Reach 1b (Maplecrest Gage to County Bridge #3-30287-0)

Reach 1b begins at the USGS gage station in Maplecrest, and flows parallel with Big Hollow Road for approximately 8,744 feet (1.7 miles) to the county bridge below the L. MacGlashen farm **(Map VI-2)**. The stream reach is located within valley zone 5 **(Figure V-11)**, with an average valley slope of 2.7%. Valley morphology is characterized by steep side slopes with a narrow, confined valley floor. The drainage area contributing to the reach ranges from 2.03 mi^2 at the top of the reach to 5.5 mi^2 at the county bridge. Land cover through the reach is dominated by forest, while other land use in the reach includes limited residential development and some small scale agriculture.

Stream Morphology/Stability

The Phase I Inventory and Assessment in 1997 identified erosion along 1,520 feet of streambank within the reach, which represents 17% of the total streambank length. The reach averages 1.91 ft^2 of exposed streambank per linear foot of streambank. The stream channel transitions from a steeper, step-pool complex in the upper reach, to a riffle-pool sequence as both valley slope and confinement decrease. Remotely sensed data was used to classify B, C, F and D stream types within the reach.

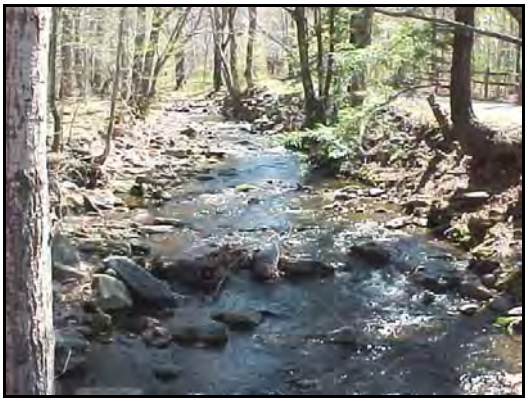


Figure VI-4: Section of segment 1b as it runs along access road to NYSDEC trail head.

To facilitate discussion of stream condition, reach 1b is further subdivided into an upper **(Figure VI-5a)** and lower **(Figure VI-5b)** reach. The upper portion of reach 1b is characterized as being relatively stable. The assessment noted evidence of abandoned channels, most likely avulsions (a rapid change in channel course typically bisecting an overextended meander) associated with larger flood events, as well as small sections of multiple, braided channels and minor bank erosion. Aerial photography has not been useful in documenting channel migration due to heavy forest cover obscuring the stream in the older aerial photographs. Observed instabilities were considered to be local in nature, with no reach-wide instability. This section of the reach has been modified in response to stream impacts on the town road, as well as the private bridges. Numerous attempts to stabilize streambanks with rock rip-rap, as well as the presence of rip-rap protection at bridge openings, was noted.

While the upper portion of the reach is characterized as being relatively stable, the lower portion of reach 1b was noted as having significant areas of channel erosion **(Figure VI-5b, photos A,B,D,E,F)**. The erosion inventoried in 1997 was almost exclusively located in this sub-reach. Instabilities were noted in several areas, with channel aggradation and degradation observed, as well as lateral channel erosion. In August of 1999, three monitoring sections were installed in this section to determine stream type and the current state of instability.

The first monitored cross section in the reach (Headwaters #3) is located just upstream of the county bridge **(Figure VI-5b)**. This bridge was substantially damaged in the April 1987 flood event, and replaced in 1989. In 1990, the GCSWCD sponsored a stabilization project that included stacked rock rip-rap on the right bank above the bridge, and sloped rip-rap on the left bank below the bridge. The project also included extensive channelization, extending approximately 100 to 150 feet upstream and downstream of the bridge. Flood events in 1996 and 1999 resulted in repetitive damage to the stacked rock rip-rap above the bridge **(Figure VI-5b, photo D)**. Subsequently, the GCSWCD has observed active erosion just above the bridge. The lateral can likely be attributed to the rip-rap bank protection, floodplain fill, and channelization of the stream.

While the bridge opening appears to be adequately sized for its location in the watershed, further evaluation of the stream/road alignment, as well as channel entrenchment, could identify an effective strategy to addressing the instability. Mitigation of the instability problem at the bridge would have a direct benefit by reducing the frequency and cost of repairs, as well as protecting the structure from future floods. Immediately below the bridge (150'), the stream channel has responded favorably to past disturbances **(Figure VI-5b, photo H)**. A well vegetated bankfull channel has formed within the over widened channel, and a young, but healthy, riparian buffer is becoming established. The response of this short section to past channelization is an excellent example of a stream's ability to re-establish a stable form.

Continuing downstream through the reach, the Batavia Kill rapidly becomes entrenched, and begins to exhibit signs of a larger instability problem that continues to the bottom of the reach. In this section of reach 1b, the Batavia Kill exhibits classic signs of stream evolution process. Work undertaken by the GCSWCD in 1987 and 1990 addressed erosion problems in this reach, and it is now evident that these sites were part of a larger instability problem in the reach. The work completed by the GCSWCD in 1987 and 1990 is likely to have contributed to the continued instability by reinitiating the degradation processes. To monitor the problems noted in the lower part of reach 1b, the GCSWCD installed two monitoring cross sections in 1999. By 2002, the problems had continued to worsen and the GCSWCD installed an additional 12 cross sections and over 3,500 feet of stream profile was surveyed.

Approximately 600 feet downstream of the county bridge, the GCSWCD installed a second cross section (headwaters #4) to monitor possible entrenchment of the stream channel that was noted during the 1997 inventory, and during continued observations by the GCSWCD. The cross section measurements resulted in an F3 stream type classification, which is characterized as having an entrenched stream morphology. The channel has been modified in the recent past, with a section of newer rip-rap located on the right bank just below the cross section. While surveys of the cross section indicated only minimal stream bank erosion, recent observations indicate signs of continued degradation (i.e increased bank failures) **(Figure VI-5b, photo A)**. The GCSWCD feels that a head cut moving up the reach will continue to degrade the reach, but currently there is insufficient monitoring data to confirm this assessment. The streambed above the cross section is heavily armored with large, well imbricated boulders that are most likely reducing the speed at which the head cut is moving upstream.

Continuing down the reach, the Batavia Kill has been characterized by adjustments in the stream's planform. The stream channel upstream of the new bridge at the L. MacGlashan farm has migrated toward the south over 150' since 1959, with the largest movement of nearly 50' occurring between 1995 and 2000 **(Figure VI-6)**. The largest shifts have occurred during years of large storm events in 1996 and 1999, with an average erosion rate of approximately 1' per year **(Figure VI-5b, photo B)**.

Figure VI-6: Aerial overlay of channel migration between 1959 (light blue) and 2000 (dark blue) at L. MacGlashen farmstead.

At the bottom portion of reach 1b, monitoring between 1999 and 2001 indicated localized channel aggradation leading to flooding problems along County Route 56 and the county bridge at the bottom of the reach. A single monitoring cross section (headwaters #5) was classified as a C4 stream type, and throughout the monitoring period the cross sectional area of the bankfull channel has remained constant, while the width/depth ratio has significantly increased due to over-widening and aggradation of the channel **(Figure VI-7)**. In one year of monitoring, the channel has aggraded almost two feet and has eroded laterally approximately six feet along the highway **(Figure VI-8)**. The aggradation significantly reduced channel capacity resulting in frequent flooding of County Route 56, while the lateral migration of the channel was threatening the road. In 2002, the GCSWCD used FEMA funds to implement temporary measures in this area. The channel was excavated to provide more capacity, and large rock was buried in the right streambank along County Route 56.

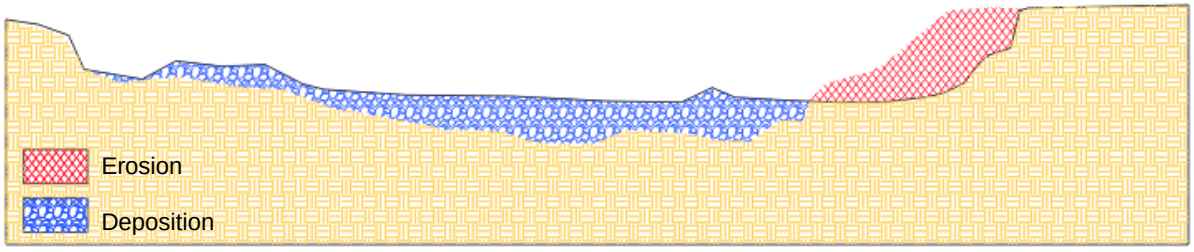


Figure VI- 7: Headwaters cross section #5 overlay from 1999-2000 depicting channel aggradation and lateral migration.

The aggradation in the lower segment of reach 1b is most likely attributed to several factors. First, the GCSWCD had inventoried a large beaver dam that was causing a decrease in sediment transport capacity and promoting local aggradation of the channel. A second factor contributing to the aggradation is an increase in overall sediment supply

from the areas of degradation and lateral erosion above. The most significant change was noted after the September 1999 flood event in which the stream discharge in this area exceeded 790 cfs and completely buried the beaver dam with gravel. The result was significant localized flooding and nearly six feet of lateral erosion.

While the upper portion of reach 1b has only minor, localized instability problems, the lower extent of the reach is felt to be heading toward extreme instability. The GCSWCD has observed aggradation, degradation, and lateral meander migrations in this section of the reach, and there is a very low probability that the stream channel will achieve an acceptable state of stability on its own. There is currently a seasonal structure threatened, and several homes are likely to be impacted in the future.

Figure VI-8: Aerial view of lateral migration along County Route 56 in lower section of management segment 1b.

Riparian Vegetation

The riparian condition in reach 1b can be characterized as fairly good in the upper reach, and poor to non-existent in the lower sub-reach. The upper reach contains dense forest cover, with small areas of shrub and/or grass cover in the immediate stream corridor. The riparian buffer appears to provide adequate cover for habitat, as well as stability, but in several areas it is not wide enough to provide effective water quality benefits. In the lower portion of the reach, much of the stream corridor does not contain adequate woody vegetation in the riparian buffer. While trees are present on the top, as well as bottom, of the sub-reach, the active degradation process is quickly causing slope failures and the buffer is being lost.

Water Quality

At the present time, the most significant water quality concern in the reach would appear to be turbidity, and total suspended solids (TSS), generated by the unstable stream segments. The GCSWCD has noted the presence of lodgement tills (a till deposited in a ground moraine at the base of a glacier) within the actively degrading channel, and assumes that glacial clays are most likely very close to the surface. Continued degradation of the channel will increase water quality impacts if the stream channel becomes entrenched in the clay deposits. Other water quality issues that require further evaluation include:

- A small horse paddock, located in the lower-sub-reach, is located immediately on the stream with a very narrow riparian buffer. While the paddock contains only a single horse, its position allows for essentially no buffering of runoff. The site may

qualify for the NYC WAP Small Farms Program, which could provide technical assistance and funding to address any potential impacts.

- While the GCSWCD has not observed any evidence of impact from septic systems, in several instances the available land for infiltration of waste water is limited, and water quality protection will require a properly functioning system. The GCSWCD will continue to monitor the availability of funding under the CWC Septic Rehabilitation and Replacement Program, and work with landowners to seek system testing and rehabilitation as necessary.

Infrastructure

In regard to infrastructure, the GCSWCD inventoried four bridges and one culvert within reach 1b. In the upper sub-reach, infrastructure includes two small private bridges and a large culvert, as well as sections of Big Hollow Road that run immediately adjacent to the stream. While no broad scale instability was noted near the bridge structures, it does appear that the alignment and the size of the hydraulic openings on the smaller bridges may be contributing to localized instabilities. Big Hollow Road does contribute to channel entrenchment, but at this time does not appear to be causing problems. Caution must be taken in road maintenance activities to avoid any further entrenchment of the channel by widening the road or placing rip-rap. The reach also includes a county bridge and a town bridge in the lower sub-reach.

In September 1999, the town bridge at the L. Milton MacGlashan farm failed during the Tropical storm Floyd flood event **(Figure VI-5b, photo F)**. The cause of the failure was documented as scour of the left bridge abutment, most likely the result of inadequate capacity to pass the storm flow, as well as degradation of the streambed and lateral erosion. The replacement bridge was relocated approximately 150 feet down stream, to a location where the stream planform was straight. The new bridge was built at 60 feet in length, in an area where the GCSWCD has determined the bankfull width to be approximately 35 feet. The combination of the new alignment and the lengthening of the bridge is both highly favorable to reestablishing a stable stream morphology in this reach.

In lower reach 1b, it must also be noted that the GCSWCD has also been watching an area of severe streambank failure associated with a large culvert on a small unnamed tributary to the Batavia Kill. The culvert was substantially damaged in the 1987, 1996 and 1999 flood events **(Figure VI-5b, photo C)**. While the culvert has been replaced after each storm event, this drainage feature continues to contribute to the instability of this section of the reach. In 1990, the GCSWCD undertook a rip rap project in this area to address erosion at the point where the small tributary meets the main stream, and to protect a small cabin in that area. Rip rap was placed on the right bank of the tributary between the culvert and the Batavia Kill, and continued downstream on the right bank of the Batavia Kill. In the 1999 flood event, this rip rap completely failed, with massive erosion occurring near the cabin **(Figure VI-5b, photo G)**. It is unknown to what extent the culvert has contributed to overall instability, but the GCSWCD strongly recommends additional assessment, and appropriate mitigation of this problem.

Habitat

Fisheries habitat within the reach can be characterized as being in good condition at the top of the reach, with poorer conditions in the lower reach corresponding with the instability problems discussed above. The reach is the location of the control and reference reach being used by the USGS to monitor effectiveness of the Big Hollow restoration project. The reference reach is located in the upper sub-reach, and represents natural conditions with good habitat. The control reach is a site with unstable conditions, similar to the Big Hollow site before the restoration project. The control for the fisheries monitoring project is a degraded reach located just above the new bridge at the L. MacGlashen farm. Future restoration activities in this area would provide enhanced habitat value.

Reach 1b Summary

While the upper section of segment 1b is currently stable, management activities should focus on maintaining and protecting the current character of the reach. Management activities related to road and bridge maintenance, logging and development should be done carefully and in a manner that will not result in increased entrenchment. Improvements to the riparian buffer may also be beneficial in some areas of the upper reach. In the lower portion of the reach, the section between the upper-most county bridge in the valley, and the recently replaced county bridge below the L. MacGlashen farm, the stream is highly unstable. The channel exhibits signs of multiple head cuts working their way up the channel, and at the present time, all stages of channel evolution can be observed in this short section of the valley.

Based on the current level of instability, and the fact that the reach frequently experiences damaging floods, the GCSWCD feels that the reach will continue to destabilize, and that natural recovery can be reasonably expected. As the reach degrades, individual efforts to address “local” instability will result in uncoordinated management activities which may further impact the reach. The GCSWCD has implemented a full Phase III/IV monitoring strategy, and will continue to assess the site for potential restoration in the future. Presently, the instability is not an immediate threat to the bridges within the reach, and the threat to County Route 56 due to lateral migration has been temporarily mitigated by the placement of large rock on the right bank.

Table VI-2: Management Recommendations Reach 1b.

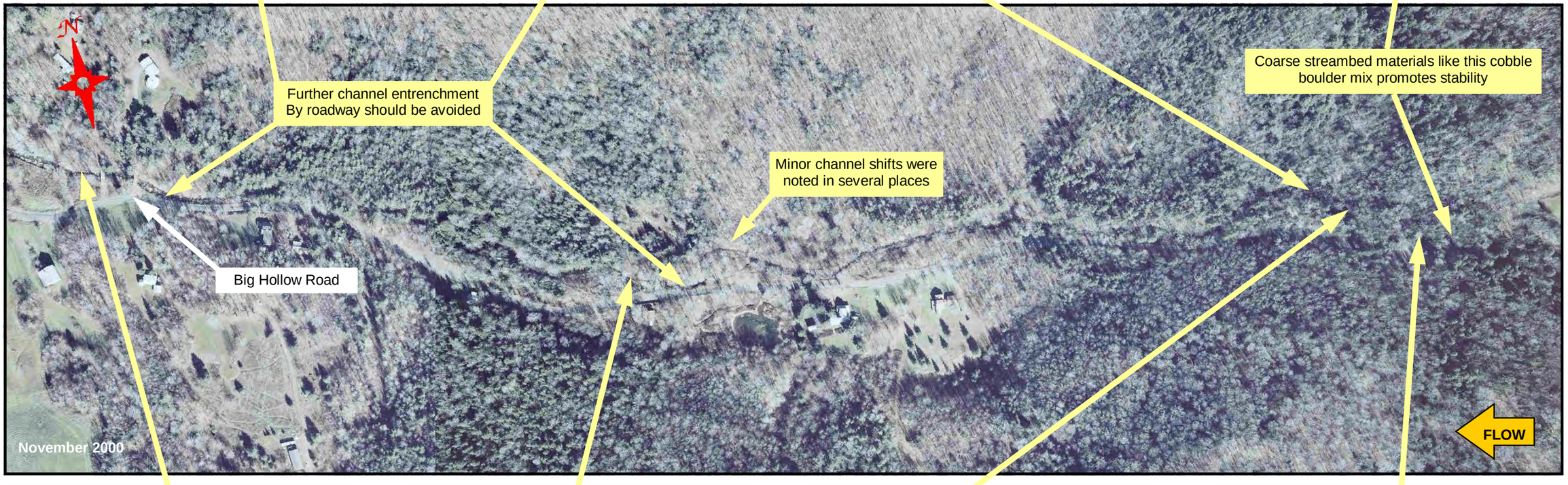
Reach 1b: Maplecrest Gage to County Bridge #3-30287-0.	
Intervention Level	Upper Reach - Protection, maintain natural stability Lower Reach - Full Restoration
Stream Morphology	Upper sections of the reach exhibit stable conditions, and future management activities must be carried out such that entrenchment is not increased. Modification of the streambed must also be avoided to prevent channel degradation. Lower section of the reach will require a full restoration to establish the appropriate stable stream type and form for the watershed setting. A C/B stream type complex appears to be the appropriate stream type for this reach. Continued instability is highly likely to threaten property and infrastructure.
Riparian Conditions	1. Lower reach requires extensive riparian buffer establishment. Stable morphology must be addressed first. 2. See General Recommendations.
Water Quality	1. Inform landowners of *WAP* Small Farms Program, seek technical assistance and funding to address small horse paddock adjacent to the stream. 2. Monitor *CWC* septic program, for increased eligibility to areas outside the current priority areas. Seek landowner participation in *CWC* program to test, and rehabilitate as appropriate, on-site septic systems.
Infrastructure	1. Observe function of new bridges. All bridges in the reach have been replaced between 1989 and 2001 and are of adequate size to support a stable stream reach. Monitor channel morphology for any possible adjustments associated with the bridges. 2. Upper county bridge should be further evaluated to address repetitive failure of rip-rap upstream of the bridge. Adjust channel alignment, reduce entrenchment by providing additional floodplain access, install rock vanes for bank stability, and re-establish riparian buffer. 3. Work with Greene County Highway Department to investigate drainage structures associated with the larger tributary upstream of L. MacGlashen bridge. Develop strategy to upgrade structures and develop stable transition from the tributary to the Batavia Kill. 4. Avoid further entrenchment of stream channel by County Route 56 or the town section of the roadway. Plan drainage infrastructure to avoid stream stability impacts.
Habitat	Fisheries habitat will greatly benefit from restoration of the lower sub-reach. See General Recommendations.
Further Assessment	1. Continue to assess data from newly established cross sections to monitor instability in the lower and middle sections of the reach.


A


B


C


D




E


F


G


H

Healthy riparian vegetation provides multiple benefits to bank stability, fisheries habitat and aesthetics

Figure: VI-5a: Reach 1b-Upper

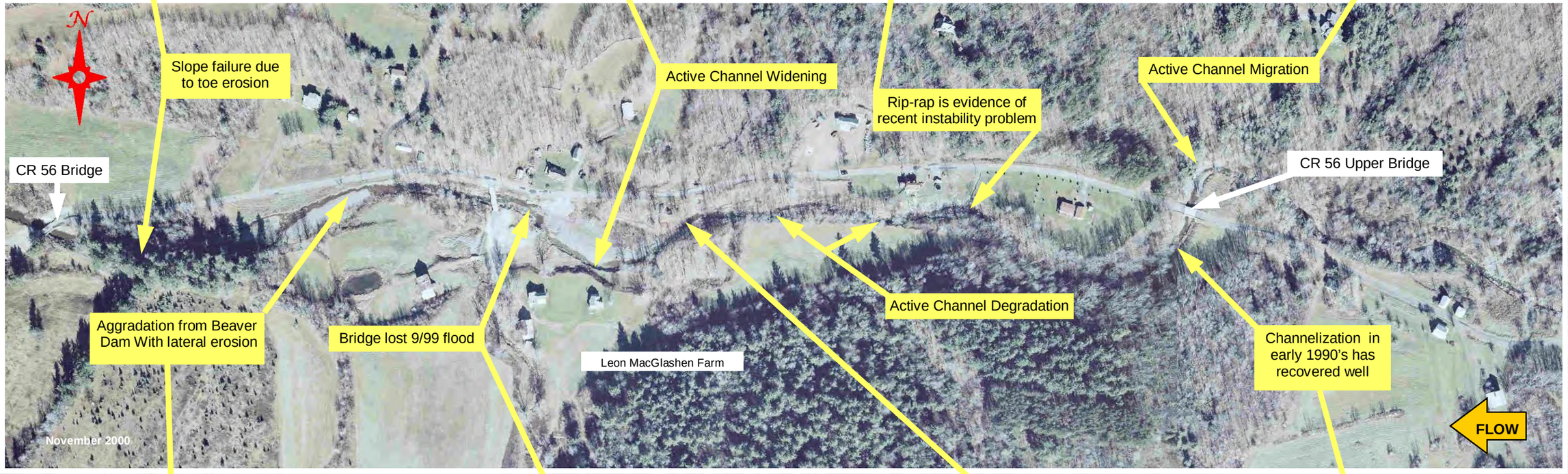
Batavia Kill Stream Management Plan

A

B

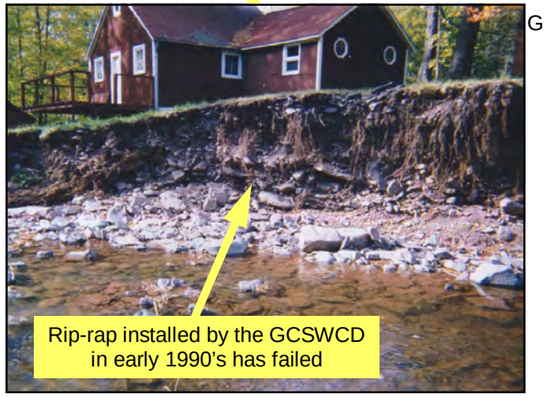
C

D



E

F



G

H

Batavia Kill Stream Management Plan

Figure VI-5b: Reach 1b - Lower