Reach 4e (Maier Farm Bridge - Tompkin's Quarry Bridge)

Reach 4e is located in the Town of Ashland and consists of approximately 1.9 miles of stream channel **(Map VI-5, Figure VI-68a, Figure VI-68b)**. The drainage area ranges from 52.7mi^2 at the Maier Farm to 60.4mi^2 at the bottom of the reach. Four smaller unnamed tributaries, as well as the larger Sutton Hollow Brook (5.3mi^2), contribute to the reach. Reach 4e runs along the foot of Tower Mountain and Patterson Ridge ending at a private bridge at Tompkin's Quarry. The reach is located in Valley Zone 2 **(Figure V-11)**, and is characterized by a gently sloped land form with the widest valley floor of the 23 mile long Batavia Kill corridor. The average valley slope is 0.23%, which typically represents a valley morphology with highly meandering stream channels and low entrenchment.

Land use in the reach consists of low density residential development on the upper 2/3 of the reach, with higher density housing and commercial uses present in the section that passes through the Ashland hamlet. Along the south side of the stream, the land cover is thick, mixed forest, with essentially no development. The south side of the stream in the upper reach area does contain a small residential subdivision on the floodplain fringe, with open fields between the homes and the stream. The fields are infrequently used for grazing or hay production and in some cases undergoing early stages of succession. As the stream enters the Ashland hamlet, homes and other buildings are much closer together, and the distance between the stream and buildings is as little as 50 feet in some places. Other land uses in the reach include a commercial gravel mining operation on the south side if the stream, as well as several smaller commercial uses in the hamlet.

Stream Morphology/Stability

The initial visual inventory, performed during the Phase I Inventory and Assessment in 1997, noted large areas of streambank erosion within reach 4e. At that time, the upper portion of the reach **(Figure VI-68a photo B,C,D,F)** was experiencing the greatest amount of instability, but eroded banks and channel problems had been noted throughout the reach. The Phase I inventory found that 4,220 feet of streambank within the reach was experiencing active erosion, with 57% of the total streambank length impacted. The scale of the erosion was estimated at nearly 5.3ft^2 of exposed streambank per linear foot of stream channel, with the majority of this occurring in the upper 3,300 feet of the reach. When compared to the erosion rates in other management segments, reach 4e exhibited the second highest rate in the watershed.

After the Phase I assessment, the GCSWCD conducted an analysis of historical aerial photographs to determine for what length of time the instability had been present. Based on a review of photographs from 1959 to 2000, an active meander migration in the upper section of the reach was evident **(Figure VI-62)**. The meander clearly had been moving laterally, as well as in a downstream direction for over 40 years. Additionally, small segments above and below the active meander also indicated signs of long term accelerated migration. In the lower end of the reach, the historical aerials did not indicate any significant changes in planform over the period of available record. This is not unexpected considering that the presence of the hamlet has most likely resulted in active maintenance of the channel over the years.

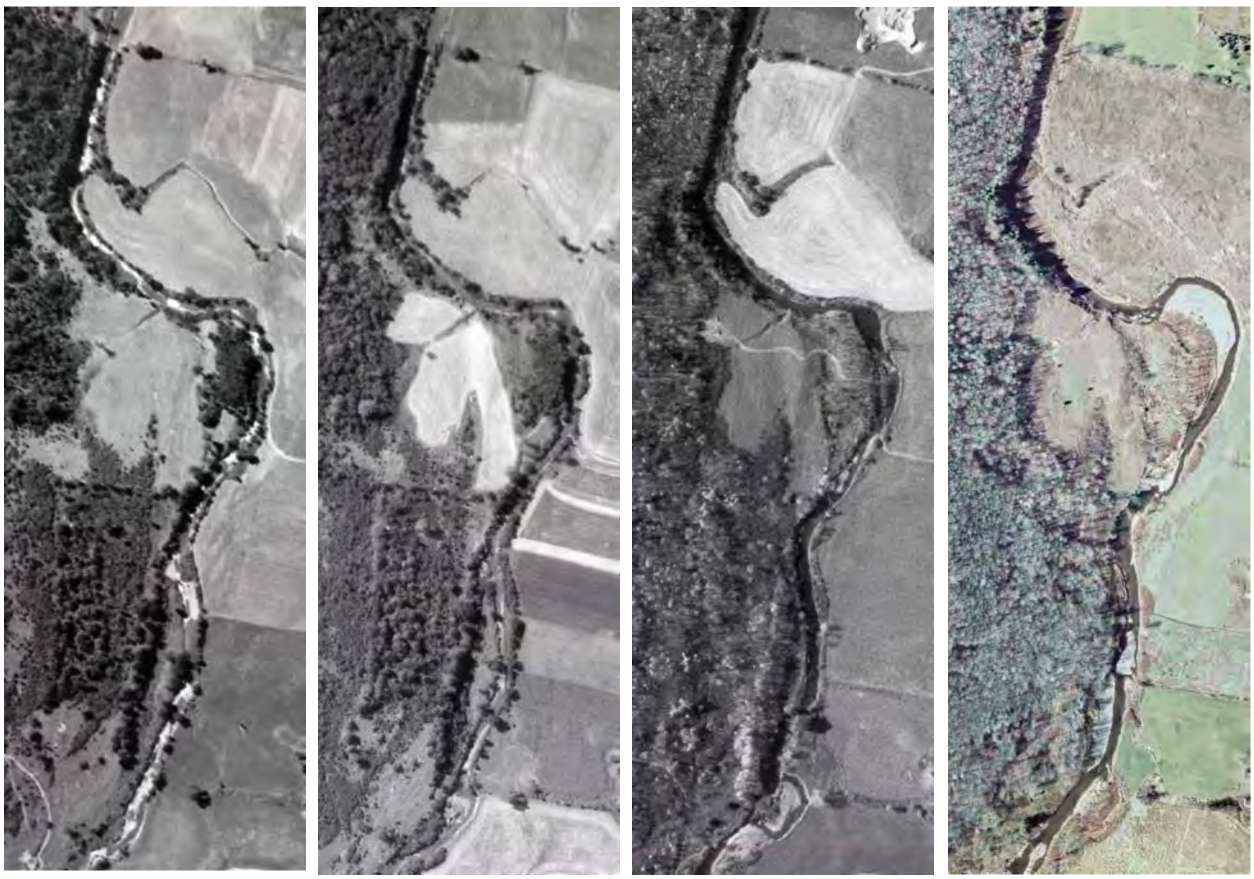

Figure VI-62: Comparison of aerial photos of reach 4e from 1959, 1967, 1980 and 1995 (left to right)

When the aerial photos from 1959, 1968 and 1980 are adjusted to match the1995 digital ortho-photo series, the GCSWCD can overlay channel planform from various time periods, and measure the impact of channel migration. When this was completed for the Kastanis site **(Figure VI-63)**,the GCSWCD found that the channel had migrated approximately 120 feet in a northwest direction during the period of record. The rate of channel migration appears to significantly increase between 1980 and 2000. Based on the aerial overlays, the channel has migrated an average of 6 feet per year at the apex of the meander bend. Between 1980 and 2000, the estimated area of bank loss is 61,350 ft^2. Applying an average bank height of 9.2 feet yields an estimated volume loss of 20,900 cubic yards, which equates to an average of over 1,000 cubic yards annually from one meander bend.

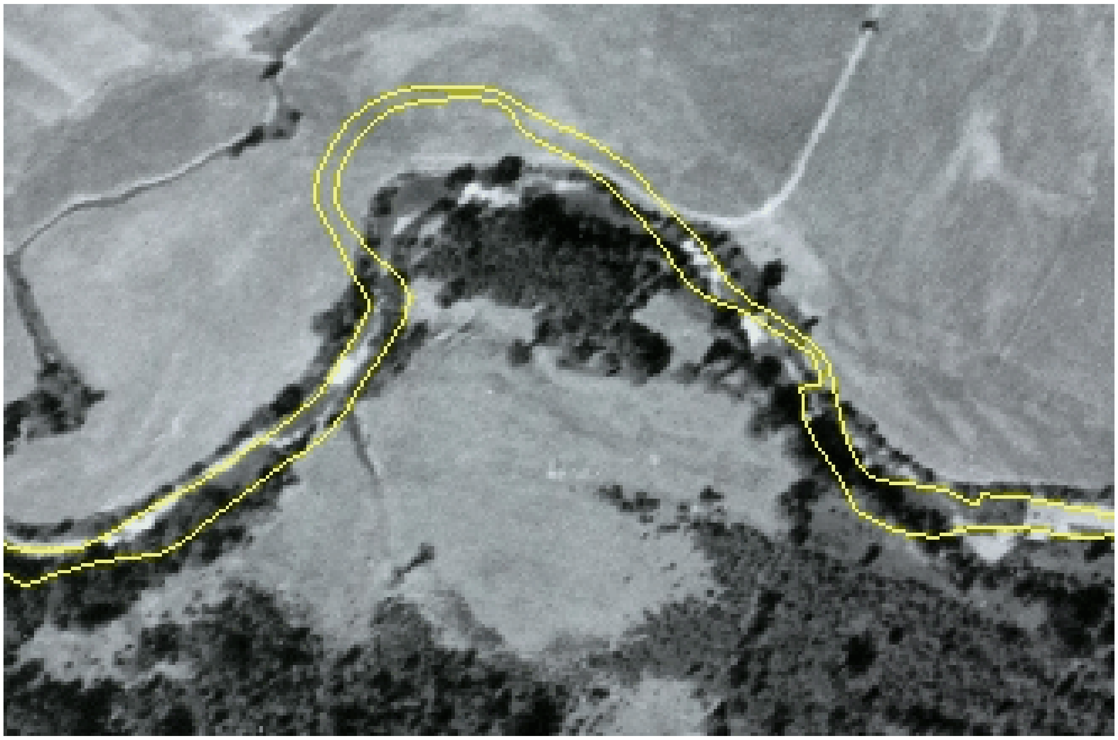

Figure VI-63: Aerial Overlay - Kastanis

After the initial inventory and assessment of the reach, the GCSWCD determined that the instability in the upper portion would require a more detailed analysis to determine the type and extent of stream process at work. Reach 4e was further divided into two sub-reaches in order to focus monitoring efforts in the unstable upper half of the reach. The upper section, which is referred to as the Kastanis Site, begins at the top of the reach and continues downstream to Carrington Rd. **(Figure VI-68a)** Monitoring at the Kastanis Site began in the summer of 1998 and continued through the summer of 2000. Phase II, III and IV assessments have been completed, including 16 monumented cross sections and 4,100 feet of longitudinal profile.

Channel morphological criteria were measured, along with analysis of the reach's sediment regime including depositional features (point bars) and channel material (pebble counts). In addition to the annual monitoring in 1998, 1999 and 2000, the reach was also surveyed immediately after the September 1999 flood event. The monitoring at the Kastanis site has been used as an untreated control reach for the Maier Farm demonstration project, as it is very similar in stability condition, soils, channel morphology, vegetation, geology and other factors. The use of the Kastanis reach as a comparison to the Maier Farm project is discussed later in this SMP **(See Section VII Demonstration Projects)**.

Analysis of the cross section data from the upper reach indicates that stream classification has shown little change over the three years of data collection. The upper limits of the site classify as a C4 stream type (Rosgen 1995), which extends from cross section #1 through section #9. Along this section of the reach, the north bank has been experiencing lateral migration as discussed previously in this section **(Figure VI-68a, photo B,C,D,G)**. The north bank ranges from 7.5 - 10.5 feet in height, and the primary failure method appears to be related to undermining of the streambank toe and mechanical slab failure of the upper banks. Representative samples of cross sections in the highly unstable area are discussed below. Cross sections #1 through #9 represent a portion of the cross sections located on the upper 2,780 feet of the reach **(Map VI-5)**.

Cross sections #1 and #3, **(Figure VI-64)** located near the top of the reach, indicated active lateral erosion on the north bank. While cross section #1 indicated a trend toward an over widened condition, with an increased width to depth ratio, cross section #3 was characterized by a greater amount of deposition on the opposite bank. At cross section #2, stream process appears to be attempting to balance erosion and deposition, with erosion on the north bank being fairly closely matched by deposition on the opposite bank resulting in no significant shift in width to depth ratio.

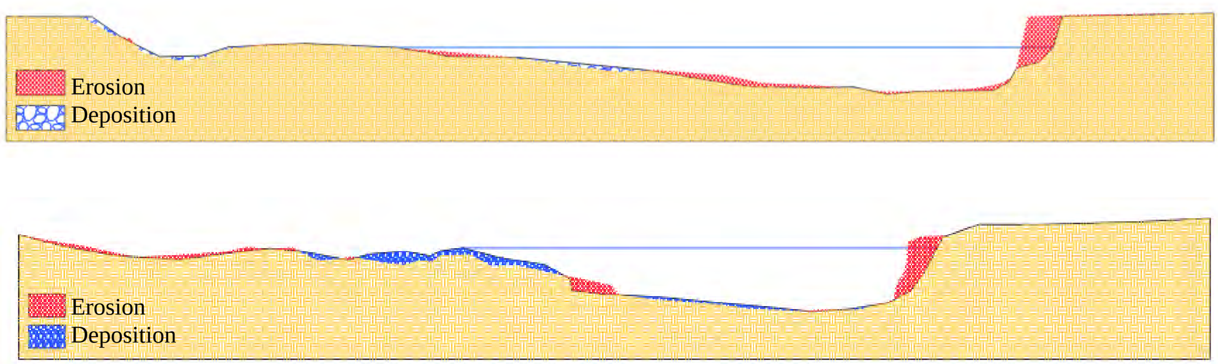

Figure VI-64: Overlay of cross section #1 (top) and #3 at the Kastanis Site, 1998 - 2000.

Cross sections #6, #7, and #9 **(Figure VI-65)** represent three of the four cross sections located on the highly active meander bend discussed previously. Cross section #6 is positioned along the upstream portion of the meander, and has documented 13.8 feet of lateral erosion during the monitoring period. The area eroded along the right bank exceeded 130ft^2 over the two year monitoring period, with 51ft^2 of this erosion occurring during the September 1999 flood event. Cross section #7 is located slightly downstream on the meander bend, and during the monitoring period measurements revealed 14.5 feet of lateral erosion with 123ft^2 of area eroded along the right bank. The September 1999 flood was responsible for 60ft^2 of the total erosion at the cross section. Cross section #8, not shown, is similar to cross section #7 with 15.4 feet of lateral erosion with 123 ft^2 of eroded area. Cross section #9 is located on the downstream portion of the meander bend, and during the monitoring period 23.6 feet of lateral erosion was documented. The area eroded on the right bank equals 205ft^2 with 120ft^2 occurring during the flood event.

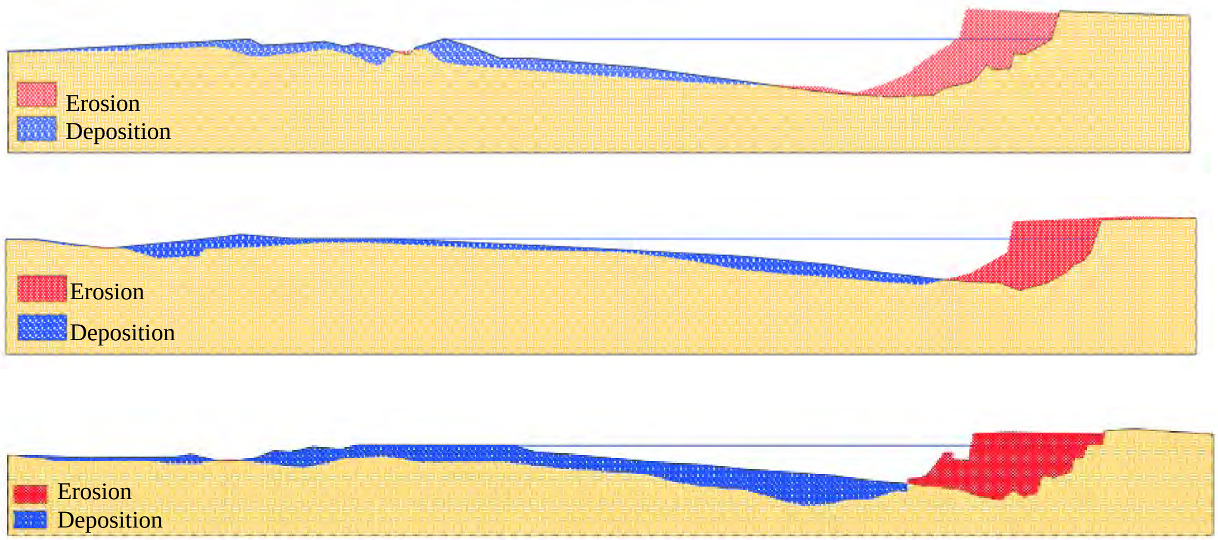

Figure VI-65: Overlay of cross sections #6 (top), #7 (middle) and #9 (bottom) at the Kastanis Site, 1998 - 2000.

Although cross section monitoring on the Kastanis site indicates varying degrees of lateral migration, there was no evidence of channel aggradation or degradation in any of the measured cross sections, or in the longitudinal profile. While the streambanks were experiencing extreme rates of erosion associated with the lateral migration, deposition on the opposite side of the channel was also occurring. This is best seen in cross section #9 **(Figure VI-65)**. The measured area of erosion at each cross section has been roughly matched by deposition on the opposite bank. The width/depth ratios of the channel have remained constant through the sampling period, and the cross sectional area has remained essentially unchanged.

While an initial review of the cross section overlays may appear to indicate minor channel degradation, what is being represented is the evolution of the stream channel dimension as the meander migration moves through the fixed ends of the cross section. For example, while cross section #6 appears to show some downcutting, the cross sections have actually captured the process of the stream profile transition from a riffle or run feature to a pool feature. As the meander migrates down valley, the cross section dimensions will change as their position in relation to the meander features changes .

Moving down the reach, the stream corridor begins to transition to a more entrenched condition **(Figure VI-68a photo A,E,F)**. The floodplain narrows, and terraces/steep slopes on both sides of the stream result in a constriction in valley morphology **(Figure IV-66)**. Between cross section #9 and #15 **(Map VI-5)**, the stream type transitions from a C4 to F4 steam type. The lower end of the Kastanis site exhibits a variable entrenchment ratio, ranging from 3.3 to 1.3. Slight changes in bankfull stage, as little as 0.2 feet, can dramatically increase or decrease the degree to which the stream channel is confined at the bankfull stage. The transition between stream types occurs gradually over approximately 1,250 feet of channel length, before a complete transition into an F4 channel at cross sections #15 and #16 where the average entrenchment ratio is 1.3.

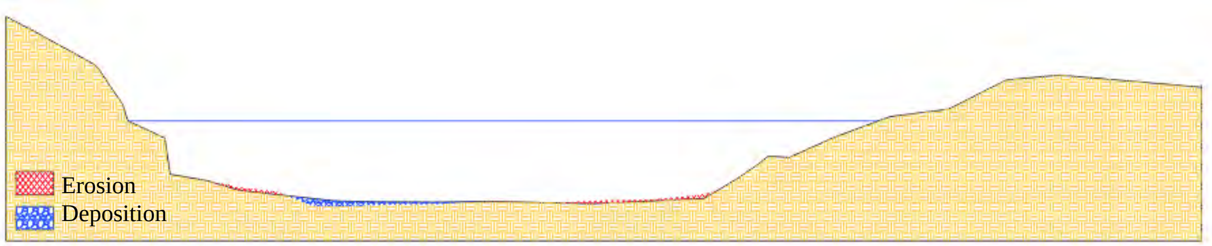

Figure VI-66: Overlay of cross section #13 at Kastanis Site 1998 - 2000. Note presence of terraces an increased entrenchment in this section of the reach

While the upper section of reach 4e exhibits more widespread signs of instability, the lower portion of the reach also presents challenges to stream managers. In the section of reach 4e between the Kastanis site and the Tompkin's quarry bridge, the GCSWCD only monitored a single cross section, but several impacts to the stream were noted. In general, the stream morphology slowly transitions back to a less entrenched condition just above the confluence of Sutton Hollow Brook, as the stream approaches the broad floodplain on the south side of the stream **(Figure VI-68b)**. In the hamlet area, the stream channel is encroached by residential and some commercial development with several of the structures clearly located within the floodplain area. While the GCSWCD is not aware of any recent reports of structural flooding, future activities in the hamlet must be done so as to avoid any further encroachment on the stream corridor.

As noted earlier, a review of the aerial photographs for this section of the reach indicates that planform has experienced only minor changes over the 40 years of available record, which is likely due to the low entrenchment as well as active human alteration of the channel. For the most part, the stream channel exhibits good stability through the lower section, with only minor areas of localized erosion noted.

The single monitored cross section is located near the bottom of the reach, at a point where NYS Route 23 is located close to the stream. The GCSWCD monitored the cross section in both 1998 and 2000 **(Figure VI-67)**, as well as several hundred feet of streambed profile. The Phase III/IV monitoring also included an analysis of streambed sediment size, with small cobble dominating the channel materials. Analysis of the cross section indicates a C3 stream type, with only minimal bank erosion and channel aggradation noted during the monitoring program. The monitoring program included the large flood event in September 1999, and any measured erosion was minimal considering the magnitude of the flood.

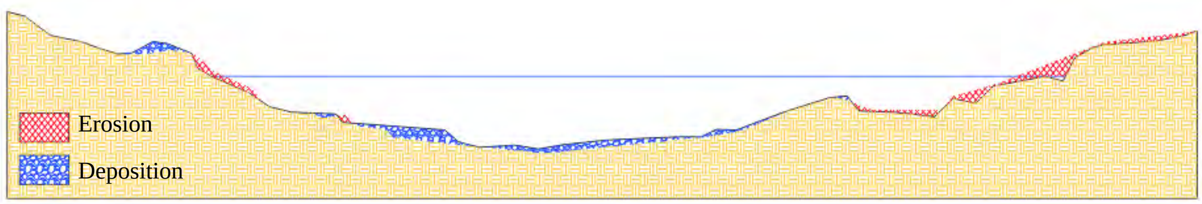

Figure VI-67: Overlay of cross section in Ashland Hamlet, lower reach 4e, 1998 and 2000.

The last feature in reach 4e that must be mentioned is the presence of the private bridge leading to Tompkin's gravel mine. The bridge was replaced after the 1999 flood event, when scour under the abutments caused the concrete to settle and tilt. As constructed, the new bridge is not adequate to span the channel at either the bankfull or flood stage. The bridge approach from NYS Route 23 includes some floodplain fill, but the fill is in a location that does not impact stream entrenchment. Once over the bridge the access road drops back to the floodplain elevation, and continues across the floodplain to the quarry location. As designed, the bridge provides access to the quarry during low flow conditions, but under flood stages the stream goes around the bridge, flooding the access road.

While the bridge is not wide enough to pass the bankfull flow, it does not appear to be having a significant impact on stream function. Some localized aggradation has been noted upstream of the bridge, but this could also be attributed to the natural tendency to maintain an active gravel bar on the inside of a meander bend. Any sediment transport problems are thought be localized in the immediate bridge area. Streambank conditions on the right streambank appear to exhibit adequate stability in the area near the bridge. While the low elevation of the access road results in fairly frequent damage and requires routine maintenance, the current condition presents far less of an impact on the stream than if the access road was elevated across the floodplain. Elevation of the access road from the bridge to the quarry would present a major impact on stream stability. If the bridge requires replacement in the future, the GCSWCD would strongly suggest the owners evaluate alternate locations.

Riparian Vegetation

In general, the riparian condition in reach 4e is similar to most areas along the lower Batavia Kill: poor. Riparian buffers, when present at all, are limited in width and provide minimal benefits. In those areas where the stream borders steep upland slopes, such as along much of the right bank through reach 4e, dense wooded buffer is common **(Figure VI-68a photo A)**. The presence of these buffers can be attributed to the slopes being too steep for farming or development. In the areas where agriculture has been active during the last 40 years or more, riparian vegetation is pretty much limited to grasses, with narrow, intermittent bands of woody material. A review of the historic aerial photographs from 1959 to 2000, shows that the riparian area has been severely limited by agricultural practices in the adjacent fields **(Figure VI-62)**. The lack of any deeply rooted vegetation is a primary factor in the high rates of erosion that have been observed in the upper section of the reach **(Figure VI-61a photo B)**. Almost the entire upper half of the reach is characterized by little to no woody vegetation on the right (north) bank.

In the lower half of the reach, while there is some tree/shrub community along most of the channel, the riparian zone averages less than 50 feet in width and is in poor condition. The presence of a narrow band of larger hardwood tress, as well as some willow and other shrub growth along the channel, are helping maintain channel stability, but is not adequate to provide water quality benefits. Reach 4e also contains significant areas of the riparian zone that is impacted by Japanese knotweed.

Water Quality

Any stream or streamside activity that would increase streambed incision or streambank erosion will increase the Batavia Kill's cutting into glacial lake clay and clay rich glacial tills that underlay or are adjacent to the stream and negatively impact clarity of the stream.

Reach 4e presents a number of issues related to water quality that require additional assessment. In regard to stormwater, the hamlet section of the reach includes NYS Route 23 and other impervious surfaces that are located very close to the stream. While the GCSWCD did not note any obvious impacts during Phase I of the Batavia Kill Project, there may be opportunities to achieve water quality protection by implementation of stormwater retrofit projects. Stormwater projects could include installation of sediment traps, as well as stabilization of small drainage ways associated with road runoff.

The NYSDOH, NYSDEC and NYCDEP are already aware of the possible impacts to water quality from on-site waste water treatment systems in the hamlet area. Small lots, with homes close to the creek, provide limited ability for effective on-site septic systems. To date, a conceptual plan for a community-wide treatment system has been developed. Ashland is one of the communities included in the NYC watershed agreement, but no time table or commitment of funds has been made at this time. The hamlet also suffers from very poor water quality in many of the private wells. The Town of Ashland has placed a high priority on investigating the development of a municipal water system.

While not specifically researched for this SMP, the GCSWCD is aware that Tompkin's Quarry has been working with NYSDEC and NYCDEP to implement sediment and erosion control measures to address stormwater runoff from the mine operation. The GCSWCD is currently unaware of the status of the Sediment and Erosion Control plan, but will offer Tompkin's Quarry technical assistance as requested.

Infrastructure

Infrastructure issues in reach 4e are primarily related to the bridge at the bottom of the reach and a short stretch of NY Route 23 which runs close to the stream. The impact of the Tompkin's Quarry bridge has been discussed earlier in this section. In regards to NY 23, the GCSWCD has not noted any problems associated with the road and stream stability. Future development of municipal water and sewer infrastructure in the hamlet should include stream impacts as a primary planning consideration.

Habitat

While the GCSWCD did not complete a detailed fisheries habitat assessment, in general the habitat appears to be very poor in the upper unstable reach, and is somewhat better in the lower portion of the reach. At the top of the reach, the rapidly changing channel morphology is not consistent with good habitat and much of the reach lacks the critical riparian vegetation needed to mitigate temperature impacts. In the lower reach a narrower channel, better stability, and the presence of some shading vegetation in the riparian buffer all are factors that suggest that habitat is in better condition in this section of the reach.

Flooding Issues

Flooding issues in reach 4e are primarily focused on property damage due to streambank erosion. In the hamlet section there are several residential structures and out-buildings that appear to be located within the regulated floodplain, but the GCSWCD is unaware of any structural flooding after either the 1996 or 1999 flood events. When the NYSDEC digital flood mapping project is complete, the GCSWCD will reevaluate flooding issues in reach 4e.

Reach 4e Summary

Reach 4e is primarily characterized by the high degree of instability in the upper section of the reach. Phase IV monitoring of the site has shown the primary instability to be related to lateral and longitudinal meander migration, with no aggradation or degradation noted at this time. Restoration of a stable stream form can provide multiple benefits and can be integrated with the Maier Farm project above, resulting in close to 1.5 miles of restored stream corridor. In the lower reach current stability should be preserved. There are several opportunities related to stormwater at the private bridge and in the hamlet area that can be implemented as time and funds allow. The entire corridor would benefit from improved riparian buffers.

Table VI-15: Management Recommendations Reach 4e.

Reach 4e: Maier Farm Bridge to Tompkin's Quarry Bridge.	
Intervention Level	Full Restoration (upper reach) Preservation/Assisted Restoration (lower reach)
Stream Morphology	1. Extreme instability in the upper reach will require Full Restoration. Restoration activities should create an appropriate stream type (C4), and restore stream stability and function. 2. In the hamlet area, avoid any additional floodplain fill, especially behind the existing structures. Avoid activities that would increase entrenchment through the center and lower portions of the reach.
Riparian Buffers	1. Restore riparian buffers in conjunction with the stream restoration project on the upper part of the reach, including addressing Japanese knotweed. 2. Reach 4e presents multiple opportunities to work with landowners on buffer enhancements. Evaluate reach for possible buffer restoration demonstration projects. 3. See General Recommendations
Water Quality	1.Evaluate potential stormwater retrofit projects associated with stormwater system on NYS Route 23. 2. Assist Tompkin's Quarry with implementation of Sediment & Erosion control practices. Provide technical assistance, seek grant funding. 3. Assist Town of Ashland with development of community wastewater treatment system for the hamlet.
Infrastructure	1. Observe status of private bridge to Tompkin's Quarry. In the event of loss or damage, work with landowner to re-site bridge or alter design. 2. Work with NYSDOT to insure maintenance activities do not impact stream stability (See General Recommendations).
Habitat	See General Recommendations
Flooding	1. Avoid new development within the floodplain limits. Prohibit fill and additional construction in flood vulnerable areas. 2. Evaluate current structures upon completion of the new digital flood mapping project. 3. See General Recommendations
Future Assessments	1. Continue Phase IV monitoring of Kastanis site.

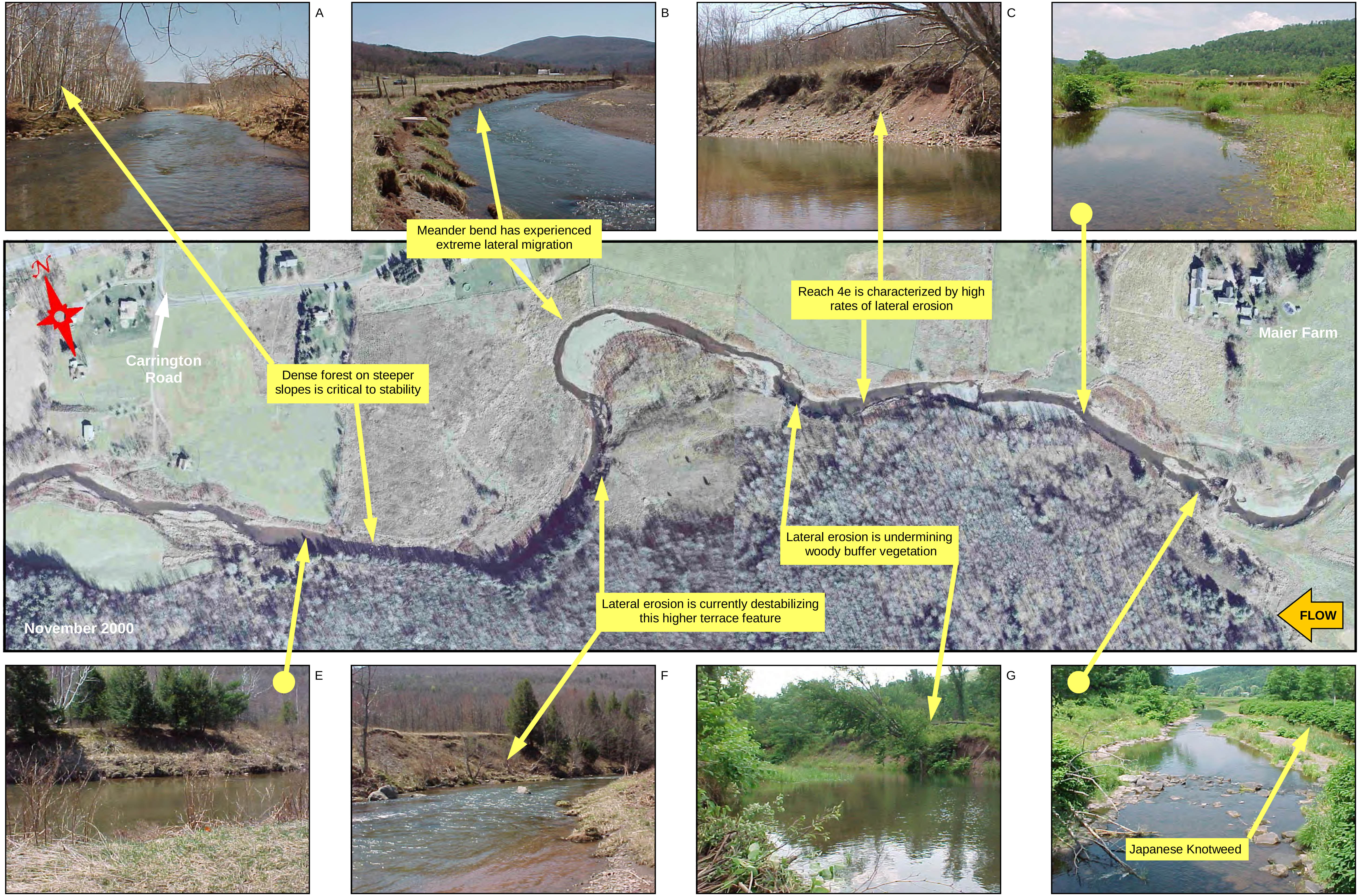

Figure VI-61a: Reach 4e- Upper

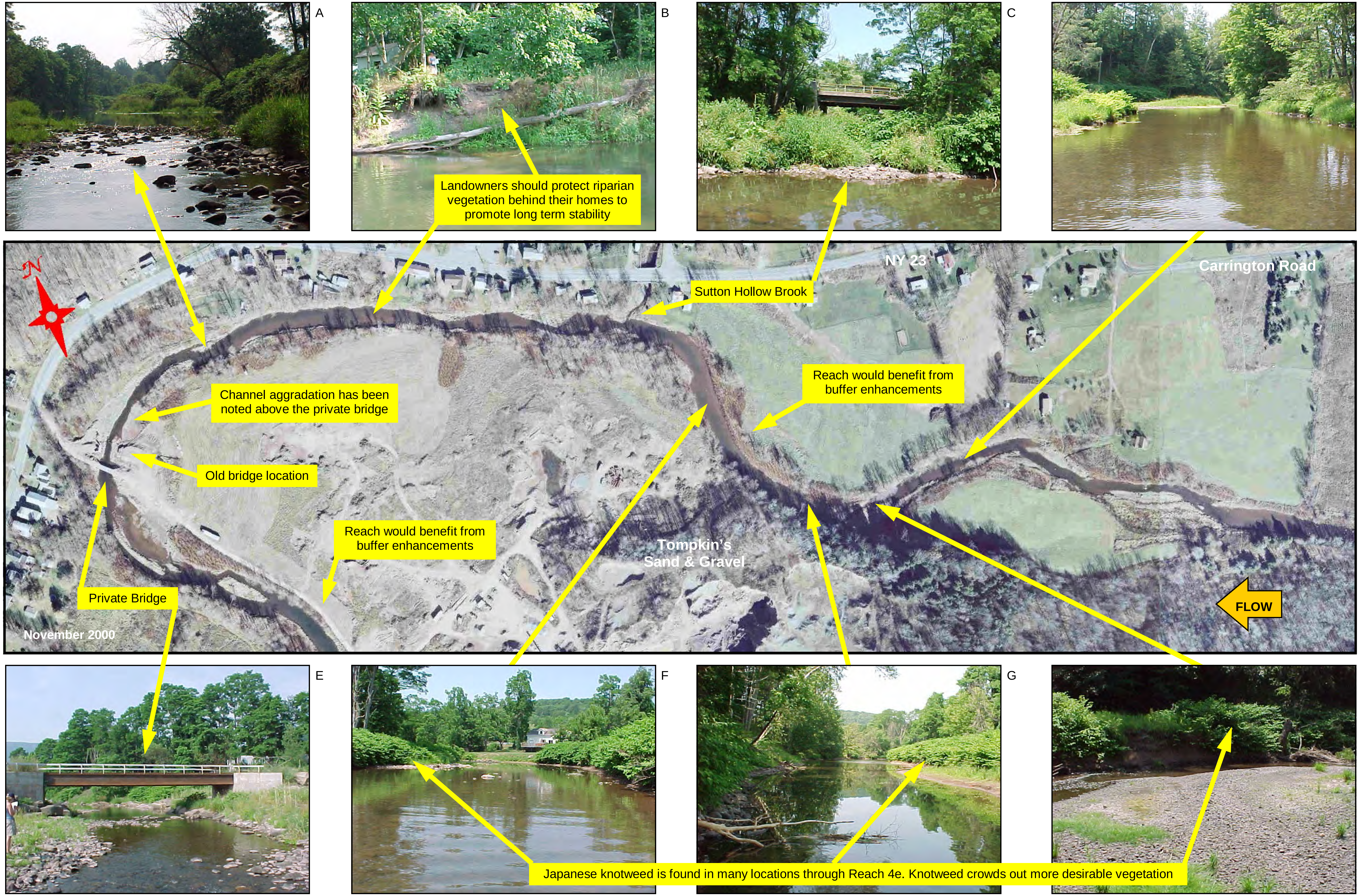

Figure VI-61b: Reach 4e-2 Lower