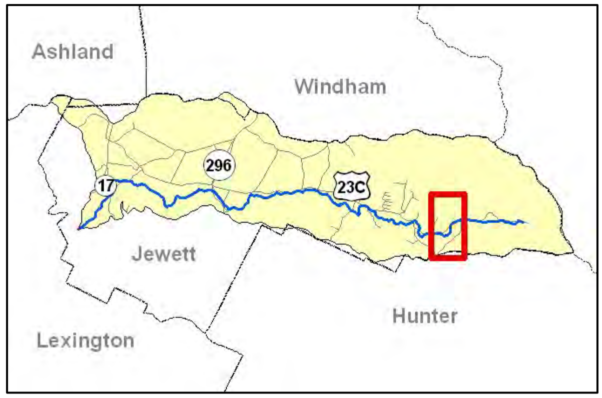
East Kill Management Unit 2

Town of Jewett – Colgate Lake Dam (Station 73769) to Vista Ridge Road (Station 67789)

This management unit begins at Colgate Lake Dam, continuing approximately 5,980 ft. to Vista Ridge Road Bridge in the Town of Jewett.



Management Unit 2 location
see Figure 4.0.1 for more detailed map

<u>Stream Feature Statistics</u>

15.8% of stream banks experiencing erosion
5.4% of stream banks have been stabilized
0% of stream banks have been bermed
262 feet of clay exposures
19.2 acres of inadequate vegetation
5,425 feet of road within 300ft. of stream

Summary of Recommendations Management Unit 2	
Intervention Level	Preservation, Assisted Self-Recovery
Stream Morphology	No recommendations at this time
Riparian Vegetation	Monitor for introduction of Japanese Knotweed and eradicate new introductions. Increase width of riparian buffer in appropriate locations.
Infrastructure	Interplant rip-rap installations
Aquatic Habitat	Watershed Aquatic Habitat Study
Flood Related Threats	No recommendations at this time
Water Quality	Removal of dump site
Further Assessment	Continue monitoring of Bank Erosion Monitoring Site Consider hydraulic analysis of private bridge openings

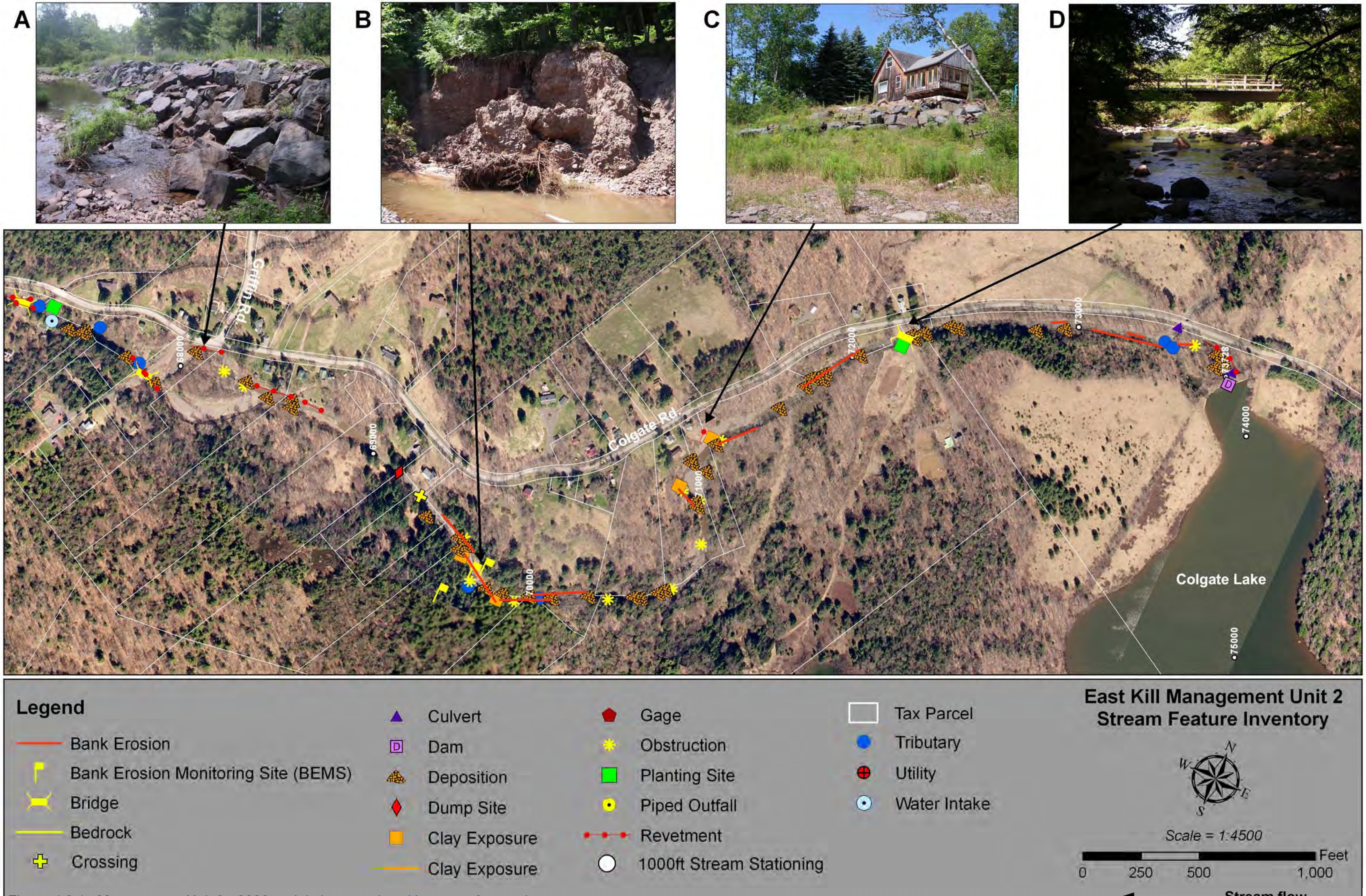
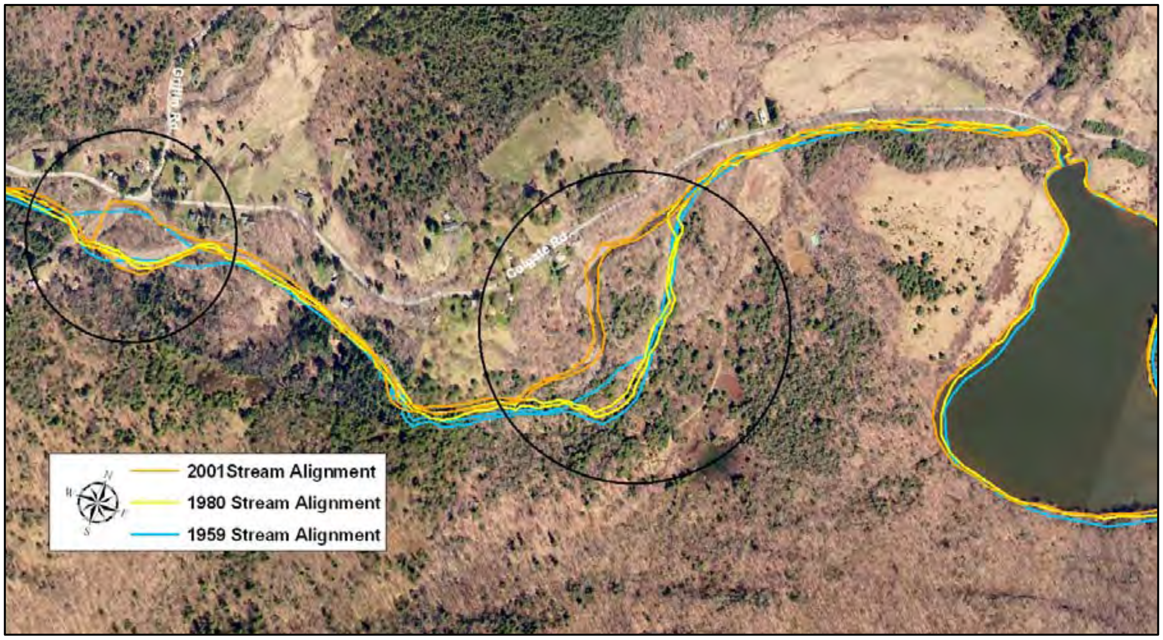


Figure 4.2.1 Management Unit 2 - 2006 aerial photography with stream feature inventory

Historic Conditions



Historic stream channel alignments overlayed with 2006 aerial photograph

As seen from the historical stream channel alignments (above), the *planform* of the channel alignment has changed significantly over the years in two locations along this management unit, otherwise the channel has remained fairly stable. The first significant change in channel alignment began approximately 2,700 feet downstream from the beginning of this management unit. A review of historical aerial photographs shows evidence that the channel began to move laterally and experience multiple channel divergences sometime between 1967 and 1980. By 2001, the main channel had moved northwest, establishing a new channel between stations 71700 and 70400. Approximately 1,900 feet further downstream, a second change in channel alignment occurred. Historically, at this channel divergence, station 68500, the northern channel alignment was cut off from the southern channel alignment sometime between 1967 and 1980, and then reestablished a connection sometime between 1980 and 2001.

As of 2006, according to available NYS DEC records dating back to 1996, there have been two stream disturbance permits issued in this management unit. Following the 1996 flood, a permit was issued for removal of tree and brush debris, and excavation of sand and gravel to restore stream flows to pre-flood conditions near station 68667. In 1996, a second stream disturbance permit was issued for flood repairs to Vista Ridge Road Bridge and for grading the road embankment.

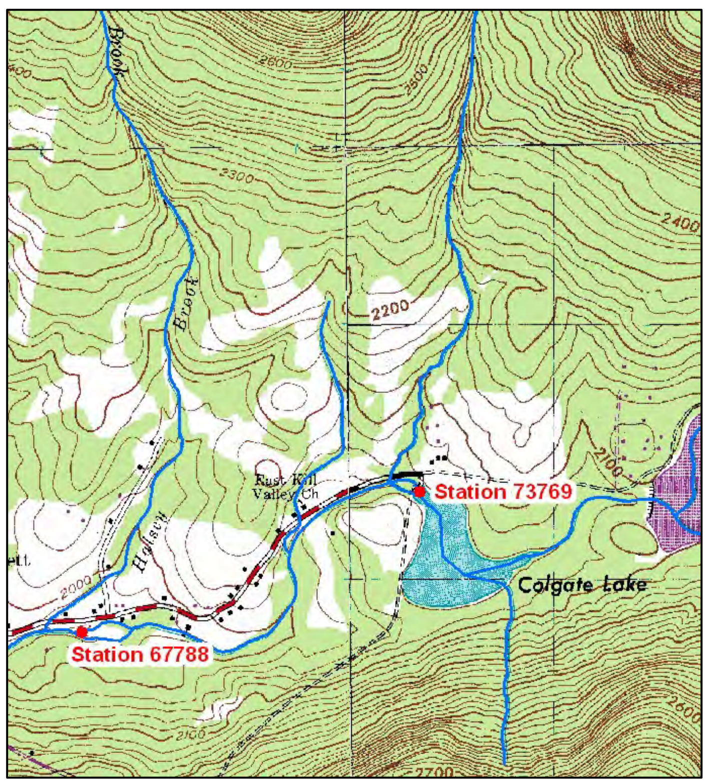
Stream Channel and Floodplain Current Conditions (2006)

Revetment, Berms and Erosion

The 2006 stream feature inventory revealed that 15.8% (1,886 ft.) of the stream banks exhibited signs of active erosion along the 11,961 ft. of total channel length in the unit (Fig. 4.2.1). *Revetment* has been installed on 5.4% (645 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 4.2.1. 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.



1980 USGS topographic map – Kaaterskill Quadrangle contour interval 20ft

Management unit #2 began at the Colgate Lake Dam. The drainage area ranged from 5.17 mi^2 at the top of the management unit to 7.73 mi^2 at the bottom of the unit. The valley slope was 1.53%.

Valley *morphology* in this management unit was unconfined with a broad glacial and *alluvial* valley flat. Generally, stream conditions in this management unit were relatively stable. There were nine eroding banks documented in this management unit, several of the banks were experiencing minor erosion, while two of the banks were experiencing significant erosion with mass failure and fallen trees. Management efforts in this unit should focus on preservation of existing wetlands and forested areas and improvements to the riparian buffer by planting *herbaceous* areas and revetted stream banks with native trees and shrubs.

Culvert at toe of dam, Station 73728

This management unit begins (Station 73769) as the stream flows from the Colgate Lake Dam through a culvert (Station 73728) under the dam outfall. The dam is an earth gravity dam that was constructed of compacted fine-grained materials and concrete for recreational purposes. It measures 15 feet high and 275 feet in length. The drainage area of the dam is 5.5 mi^2. The maximum storage space in the reservoir is 170 acre-feet, and the maximum discharge that the dam was designed for is 1,280 cu ft/sec. According to the National Inventory of Dams, the downstream hazard potential is considered significant, which is defined by the U.S. Army Corps of Engineers (USACE) as "a dam where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns". In 2007, the NYS DEC submitted a permit application for the replacement of the Colgate Lake Dam. The proposed work would include a temporary stream crossing, removal of the existing dam, upland disposal of old dam material and construction of a new dam that will meet New York State Dam Safety criteria.

Rock wall at Station 73728

Just downstream of the dam, there was a stacked rock wall and a short segment of small-stone rip-rap protecting the right stream bank; both forms of revetment were in good structural and functional condition at the time of the stream feature inventory and assessment. In this area, the stream was experiencing full channel *aggradation,* or sediment deposition. As the stream flowed close to Colgate Road, there was rip-rap along the toe of the bank protecting the road embankment that was experiencing some scour.

Tributary at Station 73374 – looking at

Through a culvert under Colgate Road, an unnamed tributary entered from the right bank (Station 73374); this tributary drains Black Dome and Black Head Mountains. At the time of the assessment, there was a small trickle of flow through the culvert and flow was subsurface at the confluence with the East Kill. There was a large drop-off and significant aggradation at the confluence. This tributary was classified C by the NYS DEC, indicating that the best uses for this stream were the support of fisheries and other non-contact activities (NYSDEC, 1994).

Continuing downstream, there were a few locations along the right stream bank, and one along the left stream bank, where the stream was causing some minor erosion and scour. Along this stretch of stream, there were multiple locations of aggradation including a *transverse bar* (Station 72480), or a diagonal accumulation of sediment within the stream channel, and two side bars. As the stream approached a private bridge (Station 72244, Figure 4.2.1 Inset D), there was a side bar along both stream banks. Depositional areas located just upstream of a bridge 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,

Transverse bar at Station 72480

resulting in the 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.

Planting site at Station 72223

Downstream of the bridge, there was some scour on the left stream bank, where the herbaceous vegetation is mowed to the edge of the stream. Recommendations for this site (Station 72223) included planting 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 and protect the stream from nearby land uses.

Eroding bank at Station 71482

Continuing downstream, there was approximately 295 ft of minor erosion along the right bank (Station 72043) and several depositional areas including, a transverse bar, side bar and two *point bars*, or sediment deposited on the inside of a meander bend. Before the stream meandered to the left, the left bank was experiencing erosion (Station 71482) for approximately 187 feet, with minor scour at the toe of the bank. There was vegetation overhanging the bank and an accumulation of woody debris at the end of the erosion; the woody debris obstruction appeared to be exacerbating or contributing to the erosion, but was also providing good cover and shading for fish. As the stream began to meander to the left, there was aggradation along the left bed and revetment (Station 71300, Figure 4.2.1 Inset C) along the right bank. There was a house at the top of this bank; the upper portion of the stream bank was protected with quarry-stone rip-rap and there were large stones placed at the toe of the bank on the outside of the meander bend where the *thalweg*, or deepest part of the stream channel, would hit

Clay exposure at Station 71289

during high flows. There was a bar along the floodplain bench in front of the rip-rap, where 10 feet of lacustrine clay (Station 71289) has been exposed near the stream's edge. 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. It is recommended to interplant native shrub and sedge species through the rip-rap and along the toe of this stream bank. This planting will help to strengthen the revetment, while enhancing aquatic habitat. Beyond the rip-rap installation there was mown grass to the edge of the bank. The risk to bank stability can be minimized by maintaining mature trees along the critical 100 foot buffer zone. While it may not be feasible to increase the buffer width by 100 feet, the buffer width should be increased by the greatest amount agreeable to the landowners.

Continuing downstream, there were multiple areas of aggradation along approximately 190 feet of the stream bed and banks, including, side, point and center bars. The center bar was approximately 156 feet long, flow moved subsurface through the center bar and within the main and secondary channels at the time of the assessment. Along this stretch of the stream, there were two woody debris obstructions in the secondary channel, one of which appeared to exacerbate the upstream aggradation. There was also some minor erosion with clay exposed along the right bank of the secondary channel.

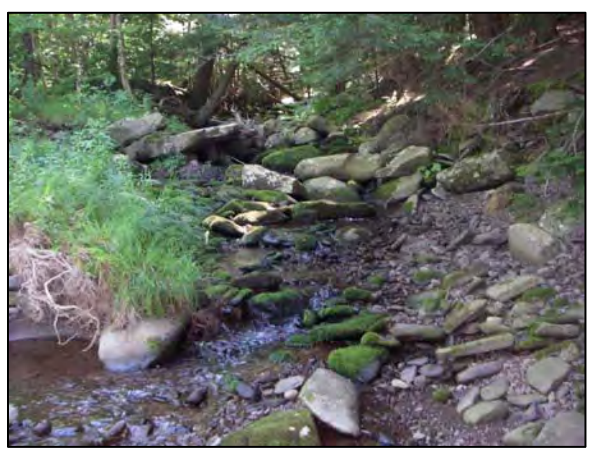
As the stream meandered to the right, there was a 2.3 acre palustrine wetland (Station 70764) with scrub-shrub vegetation along the left stream bank. This wetland was classified as PSS1Eb (see Section 2.6 for detailed wetland type descriptions). Wetlands are important features in the landscape that provide numerous beneficial functions

Wetland boundary approximately delineated by NWI (Station 70764) including protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters, and maintaining surface water flow during dry periods. Along the left bank, there was a flood chute (Station 70749 to Station 70357) that flowed through the wetland and continued downstream for approximately 392 feet until its convergence with the main channel. The flood chute, which had excessive sediment deposition and an abundance of woody debris, conveyed intermittent flows during high flow periods.

Woody debris at Station 71000

Continuing downstream there were multiple areas of sediment deposition and woody debris accumulation along both stream banks and within the channel. At the downstream end of a point bar that stretched for 450 feet along the right bed and bank, there was significant woody debris accumulation (Station 71000) that extended across the channel and along both stream banks. This debris caused a minor obstruction at low flows, but may pose a more significant obstruction at higher flows; and it appeared to be contributing to aggradation upstream of the obstruction and scour downstream of the obstruction. However, woody debris is beneficial to a stream system, it provides critical habitat for fish and insects, and adds essential organic matter that will benefit organisms downstream.

Beginning at station 70235 and continuing downstream to station 69400, there was erosion on one or both stream banks. Just before the stream begins to meander to the right, the right stream bank was experiencing minor erosion with scour and undercut trees. Along the meander bend, the left bank was experiencing hydraulic erosion with minor scour and undercut banks. A small unnamed



Tributary confluence at Station 70039

photo orientation - looking at

tributary (Station 70039) entered through the eroding bank on the left; sediment had accumulated at its confluence with the East Kill. Downstream of the tributary there were some fallen trees associated with the left bank erosion.

Bank Erosion Monitoring Site at Station 69703

The minor hydraulic erosion on the left stream bank was followed by a *mass failure*, a large slope failure associated with down-cutting stream channels and undermined support of steep slopes (Station 69857 to Station 69611). Stream bank erosion often occurs on the outside of meander bends where the stream velocity is greatest during high flows; along this section of stream, the thalweg flowed up against the toe of the bank undermining the steep slope, resulting in an erosion area of approximately 7,408 ft^2, exposing mixed till (Figure 4.2.1, Inset B) and compromising mature trees along the bank. During high flows and times of active erosion, a significant amount of clay enters the stream from this bank, which was observed during the assessment and monitoring efforts at this site; this poses a water quality threat due to the turbidity associated with clay exposures. There were also multiple small seeps along this bank, further exacerbating the erosion and mass failure at this site. To study erosion along this reach, this bank has been monumented as a Bank Erosion Monitoring Site (BEMS # 06EK1601, Station 69703). A cross-section and long profile survey were conducted to collect baseline data. In the future this cross-section can be resurveyed to calculate the bank's erosion rate. It is recommended that monitoring of this site continue.

Continuing downstream, the right stream bank has been affected by a combination of mass failure and hydraulic erosion (Station 69616 to Station 69400), resulting in an erosion area of approximately 2,162 ft^2. There were several fallen trees

Erosion along right stream bank
Stations 69616-69400

along the eroding bank that extended into the channel and there was considerable aggradation along this reach. The fallen trees appeared to be contributing to scour upstream and downstream, though they may provide some protection to the stream bank.

Dump site at Station 69132

Further downstream, there was a handmade private foot bridge with three piers made of cobbles and a wooden platform (Station 69271) that caused a minor obstruction at low flows. Along the right stream bank, downstream from the foot bridge, concrete and metal was dumped in the floodplain. It is recommended that the dump site (Station 69132) be cleared to eliminate the potential safety and pollution hazards associated with the materials.

Wetland boundaries approximately delineated by NWI (Stations 68849 – 68385 and 67873 - 67764)

Along the left stream bank, there was a 0.9 acre palustrine wetland (Station 68849-68385) with scrub-shrub vegetation. This wetland was classified as PSS1Eb (see Section 2.6 for detailed wetland type descriptions). Further downstream, there is a 0.3 acre palustrine wetland (Station 67873 - 67764) that extends from management unit #2 into management unit #3 along the right stream bank. This wetland is classified as PUBHh (see Section 2.6 for detailed wetland type descriptions).

Rip-rap along right bank at Station 68717

Opposite the first wetland, the right stream bank was reinforced with rip-rap in two locations (Stations 68717 and 68575). The lawn was mowed to the top of the stream bank along the edges of both revetted areas. Although the rip-rap was in good structural and functional condition at both locations, it is recommended to interplant native shrub and sedge species through the rip-rap and along the toe of this stream bank. This planting will help to strengthen the revetment, while enhancing aquatic habitat. The risk to bank stability can be minimized by maintaining mature trees along the critical 100-foot buffer zone. While achieving a 100 ft vegetated buffer may not be feasible due to the nearby residential structures along both revetted banks, the buffer width should be increased by the greatest amount agreeable to the landowners.

As mentioned earlier, following the flood in 1996, a DEC permit was issued to remove woody debris and excavate material (sand/gravel) to restore pre-flood channel conditions along approximately 600 feet of the stream channel near station 68668. The 2006 assessment of the East Kill showed evidence that throughout this stretch of stream, the stream channel was unable to convey its sediment load effectively, resulting in excessive sediment deposition; abundant woody debris accumulation was also observed throughout this reach during the assessment.

Point bar at Station 68600

Flood chute at Station 68481

Just before the stream meandered to the right, the channel diverges, forming a secondary channel that appeared to function primarily as a flood chute (Station 68481). Review of the historical channel alignments showed that this channel has been present since at least 1959 and that it functioned as the main channel in 1980. The flood chute converged with the main channel approximately 544 feet downstream, just before the stream flowed under Vista Ridge Road Bridge.

As the stream meandered to the right, it ran close to Colgate Road, where the right embankment was protected by approximately 140 feet of rip-rap (Station 68209, Figure 4.2.1 Inset A). Interplanting the rip-rap and reinforcing the toe of this stream bank with native shrub and sedge species is recommended. This planting will help to strengthen the revetment, while enhancing aquatic habitat. At the time of the assessment, the riparian buffer beyond the rip-rap installation was sparse, with some mature trees and mown grass to the edge of the bank. The close location of the stream bank relative to Colgate Road poses limitations for enhancing the buffer width, however, maintaining mature trees along the existing buffer is recommended.

Center bar at Station 68093

As the stream meandered to the left, flowing away from Colgate Road, there was a center bar (Stations 68093 – 67869) forming a split channel; the secondary channel flowed around the bar and close to Vista Ridge Road and converged with the main channel just upstream of the Vista Ridge Road Bridge. It appeared that this private access road may become compromised by high flows if depositional conditions persist along this reach and the stream continues to flow up against the toe of the road embankment. Reinforcing the road embankment with native shrub and sedge species is recommended.

Vista Ridge Road Bridge at Station 67777

Just downstream of the center bar, the flood chute converged with the main channel. At the time of the assessment, there was some flowing water entering from the chute at its confluence with the East Kill. This suggests that there was subsurface flow through the flood chute. Downstream of the convergence, the left stream bank was reinforced with approximately 89 feet of rip-rap as the stream approached Vista Ridge Road Bridge (Station 67777). This bridge marks the end of management unit #2. As mentioned previously, there was excessive sediment deposition upstream of the bridge. Aggradational conditions 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 the 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 was influenced by valley morphology. The unconfined valley form and topography suggest that this unit was a sediment storage zone. This unit has experienced wide-spread sediment transport deficiencies. Bed load transported by the stream channel exceeded the transport capacity of management unit #2, 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 MU 2, 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.

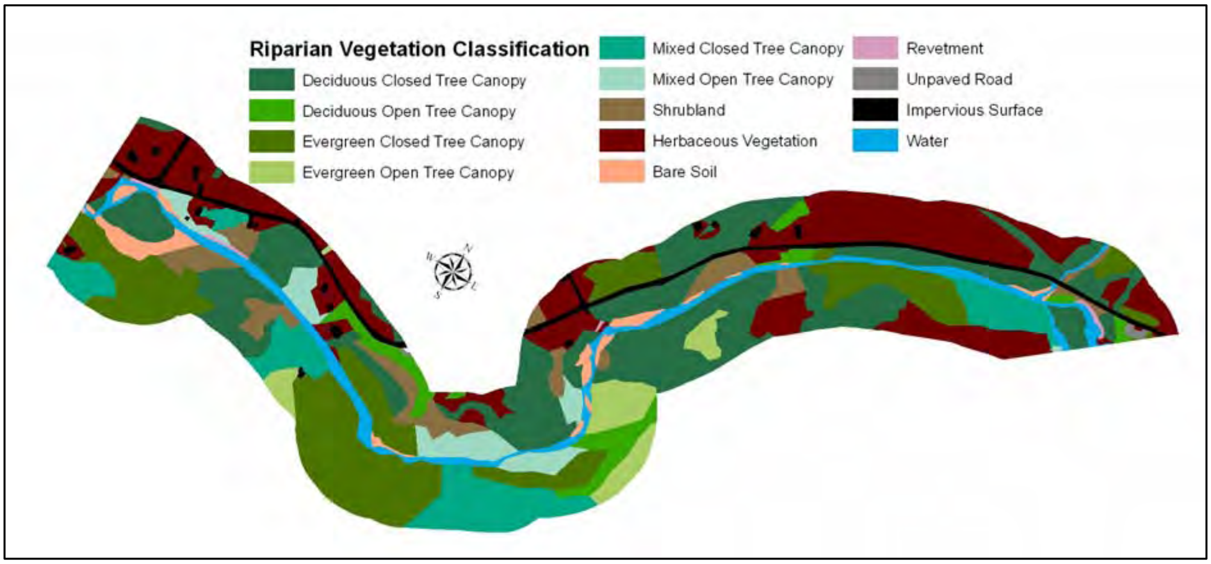
Sediment transport downstream of the Colgate Lake Dam may be affected by sedimentation of Colgate Lake. Dams tend to impact stream geomorphology and may cause channel instability when sediment is trapped and stream flow below the dam transports a smaller sediment load than would naturally occur. This may result in the erosion of stream banks to fulfill the sediment carrying capacity of the stream (Koltun et al. 1997).

The ability of the channel to convey sediment was also affected by two private bridges that appeared to be contributing to backwater conditions and upstream channel aggradation. Installation of floodplain drainage under bridge approaches may reduce the backwater conditions and improve sediment transport continuity.

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 and 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. One suitable riparian improvement planting site was documented within this management unit. There were also several locations within this unit that would benefit from interplanting of revetted embankments.

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 A). The first appearance of Japanese knotweed on the East Kill mainstem does not occur until management unit #7. 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. Periodic monitoring for knotweed introductions in this unit is recommended.

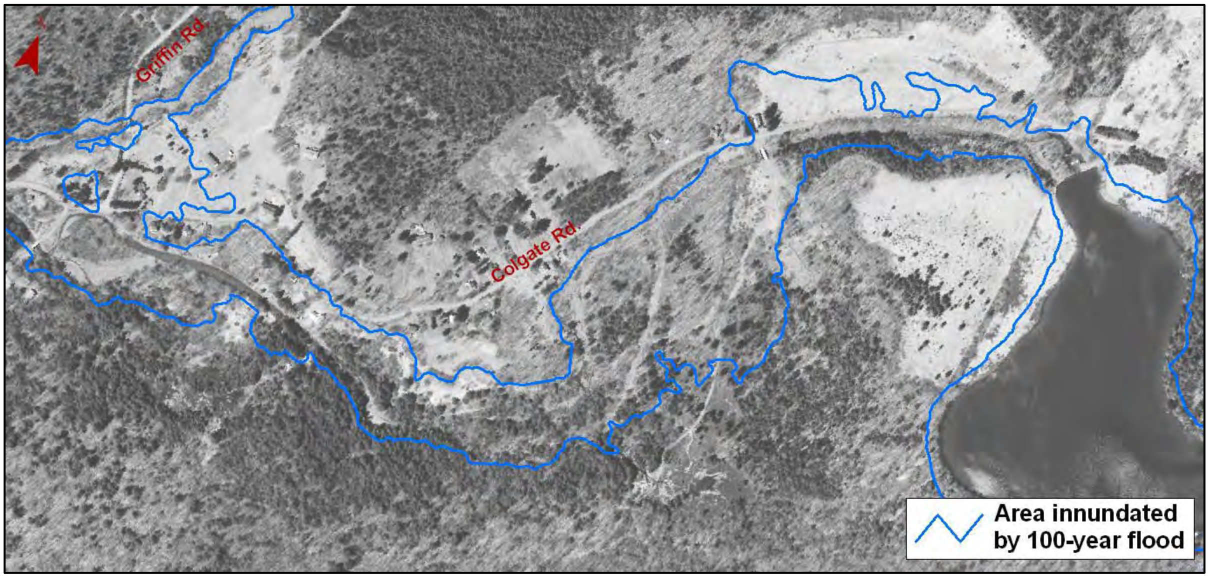


Riparian vegetation classification map based on aerial photography from 2001

An analysis of vegetation was conducted using aerial photography from 2001 and field inventories (see above map and Riparian Vegetation Mapping, Appendix A). In this management unit, the predominant vegetation type within the 300 ft. riparian buffer was forested (67 %) followed by herbaceous (21%). *Impervious* area (3.9 %) 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.

<u>Flood Threats</u>

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



100-year floodplain boundary map

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), six existing structures 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.

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 three 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 were two culverts in this management unit, one located at the toe of Colgate Lake Dam that conveyed lake water flow, and a second culvert that provided passage for an unnamed tributary under Colgate Road. However, there were no stormwater culverts 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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