Introduction

The Platte Kill watershed is located within three different townships in Delaware County: Middletown, Andes, and a small portion of Delhi. New Kingston is the only population center in this sub-basin. The drainage area of the Platte Kill is approximately 35.36 square miles and the mainstem is 12.1 stream miles from the headwaters to the confluence with the East Branch Delaware River mainstem. The Platte Kill mainstem was divided into 11 management units based upon the SGAT protocol. The Platte Kill mainstem is a fifth order stream. There are 7 major tributaries that enter the mainstem in addition to the unnamed tributaries: Jones Hollow, Canada Hollow, Bryants Brook, Weaver Hollow, Sanford Hollow, Winter Hollow, and Thomas Hollow. The Platte Kill is primarily a C stream type with some B sections in the headwaters. The confinement ratio shows that the valley is generally broad to very broad with a few sections that are narrow. The land is predominately forested with some agricultural fields. The average annual rainfall in the watershed is predominately in the range of 35-30 inches/year with a couple of areas in the headwaters that experience 39-41 inches/year.

Stream Assessment

Assessment data was collected using the SGAT protocol supplemented with video from the helicopter flyover and a windshield survey of the sub-basin. GPS data collection from a stream walkover and Rosgen Level II surveys were not completed for this sub-basin due to time constraints. The entire length of the stream was analyzed using the SGAT assessment. The assessment for PK 07 through PK 11 did not identify some features such as erosion and gravel deposition bars as these reaches were not videoed during the helicopter flyover.

Geomorphic Conditions

From PK 01 to PK 07, the stream slope is approximately 1% and the stream type is C. From PK 08 to PK 10, the slope is approximately 1.46% and the stream type is a B. At PK 11, the stream slope is 4.25% and the stream is classified as a B stream type. Sinuosity is slightly low in this sub-basin ranging from 1.11 to 1.15.

The Platte Kill contains 6,907 feet of eroding streambanks. PK 06 has a mass failure of 177.4 feet in length. Bedrock is visible in the stream channel in PK 01 and PK 05 and this could be evidence of past scouring. There is a total of 6,685.7 feet of revetment, usually stone rip rap along the streambank. PK 04 has the largest amount of revetment with 2,536.4 feet along the streambank. This means that in PK 04 about 40% of the stream length for this reach has rock rip rap along it. Overall, for the reaches PK 01 through PK 06, about 18.6% of the stream has revetment and about 18.9% experiences erosion. About 37.5% of the stream in these reaches is or has been affected by
streambank erosion. The SGAT protocol rates PK 01 and PK 03 as high impact areas for streambank erosion.

From PK 01 through PK 06, there are 23 gravel deposition bars, none of which are point bars. The highest incidence of gravel deposition bar formation is in PK 01 and PK 06, where both have a density of bar formation of 5 deposits per mile. However, in PK 06, many of the gravel bars are vegetated which suggests that they may become more stable in the future. PK 02 and PK 04 have the lowest rate of bar formation at 2 depositions per mile. All reaches are rated low or have no significant impacts on the stream according to the SGAT assessment.

The Platte Kill sub-basin, overall, has some issues with riparian vegetation buffers along the stream. PK 04, PK 05, and PK 06 have high impact ratings with a riparian buffer width of only 0-25 feet. PK 07 through PK 11 are included in the riparian buffer calculations since the riparian buffer width was obtained from the 2001 aerial photographs.

The most noteworthy problem in this sub-basin is located within the PK 02 reach. Bryant’s Brook channel downcut into its bed during the June 2006 flood and sent large amounts of sediment into the Platte Kill. No deposition has been observed so apparently the Platte Kill is capable of moving this additional bedload. Debris also blocked the existing channel near James Hollow and diverted flows creating a new 1000 foot long stream channel through an unused pasture. To date, the stream is still located in this new channel.

The primary problem facing the Platte Kill is streambank erosion. The quantity of revetment indicates that this has been an ongoing problem. Since there is no Rosgen Level II survey completed in this sub-basin, it is not possible to determine if the stream has incised.

Management Prescription for Platte Kill Sub-basin:
- Consideration should be given to the possibility of restoring the Platte Kill near James Hollow
- Additional assessment should be undertaken to determine if the stream is incised and whether this process is contributing to the ongoing erosion problem
- Bank stabilization within the sub-basin, if attempted, should account for any possible incision and consider an alternative such as reconnecting the channel back to the stream’s floodplain

**Floodplains**

There are few houses along the mainstem of the Platte Kill that impact or are affected by the flow of water on the floodplain during a high flow event. Agricultural fields and forested areas are found predominantly along the floodplain. There is minimal impact from floodplain development along the stream corridor. PK 01 and PK 02 have a narrow
valley and there is no floodplain in these areas due to NY State Route 28. Windshield surveys show that in PK 04, livestock have access to the stream and there is no floodplain at the lower end of the reach. Due to landscape features, PK 03, PK 04, and PK 05 have short sections with very little or no floodplain.

**Infrastructure**

New York State Highway 28, Delaware County Route 6, Brook Road, Thompson Hollow Road, and Harold Roberts Road run parallel to the Platte Kill mainstem and have severely impacted the stream health in some locations. In areas where the valley is narrow, the road pushes the stream against the valley wall, thereby restricting it. In these areas, stream impacts consist of floodplain restriction, downcutting, and erosion of steep streambanks.

Stormwater run-off from the road ditches adds excess water and pollution directly to the streams without allowing time for absorption into the ground. There are several locations where the stream is close to the road and revetment was placed along the banks in order to protect the road from channel migration.

There are a number of bridges that are located within this sub-basin: New York State Highways 28 and 30, Delaware County Bridges #6-1 and #6-2, Town Bridges #16, #86, #87, #170, and #146, and some private bridges. In the headwaters, the Platte Kill has a small drainage area and culverts are installed to convey the water under the road. The impacts of the culvert can be erosion or gravel deposition upstream and/or downstream of the infrastructure if the culvert is improperly sized. Further inspection of these structures is needed in order to determine the impacts on the stream.
Management Unit Descriptions

Platte Kill Sub-basin
PK 01 begins near the high water mark of the Pepacton Reservoir, about 600 feet downstream of New York State Route 30. The upper portion of this reach is approximately 2,075 feet upstream of the New York State Route 28 bridge that crosses the Platte Kill. The upper portion of the reach is near the confluence with an unnamed tributary adjacent to Meekers Hill Road. The total length of this reach is about 4,125 feet. Bridges within this reach are located on New York State Route 28 and 30. Upstream of the NYS Rt. 28 bridge, the stream appears to have downcut to bedrock in some areas. Downstream of these bridges, the stream has widened and become a gravel depositional area. The dominant surficial geologic material in this reach corridor is alluvium, which can have high potential for erodibility. About 87% of the corridor soils are in hydrologic group B, which have medium/high infiltration rates. Valley side slopes average 18% on the right side and 33% on the left side. This reach has a broad valley width. The USGS Stream Gage 01414000 (Platte Kill at Dunraven NY) is located on the right bank, 200 feet upstream from the bridge on NYS Route 28 in Dunraven and 2.5 miles southeast of Margaretville. The drainage area at the stream gage is 34.9 square miles. The period of records that is available for this gage is from October 1941 to September 1962 and December 1996 to the current year.
PK 02

PK 02 is approximately 4,850 feet long and ends at the confluence of Bryant’s Brook, just upstream of Delaware County Bridge #6-1. Bridge #6-1 is the only bridge within this reach. Two tributaries that enter this reach are Bryant’s Brook and Jones Hollow. Since June 2006, Bryant’s Brook has downcut to bedrock and widened, sending large amounts of sediment into the Platte Kill. There is little gravel deposition in this area so far, indicating that the mainstem is able to transport this sediment. The large amount of woody debris and uprooted trees in Bryant’s Brook may pose a threat to the Delaware County Bridge #6-1. If this debris should ever come downstream, it may become lodged under the bridge and cause problems during high flow events. Another problem area is near the confluence of Jones Hollow, where the stream channel has avulsed (changed course) through an abandoned agricultural field for approximately 1,000 feet before returning to the original stream channel.

The dominant surficial geologic material in this reach corridor is glacial outwash, which can have a high potential for erodibility. About 87% of the corridor soils are in hydrologic group B, which have a moderate to high infiltration rate. This reach has a narrow valley that limits the lateral movement of the stream. Valley side slopes average 13% on the right side and 33% on the left.
PK 03 is approximately 6,875 feet long and ends at the confluence of the Weaver Hollow tributary. There is one private bridge located in this reach. Weaver Hollow and a small unnamed tributary are the only tributaries that enter the mainstem. The valley is mainly narrow and there are many sections in the upper portion of the reach that contain bedrock on the streambank or in the channel bed (planform and/or grade control). There is also a concrete diversion dam in the middle portion of the reach. This dam appears (from helicopter video) to have trapped sediment behind itself, creating a large center bar upstream. Eroding banks are not a problem in this reach at present, except for a mass bank failure just upstream from Bryant’s Brook. This once-wooded steep hillside has slid into the stream, creating a constriction of the channel and pushing water flows into the bank near the edge of Trow Bridge Road. Glacial outwash is the dominant surficial geologic material and has a high potential of erodibility. Hydrologic soil groups are more widespread in this reach, including B soils with medium/high infiltration rates, A soils with high infiltration rates, and C soils with medium/slow infiltration rates. Valley side slopes average about 22% for this reach.
This reach is approximately 6,236 feet long and the valley is very broad with agriculture as its dominant land use. Two bridges located in this reach include one private bridge and Town Bridge #16 on Weaver Hollow Road. Two small unnamed tributaries enter the mainstem in this reach. Eroding streambanks can be seen in the upper 1/3 portion of this reach. The middle 1/3 has extensive revetments along the streambanks to protect them from erosion. Most of this reach has no riparian vegetation buffer along the banks, creating a higher potential for streambank erosion. The dominant surficial geologic material is glacial till with a moderate potential for erodibility. About 70% of the soils are hydrologic group B, which has a medium/high infiltration rate. Valley side slopes on both sides average about 21%.
This reach is approximately 5,905 feet long and ends upstream of the former bridge on Crawford Road. This point is also about 2,000 feet downstream from Town Bridge #170. There are three bridges in this reach: Bridge #86, #87, and a private bridge. This section of stream is in a narrow, twisting valley. Information taken from the helicopter flyover video shows that there is one area of exposed bedrock that is acting like a grade control. There may be more bedrock located along the streambanks than can be identified from the video. Because of the narrowness of the valley, the Platte Kill and Brook Road run close together most of the time. There appears to be minimal revetment placed along the streambanks in this reach suggesting that the stream may be relatively stable. Surficial geologic materials are made up entirely of glacial till and have a moderate potential for erodibility. About 72% of the soils are in hydrologic group B with a medium/high infiltration rate. Valley side slopes average 18% on both sides.
This reach is approximately 7,390 feet long and ends at the junction of Winter Hollow and Thompson Hollow. There are at least five small unnamed tributaries that enter this reach. The stream flows under three bridges: Delaware County Bridge #6-2, Town Bridges #170 and #146, and one private footbridge. The valley is fairly broad in most locations. Valley side slopes average 21% on the right side and 18% on the left side. Almost 50% of the left bank has little or no riparian vegetation buffers due to agricultural uses. In some locations, the narrow buffer stems from Delaware County Route 6 being very close to the stream. Only 7% of the reach has observed revetments and 15% of the length contains eroded streambanks. There is an increase in the number of depositional bars located in this reach. Most of these deposition bars are vegetated, suggesting that they are stable and have been in existence for a long time. Surficial geologic material in the corridor is entirely glacial till that has a moderate potential for erodibility. About 73% of the soils are hydrologic group B with a medium/high infiltration rate.

PK 07, 08, 09, 10

These four reaches are being combined because of their similarities. The helicopter video logging did not include these sections of stream therefore some of the data collected in previous reaches was not obtained. These units run upstream from PK 06 approximately 23,650 feet and end at a point in the stream at Bill Dougherty Road. There are about seven small unnamed tributaries that enter Thompson Hollow within this section. There are seven bridges and/or culverts in these reaches, which include both private and public structures. The land cover is primarily forest, abandoned agricultural fields reverting to brush and saplings, and some active agricultural fields. Riparian vegetation buffers are
generally greater than 100 feet, except in PK 07 where 72% of that reach contains buffers less than 25 feet wide. Reach PK 08 has 48% of the left bank with less than 25 feet of buffer. Approximately 25% of PK 10 contains wetlands in the corridor. Many beaver ponds and swamps can be seen that create good storage areas for stormwater run-off and excess nutrients. The surficial geologic material in this unit is entirely glacial till that has a moderate potential of erodibility. Theses reaches have hydrologic group B soils with a medium/high infiltration rate. Valley side slopes average between 14% - 24%.
This reach is located between Bill Dougherty Road and Harold Roberts Road and is approximately 5,130 feet long. This is a typical headwater section, somewhat confined within narrow valley side slopes and with a steep channel slope. Land cover in this corridor is 95% covered with forest and brush. Approximately 95% of the riparian vegetation buffer is greater than 100 feet wide on both sides of the streambanks. The surficial geologic material is mainly glacial till that has a moderate potential of erodibility. Hydrologic group C soils have a medium to slow infiltration rate, which is expected in the headwaters of a stream. On both sides of the valley, side slopes average about 25%.
## Platte Kill Summary Sheet

<table>
<thead>
<tr>
<th>Reach No.</th>
<th>Length Reach (feet)</th>
<th>Stream Type</th>
<th>Dominant Corridor Land Use/Cover</th>
<th>Sub-dominant Corridor Land Use/Cover</th>
<th>Riparian Buffer Width</th>
<th>Number Bridges and Culverts</th>
<th>% Impact of Bank Armoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>PK 01</td>
<td>4124.5</td>
<td>C</td>
<td>Forest</td>
<td>Brush</td>
<td>Right Bank 0-25’ Left Bank &gt;100’</td>
<td>2</td>
<td>25% Low</td>
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<td>PK 02</td>
<td>4850.4</td>
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<td>Forest</td>
<td>Brush</td>
<td>Right Bank &gt;25-50’ Left Bank &gt;100’</td>
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<td>13% Low</td>
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<tr>
<td>PK 03</td>
<td>6874.9</td>
<td>C</td>
<td>Forest</td>
<td>Brush</td>
<td>Right Bank &gt;100’ Left Bank &gt;25-50’</td>
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<td>17% Low</td>
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<tr>
<td>PK 04</td>
<td>6235.8</td>
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<td>Right Bank 0-25’ Left Bank 0-25’</td>
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<td>41% High</td>
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<td>PK 05</td>
<td>5904.6</td>
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<td>13% Low</td>
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<tr>
<td>PK 06</td>
<td>7970.3</td>
<td>C</td>
<td>Forest</td>
<td>Agriculture</td>
<td>Right Bank &gt;100’ Left Bank 0-25’</td>
<td>4</td>
<td>8% Not significant</td>
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<td>C</td>
<td>Forest</td>
<td>Brush</td>
<td>Right Bank 0-25’ Left Bank &gt;100’</td>
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<tr>
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<td>Forest</td>
<td>Brush</td>
<td>Right Bank &gt;100’ Left Bank 0-25’</td>
<td>---</td>
<td>No info</td>
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<tr>
<td>PK 09</td>
<td>6124.1</td>
<td>B</td>
<td>Forest</td>
<td>Agriculture</td>
<td>Right Bank &gt;100’ Left Bank &gt;100’</td>
<td>---</td>
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<tr>
<td>PK 10</td>
<td>4498.3</td>
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<td>Wetland</td>
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<td>PK 11</td>
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<td>Forest</td>
<td>Brush</td>
<td>Right Bank &gt;100’ Left Bank &gt;100’</td>
<td>---</td>
<td>No info</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Reach No.</th>
<th>% Impact Berms, Roads, Railroads, Paths</th>
<th>Impact Floodplain Development</th>
<th>Impact Depositional Features</th>
<th>Impact Meander Migration</th>
<th>Bank Erosion/Bank Height</th>
<th>Ice/Debris Jam Potential (Y/N)</th>
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<tbody>
<tr>
<td>PK 01</td>
<td>54% High</td>
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<td>High</td>
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<tr>
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</tr>
<tr>
<td>PK 06</td>
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<td>No Info</td>
<td>Low</td>
<td>No Info</td>
</tr>
<tr>
<td>PK 07</td>
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<td>Not significant</td>
<td>Not significant</td>
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<tr>
<td>PK 09</td>
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<td>Not significant</td>
<td>No Info</td>
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<tr>
<td>PK 10</td>
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<td>PK 11</td>
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<td>Not significant</td>
<td>Not significant</td>
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</table>
Introduction

The East Branch Delaware River mainstem watershed is located within the Town of Middletown in Delaware County. The Village of Margaretville is the only population center within this sub-basin. East Branch Delaware River mainstem was divided into three management units based upon the Vermont Protocol.

The East Branch mainstem is a sixth order stream. Huckleberry Brook, Bull Run, Dry Brook, Hubbell Hill Hollow, Batavia Kill, and numerous unnamed tributaries enter the East Branch mainstem. Tributaries that are near highly populated areas are more likely to have been straightened and maintained. The drainage area of East Branch mainstem is approximately 25.76 square miles and the stream is 9.8 stream miles long from the confluence with the Batavia Kill to the high water mark of the Pepacton Reservoir. The East Branch mainstem is primarily a C stream type and the valley is generally broad. The land is predominately forested along the majority of the mainstem, with some built-up and/or brush areas. The average annual rainfall in the watershed can range from 35-39 inches/year.

Stream Assessment

Data was collected using several different methods. The first step was gathering information to separate the stream into manageable sections using the SGAT protocol. This data helped target problem areas that needed further assessments. There were two helicopter flights conducted in order to get a visual of the whole watershed from a bird’s eye view. The first helicopter flight’s main purpose was to take photographs of problem areas. Figure 1.14 depicts the Village of Margaretville. The second helicopter flight by RETTEW, an engineering consulting firm with offices in Margaretville, produced a video log for the sub-basin. GPS synchronization with the video log enabled the assessment team to map and describe stream features, such as eroding stream bank locations, to the GIS. Rosgen Level II surveys were not completed in this stream reach due to time constraints.
Geomorphic Conditions

The East Branch Delaware River mainstem begins at the end of the East Branch Delaware River headwaters and ends at the high water mark of the Pepacton Reservoir. The channel slope is flat and the stream type is classified as C. However, there is a reach of braided stream channels for about 3,500 feet in EBMS 01, a reach that is located between the Pepacton Reservoir stem and the lower limits of Margaretville. The “island” in this braided reach appears to be old since the island is covered with forest and brush. Therefore, while this reach is technically a type D or DA stream, it is not an unstable reach. This braided area, being less than a third of the overall length of EBMS 01, does not affect the management approach for this reach. Sinuosity is low for this sub-basin: EBMS 01 has a sinuosity of 1.11, EBMS 02 is 1.04, and EBMS 03 is 1.10. There are two unnaturally straight reaches in EBMS 02 that are particularly noticeable, one located upstream of the Margaretville firemen’s pavilion and the other opposite the golf course. These straight portions of the stream are joined by a sharp, very small radius bend that most likely was created 100-200 years ago when the river was moved to this position. A similar condition occurs at the Hannah Country Club golf course, where the stream follows a very straight channel. All three reaches are highly impacted by urban areas and/or agricultural activities. Similarly, reaches EBMS 02 and EBMS 03 suffer from a lack of adequate riparian vegetation buffer. The dominant buffer width in these two reaches ranges from 0-25 feet wide. The dominant vegetation buffer of EBMS 01 is more effective at a width of 100 feet or more.

Reaches EBMS 01 and EBMS 02 both contain large amounts of streambank erosion and gravel deposition. Reach EBMS 01 has 7,506 linear feet of eroding banks and 11 areas of gravel deposition; reach EBMS 02 has 2,050 linear feet of eroding banks and 8 areas of gravel deposition; reach EBMS 03 has only 822 linear feet of eroding banks and 7 areas of gravel deposition. Streambank protection, such as riprap, is extensive in reach EBMS 02, which has 2,415 linear feet of streambank revetment. There are fewer revetments located in reaches EBMS 01 and EBMS 03, which have 670 linear feet and 850 linear feet respectively. The presence of revetment, especially the high amount in reach EBMS 02, is evidence of a historic and possibly continuing streambank erosion problem. Dry Brook is a tributary that enters the mainstem and contributes a large amount of sediment. Whether this sediment drops out in reaches EBMS 01 and EBMS 02 is not known. It should be noted that repairing the streambanks in these reaches could be helpful, but may not solve the problem entirely.
The East Branch mainstem and tributaries have been maintained since the stream was confined within its banks in populated areas. Figure 1.15 shows the Binnekill and Bull Run tributaries after gravel had been removed near the confluence with the East Branch mainstem. Gravel will continue to deposit in this location since the tributaries transport excess sediment and the slope is quite level.

In EBMS 02, a portion of the East Branch mainstem is diverted into maintained channel known as the Binnekill. This diverted water flows through the Village of Margaretville and is used by the community for fire control. Bull Run, a tributary from the north side of the village, and the Binnekill enter the East Branch Mainstem at the same location. Gravel deposits can be a problem at this location and are regularly removed to maintain flows. Figure 1.16 shows the headwall where the mainstem enters and becomes the Binnekill.

Gravel deposits along EBMS 02 are a concern for the Village of Margaretville. Gravel deposits at four locations along the reach: below the village near the Margaretville Wastewater Treatment facility, across from Margaretville High School upstream from the Fair Street Bridge, upstream of the Bridge Street bridge opposite the Pavilion, and below the inlet to the Binnekill. In the summer of 2006, some gravel was removed from a large point bar on the left side of the stream upstream of the Bridge Street bridge in an attempt to restore channel capacity in reach EBMS 02 (near the Margaretville Pavilion). On the right bank, a metal boilerplate wall was removed that had failed during the June 2006 flood. This wall – and the stone fill behind it – was placed 50 years ago to protect the streambanks. The boilerplate wall was determined to be in disrepair, ineffective, and a dangerous structure for recreational activities. In the summer of 2007, the DCSWCD SCMPr and NYCDEP constructed a demonstration project to reduce bank erosion. Rock vanes were used to reduce shear stress on the bank and the bank was strengthened with vegetation (See Volume 1, Section III).

No Rosgen Level II survey was performed on these reaches due to the lack of time and the depth of the stream. A complete topographic survey including cross sections was completed for use in the design of the demonstration restoration project. According to the SGAT protocol, these three stream reaches are able to access their floodplains.

Management Prescription for East Branch Delaware River Mainstem Sub-basin:

- Address streambank erosion
- Access to the floodplain must be maintained. No development or modification to the floodplain must be permitted as this would increase bank erosion,
accelerate channel evolution, and could easily lead to the destabilization of the stream system.

- Since it is known that the channel has been altered, any repair work or changes must be based on geomorphic principles to assure that no instabilities are created and that the sediment transport is adequately addressed.

**Floodplains**

The floodplain is predominantly undeveloped, except within the Village of Margaretville. Numerous houses and business are located within the 100 year floodplain in the Village of Margaretville. Some of the pre-FIRM development within a natural floodplain has constricted flows and raised flood elevations and velocities resulting in damage to upstream and downstream properties. Additional development within the floodplain should be avoided as it will likely raise the flood elevations, affect the stream alignment, increase the stream’s energy within the channel, and produce accelerated bank erosion near the developed area.

The upper portion of the sub-basin’s floodplain is less developed with the exception of the Hannah Golf Course. While the course does not necessarily restrict the floodplain, the products used to manage the turf can impact water quality with the addition of excess nutrients, pesticides and herbicides. Stormwater runoff may pick up the excess nutrients and deliver it to the streams without a sufficient buffer to absorb the nutrients. This can result in algae growth and other related problems. Riparian vegetation buffers along the golf course may reduce the nutrient load. **Figure 1.17** is a helicopter photo of the golf course that depicts little to no riparian buffer. This area would be an excellent place for the development of a riparian buffer program to establish trees along the streambanks.

The valley is broad along the mainstem and the road follows along the stream. The road cuts off the stream’s floodplain in several locations, causing problems upstream and downstream of the bridges that include bank and bed scour, gravel deposition, and debris jams.

**Infrastructure**

New York State Route 28 and 30, Delaware County Route 3, and a railroad bed run parallel to the East Branch mainstem. The roads adversely impact the stream health and
can cause floodplain restriction in areas. Stormwater runoff from the road ditches adds excess water and pollution directly to the streams without allowing time for absorption into the ground. In the several locations where the stream is close to the road, revetment was placed along the banks in order to protect the road from channel migration.

Town Bridge #24, Delaware County Bridge #38-1, three bridges on New York State Highway 30, and some private bridges are located within this sub-basin. The impacts of these structures are sediment deposition and log debris jams. Further inspection of these structures is needed in order to determine the impacts of the bridges on the stream system.
Management Unit Descriptions

East Branch Mainstem Sub-basin

Scale
1:60,000
This reach begins near the high water mark of the Pepacton Reservoir (at the NYS Route 28/30 bridge) and runs upstream for about 11,440 feet. In many parts of this reach, the stream contains multiple channels as it runs through a broad valley. Huckleberry Brook and at least two other unnamed tributaries enter into this reach. Land within the stream corridor is 70% forested and wetlands. About 20% of the land is considered built-up, which includes the paved roads of NYS Route 28/30 and Delaware County Route 3. About 59% of the reach has an eroding streambank along the main channel and 31% of these eroding banks have little to no riparian buffer. Approximately 34% of the reach length contains a narrow buffer of 0-25 feet wide. Most of these narrow buffers occur when a road closely parallels the river. At least 26% of the main channel experiences gravel deposition, mostly consisting of large side bars. Revetments affect only 6% of the reach length while protecting the streambanks near the road and bridges. This section of river has plenty of available floodplain and there are no residential areas in the floodplain area. There is a short section of confined stream near the confluence with Huckleberry Brook. The river’s floodplain is restricted by NYS Route 28/30 at the bridge in the downstream end of the reach. The state road cuts across the floodplain and funnels all flow under the bridge during high flow events.
This reach is about 8,746 feet long and ends at the Dry Brook confluence. This reach has been straightened in the past and it flows through a very broad valley. Bull Run is the only tributary in this reach that contributes water and sediment. The Village of Margaretville is built on the ancient alluvial fan for the Bull Run Hollow. The broad valley is naturally constricted at the outlet of Bull Run by the alluvium from the tributary on the right bank and the steep hillside on the left bank. Two bridges, located on Fair Street and Bridge Street, cross over the river in this reach and essentially define the extent of the valley/floodplain constriction. USGS Stream Gage 01413500 (East Branch Delaware River at Margaretville NY) is located on the right bank downstream of the bridge on Fair Street. The drainage area at the stream gage is 163 square miles. The period of records that is available for this gage is from February 1937 to the current year. The stream corridor, which runs through a portion of the Village of Margaretville, is about 37% built-up/residential and about 33% fields/open area. Narrow riparian buffer widths of 0-25 feet wide are common along the streambanks. About 99% of the length has a narrow vegetation buffer on one streambank or the other bank. Revetments on the streambank cover 30% of the reach length. At the beginning of the reach, the stream flows along the right valley wall before cutting diagonally across to the left valley wall. The slope of the river becomes more level at the point where it moves across the valley. This short section exhibits half the deposition (10%) of the entire stream reach (20%). Upstream of the Village of Margaretville, the East Branch Delaware River branches off into the Binnekill through the bulkhead. Historically, the Binnekill was used to feed water to a mill, but is now used as a tourist attraction for the Village of Margaretville. A FEMA grant has been obtained to improve the bulkhead. As previously described, a DCSWCD/DEP demonstration stream restoration project was constructed during the
summer of 2007 within this reach upstream of the Bridge Street bridge near the village fair grounds.

**EBMS 03**

This reach is approximately 15,514 feet long and ends at the confluence with the Batavia Kill and the East Branch Delaware River headwaters. The valley is very broad and most of the stream is straightened as it flows against the valley wall. A 2,000-feet-long section downstream from Delaware County Bridge #38-1 appears to have been less manipulated as it flows in the center part of the valley and is much more sinuous. The reach has excellent streamside vegetation, which helps maintain the stability of this reach. There are seven tributaries that enter into this reach, including Hubbell Hill Hollow and the Batavia Kill. The four bridges in this reach are Delaware County Bridge #38-1, the NYS Route 30 bridge, the East Hubbell Hill Road bridge, and a golf cart path bridge. The stream corridor is forested on the valley walls while the floodplain is covered with brush, abandoned fields, and a golf course. Eroding streambanks and revetment lengths each total 5% of the total reach length. Depositional features are also low at 4% of the reach length. A narrow riparian vegetation buffer of 0-25 feet wide can be seen on one streambank or the other for about 72% of this reach, mostly due to the golf course and abandoned fields located in the downstream portion. At this time, the narrow buffers are not affecting streambank stability but may not be wide enough to help water quality issues.
## East Branch Mainstem Summary Sheet

<table>
<thead>
<tr>
<th>Reach No.</th>
<th>Length Reach (feet)</th>
<th>Stream Type</th>
<th>Dominant Corridor Land Use/Cover</th>
<th>Sub-dominant Corridor Land Use/Cover</th>
<th>Riparian Buffer Width</th>
<th>Number Bridges and Culverts</th>
<th>% Impact of Bank Armoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>MU 1</td>
<td>11440</td>
<td>C</td>
<td>Forest</td>
<td>Built-up</td>
<td>Right Bank &gt;100'</td>
<td>1</td>
<td>6% Not Significant</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Left Bank &gt;100'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MU 2</td>
<td>8746</td>
<td>C</td>
<td>Forest</td>
<td>Built-up</td>
<td>Right Bank 0-25'</td>
<td>2</td>
<td>28% Low</td>
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<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>MU 3</td>
<td>15514</td>
<td>C</td>
<td>Forest</td>
<td>Brush</td>
<td>Right Bank 0-25'</td>
<td>4</td>
<td>5% Not Significant</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Left Bank 0-25'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reach No.</th>
<th>% Impact Berms, Roads, Railroads, Paths</th>
<th>Impact Floodplain Development</th>
<th>Impact Depositional Features</th>
<th>Impact Meander Migration</th>
<th>Bank Erosion/Bank Height</th>
<th>Ice/Debris Jam Potential (Y/N)</th>
</tr>
</thead>
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<tr>
<td>MU 1</td>
<td>10% Low</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Y</td>
</tr>
<tr>
<td>MU 2</td>
<td>32% High</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Y</td>
</tr>
<tr>
<td>MU 3</td>
<td>14% Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Y</td>
</tr>
</tbody>
</table>
Introduction

The East Branch headwaters are located within two townships in Delaware County: Middletown and Roxbury. Roxbury and Halcottsville are the population centers within this sub-basin. The East Branch Delaware River headwaters were not separated into management units due to time constraints, and windshield surveys determined that the stream appeared to be relatively stable. Additional research should be done along the stream in the future.

The East Branch headwater is a fourth order stream. Bragg Hollow, Meeker Hollow, Pleasant Valley Brook, Montgomery Hollow, and numerous unnamed tributaries enter the East Branch headwaters. Tributaries within this sub-basin seem to have minimal impact on stream health and appear to be fairly stable. Tributaries that are near highly populated areas are more likely to have been straightened and maintained. The East Branch headwaters are 14.7 stream miles long from the upper reaches to the East Branch mainstem, draining approximately 49.66 square miles. The land use is predominately residential along the majority of the headwaters. The average annual rainfall in the watershed can range from 37-39 inches/year in the lower reaches to 39-45 inches/year in the upper reaches.

Stream Assessment

Data was collected via windshield surveys, 2001 aerial photography, and helicopter video logging. Portions of the stream could not be seen from the road. Due to time constraints, this sub-basin was not determined a priority to complete GPS data collection or the SGAT protocol. Future stream assessment is recommended.

Geomorphic Conditions

For the purpose of this plan, the headwater is considered to begin at a pond located near Grand Gorge and end at the confluence with the Batavia Kill tributary.

The East Branch Delaware River headwaters have been classified as a type C stream based on the 2001 aerial photographs. According to USGS topography quad maps, the slope is about 0.4%. Near Mac More Road, the stream appears to have been straightened and could have been pushed up against the valley wall. From this location to Roxbury, the stream appears to meander across the floodplain. South of Roxbury, the stream enters a wetland and then emerges to continue on its course until it enters Wawaka Lake. It exits the lake and continues south until its meets the Batavia Kill tributary near Kelly’s Corners.

According to 2001 aerial photography, the East Branch headwaters appear to have large amounts of sediment being transported and deposited throughout the entire stream.
system. The Wawaka Lake dam impounds water, slowing flow and causing deposition to occur. Windshield surveys have identified some locations of deposition and problem areas in the headwaters of the sub-basin. The majority of the stream cannot be seen from the road, so further inspection of the mainstem is recommended in order to identify problem areas of deposition and their causes.

Approximately 3.2 miles (or 53% of the total stream length) appears to have inadequate riparian vegetation buffer on one or both streambanks. This information was obtained by a conservative interpretation of the 2001 aerial photographs and helicopter video. A GPS walkover and subsequent analysis of the collected data would probably show that much of the perceived vegetation buffer is too narrow to be an effective. Generally speaking, the riparian vegetation buffer appears to be sufficient except where the stream runs through agricultural fields or developing areas.

Based on 2001 aerial photographs, there appears to be several locations where the stream is running along the valley wall. Comparison of this visual data to USGS quad maps seems to verify this interpretation. This area has the potential to be unstable depending on the soils present, which determine the stability of the streambank. For example, a bedrock valley wall will probably remain stable, but a colluvium-based valley wall is potentially unstable.

Management Prescription for East Branch Delaware River Headwaters Sub-basin:

- A GPS walkover should be completed for this sub-basin
- A Rosgen Level II survey should be completed to verify stream type
- Eroded areas should be located and related to existing vegetation buffers or the lack thereof
- Instances where the stream is against the valley wall should be recorded during GPS data collection, along with any stream issues that may be occurring

**Floodplains**

There are several areas of development along the floodplain. Development leads to floodplain constriction and areas may be prone to flooding during high flow events. Halcottsville and Roxbury – located on the floodplain – have encroached on the floodplain and may have altered the path of the stream.

The valley is narrow along most of the mainstem and the road follows along the stream. The road cuts off the stream’s floodplain in several locations, causing problems upstream and downstream such as channel migration, gravel deposition, and debris jams. Further studies are needed to determine additional causes of the channel migration.

**Infrastructure**

New York State Route 30, Frog Alley Road, Old River Road, Delaware County Route 41, and an abandoned railroad bed all run parallel to the East Branch headwaters. The roads have adverse impacts on stream health and can cause floodplain restriction in
certain areas. Stormwater runoff from the road ditches adds excess water and pollution directly to the streams without allowing time for absorption into the ground. There are several locations where the stream is close to the road and revetment was placed along the banks in order to protect the road from channel migration. Further inspections will be required in order to document additional stream impacts.

Town Bridges #25, #53, #26, #102, #143, Delaware County Bridge #41-2, one bridge on New York State Highway 30, and some private bridges are located within this sub-basin. The small drainage area in the upper portions of the headwaters allows for culverts to be installed, conveying the water under the road. According to the windshield survey, the impacts of these structures are deposition and log debris. Culvert impacts can also be erosion or deposition upstream and/or downstream of the structure if the culvert is improperly sized. Further inspection of these structures is needed in order to determine the impacts on the stream.
Introduction

The Terry Clove watershed is located within three different townships in Delaware County: Hamden, Colchester, and a small portion of Andes. There are no population centers located in this sub-basin. Terry Clove was not separated into management units due to time constraints, and it was determined during windshield surveys that the sub-basin appears to be stable. Additional assessment should be conducted along the stream in the future as time and resources permit. The Terry Clove mainstem drains directly into the Pepacton Reservoir.

The Terry Clove mainstem is a third order stream. In addition to unnamed tributaries, there are two major tributaries that enter the mainstem: Bryden Hill Brook and Basin Clove. The drainage area of Terry Clove is approximately 15.08 square miles, and the mainstem runs 6.1 stream miles from the headwaters to the confluence with the Pepacton Reservoir. The land use is predominately agricultural along the majority of the mainstem. The average annual rainfall for the majority of Terry Clove watershed ranges from 41-43 inches/year, while the headwaters experience 39-41 inches/year. The Basin Clove and Bryden Hill Brook tributaries range from 43-45 inches/year in the headwaters.

Stream Assessment

Data was collected using observations from windshield surveys and 2001 aerial photographs. Portions of the stream could not be seen from the road and tree cover made it difficult to see the stream from aerial photographs. Due to time constraints, this sub-basin was not determined a priority for the collection of GPS data, the completion of SGAT protocol, or a helicopter flyover. Future stream assessment is recommended for this sub-basin.

Geomorphologic Conditions

Based on the 2001 aerial photographs, Terry Clove has been classified as type C stream. According to USGS quad maps, the slope is about 1.7%. The stream generally meanders throughout the sub-basin. However, for about the first 6,000 feet of the headwaters, the stream is rather straight with small, sharp radius bends. The stream channel planform, as seen on the 2001 aerial photographs, resembles a stream type B. From this location on downstream, the stream meanders and the bends become a combination of long bends with larger radii and short bends with small, angular radii.

Approximately 2.0 miles of the stream (33% of the stream length) appear to have inadequate riparian vegetation buffer on one or both streambanks. This information is based on a conservative visual interpretation of the 2001 aerial photographs. A GPS walkover and subsequent analysis of the collected data would probably show that much
of the perceived buffer is too narrow or less vegetated than would be effective. Therefore, the amount of inadequate buffer is probably higher than 33%.

Based on 2001 aerial photographs, there appears to be several locations where the stream is running along the valley wall. Comparison of this visual data to USGS quad maps seems to verify this interpretation. This area has the potential to be unstable depending on the soils present, which determine the stability of the streambank. For example, a bedrock valley wall will probably remain stable, but a colluvium-based valley wall is potentially unstable. These areas should be inspected in the future.

Management Prescription for Terry Clove Sub-basin:
- A GPS walkover should be completed for this sub-basin
- A Rosgen Level II survey should be completed to verify stream type
- Eroded areas should be located and related to existing vegetation buffers or the lack thereof

Infrastructure

East Terry Clove Road, Terry Clove Road, and Coles Clove Road run parallel to the Terry Clove mainstem. Edwards Road, Basin Clove Road, and West Terry Clove Road are perpendicular to the mainstem. The roads have made little adverse impacts to the stream health. Stormwater runoff from the road ditches adds excess water and pollution directly to the streams without allowing time for absorption into the ground. There are several locations where the stream is close to the road and revetment was placed along the banks in order to protect the road from channel migration. Location of revetment or problem areas should be identified in the future.

Town Bridges #76 and #165 and some private bridges are located within this sub-basin. In the headwaters, the Terry Clove mainstem has a small drainage area and culverts are installed to convey the water under the road. The impacts of the culverts can be erosion or deposition upstream and/or downstream of the structure if the culvert is improperly sized. Further inspection of these structures is needed in order to determine their impacts on the stream.
**Introduction**

The Fall Clove watershed is located within three different townships in Delaware County: Andes, Colchester, and a small piece of Hamden. There are no population centers located within this sub-basin. Fall Clove was not separated into management units due to time constraints and it was determined during windshield surveys that the stream appeared to be stable. Additional research should be completed along the stream in the future. The Fall Clove mainstem drains directly into the Pepacton Reservoir.

The Fall Clove mainstem is a third order stream. There are two major tributaries that enter the mainstem: Skunk Hollow and Fish Hollow, and there are numerous unnamed tributaries. Tributaries within this sub-basin seem to have minimal impact and the mainstem appears to be very stable. The drainage area of Fall Clove is approximately 11.18 square miles and the mainstem is 7.6 stream miles from the headwaters to the outlet at the Pepacton Reservoir. The land use is predominately agricultural along the mainstem. The average annual rainfall for the entire watershed ranges from 41-43 inches/year.

**Stream Assessment**

Data was collected via windshield surveys and 2001 aerial photographs. Portions of the stream could not be seen from the road and tree cover made it difficult to see portions of the stream from the aerial photographs. Due to time constraints, this sub-basin was not determined a priority for GPS data collection, the completion of the SGAT protocol, and/or a helicopter flyover. Future stream assessment is recommended for this sub-basin.

**Geomorphic Conditions**

Based on 2001 aerial photographs, Fall Clove has been classified as a type C stream. According to the USGS quad maps, the overall slope is about 2%. The stream appears to meander throughout the sub-basin. Near Brace Hollow Road, there is a stretch of stream about 4,000 feet long that flows through a straight stream channel. It is possible that this reach was, at some time in the past, moved or channelized to this location. Near the stream’s outlet at the Pepacton Reservoir, the stream runs fairly straight until it reaches a location that contains bedrock control.

Approximately 3.4 miles of stream appear to have inadequate riparian vegetation buffers on one or both streambanks, equaling 45% of the total reach length. This information is based on a conservative visual interpretation of the 2001 aerial photographs. A GPS walkover and a subsequent analysis of the data would probably show that much of the perceived vegetation buffer is too narrow to provide effective bank protection.
There appears to be several locations where the stream flows along the valley wall. This was observed on 2001 aerial photographs and compared to the USGS quad maps, which seems to verify the data. This area has the potential to be unstable depending on the soils present, which determine the stability of the streambank. For example, a bedrock valley wall will probably remain stable, but a colluvium-based valley wall is potentially unstable. These areas should be inspected in the future.

Management Prescription for Fall Clove Sub-basin:

- A GPS walkover should be completed for this sub-basin
- A Rosgen Level II survey should be completed to verify stream type
- Eroded areas should be located and related to existing vegetation buffers or the lack thereof

Floodplains

The Fall Clove mainstem has access to the floodplain. Development along the floodplain is very sparse and minimally impacts the stream. Farms and fields occur along the mainstem. Roads that run parallel to the stream may cause some floodplain restriction in certain areas, but further research is needed to determine their impact on the stream.

Infrastructure

Fall Clove Road runs parallel to the Fall Clove mainstem and minimally impacted the stream health. The mainstem is generally located away from the road, and in most areas can hardly be seen from the road. Stormwater runoff has a minimal impact on the streams, especially since this is a small watershed. Further research is needed to determine any additional stormwater runoff impact in this sub-basin.

Bridges located within this sub-basin are Town Bridge #164 and some private bridges. The drainage area in the headwaters is so small that only culverts are needed to convey the water under the roads. The bridges and culverts have minimal impact to the stream health. Some impacts of the culvert can be erosion or deposition upstream and/or downstream of the structure if the culvert is improperly sized. Further inspection of these structures is needed in order to determine the impacts on the stream.
MILL BROOK SUB-BASIN  
Towns of Middletown, Hardenburgh and Colchester

Introduction

The Mill Brook watershed is located within three different townships: Middletown and a small portion of Colchester in Delaware County, and Hardenburgh in Ulster County. There are no population centers located in this sub-basin. Mill Brook was not divided into management units due to time constraints and it was determined during windshield surveys of the sub-basin that the stream appeared to be relatively stable. Additional research should be done along the stream in the future. The Mill Brook mainstem drains directly into the Pepacton Reservoir. The majority of the land along Mill Brook mainstem is owned by a private club called the Tuscarora Club. The stream is managed by the Tuscarora Club to preserve quality fishing habitat along the mainstem.

The Mill Brook mainstem is a fourth order stream. Clark Hollow is one major tributary that enters the Mill Brook mainstem in addition to numerous unnamed tributaries. Tributaries within this sub-basin seem to have a small impact on the mainstem and appear to be fairly stable. The drainage area of Mill Brook is approximately 25.36 square miles and the mainstem is 11.2 stream miles from the headwaters to the outlet of the Pepacton Reservoir. The land is predominately forested along the majority of the mainstem. The average annual rainfall in the watershed can range from 35-41 inches/year at the lower portion of the sub-basin to 41-51 inches/year in the headwaters. The USGS Stream Gage 01414500 (Mill Brook Near Dunraven NY) is located on the left bank 0.4 miles upstream from the bridge on New York City Road 9 and 2.7 miles southwest of Dunraven. The drainage area at the stream gage is 25.2 square miles. The period of records that is available for this gage is from February 1937 to the current year, and some of these records are published as "at Arena" 1937-67.

Stream Assessment

Data was collected via windshield surveys, 2001 aerial photographs, and USGS topographic quad maps. Portions of the stream could not be seen from the road. Due to time constraints and general knowledge of its relatively stable condition, this sub-basin was not determined a priority for GPS data collection, completion of the SGAT protocol, and/or a helicopter flyover. Future stream assessment is recommended for this sub-basin.

Geomorphic Conditions

Based on the 2001 aerial photographs, Mill Brook has been classified as a type C stream. The upper reaches are steep and the stream can be assumed to be a type B or even a type A stream. According to the USGS quad maps, the overall slope is about 3.2%. Mill Brook meanders throughout the sub-basin, but tends to run in a straight channel for the last half mile just before entering the Pepacton Reservoir. The stream at this location is confined by the valley walls and there are roads located on either side of the stream.
There are four locations (totaling 1,850 feet) where the stream exhibits excessive gravel deposition. These areas of the stream have a tendency to braid through the gravel deposition. Gravel deposits represent 3% of the total stream length; data was obtained using visual inspection from 2001 aerial photographs. Generally speaking, the riparian vegetation buffer is quite good. It should be noted that each gravel depositional area exhibits poor or non-existent riparian buffer. Possibly, the stream has become too wide and has lost its ability to transport the sediment, causing the sediment to deposit as gravel bars.

Mill Brook has a very narrow valley and appears in some locations to be up against the valley wall. However, with a valley as narrow as Mill Brook’s, it is impossible to determine from 2001 aerial photographs and USGS topography maps whether the channel is in fact against the valley wall or what condition the stream is in.

Management Prescription for Mill Brook Sub-basin:
- A GPS walkover should be completed for this sub-basin
- A Rosgen Level II survey should be completed to verify stream type
- Eroded areas should be located and should be related to existing vegetation buffers or the lack thereof
- Instances where the stream is against the valley wall should be recorded during GPS data collection, along with any stream issues that may be occurring

**Infrastructure**

Mill Brook Road and Jim Alton Road run parallel to the Mill Brook mainstem, while Hinkley Road and Kittle Road are perpendicular to the mainstem. The roads have some adverse impacts on the stream health since the floodplain is restricted in these areas. Stormwater runoff from the road ditches adds excess water and pollution directly to the streams without allowing time for absorption into the ground. There are several locations where the stream is close to the road and revetment was placed along the banks in order to protect the road from channel migration. Further inspections will be required in order to document additional stream impacts.

Town Bridges #112, #100, #17, and some private bridges are located within this sub-basin. In the headwaters, the Mill Brook mainstem has a small drainage area and culverts are installed to convey the water under the road. According to windshield surveys, the impacts of these structures are deposition and log debris. The impacts of the culverts can be erosion or deposition upstream and/or downstream of the structure if the culvert is improperly sized. Further inspection of these structures is needed in order to determine the impacts on the stream.