist watershed landowners with septic system issues, technical and financial assistance is available through two Catskill Watershed Corporation (CWC) programs, the Septic Rehab and Replacement program and the Septic Maintenance program (See Section 2.12). Through December 2005, four homeowners within the drainage area of this management unit had made use of these programs to replace or repair a septic system.

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