Malletts Creek & Allen (Petty) Brook Phase 1 & Phase 2 Stream Geomorphic Assessment Summary Report

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EXECUTIVE SUMMARY

- The Malletts Creek and Allen (Petty) Brook watersheds are located predominately in the towns of Colchester and Milton, but some sections extend into Westford and Essex. Malletts Creek has a drainage area of 23.7 Mi² (excluding Allen Brook) and Allen Brook has a drainage area of 5.4 Mi². The two meet at the confluence with Lake Champlain east of Interstate 89 and west of Route 7. In addition to Allen Brook, six other significant tributaries draining to Malletts Creek were identified in this study. Pond Brook (T2) branches off the main stem west of the Route 7 crossing in the large wetland area. Pond Brook previously had Phase 1 geomorphic assessments conducted by the Fitzgerald Environmental Associates, LLC. for CCRPC and VTDEC. The only tributaries to Malletts Creek that received full Phase 1 assessments in this study were Allen Brook (T1) and portions of tributary 6 (T6).

- A total of 95 reaches were identified during the initial watershed delineation. Of the 95 delineated reaches, 51 reaches were identified for Phase 1 analysis by the CCRPC, VTDEC, and local town officials. A total of 25.2 miles received full Phase 1 assessment. The Phase 1 SGA approach resulted in watershed-scale data about the landscape (e.g., soils and land cover) and the stream channel (e.g., slope and form), providing a basis for understanding the natural and human-impacted conditions within the watershed. The SGA data also aided in the identification of specific stressors affecting the physical conditions of the stream channels and structures (e.g., bridges and culverts).

- Approximately three-quarters (78%) of the assessed reaches are found in an unconfined valley setting that would naturally support channels with E or C-type geometry with coarse equilibrium or fine deposition geomorphic processes. The remaining reaches (22%) are found in a confined valley setting with higher channel slopes, and A or B-type channel geometry. These reaches typically have transport based sediment regimes.

- The majority of the watershed land use is comprised of forested land (57.8%) and agricultural land (24.6%). Developed lands (7.2%) are most commonly found as low density residential areas throughout the watershed, but some higher density areas of industrial and residential development are found in Milton near Route 7. Wetlands and other surface waters represent 7.1% of the watershed area and shrub/scrub lands occupy approximately 3.3%.

- Impact ratings were developed for each reach using the Phase 1 parameters representing four classes of watershed and reach-scale impacts: 1) Land Cover and Reach Hydrology; 2) Channel Modifications; 3) Floodplain Modifications and Planform Changes; 4) Bed and Bank Conditions. Out of a total possible impact score of 32, the average rating for all reaches was 9.9, with a maximum score of 17 and a minimum score of 2.

- Based on the Phase 1 impact ratings, a total of 17 high priority reaches were recommended for Phase 2 assessment. An additional 10 reaches were considered moderate priority, and the remaining 24 reaches were considered low priority for additional assessment. In fall of 2010 CCRPC consulted with Milton and Colchester town officials to select reaches for Phase 2 assessments based on the recommendations. A total of 11 reaches (6.2 miles) were selected for field assessment in fall of 2010.
• In Milton, four (4) reaches on the main stem of Malletts Creek and two (2) reaches on a small tributary were assessed in the field. Beaver activity was common, and historical and ongoing ponding has influenced the character and stability of the channel in many locations. Geomorphic stability and habitat conditions were generally “good” to “fair”. One section on upper Malletts Creek, segment M17-3 found to the east of East Road, had high quality aquatic habitat. The small tributary entering Malletts Creek from the north is unstable in two locations: 1) south of Main Street crossing where channel was historically straightened and is severely incised (segment T6.01-C); 2) north of Main Street crossing where increased runoff from an upslope residential development is causing channel migration (Reach T6.02).

• The Phase 2 reaches for Allen (Petty) Brook span both Colchester and Milton. In the Colchester portion of Allen Brook, channel conditions varied widely. Stability and habitat was generally “good” to “fair” in the southern portion where historical agricultural land use, modern day development and road crossings have some impact on the conditions. Near the Colchester-Milton town line the brook flows through a nearly pristine area of corridor where stability and habitat was excellent. In the northernmost reach assessed in the field (T1.06), road crossings and recent residential development have impacted the channel conditions, which were “fair”.

• One segment (T6.01-C) had severe channel adjustments and has departed from reference conditions primarily due to channel incision and/or straightening. These types of departures result in a conversion of river segments to effective transporters of sediment to downstream areas, with a subsequent loss of storage of sediment and floodwaters within the floodplain.

• A total of eight (8) culverts at road crossings were assessed using the VTDEC methods. None of the assessed culverts are adequately sized to accommodate stream equilibrium conditions. Five (5) of the assessed culverts have widths less than 50% of bankfull channel width and cause significant flood constrictions and reduced aquatic organism passage (AOP). Three (3) culverts have been identified as “high” priorities for replacement or retrofit to address their incompatibility with channel stability and/or AOP.

• Site level approaches to restoration of dynamic equilibrium conditions were evaluated in detail at the reach scale using a step-wise procedure developed by VTANR. This resulted in the identification of 21 unique projects for the study area, including 13 projects that do not require significant further study (i.e., passive approaches such as buffer plantings and corridor protection), and 8 projects requiring further feasibility study or engineering design (i.e., active restoration approaches such as culvert replacements).
1.0 Project Background

The Chittenden County Regional Planning Commission (CCRPC) and the Vermont Department of Environmental Conservation (VTDEC) identified the Malletts Creek and Allen (Petty) Brook watersheds in northwestern Vermont for assessment of fluvial geomorphic conditions. Fitzgerald Environmental Associates, LLC (FEA) was retained by CCRPC in 2010 to carry out Phase 1 assessments following the Stream Geomorphic Assessment (SGA) Protocols developed by the Vermont River Management Program (RMP). The study was initiated to identify the extent of geomorphic stressors throughout the watershed (e.g., encroachment, development, etc), and to collect preliminary data on the stream’s condition.

FEA used the Stream Geomorphic Assessment Tool (SGAT) to develop the baseline GIS data for the watershed in the summer of 2010. The remaining Phase 1 data was collected via windshield surveys and historical research. A total of 95 reaches were identified during the initial watershed delineation. Of the 95 delineated reaches, 51 reaches were identified for Phase 1 analysis by the CCRPC, VTDEC, and local town officials. A total of 25.2 miles received full Phase 1 assessment. The Phase 1 SGA approach results in watershed-scale data about the landscape (e.g., soils and land cover) and the stream channel (e.g., slope and form), providing a basis for understanding the natural and human-impacted conditions within the watershed. The SGA data also aids in the identification of specific stressors affecting the physical conditions of the stream channels and structures (e.g., bridges and culverts). In fall of 2010 CCRPC consulted with Milton and Colchester town officials to select reaches for Phase 2 assessments based on the recommendations. A total of 11 reaches (6.2 miles) were selected for field assessment in fall of 2010. This report summarizes the results of the Phase 1 and 2 SGA, and the preliminary restoration projects identified as part of this planning effort.

The overall goal of the RMP is to “manage toward, protect, and restore the fluvial geomorphic equilibrium condition of Vermont rivers by resolving conflicts between human investments and river dynamics in the most economically and ecologically sustainable manner,” (VTANR, 2010) achieved through: 1) Fluvial erosion hazard (FEH) mitigation, 2) Sediment and nutrient load reduction, and 3) Aquatic and riparian habitat protection and restoration.

The SGA study of the Malletts Creek and Allen (Petty) Brook watersheds provides:

1) A basis for understanding the overall causes of channel instability and habitat degradation
2) The data needed to develop FEH Zones for the study area
3) A list of preliminary corridor restoration projects that can be further developed in the future to mitigate flood and erosion hazards in the watershed
2.0 WATERSHED BACKGROUND

2.1 GEOGRAPHIC SETTING AND LAND USE HISTORY

The Malletts Creek and Allen (Petty) Brook watershed is located in northwestern Chittenden County, Vermont (Figure 2.1). This area of the state is part of the upper Lake Champlain drainage. The Malletts Creek watershed, which includes Pond Brook, has a drainage area of 23.6 square miles and outlets to Lake Champlain east of the Interstate 89 crossing at Malletts Bay. The Allen (Petty) Brook watershed is lumped into the Malletts Creek for this study, but actually is an independent watershed draining into Lake Champlain at the same location as Malletts Creek. The Allen Brook watershed has a drainage area of 5.4 square miles. The watersheds are found predominately in the towns of Colchester and Milton, but some sections extend into Westford and Essex. In addition to Allen Brook, which meets Malletts Creek at the confluence with Lake Champlain, six other significant tributaries draining to Malletts Creek were identified in this study. Pond Brook (T2) branches off the main stem west of the Route 7 crossing in the large wetland area. Pond Brook previously had Phase 1 geomorphic assessments conducted by the FEA for the CCRPC and VTDEC. Only Allen Brook (T1) and portions of tributary 6 (T6) received full Phase 1 assessments in this study.

Land cover data based on imagery from 2006 (NOAA, 2008a) are summarized in Table 2.1 and Figure 2.2. The Malletts Creek is drained by a rural watershed, with forest and agriculture representing the dominant cover types with 60.3% and 25.1%, respectively. Allen (Petty) Brook has a much higher proportion of the watershed that is developed (17.5%) with less forested lands (46.5%). The most concentrated areas of development are primarily found to the east of Interstate 89 south of downtown Milton. Much of the agricultural lands within the two watersheds are for hay production and pasture land (NOAA, 2008a). There is a significant area of wetlands in both the Allen Brook and Malletts Creek watersheds with 10.0% and 4.9%, respectively.

<table>
<thead>
<tr>
<th>Land Cover/Land Use Type</th>
<th>Malletts Creek*</th>
<th>Allen (Petty) Brook</th>
<th>Pond Brook</th>
<th>All Phase 1 Reaches**</th>
<th>Entire Watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>25.1%</td>
<td>22.9%</td>
<td>19.4%</td>
<td>32.2%</td>
<td>24.6%</td>
</tr>
<tr>
<td>Development</td>
<td>4.8%</td>
<td>17.5%</td>
<td>5.6%</td>
<td>6.9%</td>
<td>7.2%</td>
</tr>
<tr>
<td>Forest</td>
<td>60.3%</td>
<td>46.5%</td>
<td>61.0%</td>
<td>50.5%</td>
<td>57.8%</td>
</tr>
<tr>
<td>Open Water</td>
<td>1.5%</td>
<td>0.1%</td>
<td>6.3%</td>
<td>0.5%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Scrub/Shrub</td>
<td>3.4%</td>
<td>3.0%</td>
<td>5.8%</td>
<td>3.0%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Wetland</td>
<td>4.9%</td>
<td>10.0%</td>
<td>1.9%</td>
<td>6.9%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Drainage Area (ac)</td>
<td>23.7</td>
<td>5.4</td>
<td>4.5</td>
<td>10.3</td>
<td>29.1</td>
</tr>
</tbody>
</table>

* Malletts Creek excludes Allen (Petty) Brook, but includes Pond Brook; **Phase 1 reaches include 51 assessed reaches in both watersheds
Figure 2.1 Watershed location map for the Malletts Creek and Allen (Petty) Brook watershed
Figure 2.2 Watershed Land Cover/Land Use for the Malletts Creek and Allen (Petty) Brook watershed
Historical Land Uses
The Malletts Creek and Allen Brook watersheds, like much of the state of Vermont, were largely devoid of forest vegetation in the middle part of the 1800’s (Albers, 2000). This watershed-scale impact, along with the direct impacts to the channel associated with clearing and farming (e.g., straightening), left scars that are still healing today. In the absence of historic aerial photographs which predate 1937, only anecdotal information from historical records can be used to piece together the story of the watershed and its land use. Nevertheless, historic aerial photos taken in 1937 and 1962 provide a basis for using time-lapse analysis to understand the extent of the forest clearing and subsequent recovery in the 1900’s as the economy shifted away from the traditional pastoral land uses.

As Vermont’s farmers began to move to the Midwest in search of more productive farmland in the mid to late 1800’s, the deciduous forests along the mountain and foothill slopes began to recover (Albers, 2000). Throughout the early and mid 1900’s, as more family farms found on marginal lands were given up, the forests continued to recover (Figure 2.3 & Figure 2.4).

![Figure 2.3](image-url) Upper headwaters area in 1952 where the channel crosses over Westford Road; note lack of trees
2.2 Geologic and Geomorphic Setting

Geologic Setting

The Malletts Creek/Allen Brook watershed lies in the Northern Champlain Valley. Its surficial geology and soils have been shaped by three dominant processes of the landscape change since the last period of glaciation: 1) Retreat of the Laurentide Ice Sheet; 2) Presence of Glacial Lake Vermont and the Champlain Sea; 3) Deposition from the Lamoille River. Each of these historic geologic processes help to describe the current distribution of soil characteristics found throughout the watershed today.

As the Laurentide Ice Sheet retreated from Vermont approximately 14,000 years ago it left behind a “tongue” of ice extending through the lower elevations of the Champlain Valley. During a glacial retreat the rate of ice melt exceeds the rate at which the ice is flowing. For the Laurentide Ice Sheet this process and the southward movement (flow) that preceded it left a barren landscape with glacial till soils. During the retreat of the glaciers, a large freshwater lake formed as the melt water draining to the north was blocked by the remaining “tongue” of ice in the northern Champlain Valley. The blockage of ice to the north created Glacial Lake Vermont (Figure 2.5). At this time the elevation of water was approximately 620 feet above sea level. Approximately 2,000 years later, as the ice sheet receded farther to the north, the freshwater of Lake Vermont broke through the ice blockage and spilled out the Saint Lawrence Valley. The water became brackish as the elevation of water equilibrated between the lake, now called the Champlain Sea, and the Atlantic Ocean. During this time the water elevation was approximately 320 feet above sea level. The Champlain Sea persisted for approximately 2,000 years as the land of northern Vermont isostatically rebounded from the mass of the Laurentide Ice Sheet (Wright, 2003).
The presence of Glacial Lake Vermont and the Champlain Sea shaped the soils that are presently found in the watershed, especially throughout the southern and eastern portions. During this historic period of Lake Vermont, the surface elevation of the water extended up to the foothills of the mountains to the East of East Road. Due to the quiescent waters of the Lake, large amounts of fine sediment settled in these areas, leaving behind the silt and sand rich soils found throughout the watershed today. The only section of the watershed that was not greatly affected by the presence of Lake Vermont was the upper headwaters of along the eastern portion of the basin, where till soils are dominant. The surficial geology of the lower part of the watershed is dominated by a mix of silts, sands and coarse gravels associated with deposition in the Lake. In the northwestern watershed, in Milton, outwash soils associated with the historical Lamoille River floodplain are present. This outwash area represents an ancient delta of the Lamoille River where coarser substrates were deposited during the time of the Champlain Sea when water from the Green Mountains deposited in large deltas extending to the west into the Sea.

Geomorphic Setting

The Malletts Creek and Allen (Petty) Brook watersheds are two small drainages that enter directly into Lake Champlain. For the purpose of this analysis Petty Brook has been considered a tributary (T1) to Malletts Creek. Malletts Creek has seven significant tributaries off the main stem and several small sub-tributaries. The main stem of Malletts Creek (Reaches M01-M25) has an overall channel slope of 1.0%, with the majority of the slope change occurring in the upper watershed as the channel heads to the east paralleling Westford Road. The watershed tends to have unconfined valley types where the channel passes through the wide valleys what was once the bottom of Glacial Lake Vermont. Significant changes
in channel slope are only found in areas where bedrock grade controls exist or the valley is naturally narrow. A large portion of the main stem surface waters are slow-moving, meandering E-type channels with sand and fine gravel substrates.

Allen Brook (T1.01-T1.10) has an average channel slope of 0.7%. Valley characteristics and reference channel setting is very similar to that of the main stem. Low sloped E-type and C-type channels with unconfined valleys and dune-ripple and riffle-pool bedform are most common. The sub-tributaries that branch off of Allen Brook tend to have slightly higher slopes and are more likely to have gravel substrate and riffle-pool bedform. Where the valley is confined or narrow the reference morphology tends to be B-type.

2.3 ECOLOGICAL SETTING
The Malletts Creek and Allen Brook watershed is found within the Champlain Valley (CV) biophysical region (Thompson and Sorensen, 2000). The CV region extends from just north of Rutland up to the Canadian border, and is bound to the west by Lake Champlain and to the east by the foothills of the Green Mountains. The CV is much warmer and somewhat dryer than the other biophysical regions of the state. In South Burlington the average temperature is 45 degrees Fahrenheit and the average annual rainfall is 36.1 inches (NOAA, 2008b). As discussed above in the summary of the geological setting, the CV has been shaped by the presence of Lake Vermont and the Champlain Sea, leaving behind fine grained soils rich in calcium and well suited for agriculture. As such, much of the CV, including the Malletts Creek and Allen Brook watershed, was extensively developed for agricultural uses during its original settlement in the 1700’s and 1800’s.

Very few areas of the original plant communities that occupied the CV exist today, as most were cleared for agriculture. Three forest types, in addition to the beaver meadows common along the Malletts Creek channel, likely occupied the watershed: 1) Sandplain forest: areas of coarse alluvial and outwash substrate in the northwestern watershed where the Lamoille delta once was likely supported forests with white pine, pitch pine, oaks, and red maple; 2) Clayplain forest: in the lower watershed around where heavy lacustrine clays are found, the forest was likely comprised of red maple, beech, white ash, and various species of the white oak subfamily; 3) Northern Hardwood: in the upland areas where till soils are found, the forest was likely comprised of maple, birch and beech trees.

Elevations within the watershed range from 98 feet at the confluence with Lake Champlain, up to approximately 1,390 feet in the headwaters to the north of Westford Road. Extensive wetlands occupy large areas within the watershed (NWI, 2004). In total about 6.0% of the watershed is considered to be wetland (NOAA, 2008a). The floodplain corridor throughout the majority of the watershed is classified as wetland. The main stem has two large wetland complexes in addition to the wetlands found in the corridor. One is near Lake Champlain and the other is located mid-watershed in reaches M10 to M15.
(NWI, 2004). Allen Brook has a large wetland complex near the confluence with Lake Champlain and another large wetland found near the headwaters reaches T1.11 and T.12.

Throughout the study area the low slope makes for excellent beaver habitat. Many reaches are currently experiencing beaver activity or recovering from past beaver dams that have been breached. These natural sediment sinks have likely reduced the sediment load to the lake. The mouth of the Malletts Creek at the confluence with Lake Champlain has changed considerably in the last 70 years. In 1937 the mouth was well developed-with sediment pouring out into the lake (Figure 2.6). Currently, little sediment appears to be reaching the lake from the upslope watershed. The present increase in beaver activity and decrease in agricultural land use directly decreases the total sediment flux out of the watershed (Figure 2.7).

Figure 2.6 Mouth of Malletts Creek with Lake Champlain in August, 1937
3.0 METHODS

3.1 DATA COLLECTION METHODS

The Vermont River Management Program (RMP) has invested many person-years of effort into developing a state-of-the-art system of Stream Geomorphic Assessment (SGA) protocols. The SGA protocols are intended to be used by resource managers, community watershed groups, municipalities and others to identify how changes to land use affect hydro-geomorphic processes at the landscape and reach scale, and how these changes alter the physical structure and biological habitat of streams in Vermont. The SGA protocols have become a key tool in the prioritization of restoration projects that will 1) reduce sediment and nutrient loading to downstream receiving waters such as Lake Champlain and the Connecticut River, 2) reduce the risk of property damage from flooding and erosion, and 3) enhance the quality of in stream biological habitat. The protocols are based on defensible scientific principles and have been tested widely in many watersheds throughout the state.

The SGA protocols include three phases (VTANR, 2007; VTANR, 2009a; VTANR 2009b):

- **Phase 1**: The Phase 1 SGA approach utilizes the Stream Geomorphic Assessment Tool (SGAT), a GIS extension developed by RMP for the collection of reach and watershed scale data. In addition to the GIS and remote sensing effort, a cursory field assessment (“windshield survey”) is included for the verification of stream and valley forms, significant channel features and the location of
man-made infrastructure. The Phase 1 SGA approach results in watershed-scale data about the landscape (e.g., soils and land cover) and the stream channel (e.g., slope and form), which provides a basis for understanding the natural and human-impacted conditions within the watershed. The SGA data also aids in the identification of specific stressors affecting the physical conditions of the stream channels and structures (e.g., bridges and culverts). Table 3.1 summarizes the parameters collected in Phase 1 using the Feature Indexing Tool (FIT), which include those utilized to develop the final impact ratings (VTANR, 2007).

- **Phase 2**: The Phase 2 approach builds upon Phase 1 data through the collection of reach-specific data about the current physical conditions. Characterization of reach conditions utilizes a suite of quantitative (e.g., channel geometry, pebble counts) and qualitative (e.g., pool-riffle habitat) measurements to calculate two indices: Rapid Geomorphic Assessment (RGA) Score; Rapid Habitat Assessment (RHA) score. Using the RGA scores in conjunction with knowledge about the background or “reference” conditions, a sensitivity rating is developed to predict the degree to which the channel will adjust to human impacts in the future. Table 3.1 summarizes the parameters collected and verified in Phase 2 using the Feature Indexing Tool (FIT; VTANR, 2009a).

<table>
<thead>
<tr>
<th>Phase 1 Step</th>
<th>Phase 2 Step</th>
<th>Data Type</th>
<th>Impact</th>
<th>Sub-Impact</th>
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<td>1.2</td>
<td>Point</td>
<td>Alluvial Fan</td>
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</tr>
<tr>
<td>3.2</td>
<td>1.6</td>
<td>Point</td>
<td>Grade Control</td>
<td>Dam, Ledge, Waterfall, or Weir</td>
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<tr>
<td>NA</td>
<td>3.3</td>
<td>Point</td>
<td>Mass Failure</td>
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</tr>
<tr>
<td>5.5</td>
<td>5.5</td>
<td>Point</td>
<td>Dredging</td>
<td>Dredging, Gravel Mining, or Commercial Mining</td>
</tr>
<tr>
<td>NA</td>
<td>4.4</td>
<td>Point</td>
<td>Debris Jam</td>
<td>NA</td>
</tr>
<tr>
<td>NA</td>
<td>4.6</td>
<td>Point</td>
<td>Stormwater Input</td>
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</tr>
<tr>
<td>NA</td>
<td>4.9</td>
<td>Point</td>
<td>Beaver Dam</td>
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<tr>
<td>NA</td>
<td>5.2</td>
<td>Point</td>
<td>Migration</td>
<td>Neck Cut Off, Flood chute, Avulsion, or Braidng</td>
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<tr>
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<td>3.1</td>
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<td>Rip-Rap, Hard Bank or Other</td>
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<td>5.4</td>
<td>5.5</td>
<td>Line</td>
<td>Straightening</td>
<td>Straightening or With Windrowing</td>
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</tbody>
</table>

- **Phase 3**: Phase 3 surveys involve the collection of detailed, reach-scale survey data to verify or build upon Phase 2 data. These surveys are typically carried out prior to project development for an “active” channel management approach (e.g., floodplain restoration), or for long-term monitoring purposes (VTANR, 2009b).
During the summer of 2010 FEA used SGAT to develop the baseline data layers for the watershed. The remaining Phase 1 data has been collected remotely and with windshield surveys for the 51 reaches along 25.2 river miles. All major human impacts and natural features were indexed in a GIS using the Feature Indexing Tool (FIT). Following the completion of the Phase 1 assessment in the summer of 2010, FEA was contracted to conduct Phase 2 assessments on 11 additional reaches along 6.3 river miles. Detailed field sketches as well as channel cross-sections were taken in each reach according to the Phase 2 SGA protocol (VTANR, 2009a). Where appropriate reaches were segmented based on higher quality field observations or property access restrictions. In total, the 11 reaches assessed were subdivided into 18 segments. Results from the Phase 2 assessment were used to identify preliminary restoration projects. Table 3.2 provides the scope for all Phase 1 and Phase 2 assessed reaches.

<table>
<thead>
<tr>
<th>Surface Water</th>
<th>Assessed Reaches</th>
<th>Assessed River Length (Miles)</th>
<th>Number of Assessed Reaches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Phase 1</td>
<td>Phase 2</td>
<td>Ph 1</td>
</tr>
<tr>
<td>Malletts Creek</td>
<td>M01-M25 &amp; M16-S1.01</td>
<td>M14-M17</td>
<td>14.6</td>
</tr>
<tr>
<td>Allen (Petty) Brook</td>
<td>T1.01-T1.10 &amp; T1.06-T1.01</td>
<td>T1.02-T1.06</td>
<td>5.9</td>
</tr>
<tr>
<td>Unnamed Tributary</td>
<td>T6.01, T6.02, &amp; T6.51.01</td>
<td>T6.01 &amp; T6.02</td>
<td>0.8</td>
</tr>
<tr>
<td>Unnamed Tributary</td>
<td>T1.51.01-T1.51.03</td>
<td>Not Assessed</td>
<td>1.0</td>
</tr>
<tr>
<td>Unnamed Tributary</td>
<td>T1.52.01-T1.52.04, T1.52.03-T1.01, &amp; T1.02</td>
<td>Not Assessed</td>
<td>1.6</td>
</tr>
<tr>
<td>Unnamed Tributary</td>
<td>T1.53.01</td>
<td>Not Assessed</td>
<td>0.6</td>
</tr>
<tr>
<td>Unnamed Tributary</td>
<td>T1.54.01</td>
<td>Not Assessed</td>
<td>0.7</td>
</tr>
</tbody>
</table>

**Totals:** 25.2 6.3 51 11

3.2 **BRIDGE AND CULVERT ASSESSMENTS**

FEA conducted bridge and culvert surveys on all private and public structures within the selected Phase 2 reaches. The Bridge and Culvert Assessment and Survey Protocols specified in Appendix G of the Vermont Stream Geomorphic Assessment Handbook (VTANR, 2009a) were followed. Latitude and Longitude at each of the structures was determined using a GPS unit. The assessment included various photos documenting the conditions of each structure.

The Vermont Culvert Geomorphic Screening tool (MMI, 2008a) and the Vermont Culvert Aquatic Organism Passage Screening Tool (MMI, 2008b) developed by Milone and MacBroom, Inc. for VTDEC were used to identify culverts within the Malletts Creek and Allen Brook watershed that have a higher priority for replacement/retrofit due to geomorphic incompatibility and/or for being potential barriers to movement and migration of aquatic organisms.
3.3 STRESSOR AND DEPARTURE ANALYSIS

FEA followed the VTDEC methods for developing river corridor plans as outlined in the Vermont River Corridor Planning Guide (VTANR, 2010). This technical guide is directed towards river scientists, planners, and engineers engaged in finding economically and ecologically sustainable solutions to the conflicts between human investments and river dynamics. The guide provides explanations for the following:

- River science and societal benefits of managing streams in a sustainable manner toward equilibrium conditions
- Methods for assessing and mapping stream geomorphic conditions, and identifying and prioritizing river corridor protection and restoration projects
- Methods for examining project feasibility and negotiating management alternatives with stakeholders
- Information on current programs available to Vermont landowners, towns, and other interested parties to implement river corridor protection and restoration projects

Included in this approach is a mapping exercise to lay the foundation for understanding stressors on stream channel stability at the watershed and reach scales. These maps are compiled as part of the departure and sensitivity analysis, and illustrate a gradient of human impacts and stream response across the watershed. The maps provide a basis for identifying projects through a step-wise procedure to screen potential projects for compatibility with long-term equilibrium conditions.

3.3.1 STRESSOR ANALYSIS

The data collected through the Phase 1 and 2 SGA studies provides the basis for assessing the impacts to the hydrologic and sediment regimes, and the channel riparian and boundary conditions. This data, when combined with other watershed-scale data developed in this study, allows for the assessment of physical departure from reference conditions, and serves to validate watershed-scale patterns and stream conditions observed in the field.

Stressor, departure and sensitivity maps have been prepared to depict the effects of significant physical processes occurring within the study area. These maps provide an indication of where channel adjustment processes have been altered, at both the watershed-scale and the reach-scale. The analysis of existing and historic departures from equilibrium conditions along a stream network allows for the prediction of future channel adjustments. This is helpful in developing and prioritizing potential river corridor protection and restoration projects.

3.3.2 DEPARTURE ANALYSIS

Much research has shown that alluvial river channels in wide valleys will adjust their geometry and planform to accommodate changes in the discharge and sediment loading from the upslope watershed (Dunne and Leopold, 1978). This concept was summarized by Lane (1955) to show that
stream power and sediment (size and distribution) will seek a dynamic equilibrium condition in the absence of anthropogenic disturbance or catastrophic natural storm events. Slight changes from one year to another, such as variation in rainfall amounts (and a resulting variation in discharge), may cause subtle changes in channel form. However, the cross-sectional shape and profile of a river is typically stable under reference watershed conditions, and predictable given knowledge about: 1) the geologic conditions of the watershed and river corridor, 2) the topography of the watershed and river corridor, and 3) the regional climate.

Channel evolution models (CEM) also provide a basis for understanding the temporal scale of channel adjustments and departure in the context of SGA Phase 2 results. Both the “D” stage and “F” stage CEMs (VTDEC, 2009) are helpful for explaining the channel adjustment processes underway in the Mallets Creek watershed. The “F” stage CEM is used to understand the process that occurs when a stream degrades (incises) its bed. The more dominant adjustment process for the “D” stage channel evolution is aggradation, widening and planform change. D-stage CEM typically occurs where grade controls prevent severe channel incision and abandonment of the adjacent floodplain. The common stages of both CEMs are depicted in Figure 3.1 below.

![Channel Evolution Models](image-url)

**Figure 3.1** Typical channel evolution models for F-stage and D-stage (VTDEC, 2009)

Analysis of a watershed’s sediment regime is a useful approach for summarizing the reach and watershed-scale stressors affecting the equilibrium conditions of river channels. Sediment regime mapping provides a context for understanding the sediment transport and channel evolution processes (Schumm, 1977) which govern changes in geometry and planform for river channels in
a state of disequilibrium. The VTANR River Corridor Planning Guide (VTANR, 2010) outlines a methodology for understanding the reference and altered sediment regimes of reaches according to data collected during the Phase 2 field assessments. The sediment regime types used in this analysis are summarized below in Table 3.3.

<table>
<thead>
<tr>
<th>Sediment Regime</th>
<th>Narrative Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport</td>
<td>Steeper bedrock and boulder/cobble cascade and step-pool stream types; typically in more confined valleys, do not supply appreciable quantities of sediments to downstream reaches on an annual basis; little or no mass wasting; storage of fine sediment is negligible due to high transport capacity derived from both the high gradient and/natural entrenchment of the channel.</td>
</tr>
<tr>
<td>Confined Source and Transport</td>
<td>Cobble step pool and steep plane bed streams; confining valley walls, comprised of erodible tills, glacial lacustrine, glacial fluvial, or alluvial materials; mass wasting and landslides common and may be triggered by valley rejuvenation processes; storage of coarse or fine sediment is limited due to high transport capacity derived from both the gradient and entrenchment of the channel. Look for streams in narrow valleys where dams, culverts, encroachment (roads, houses, etc.), and subsequent channel management may trigger incision, rejuvenation, and mass wasting processes.</td>
</tr>
<tr>
<td>Unconfined Source and Transport</td>
<td>Sand, gravel, or cobble plane bed streams; at least one side of the channel is unconfined by valley walls; may represent a stream type departure due to entrenchment or incision and associated bed form changes; these streams are not a significant sediment supply due to boundary resistance such as bank armorng, but may begin to experience erosion and erosion and supply both coarse and fine sediment when bank failure lead to channel widening; storage of coarse or fine sediment is negligible due to high transport capacity derived from the deep incision and little or no floodplain access. Look for straightened, incised or entrenched streams in unconfined valleys, which may have been bermed and extensively armored and are in Stage II or early Stage III of channel evolution.</td>
</tr>
<tr>
<td>Fine Source and Transport &amp; Coarse Deposition</td>
<td>Sand, gravel, or cobble streams with variable bed forms; at least one side of the channel is unconfined by valley walls; may represent a stream type departure due to vertical profile and associated bed form changes; these streams supply both coarse and fine sediments due to little or no boundary resistance; storage of fine sediment is lost or severely limited as a result of channel incision and little or no floodplain access; an increase in coarse sediment storage occurs due to a high coarse sediment load coupled with the lower transport capacity that results from a lower gradient and/or channel depth. Look for historically straightened, incised, or entrenched streams in unconfined valleys, having little or no boundary resistance, increased bank erosion, and large unvegetated bars. These streams are typically in late Stage III and Stage IV of channel evolution.</td>
</tr>
<tr>
<td>Coarse Equilibrium (in = out) &amp; Fine Deposition</td>
<td>Sand, gravel, or cobble streams with equilibrium bedforms; at least one side of the channel is unconfined by valley walls; these streams transport and deposit coarse sediment in equilibrium (stream power—produce as a result of channel gradient and hydraulic radius—is balanced by the sediment load, sediment size, and channel boundary resistance); and store a relatively large volume of fine sediment due to the access of high frequency (annual) floods to the floodplain. Look for unconfined streams, which are not incised or entrenched, have boundary resistance (woody buffers), minimal bank erosion, and vegetated bars. These streams are Stage I, late IV, and Stage V.</td>
</tr>
<tr>
<td>Deposition</td>
<td>Silt, sand, gravel, or cobble streams with variable and braided bed forms; at least one side of the channel is unconfined by valley walls; may represent a stream type departure due to changes in slope and/or depth resulting in the predominance of transient depositional features; storage of fine and coarse sediment frequently exceeds transport**. Floodplains are accessed during high frequency (annual) floods. Look for unconfined streams, which are not incised or entrenched, have become significantly over-widened, and if high rates of bank erosion are present, it is offset by the vertical growth of unvegetated bars. These regimes may be located at zones of naturally high deposition (e.g., active alluvial fans, deltas, or upstream of bedrock controls), or may exist due to impoundment and other backwater conditions above weirs dams and other constrictions.</td>
</tr>
</tbody>
</table>

** Use of the "Deposition" regime characterization may be rare, but valuable as a planning tool, where the reach is storing far more than it is transporting during some defined planning period. The extreme example would be that of an impounded reach where all of the coarse and a great percentage of the fine sediments are being deposited, rather than transported downstream. This man-made condition may change, thereby changing the sediment regime, but is not likely over the period at which the corridor plan will be used.
3.3.3 **SENSITIVITY ANALYSIS**

The following description of the sensitivity of various stream types to changes in sediment and flow regimes, boundary conditions and channel morphology, is included from the most recent version of the VTANR River Corridor Planning Guide (VTANR, 2010).

Certain geomorphic stream types are inherently more sensitive than others, responding readily through lateral and/or vertical adjustments to high flow events and/or influxes of sediment. Other geomorphic stream types may undergo far less adjustment in response to the same watershed inputs. In general, streams receiving a large supply of sediment, having a limited capacity to transport that sediment, and flowing through finer-grained, non-cohesive materials are inherently more sensitive to adjustment and likely to experience channel evolution processes than streams with a lower sediment supply, higher transport capacity and flowing through cohesive or coarse-grained materials (Montgomery and Buffington, 1997). The geometry and roughness of the stream channel and floodplain (i.e., the width, depth, slope, sediment sizes, and floodplain relations) dictate the velocity of flow, how much erosive power is produced, and whether the stream has the competence to transport the sediment delivered from upstream (Leopold, 1994). If the energy produced by the depth and slope of the water is either too little or too great in relation to the sediment available for transport, the stream may be out of equilibrium and channel adjustments are likely to occur, especially during flood conditions (Lane, 1955).

Stream sensitivity maps have been prepared for the Malletts Creek and Allen Brook study area. Sensitivity ratings were assigned using the VTDEC Protocols (VTDEC, 2009).

3.4 **PROJECT IDENTIFICATION**

Site-specific projects were identified using methods outlined by VTANR in Chapter 6 Preliminary Project Identification and Prioritization (VTANR, 2010). This planning guide is intended to aid in the development of projects that protect and restore river equilibrium conditions. The projects identified for the study reaches can be classified under one of the following categories: Active Geomorphic Restoration, Passive Geomorphic Restoration, and Conservation.

- **Active Geomorphic Restoration** implies the management of rivers to a state of geomorphic equilibrium through active, physical alteration of the channel and/or floodplain. Often this approach involves the removal of human constructed constraints or the construction of meanders, floodplains or stable banks. Riparian buffer re-vegetation and long-term protection of a river corridor is essential to this alternative.

- **Passive Geomorphic Restoration** allows rivers to return to a state of geomorphic equilibrium by removing factors adversely impacting the river and subsequently using the river’s own energy and watershed inputs to re-establish its meanders, floodplains and equilibrium conditions. In many cases, passive restoration projects may require varying degrees of active measures to achieve ideal results. Riparian buffer re-vegetation and long-term protection of a river corridor (e.g., corridor easements) is essential to this alternative.
• Conservation is an option to consider when stream conditions are generally “good” or “reference” and the channel is in a state of dynamic equilibrium. Typically, conservation is applied to minimally disturbed reaches where river structure and function and vegetation associations are relatively intact, and/or where high quality aquatic habitat is found.

3.5 Quality Assurance/Quality Control

The RMP Quality Assurance (QA) protocols outlined in the SGA protocols (VTANR, 2007) were followed in order to ensure a complete and accurate dataset. RMP staff shared responsibility with FEA for the QA of the finalized Phase 1 and 2 datasets. All metadata describing the data sources were entered in the Data Management System (DMS), with extraordinary sources noted in the comments section in Step 7. The Phase 1 and Phase 2 QA reviews were completed by RMP staff following the completion of the dataset. A written record of QA issues raised by RMP, and responses from FEA is included in Appendix D.

4.0 Phase 1 Results

4.1 Reach Delineations

The 61.7 miles of primary surface water within the Malletts Creek and Allen Brook watershed were divided into 95 reaches during the reach delineation process. Reach divisions were based on changes in valley geometry, channel slope, and the size and influence of tributaries entering the main stem channel (VTANR, 2007). Of the 95 total reaches, 51 were selected to receive full Phase 1 assessments on a total of 25.2 stream miles. Seven (7) major tributaries (e.g., drainage area exceeds 10% of main stem drainage area at confluence) were identified during the delineation analysis (Figure 4.1). Full SGAT analysis was conducted on the main stem of Malletts Creek, Allen (Petty) Brook and several sub-tributaries. Table 4.1 summarizes data for the main stem and tributaries assessed. Detailed information about each reach location is found in the reach reports in Appendix A.

4.2 Reference Stream Types

Remotely collected data of valley confinement, channel slope, and sinuosity were used to develop reference stream types for the assessed reaches according to the Rosgen (1994) and Montgomery and Buffington (1997) classification systems. Characterization of reference stream types is based on the channel forms and processes expected in a particular geologic and geomorphic setting without human influences. Detailed information about each reach and their reference stream type is found in the reach reports in Appendix A. Table 4.2 presents general valley and channel characteristics associated with reference stream types found in the Malletts Creek and Allen Brook watershed.
Table 4.1 Reference stream type characteristics

<table>
<thead>
<tr>
<th>Stream Type</th>
<th>Valley Confinement</th>
<th>Channel Slope</th>
<th>Sinuosity</th>
<th>Bedform</th>
<th>Number of Study Reaches*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Confined</td>
<td>&gt; 4%</td>
<td>Low</td>
<td>Cascade or Step-pool</td>
<td>5 (10%)</td>
</tr>
<tr>
<td>B</td>
<td>Confined</td>
<td>2 – 4%</td>
<td>Low</td>
<td>Step-pool or Plane bed</td>
<td>6 (12%)</td>
</tr>
<tr>
<td>C</td>
<td>Unconfined</td>
<td>&lt; 2%</td>
<td>Moderate</td>
<td>Riffle Pool</td>
<td>14 (27%)</td>
</tr>
<tr>
<td>E</td>
<td>Unconfined</td>
<td>&lt; 2%</td>
<td>High</td>
<td>Riffle Pool or Dune-Ripple</td>
<td>26 (51%)</td>
</tr>
</tbody>
</table>

* Number of reaches and percentage of total reaches represented by type

Figure 4.1 presents the location of the reference stream types developed for the Malletts Creek and Allen Brook watershed. A majority of the reaches (51%) in the watershed are E-type under reference conditions. This stream type is characterized by channels with high sinuosity found in a narrow or very narrow valley setting. A low degree of slope (<2%) is usually observed with this stream type, making the dominant geomorphic processes as coarse equilibrium and fine deposition. Thirty-five percent (27%) of the reaches in the watershed are C-type under reference conditions. This stream type is typically characterized by a moderately sinuous channel found in a broad, unconfined valley setting with a balance between the upslope sediment supply and the transport capacity. The other 22% of the watershed is mostly A-type and B-type channels. In these reaches the confined valley settings and higher slopes have more of a transport-based sediment regime and either step-pool or cascade bedform.
Figure 4.1 Reference stream type map for the Malletts Creek and Allen (Petty) Brook watershed
4.3 WATERSHED GEOLOGY AND SOILS

The NRCS soils data (NRCS, 2008) was utilized to review the parent material of the watershed. Figure 4.4 depicts the main classes of parent materials distributed across the watershed. Only a few grade controls were observed in the field during the windshield survey. In other areas grade controls were discerned using the LiDAR derived 2-foot contours where channel slopes exceeded 25% (VCGI, 2009). One very large bedrock cascade section was noted in reach M19 along Westford Road (Figure 4.2). The presence of numerous other grade controls in the headwaters reaches is likely where bedrock outcroppings are present. Detailed geologic information about each reach is found in the reach reports found in Appendix A.

![Figure 4.2 Bedrock cascade in reach M19](image)

The 2004 2-ft LiDAR obtained from VCGI contour data was also effective in showing areas of glacial terraces (2009). The steep valleys that have cut down, like fingers, through the Glacial Lake Vermont sediment’s dense hydric soil can be seen easily using the LiDAR data (Figure 4.3). No further research was done to determine the time frame at which these valleys have shaped since the last glacionation. The parent material in the watershed was mostly lacustrine material from the presence of Glacial Lake Vermont and outwash from the Lamoille River Delta during the Champlain Sea era. Glacial tills make up a large portion of the highlands on the east side of the watershed (Figure 4.4). The soils in the watershed are mostly hydric comprised of poorly drained clays and clay-loams (hydrologic soil group D; Figure 4.5). These dense soils were deposited during the time of Lake Vermont and Champlain Sea post glaciations.

![Figure 4.3 Dendritic valley scars and terraces on tributaries to M13 and M14](image)
Figure 4.4 Parent surficial material map Malletts Creek and Allen (Petty) Brook watershed
Figure 4.5 Hydrologic soil group map Malletts Creek and Allen (Petty) Brook watershed
4.4 LAND COVER AND REACH HYDROLOGY

Step 4 of the Phase 1 protocols evaluates the impacts of watershed land use, riparian vegetative cover, and other reach-scale controls on hydrologic processes. Conversion of natural forest cover to urban and agricultural land uses in a watershed, even at low levels (e.g., 10% of watershed area), has been shown to have measurable deleterious effects on channel stability and aquatic biota (Paul and Meyer, 2001; CWP, 2003). Loss of forest cover reduces the infiltration capacity of soils, and typically results in increased runoff during infrequent storm events and reduced base flow during the dry periods of the year. In addition, direct impacts to riparian cover along the river bank and within the corridor are also known to have negative impacts on channel stability (e.g., loss of boundary resistance) and available habitat for biota (e.g., canopy shading, large woody debris, etc.). Other local-scale influences on reach hydrology include adjacent wetlands, small tributaries, and other sources of groundwater inputs. These features provide important inputs of cooler waters that are critical for microhabitats, especially during the late summer and fall months when water temperatures can become elevated to levels that are harmful to native stenotherms (e.g., trout).

Land cover in the Malletts Creek and Allen Brook watershed was summarized with the SGAT tool using data derived from 2002 LANDSAT satellite imagery (VCGI, 2003). This dataset was clipped to the local watershed (e.g., area draining directly to reach) and stream corridor to understand the impacts to each reach at each scale. Impact ratings were automatically generated upon upload of the data to the DMS based on the rankings provided in Table 4.2. In addition to the DMS summarized data, more recent land cover data was summarized at the watershed scale, as previously reviewed in Table 2.1 in Section 2.1.

<table>
<thead>
<tr>
<th>Impact Rating</th>
<th>Land Cover Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>10% or more of reach watershed is crop and/or urban</td>
</tr>
<tr>
<td>Low</td>
<td>Between 2 - 10% of reach watershed is crop and/or urban</td>
</tr>
<tr>
<td>Not Significant</td>
<td>Less than 2% of reach watershed is crop and/or urban</td>
</tr>
</tbody>
</table>

Historic land cover data for the reach watershed and corridor scales was reviewed using a series of aerial photographs of the study area from 1937 and 1962 available through the University of Vermont Bailey/Howe Library. The images were georectified and overlain on the subwatershed mapping to understand land use changes over the last 40 years. In short, the watershed was a mixture between agriculture and forest lands in the 1960’s, however the forest stands were likely much younger and homogenous and the agriculture made up a much larger component of the total land area. Even more agricultural lands were present in the 1937 photos. The current dominant land cover type for the entire watershed is forest, because much of the suboptimal farmland was abandoned.

Analysis of multiple vintages of aerial photographs aids in understanding the extent of watershed development that has occurred, and the degree to which the land use changes may have influenced the
channel morphology. The watershed has seen some urbanization since the 1960's. Much of the Malletts Creek watershed has lost significant amounts of agricultural land that has been replaced by low density residential developments and a few areas of higher density residential (Figure 4.6). Petty Brook also has had some recent urbanization and industrialization in the upper watershed between Route 7 and Interstate 89. A large industrial park occupies reach T1.06.t1.01 and T1.06.t1.02 (Figure 4.7). This park has greatly impacted the hydrology and a large stormwater detention basin is situated just upstream of the confluence point with T1.06. The land use in the watershed currently is variable, however, most reaches scored “high” because of urban impacts of roads or from crop impacts at both the watershed and corridor scale. A complete summary of land use impact scores from the SGAT derived 2002 LandSAT data can be found in Appendix A.

Figure 4.6 Change in land use from 1962 to 2007 in upper Malletts Creek watershed

Figure 4.7 Change in land use from 1962 to 2007 in Allen (Petty) Brook upper watershed
Riparian buffer widths were estimated remotely and verified in the field where possible during the windshield surveys. Areas where the buffer widths were less than 25 feet were mapped remotely and indexed using the FIT. Areas that received high impact scores for the lack of a healthy riparian buffer were those valleys where adjacent lands have been intensively used for agricultural or residential land uses including the presence of roadways (Figure 4.8). Adequate buffer widths are very important to habitat function and in preventing thermal loading to the surface water. A complete summary of land use impact scores from buffers less than 25 feet can be found in Appendix A.

![Figure 4.8 A buffer width of less than 25 feet along the right (west) bank of reach M07](image)

Groundwater and small tributary inputs were reviewed for each reach using the National Wetlands Inventory (NWI, 2004) and the Vermont Hydrography Dataset. The very large wetland complex between Lake Champlain and the Route 7 crossings of Petty Brook and Malletts creek covers over 350 acres (Figure 4.9). This contiguous wetland and others like it in the watershed offer recharge to the groundwater and consistent flow during the dry months. Additional detailed information about each Step 4 parameter for all reaches is found in the watershed summary data and reach reports found in Appendix A.

![Figure 4.9 Looking West (left) and East (right) from the crossing of T1.01 into the large wetland area east of Lake Champlain](image)
4.5 **In Stream Channel Modifications**

Data collected as part of SGA Step 5 aids in the understanding of how direct impacts to the channel boundaries have altered the sediment supply and transport regimes at the reach scale. Flow-regulating structures that span the channel impact the natural flow variability in downstream reaches, and interrupt the sediment supply along the channel network. These features often result in reduced in stream habitat as well as channel incision in downstream areas where the sediment transport capacity exceeds the limited supply from upslope. Bridges and culverts that are inadequately sized to accommodate channel forming flows have similar impacts to habitat and sediment transport as flow-regulating structures. In addition, culverts that have severely “perched” outlets create a discontinuity in habitat along the channel by preventing fish passage. Bank armoring, channel straightening, and dredging are human impacts that increase the sediment transport capacity of the channel through the increased resistance to lateral migration and channel slope. Further discussion of the impacts of in stream channel modifications is provided in the SGA Phase 1 Handbook (VTANR, 2007b). Reaches with significant impacts from these features are summarized below. Additional detailed information about each Step 4 parameter for all reaches is found in the watershed summary data and reach reports found in Appendix A.

*Impoundments and Flow Regulations*

Flow regulations have been reviewed and mapped using the VTANR Dam Inventory (VTANR, 2005), as well as further field observations. These features are summarized below for the main stem and tributary reaches. Each of the flow regulations indexed with the FIT is considered a run-of-the-river feature (e.g., no current water withdrawals).

Using aerial imagery, a total of two (2) impoundments were observed in the basin. All three of these features were considered large run-of-the-river because the width of the impounded area was larger than that of the channel. The only flow regulation feature located on the main stem is found in the headwaters reach M24 where the channel has been backed up to create a pond near a residence. The other impoundment is a large detention pond on T1.06.T1.01 this detention pond receives all of the surface water from the industrial park found west of Route 7. Other impoundments were observed in aerial imagery, but these features were outside of the Phase 1 study area and not indexed.

*Bridges and Culverts*

The locations and lengths of bridge and culvert crossings were mapped remotely and were verified in the field where possible. A total of 40 structures were noted on the 51 assessed reaches: 9 bridges, 27 culverts, and 4 unknown structures were observed. Culverts and bridges act as a constriction point to the channel at various flow depths, or inhibit the passage of wildlife if the culvert is improperly constructed. The McMullen Road crossing of M12 has a beaver dam immediately upstream this debris blockage impedes flows and might create problems for the structure in the future (Figure 4.10).
Bank Armoring
Bank armoring and revetments were noted in as much detail as possible during the windshield surveys. Three reaches had significant amounts of bank armoring that was observed during the windshield survey. All of the rip-rap observed was in short lengths around bridges or culverts to protect them from bank erosion occurring during high flows.

Channel Straightening and Dredging
Multiple data sources were utilized to identify areas of channel straightening, including: 1) historic aerial photographs from 1962 and 1937, 2) high resolution, 3-band color imagery from 2004, 3) black and white orthographic photos from 2007, and 4) NAIP imagery from 2008 and 2009. In addition, field observations were made to verify areas of inferred channel straightening from available mapping. Tributary 6 was extensively straightened along East Road even though the valley is wide (Figure 4.11). No data regarding dredging could be obtained from state officials, but a complete record of straightening impacts can be found in Table 4.3.
Table 4.3 Summary of channel straightening impacts on Malletts Creek and Allen (Petty) Brook

<table>
<thead>
<tr>
<th>Reach ID</th>
<th>Impact Length (ft)</th>
<th>Percent (%)</th>
<th>Impact Type</th>
<th>Reach ID</th>
<th>Impact Length (ft)</th>
<th>Percent (%)</th>
<th>Impact Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>M02</td>
<td>864</td>
<td>18.1%</td>
<td>Low</td>
<td>T1.03</td>
<td>607</td>
<td>22.4%</td>
<td>High</td>
</tr>
<tr>
<td>M03</td>
<td>502</td>
<td>10.0%</td>
<td>Low</td>
<td>T1.04</td>
<td>1,154</td>
<td>21.4%</td>
<td>High</td>
</tr>
<tr>
<td>M05</td>
<td>565</td>
<td>15.7%</td>
<td>Low</td>
<td>T1.06</td>
<td>594</td>
<td>13.0%</td>
<td>High</td>
</tr>
<tr>
<td>M07</td>
<td>1,335</td>
<td>43.3%</td>
<td>High</td>
<td>T1.06.11.01</td>
<td>727</td>
<td>73.4%</td>
<td>High</td>
</tr>
<tr>
<td>M10</td>
<td>1,022</td>
<td>43.9%</td>
<td>High</td>
<td>T1.09</td>
<td>149</td>
<td>3.7%</td>
<td>Not Sig.</td>
</tr>
<tr>
<td>M14</td>
<td>408</td>
<td>14.7%</td>
<td>Low</td>
<td>T1.10</td>
<td>684</td>
<td>27.7%</td>
<td>High</td>
</tr>
<tr>
<td>M15</td>
<td>2,016</td>
<td>93.4%</td>
<td>High</td>
<td>T1.51.03</td>
<td>499</td>
<td>23.1%</td>
<td>High</td>
</tr>
<tr>
<td>M16-51.01</td>
<td>2,522</td>
<td>98.2%</td>
<td>High</td>
<td>T1.52.03</td>
<td>284</td>
<td>15.2%</td>
<td>High</td>
</tr>
<tr>
<td>M17</td>
<td>733</td>
<td>14.3%</td>
<td>Low</td>
<td>T1.52.04</td>
<td>2,772</td>
<td>100.0%</td>
<td>High</td>
</tr>
<tr>
<td>M20</td>
<td>3,654</td>
<td>98.5%</td>
<td>High</td>
<td>T1.53.01</td>
<td>48</td>
<td>1.6%</td>
<td>Not Sig.</td>
</tr>
<tr>
<td>M23</td>
<td>1,005</td>
<td>99.4%</td>
<td>High</td>
<td>T1.54.01</td>
<td>2,372</td>
<td>63.8%</td>
<td>High</td>
</tr>
<tr>
<td>M24</td>
<td>116</td>
<td>12.3%</td>
<td>Low</td>
<td>T6.01</td>
<td>2,537</td>
<td>88.8%</td>
<td>High</td>
</tr>
<tr>
<td>T1.01</td>
<td>250</td>
<td>5.0%</td>
<td>Low</td>
<td>T6.02</td>
<td>609</td>
<td>100.0%</td>
<td>High</td>
</tr>
<tr>
<td>T1.02</td>
<td>945</td>
<td>58.9%</td>
<td>High</td>
<td>T6.51.01</td>
<td>876</td>
<td>97.9%</td>
<td>High</td>
</tr>
</tbody>
</table>

4.6 Floodplain Modifications and Planform Changes

Due to the historical development of road networks and settlement patterns in the lowland areas of Vermont, many alluvial rivers and their floodplains have been encroached upon by roads and development over the years. As discussed in the previous section, many of these areas have also been historically manipulated and straightened to maintain an unnaturally steep slope in a state of sediment transport, allowing for a short-term sense of security from flooding and subsequent encroachment of infrastructure in the floodplain. In addition to historic alterations to channel slope in Vermont’s alluvial rivers, the lowering of stream beds (e.g., dredging) and the raising of floodplains (e.g., berming) has resulted in an increase in channel depth (VTANR, 20010). Channel depths have typically been increased through the encroachment on the floodplain by roads, development and railroads and subsequent filling and armoring required to construct and to maintain this infrastructure. Increases in impervious cover have also led to the deepening and eventual widening of channels throughout urbanized areas of Vermont (Fitzgerald, 2007).

These human impacts tend to induce a series of channel adjustments that begin with channel incision, leading to widening and eventually a redevelopment of a sinuous planform in alluvial reaches. Reaches with significant impacts associated with the above-described human impacts are summarized below according to the SGA impact ratings listed in Table 4.4. Additional detailed information about each Step 5 parameter for all reaches is found in the reach reports in Appendix A.
Table 4.4 Impact ratings for corridor encroachments and development

<table>
<thead>
<tr>
<th>Impact Rating</th>
<th>Impact Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Greater than 20% of reach length affected.</td>
</tr>
<tr>
<td>Low</td>
<td>Between 5 - 20% of reach length affected.</td>
</tr>
<tr>
<td>Not Significant</td>
<td>Less than 5% of reach length affected.</td>
</tr>
</tbody>
</table>

**Encroachments**

Following the Phase 1 protocol, any berms, roads, driveways, railroads and/or improved paths found within the stream corridor were indexed using the FIT. These areas were identified using the high resolution, 3-band color imagery from 2004 and were confirmed and/or refined during the field observations. Figure 4.12 depicts Reach M10 where railroad encroachment has significantly impacted the stream corridor, cutting off a once accessible floodplain. Impact ratings for step 6.1 based on the percentage of the reach length that was impacted as indicated in Table 4.2. A complete record of the corridor encroachments within the watershed is available in Table 4.5, however further Phase 2 assessments may reveal additional berm encroachments that were not observed remotely or during the windshield surveys.

![Figure 4.12 Railroad encroachment impacts on reach M10 west of East Road](image-url)
Table 4.5 Summary of corridor encroachment impacts

<table>
<thead>
<tr>
<th>Reach ID</th>
<th>Height (ft)</th>
<th>Impact Length (ft)</th>
<th>Percent (%)</th>
<th>Impact Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>M09</td>
<td>15.0</td>
<td>1,837</td>
<td>19%</td>
<td>Low</td>
</tr>
<tr>
<td>M10</td>
<td>12.0</td>
<td>1,902</td>
<td>82%</td>
<td>High</td>
</tr>
<tr>
<td>M11</td>
<td>5.0</td>
<td>929</td>
<td>16%</td>
<td>Low</td>
</tr>
<tr>
<td>M12</td>
<td>5.5</td>
<td>386</td>
<td>71%</td>
<td>High</td>
</tr>
<tr>
<td>M17</td>
<td>8.0</td>
<td>110</td>
<td>21%</td>
<td>High</td>
</tr>
<tr>
<td>M22</td>
<td>10.0</td>
<td>152</td>
<td>12%</td>
<td>Low</td>
</tr>
<tr>
<td>M23</td>
<td>10.0</td>
<td>24</td>
<td>2%</td>
<td>Not Sig.</td>
</tr>
<tr>
<td>M25</td>
<td>4.0</td>
<td>138</td>
<td>9%</td>
<td>Low</td>
</tr>
<tr>
<td>T1.06</td>
<td>13.1</td>
<td>1,042</td>
<td>23%</td>
<td>High</td>
</tr>
<tr>
<td>T1.54.01</td>
<td>6.0</td>
<td>1,051</td>
<td>28%</td>
<td>High</td>
</tr>
<tr>
<td>T6.51.01</td>
<td>6.0</td>
<td>367</td>
<td>41%</td>
<td>High</td>
</tr>
</tbody>
</table>

Development

The impact of development within the stream corridor was evaluated using high resolution, 3-band color imagery from 2004, black and white orthographic photos from 2007, NAIP imagery from 2009, and refined during the field observations. The presence of development was indexed using the FIT, and impact ratings for each reach were developed based on SGA criteria presented in Table 4.2. The majority of the development observed on the main stem was on mid and upper reaches (Table 4.6). Some development is noted on Allen Brook, but the rest of the watershed is well buffered with little corridor encroachment by houses.

Table 4.6 Summary of corridor development impacts

<table>
<thead>
<tr>
<th>Reach ID</th>
<th>Impact Length (ft)</th>
<th>Percent (%)</th>
<th>Impact Type</th>
<th>Reach ID</th>
<th>Impact Length (ft)</th>
<th>Percent (%)</th>
<th>Impact Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>M09</td>
<td>1,073</td>
<td>11.2%</td>
<td>Low</td>
<td>M24</td>
<td>77</td>
<td>8.2%</td>
<td>Low</td>
</tr>
<tr>
<td>M16-51.01</td>
<td>459</td>
<td>17.9%</td>
<td>Low</td>
<td>M25</td>
<td>214</td>
<td>13.5%</td>
<td>Low</td>
</tr>
<tr>
<td>M17</td>
<td>215</td>
<td>4.2%</td>
<td>Not Sig.</td>
<td>T1.06</td>
<td>350</td>
<td>7.7%</td>
<td>Low</td>
</tr>
<tr>
<td>M20</td>
<td>101</td>
<td>2.7%</td>
<td>Not Sig.</td>
<td>T1.54.01</td>
<td>149</td>
<td>6.0%</td>
<td>Low</td>
</tr>
<tr>
<td>M21</td>
<td>165</td>
<td>15.7%</td>
<td>Low</td>
<td>T6.02</td>
<td>577</td>
<td>94.7%</td>
<td>High</td>
</tr>
<tr>
<td>M22</td>
<td>291</td>
<td>22.4%</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Depositional Features

Sediment depositional features (e.g., point bars, mid channel bars, etc.) were evaluated using the 2004 high resolution, 3-band color imagery and were confirmed and/or refined during the field observations. Reaches with multiple types of depositional features indicated where upslope sediment supply exceeded the transport capacity. These areas represent conditions that are favorable for increased lateral channel migration that could endanger adjacent infrastructure and properties. For most of the watershed it was difficult to access the stream channel remotely (due to the channel's small size), or to get a clear sense of the depositional processes at the access points during the windshield surveys. Given the relatively small size of the watershed, and forest cover over much of the corridor area, only about one-half of the reaches were assessed for depositional features. Despite the drawbacks in reach
accessibility, several reaches were deemed to have a "low" impact from depositional material and one reach had a "high" impact rating. This reach, M05, had an abundance of sediment on the point bars upstream and downstream of the Juniper Hill Road crossing. Here, the upslope sediment supply greatly exceeds the transport capacity of the channel (Figure 4.13). Additional detailed data about the types of depositional features and their relative impacts for all reaches are found in the reach reports found in Appendix A.

![Image of large point bar upstream of Middle Rd crossing of reach M05]

**Figure 4.13** Large point bar upstream of Middle Rd crossing of reach M05

**Meander Migration**

Recent and historic aerial photographs and imagery were reviewed to identify areas of channel migration, bifurcation, and avulsions on the Malletts Creek and Allen Brook watershed. Historical photographs from 1962 and 1937 were reviewed. For areas where significant channel migration was noted, the historical imagery was georectified using ArcGIS software to transform the mapping into the NAD 1983 State Plane Meter projections. Previous channel locations (1962) were compared with the current centerlines digitized from the high resolution aerial photographs taken in 2004 for the watershed. The confluence of M17 with T6.01 showed a dramatic change in planform with extensive meander migration and channel straightening in M17 (Figure 4.14). The straightening in the sinuous portion of M17 led to a channel avulsion at the confluence and now the historic channel to the west only receives small volumes of flow and the new channel is the primary thread.
**Meander Geometry**

For reaches characterized within unconfined valley settings (C or E-type channels), meander geometry was reviewed following the Phase 1 protocols. Shapefiles were developed to indicate the areas where meander width and wavelength was measured. In some cases, multiple meanders were measured and an average of the measurements was entered in the DMS. Where the meander wavelengths and widths fell outside of the range of expected values relative to the predicted channel width, impact ratings of high or low were assigned according to the degree of departure (VTANR, 2007). Most reaches that have E-type morphology have a narrower channel width then predicted by the hydraulic geometry curve, which is common for these types of channels. The meander geometry is calculated using the hydraulic geometry curve data, which would slightly reduce the scores for all E-type reaches. The meanders in the watershed are most often well developed, but have a high frequency and narrower than expected beltwidth. This, in combination with the higher predicted channel widths have yielded low and high impacts for most reaches assessed.

4.7 **Bed and Bank Windshield Surveys**

Windshield surveys were completed following the initial classification of stream type and substrate based on remotely sensed data alone. Surveys were completed in mid-July on all reaches accessible by public roads. Thirty (30) of the 51 total reaches in the study area were at least partially accessible by
roads and were viewed. The DMS metadata for Step 2 has been revised and indicates whether or not the reach was evaluated in the field. The Phase 1 parameters verified and/or evaluated during the field surveys included:

- General stream and valley geometry, including valley width and confinement, bed substrate, and bedform features (Step 2).
- Grade controls and areas of known or potential alluvial fans (Step 3).
- Impacts on the buffer and stream corridor, including areas of reduced buffer vegetation, road encroachments, and the presence of development within the stream corridor (Steps 4 and 6).
- Types of stream crossing structures (e.g., bridges and culverts), and their potential for causing ice and debris jams (Steps 5 and 7).
- Areas of bank erosion and armoring (Steps 5 and 7).
- Areas of increased sediment deposition and meander migration (Step 6).

Of the parameters listed above, particular attention was paid to recording bank erosion and ice/debris jam potential at the stream crossings. Due to limited direct accessibility on most reaches, bank erosion along the entire channel length was not practical; rather, bank erosion plainly visible along roads or at stream crossings was indexed using the FIT. Therefore the relative length of the reach impacted by bank erosion was likely underestimated compared to typical Phase 2 field observations. Debris and ice jam potential at points of channel constrictions associated with stream crossings and sharp channel bends were recorded in the field. Qualitative ratings of the impact of these areas on sediment and debris continuity were developed and entered into the DMS. A complete summary of impact ratings for bank erosion or ice and debris jam potential for each reach can be found in Appendix A.

4.8 Data Analysis

Impact scores have been generated for each of the Phase 1 steps for the 51 study reaches. In total, 16 individual parameters are evaluated for each study reach (Table 4.7). The Phase 1 dataset in the DMS summarizes each individual parameter using a score range from zero ("not significant") to 2 ("high") depending on the degree of impact recorded. The 16 parameters evaluated are summarized for each study reach (Figure 4.15). The scores presented in Figure 4.15 are the total parameter impact scores displayed by quartiles.
Figure 4.15 Total impact scores by reach in the Malletts Creek and Allen Brook Watershed
Table 4.7 Final impact score parameters for phase 1 dataset

<table>
<thead>
<tr>
<th>Phase 1 Step</th>
<th>Phase 1 Parameter</th>
<th>Impact Category</th>
<th>Phase 1 Step</th>
<th>Phase 1 Parameter</th>
<th>Impact Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Local Watershed Land Cover/Land Use</td>
<td>Land Use</td>
<td>6.1</td>
<td>River Corridor Encroachments</td>
<td>Flooding Modifications and Planform Changes</td>
</tr>
<tr>
<td>4.2</td>
<td>Corridor Watershed Land Cover/Land Use</td>
<td></td>
<td>6.2</td>
<td>River Corridor Development</td>
<td></td>
</tr>
<tr>
<td>4.3</td>
<td>Riparian Buffer Width</td>
<td></td>
<td>6.3</td>
<td>Depositional Features</td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>Flow Regulations</td>
<td></td>
<td>6.4</td>
<td>Meander Migration</td>
<td></td>
</tr>
<tr>
<td>5.2</td>
<td>Bridges and Culverts</td>
<td></td>
<td>6.5</td>
<td>Meander Belt Width Departure</td>
<td></td>
</tr>
<tr>
<td>5.3</td>
<td>Bank Armoring</td>
<td></td>
<td>6.6</td>
<td>Meander Wavelength Departure</td>
<td></td>
</tr>
<tr>
<td>5.4</td>
<td>Channel Straightening</td>
<td></td>
<td>7.2</td>
<td>Bank Erosion</td>
<td>Bed and Bank Conditions</td>
</tr>
<tr>
<td>5.5</td>
<td>Dredging and Gravel Mining</td>
<td></td>
<td>7.3</td>
<td>Debris and Ice Jam Potential</td>
<td></td>
</tr>
</tbody>
</table>

Based on the Phase 1 impact scores, the DMS also develops predictions for channel adjustment processes (VTANR, 2007b). These predictions are based on the dominant impacts recorded for each reach, and are categorized based on the impacts typically associated with the following four channel adjustment processes: 1) Degradation (e.g., channel incision); 2) Aggradation (e.g., increased sediment deposition); 3) Channel widening (e.g., increased bank erosion); 4) Planform Changes (e.g., irregular meander patterns). Using the channel adjustment process ratings, a provisional geomorphic rating is developed for each reach based on the methods outlined in the SGA Phase 1 protocols (page 76; VTANR, 2007b). Table 4.8 outlines the four possible geomorphic ratings based on the SGA methods. Reach reports in Appendix A summarize the predicted reach adjustment processes, as well as stream sensitivity ratings. Both of these parameters have been used in conjunction with the overall impact scores in developing recommendations for further Phase 2 assessment.

Table 4.8 SGA reach condition ratings

<table>
<thead>
<tr>
<th>SGA Rating</th>
<th>Predicted Conditions and Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>In Equilibrium – no apparent or significant channel, floodplain, or land cover modifications; channel geometry is likely to be in balance with the flow and sediment produced in its watershed.</td>
</tr>
<tr>
<td>Good</td>
<td>In Equilibrium but may be in transition into or out of the range of natural variability – minor erosion or lateral adjustment but adequate floodplain function; any adjustment from historic modifications nearly complete.</td>
</tr>
<tr>
<td>Fair</td>
<td>In Adjustment – moderate loss of floodplain function; or moderate to major planform adjustments that could lead to channel avulsions.</td>
</tr>
<tr>
<td>Poor</td>
<td>In Adjustment and Stream Type Departure - may have changed to a new stream type or central tendency of fluvial processes – significant channel and floodplain modifications may have altered the channel geometry such that the stream is not in balance with the upslope sediment load and/or runoff processes.</td>
</tr>
</tbody>
</table>
4.9 **PHASE 2 ASSESSMENT PRIORITIZATION**

Using the Phase 1 Impact Ratings as the primary basis for reach selection, a list of high and medium-priority reaches was compiled for further Phase 2 surveys. Figure 4.16 presents the selected reaches by location in the watershed and summarizes the selected reaches based on channel length, preliminary reference stream type, substrate, and bedform.

**High Priority Reaches**

Seventeen (17) reaches are considered high-priority for assessment, including 12 reaches on the main stem of Malletts Creek and five (5) reaches on Allen Brook. The total channel length for the selected reaches is 12.3 miles. Reaches were generally chosen if the total impact scores exceeded 11 or if the reach was located in the lower portion of the watershed (e.g., M06). Reach M17 was considered as a high priority because of extensive channel modification in the lower reach. In 1962 the area downstream of East Road was highly sinuous and now it is completely channelized.

**Moderate Priority Reaches**

Ten (10) additional reaches have been included as moderate-priority reaches due to their relative impact ranking and location in the watershed. The total channel length for the selected reaches is 4.5 miles. Several of the lower scoring reaches such as M02, M04, and T1.05 were chosen because of their watershed location and drainage areas. These reaches often connect two higher ranking reaches and should be included in order to obtain a contiguous dataset up the channel network from Lake Champlain to the headwaters. Other reaches were ranked moderately because impacts could not be fully determined remotely or the reach was not accessible during windshield surveys, such as reach M08.

**Low Priority Reaches**

The remaining 24 reaches were given a low priority for Phase 2 assessments. These reaches either had low impact scores (1-7), were very small in size, or had significant wetland influences that would prohibit fluvial assessments.

**2010 Phase 2 Reaches**

A total of 11 reaches (6.2 miles) were selected for additional Phase 2 assessments in the fall of 2010. These reaches are highlighted within Figure 4.16.
Figure 4.16 Phase 2 Assessment priority reaches in the Malletts Creek and Allen Brook Watershed
5.0 PHASE 2 RESULTS

The following section includes narratives describing the Phase 2 results and a summary of the geomorphic and habitat conditions. Detailed summaries of geomorphic and habitat data for each segment are provided in Appendix B.

5.1 REACH NARRATIVES

M14-A

M14-A is a short segment, 261 ft in length, which begins at the reach break with M13 just downstream of the very broad valley setting and ends at a large beaver dam upslope. The reach was segmented because of the extensive ponding caused by the beaver dam. The channel is situated in a very broad valley with an overall channel slope of 1.1%. Currently, the segment has one primary thread which drains the outlet of the beaver dam and several smaller threads that have formed from impounded water spilling over the floodplain upstream of the beaver dam. Evidence of flood chutes and large abandoned avulsions downstream are indicative of historical beaver dam breaching. When these events occurred, considerable amounts of sediment and water rapidly change the channel's planform. These features are natural and the channel exhibits its reference E-type condition with dune-ripple bedform (Figure 5.1). The width-to-depth ratio (WDR) and entrenchment ratios (ER) are 5.0 and 41.9, respectively. No incision was observed in this segment. The incision ratio (IR) is 1.0. The median substrate size is sand (70%) and the channel has moderate sinuosity.

Habitat in segment M14-A is abundant (RHA score = “Good”). Both the woody debris and pool densities are in “reference” condition with 343 LWD/Mile and 81 Pools/Mile, respectively (Figure 5.2). One nice undercut was observed upstream of the cross-section location. Geomorphically, the segment has some minor impacts associated with the beaver dam. These impacts are natural, so the overall RGA score remains in “Good” condition. The channel evolution model (CEM) does not do a great job characterizing channels affected by so much beaver activity. Incision and widening was not present in the segment, but beaver activity has led to extensive shifts in planform. Because of the natural planform shifts, but also the relatively stable setting, stage I of the F-model CEM was chosen.

Figure 5.1 Cross-section location with E-type geometry
Figure 5.2 Great habitat feature with LWD and undercut bank
M14-B
This segment was only assessed for bank and buffer conditions because extensive beaver activity impounds the entire channel length of 2,518 ft (Figure 5.3). The very broad valley and abundance of alders and other fast growing woody species makes this segment ideal for beaver inhabitance (Figure 5.4). Under reference conditions the channel was probably very similar to its current impounded state. Beaver activity greatly increases the time it takes for water to flow downstream, and the dams act as sediment sinks allowing fine silts and sands to settle out and aggrade. The channel is extremely well buffered because of the abundance of wetlands in the wide valley. Professional judgment was used to determine the RGA score as “Good” and E5-type channel morphology with dune-ripple bedform.

Figure 5.3 Large beaver dam at segment break with M14-B

Figure 5.4 Typical impounded setting with many alders

M15-A
M15-A, like M14-B, is impounded by beaver activity (Figure 5.5). The segment is 671 feet in length and extends from the reach break with M14-B at the confluence with tributary T5.01 and ends approximately 400 feet downstream of the Kingsbury Road crossing. Bank and buffer conditions were surveyed and professional judgment was assigned for the geomorphic condition (RGA score = “Good”). An E5-type channel with dune-ripple bedform would likely occur if the segment was not so heavily impounded.
M15-B
Segment M15-B is 1,487 feet in length with an average channel slope of 0.4%. The segment begins at the end of impoundment and extends up to the reach break with M16 about 850 feet upstream of the Kingsbury Rd crossing where the confinement changes. The valley setting is very broad by reference. The channel exhibits E-type geometry with riffle-pool bedform which is consistent with the reference stream type designation (Figure 5.6). The width-to-depth and entrenchment ratios are 9.5 and 22.3, respectively. No incision was observed at the cross-section location (IR = 1.0), however, some minor incision was observed upstream of the Kingsbury Road crossing. Substrate is slightly coarser in this segment than observed in the reaches below, with fine gravel representing the median substrate type (36%). The Kingsbury Road crossing has been recently replaced and may have previously had some erosion problems (Figure 5.7). Angular fill rock typical of road footings was found in abundance downstream of the road crossing suggesting that the previous crossing may have blown out.

The habitat and geomorphic condition in segment M15-B has been impacted by historical channel straightening. The woody debris recruitment potential has been slightly reduced by bank and buffer
impacts in the left corridor, but the density still remains in reference condition (LWD/Mile = 185). Pools and undercut banks are also in reference conditions with 67 Pools/Mile and 46 Undercuts/Mile, respectively. The overall RHA score is in “Fair” condition. The historical channel straightening, which has led to neck-cutoffs and a few floodchutes decreased the planform score of the RGA (RGA score = “Fair”). As mentioned above, some incision was observed in the upstream end of the segment but not enough incision was observed to indicate channel evolution. The channel is responding to impacts from straightening and these adjustments are lateral; however the segment is in stage I of the CEM (F-Model). Additional widening will likely occur as the channel becomes more sinuous in the near future.

M16
Reach M16 is 3,142 feet in length with an average channel slope of 0.8%. The reach begins at the large meander bend that doubles back in the valley and ends upslope at the confluence with T6.01, a small tributary entering from the north. The valley is very broad, with no human caused change to its width. In some places, however, the valley naturally becomes slightly confined. These areas are short in length and have not been segmented out, because the channel geometry remains consistent throughout (WDR = 10.2; ER = 5.5; IR = 1.2). The channel bedform is riffle-pool by reference with C-type channel morphology (Figure 5.8). Coarse gravel is the median substrate type, comprising approximately 42% of the substrate observed in the channel. Where sand substrates were more prevalent there were no defined riffles and some dune-ripple formations. Where gravel substrate dominated, riffles occurred at an interval of 135ft, which is approximately 7 times the channel width (Figure 5.9).

Historical beaver activity on this reach, albeit a natural process, has played a large role on the current condition of the stream channel. Several breached beaver dams were observed in this reach and the changes in the base water level altered the sediment regimes. In most cases, large sediment deposits were observed upstream of these relic structures. This sediment was usually a dense mix of silt and other fine particles that settled out over the duration of the structures existence. With the dam gone the channel is responding by cutting down through the sediment in the form of headcuts (Figure 5.10). Headcuts migrating upslope will do so until the channel slope reaches equilibrium between the up and

Figure 5.8 Downstream view of the cross-section
Figure 5.9 Well-spaced riffle-pool sequence located mid-reach
downstream channels. The net effect of sediment aggradation and subsequent degradation as beaver dams come and go effectively neutralizes the adjustment processes observed on this reach (RGA score = “Good”). Stage I of the CEM was chosen because degradation through naturally aggraded, beaver-related substrate is the dominant adjustment process observed. The habitat condition score in M16 is also “Good.” Woody debris was abundant (LWDs/Mile = 122), but pools were somewhat limited (Pools/Mile = 25).

Figure 5.10 Two examples of headcuts migrating upstream through sediment aggraded historically by beaver activity

M17-A
Segment M17-A begins at the reach break where the Main Stem meets tributary T6.01 and extends upstream 916 feet to the segment break where the valley setting changes from an unconfined to a confined setting. The valley in M17-A is very broad and the segment has an average channel slope of 2.0%. This reach was segmented to highlight the straightening and planform changes downstream of the East Road Crossing. Currently, the channel exhibits E-type morphology with plane bedform (Figure 5.11). The width-to-depth and entrenchment ratios are 8.7 and 32.5, respectively. However, there is strong evidence to suggest that the reference channel is a C-type. Historical aerial photographs of Chittenden County show the channel with a meandering profile (Figure 5.12). The sinuosity of the channel in 1962 was about 1.5, and presently it is less than 1.1. The median substrate size observed in this segment was gravel (49%), but a large proportion of cobble substrate was also observed (32%).
The impacts to the natural planform of the channel have also impacted the habitat condition of this segment. M17-A has limited wood (LWD/Mile = 40), pools (Pools/Mile = 28), and undercut banks (UCB/Mile = 17), which reduced the overall habitat score to “Fair” condition. It is evident in Figure 5.11 that the banks and buffers in the lower portion of the segment have been recovering from previous deforestation. The plant assemblages are typical of old field succession occurring in a wet environment. Boxelder (Acer negundo), speckled alder (Alnus rugosa), and black willow (Salix nigra) are the dominant woody species in the lower segment. The geomorphic condition of M17-A has been reduced as a result of several adjustment processes (RGA score = “Fair”). The straightening which occurred sometime between 1962 and the present likely caused the channel to degrade and down-cut. However, vertical changes in the channel were not observed in the cross-section; only minor incision (IR = 1.1) was noted upstream and downstream. The lack of incision suggests that the bed elevation might be aggrading sediment from upslope. Several large sediment deposits were observed at the upstream end of reach M16, indicative of a high sediment load (Figure 5.13). As more coarse sediment spills into this segment, widening and planform adjustments are likely to recreate a similar sinuous setting as observed in 1962. Stage I of the CEM describes the state of this segment, because no active incision associated with historical straightening was noted. Widening and shifts in planform will likely be more prominent adjustment processes in the future.
M17-B
Segment M17-B begins at the segment break where valley confinement changes and ends immediately upstream of the Forest Road Crossing upslope. In total the segment is 4,197 feet in length with an average channel slope of 4.2%. The valley is predominately in a semi-confined setting; however, several small sections had an unconfined setting. The channel exhibited Ba-type morphology, with width-to-depth and entrenchment ratios of 9.7 and 2.2, respectively (Figure 5.14). Although the width-to-depth ratio was slightly lower than the +/- 2.0 confidence interval of the Rosgen system, B-type morphology best summarizes the observed condition of the channel. The dominant bedform of M17-B was step-pool, except in areas where the valley became unconfined. In these short stretches the channel tended to have a naturally braided planform (Figure 5.15). Substrate tended to be larger in areas with steep slope changes and finer where the valley width was wider. The median substrate size was cobble (45%).

The habitat in this segment was in “Good” condition. Woody debris density was reference (LWD/Mile = 212) and pools were abundant and well-spaced (Pools/Mile = 64). The only major impact to the habitat condition was some lack of buffer plant diversity in the lower reach where the understory was cleared.
as a sugarbush (Figure 5.16). Many brook trout (*Salvelinus fontinalis*) and other fish were observed while assessing this segment. High amounts of coarse particulate organic matter provide the necessary resources for healthy benthic communities. Geomorphically, the segment is stable, with few notable adjustments (RGA score = “Good”). This segment is in stage I of the CEM. The upstream end of the segment has two large cascades that control any vertical adjustment (Figure 5.17). These features may inhibit fish passage, but overall channel connectivity is good.

![Figure 5.16 Upstream view of channel and valley in sugarbush](image)

![Figure 5.17 Cascade grade control in upper segment](image)

**T6.01-A**

Reach T6.01 was segmented twice to best characterize the diversity in channel characteristics and impacts associated with beaver and anthropogenic activities. Segment T6.01-A begins at the confluence with the main stem at the upper end of M16 and ends at a large beaver dam observed under the utility line right-of-way. In total, the segment is 994 feet in length with an average channel slope of 0.9%. The segment has an unconfined valley setting with a very broad valley type. Like many of the lower-sloped reaches on Malletts Creek, beaver activity has been a constant factor in the geomorphic conditions observed (Figure 5.18). On T6.01-A, no active beaver dams were observed at the time of survey, but many relic structures were present. The channel exhibits E-type morphology with minor incision and dune-ripple bedform (WDR = 5.4, ER = 39.4; IR = 1.2; Figure 5.19).
Habitat in this segment has been impacted by historical land use practices (e.g., agriculture) and the beaver activity (RHA Score = “Fair”). Woody debris and pool density were 111 LWD/Mile and 63 Pools/Mile, respectively. The high density of LWD can be attributed to the high concentration of small and medium-sized pieces around relic beaver dams. Some dredging was noted at the upstream end of the segment where the adjacent field is used for hay. The dredging and straightening continues up into the other two segments. The area of dredging in the upper segment and shifting planform in the lower segment from beaver dam breaching were the primary adjustments to this reach (RGA Score = “Fair”). T6.01-A is in early stage II of the channel evolution model. The channel is only slightly incised, but several small headcuts associated with the blown-out beaver dams indicate potential for future degradation.

**T6.01-B**

T6.01-B is impounded by beaver activity and only partially assessed for bank and buffer conditions. The segment is 460 feet in length and extends from the segment break with T6.01-A at the utility line right-of-way up to the confluence with an unnamed tributary that enters from the east. The segment has been historically straightened and dredged, which confines the extent of impoundment to the size of the dredge channel (Figure 5.20; Figure 5.21). The east buffer area of this segment is used for hay production and has a limited natural buffer width. If the beaver dam were to breach it is likely that that the channel form would resemble the upstream segment T6.01-C with an unstable, incised state. Professional judgment was used to determine the RGA score as “Fair” and G5-type channel morphology with plane bedform.
T6.01-C

Segment T6.01-C begins at the end of the ponding where the tributary enters from the east and ends at the reach break upstream of the Main Street crossing. The segment is 1,403 feet in length with an average channel slope of 1.1%. The valley setting is very broad with some impacts to the valley width because of East Road. Extensive dredging, channel straightening, and incision has led to a stream type departure from reference E-type morphology to the current G-type (Figure 5.22). Dredging has made floodplain access virtually impossible. The channel has an incision ratio of 2.8, and the width-to-depth and entrenchment ratios are 9.3 and 1.6, respectively. The channelized state of the segment has altered the reference cune-ripple bedform to the current plane bed condition. The median observed substrate size was sand (50%) and plane bedform was dominant.

The extensive dredging and channel straightening with little buffer resistance has led to a highly incised G-type channel. Three small headcuts were observed downstream of the Main Street crossing. These features were armored with coarse material to prevent any additional migration upstream (Figure 5.23).
Geomorphically, the degradational adjustments that have shaped the current state of this channel are likely over. The channel is established at a lower elevation and the upstream headcut migration has been mitigated. The segment will likely transition into stage II of the CEM and will widen and erode laterally to develop a more sinuous planform. The RGA score is in “Fair” condition, but this segment should be watched carefully for erosion problems and planform shifts. The habitat, a reflection of the degraded geomorphic state, is also in “Fair” condition. Wood density was very low (LWD/Mile = 33), but pools were more frequently observed in the deeply incised channel (Pools/Mile = 63).

T6.02
T6.02 is a reach, 609 feet in length, that begins just upstream of the Main Street crossing and ends approximately 600 feet downstream of a driveway crossing off North Road. The hydrological condition of this reach has changed because of an influx of stormwater runoff from the Hunting Ridge Development. The development, built around the turn of the millennia, lacks sufficient stormwater best management practices to reduce the large volume of water which surge off the impervious surfaces and down the steep slope into the tributary. The channel has E-type morphology with dune-ripple bedform. The width-to-depth and entrenchment ratios are 9.0 and 19.3, respectively. Much of the very broad valley is occupied by wetlands. The primary thread of the channel dissipates into a wetland for a brief extent where the vegetation is herbaceous (Figure 5.24).

The short length and small drainage area of this reach made it difficult to assess the habitat conditions, especially because the channel dissipates into a wetland for a portion of the reach. The stream channel runs adjacent to several homes on North Road and Main Street which had a significant impact on the bank and buffer conditions. The left buffer was predominately herbaceous with little canopy cover and areas of the near bank were mowed on both sides of the channel. Wood density was skewed higher because of the short reach length and one large debris jam with several pieces of wood (LWD/Mile = 112). The overall habitat score was of “Fair” condition. Geomorphically, the increased flow from upslope land use changes has caused changes in planform and some minor degradation (RGA Score = “Fair”). The channel avulsed around a large tree and into a landowner’s yard, requiring the fence line to be moved (Figure 5.25). Channel evolution stage is difficult to pinpoint, because of the presence of wetlands and minor degradation. Stage I was chosen because no significant incision was observed in the field.
T1.02
Assessment of Allen (Petty) Brook began on reach T1.02, because reach T1.01 is a large wetland found west of Route 7. T1.02 begins just upstream of the Route 7 bridge and extends 1,602 feet upstream, ending at the confluence with sub-tributary T1.51 entering from the east. This reach is set in a very broad valley, with an average channel slope of 0.1%. The low slope, high sinuosity (1.6) and sand substrate (60%) are ideal conditions for the dune-ripple bedform observed. Channel morphology is E-type with width-to-depth and entrenchment ratios of 6.6 and 11.6, respectively (Figure 5.26). Minor channel incision was observed at the cross-section, however, more pronounced abandoned floodplain features could not be discerned through the dense herbaceous riparian vegetation. A few small beaver dams were observed upstream of the reach break. These dams were not substantial enough to justify reach segmentation.

T1.02 has changed significantly over the last 50 years. Much of the readily accessible floodplain was once used for hay production and the channel was pushed up against the valley wall to the south. In total, approximately 59% of the channel was once straightened. Since the land was abandoned for
agricultural uses it has gained back considerable amounts of sinuosity and stability. The geomorphic score of the reach is of “Good” condition. Only minor adjustments in planform are taking place because degradation and aggradation is historical. Stage I of the CEM (F-Model) was chosen because of the lack of pronounced abandoned floodplain features and minimal channel incision. Increased stabilization is predicted as larger woody species buffer the stream and reduce the minor lateral adjustments noted in the field. The habitat condition is also “Good,” with abundant pools (Pools/Mile = 65) and undercut banks (UCB/Mile =36). The woody debris density was reduced, because of historical land clearings (LWD/Mile = 9).

T1.03
Reach T1.03 begins at the confluence with sub-tributary T1.51 and ends upstream at the confluence with sub-tributary T1.52. The reach is 2,706 feet in length with an average channel slope of 0.3%. The valley setting of the reach is very broad and the channel has a sinuosity of 1.4. The channel exhibits E-type morphology with dune-ripple bedform. The median substrate type is sand, which comprises approximately 85% of the bed. The width-to-depth ratio and entrenchment ratio are 6.0 and 9.8, respectively (Figure 5.27). Minor incision was noted through much of this reach (IR = 1.2), with more sever degradational impacts observed downstream of the culvert crossing mid-reach.

The Coon Hill Road crossing is located mid-reach. This culvert crossing has numerous problems that should be addressed. The culvert width of 5.0 feet is only 30% of the bankfull channel width. This severe constriction causes water to back up behind the structure a few feet above the top of the culvert inlet. When water backs up above the undersized culvert hydraulic head is formed and water is forced through the structure. The deep scour pool and eroding banks downstream are the result of this process (Figure 5.28). Upstream the culvert inlet is partially blocked by sediment and woody debris. Lots of aggradation has taken place as well as bank slumping and erosion (Figure 5.29). This structure is recommended for replacement.
The RGA condition has been impacted by the crossing and the subsequent geomorphic processes it has triggered (RGA score = "Fair"). Downstream of the structure degradation and planform shifts are the dominant processes observed and upstream aggradation of sediment and some widening and planform shifts were observed. The channel is in stage III of the CEM and will likely experience more widening and planform above and below the structure as it tries to equilibrate. Habitat in T1.03 is in "Good" condition. The density of woody debris (LWD/Mile = 160) and pool occurrence (Pools/Mile = 80) were not greatly altered by the adjustments associated with the crossing. Like the downstream reach, T1.03 is recovering from past land clearing for agricultural purposes. However, the bank and buffer conditions of this reach are much further along in the sequence of succession. Larger trees and abundant shrub/scrub vegetation was observed, especially upstream of the crossing.

**T1.04**
Reach T1.04 begins at the confluence with sub-tributary T1.52 and ends at the VAST trail crossing east of the large apartment complex off of Route 7. The reach is 5,392 feet in length and the valley type is very broad. Channel slope is 0.5% and sinuosity is moderate (1.3). The channel is E-type by reference with dune-ripple bedform (Figure 5.30). Channel geometry is typical of E-type channels with a width-to-depth and entrenchment ratio of 7.4 and 7.6, respectively. A moderate level of incision was observed at the representative cross-section (IR = 1.3), yet only minor incision persisted throughout the reach. Sand is the median substrate (53%) although some areas where gravel substrate was dominant were also observed. Also, several pockets of dense clay were observed, often near mass failures (Figure 5.31). The clay was heavily varved - an indication of the glacial lakes (e.g. Glacial Lake Vermont and Champlain Sea) that once occupied the area.
The habitat in this segment was in “Good” condition. Woody debris density (LWD/Mile = 166) and pool occurrence (Pools/Mile = 56) were both high. About 3,000 feet upstream of the reach break the near bank and buffer vegetation shifted from primarily shrubby with lots of alders (A. rugosa), to a more forested setting with more eastern hemlocks (Tsuga canadensis). The shrubby section, which was more representative of the reach as a whole, was probably used for agriculture before being left to revegetate to a natural state. Some evidence of straightening was observed in the lower reach in the historical aerial photographs. The subsequent planform adjustments following the straightening slightly impacted the overall geomorphic condition (RGA score = “Fair”). The channel is in stage III of the CEM, because of the minor incision which persisted throughout the reach.

T1.05
Reach T1.05 begins at the VAST trail crossing and extends upstream 1,860 feet to the reach break where the valley confinement changes slightly. The reach has an average channel slope of 0.4% and a moderate sinuosity. T1.05 is set in a narrow to broad unconfined valley. The stream channel exhibits reference E-type morphology with dune-ripple bedform (Figure 5.32). The width-to-depth and entrenchment ratios are 6.8 and 6.2, respectively. The floodplain throughout the reach is readily accessible with no observed incision (IR = 1.0). Substrate is almost entirely comprised of sand (77%) with some finer material and gravel.

The habitat score in reach T1.05 is in “Reference” condition. Woody debris density was extremely high (LWD/Mile = 332) and debris jams were abundant (DJ/Mile = 28). Pool density was slightly lower than expected (Pools/Mile = 22; Figure 5.33). The high volume of non-cohesive sand substrate limited pool formation to areas of localized hydraulic variability, such as areas where large debris jams created scour pools. The bank and buffer conditions reflect several decades free of management or clearing. The extent of the riparian buffer observed in the 1962 aerial images are very similar to the buffer observed today. The buffer is primarily composed of eastern hemlocks (T. canadensis) with some large, sporadic hardwoods. Geomorphically, the reach is stable, with few adjustments noted (RGA Score = “Reference”). Some minor shifts in planform and migration were caused by the many debris jams noted, but these
changes are natural. The recent development along Route 7 has increased the stormwater discharge into the reach, but the wide buffer seems to be adequately mitigating any negative impacts. The reach is in stage I of the CEM, with no evidence of recent incision or any significant adjustment.

Figure 5.32 Cross-section with reference E-type morphology

Figure 5.33 Excellent habitat with abundant LWD and DJs

T1.06-A
Reach T1.06 was segmented twice because of bank and buffer conditions, as well as property access restrictions. T1.06-A begins at the slight change in valley confinement and ends upstream just above the confluence with sub-tributary T1.06.t1.01. The segment is 2,816 feet in length with an average channel slope of approximately 0.4%. The valley conditions in this segment are broad with no human impacts to the valley width. E-type channel morphology was observed with very well-formed dune-ripple bedform (Figure 5.34). The width-to-depth, entrenchment, and incision ratios were 7.5, 9.9, and 1.0, respectively. The dense coniferous vegetation makes it incredibly difficult to remotely observe the planform of the channel in the lower segment; however, sinuosity was determined to be high (>1.5). Sand was the dominant substrate type observed in this segment; it represented 82% of the particle distribution.

The ecological setting and habitat condition of this segment is very similar to T1.05. Woody debris density and debris jam density were extremely high, with 442 LWD/Mile and 31 DJ/Mile, respectfully (Figure 5.35). Pool density was high as well with 123 Pools/Mile observed. The excellent condition of the riparian buffer and near banks has helped preserve this segment’s habitat integrity (RHA Score = “Reference”). Like T1.05, limited clearing was observed in T1.06-A over the last 50 years. Many trees had a diameter at breast height that exceeded 30 inches. The sub-tributary located at the upper end of this segment is highly managed. The channel on the western side of Route 7 drains into a very large stormwater detention basin, the outlet of which crosses under the highway and becomes T1.06.s1.01. The stormwater inputs and other road drainage ditches that enter sub-tributary T1.06.s1.01 have created some geomorphic instability in the upper portion of segment T1.06-A. Migration and neck cutoff potential are the most common impacts observed. The overall RGA score is in “Good” condition. Despite minor impacts in the upper segment the channel remains in stage I of the CEM.
T1.06-B
Segment T1.06-B was parsed out because of property restrictions and changes to the bank and buffer condition. The segment, 1,009 feet in length, begins just upstream of the confluence with sub-tributary T1.06.s1.01 and ends about 110 feet upstream of the Sweeney Farm Road (Figure 5.36). The segment is set in a very broad valley, with some human caused change in the valley width. Bank and buffer conditions were assessed using aerial imagery and the corridor was walked along route 7. Professional judgment was used to determine a geomorphic condition (RGA score = “Fair”). The channel observed from the road exhibits E-type morphology with plane bedform. Bank and buffer impacts, channel straightening and the undersized culvert at Sweeney Farm Road were considered in this decision (Figure 5.37).

T1.06-C
Segment T1.06-C is the 747 foot section of the reach that remains upstream of the restricted property access portion. It was assessed fully to capture the impacts from the nearby development. The segment has an average channel slope of 0.3% and it is set in a broadly unconfined valley. The channel exhibits E-
type morphology with plane bedform (Figure 5.38). The width-to-depth and entrenchment ratios are 7.9 and 12.2, respectively. Minor incision was observed in segment T1.06-C, the channel had impacts associated with historical channel alteration and straightening (IR = 1.2). The median substrate size observed was sand (71%), with some fining of silts (15%). The Allen Brook Drive crossing had significant impacts on the channel condition. The culvert is a constriction to the bankfull channel width and the structure occupies approximately 20% of the total segment length. Extensive fill was placed in the valley to create the road footing (Figure 5.39) for the development to the east and two stormwater inputs were observed on the upstream end of the structure.

The habitat score for the segment is in “Fair” condition. Impacts from low buffer widths and channel crossings were severe and responsible for the stream habitat type departure from dune-ripple to plane bed. The invasive grass species reed canary grass (*Phalaris arundinacea*) was found commonly along both banks. Woody debris density was quite low (LWD/Mile = 56), but pools and undercut banks were common and often unstable or poorly formed (Pools/Mile = 42; UCB/Mile = 63). Most impacts that influenced the habitat condition also affected the geomorphic condition (RGA Score = “Fair”). The degradation adjustment from ongoing incision and straightening was the most severe impact noted. Stage II of channel evolution was chosen to highlight impacts that will likely continue in this segment.

5.2 Phase 2 Summary Results

A map of all reaches selected for Phase 2 assessments as well as the existing stream type designation can be found below in Figure 5.40. Rapid Habitat Assessment (RHA) and Rapid Geomorphic Assessment (RGA) result summaries can also be found below in Table 5.1. Additional, segment-specific data summaries for assessed Phase 2 reaches are provided in Appendix B.
Figure 5.40 Phase 2 Assessment stream types in the Malletts Creek and Allen Brook watersheds
## 5.3 Departure and Sensitivity Summary for Phase 2 Reaches

### 5.3.1 Departure Analysis

The reference and existing sediment regime types have been mapped using data from the Phase 1 and 2 assessments (Figures 5.41 & 5.42). Although most segments are stable, some have undergone changes in sediment regime type due to channel incision and/or widening as a result of: 1) historical land uses, 2) encroachments or development in the river corridor, or 3) extensive straightening. Reach stream type departures are summarized below to better describe the reaches where physical changes in channel morphology have accompanied sediment regime changes (Table 5.2).

### Table 5.2 Summary of Stream Type Departures from Reference Conditions

<table>
<thead>
<tr>
<th>Surface Water</th>
<th>Phase 2 Segment ID</th>
<th>Stream Type Departure</th>
<th>Dominant Adjustment Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malletts Creek</td>
<td>M17-A</td>
<td>C to E</td>
<td>Degradation, Now Aggradation</td>
</tr>
<tr>
<td>Unnamed Tributary</td>
<td>T6.01-C</td>
<td>E to Gc</td>
<td>Degradation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Malletts Creek (M14-M17): In reference conditions, the assessed reaches found in the upper portion of Malletts Creek have stable sediment regimes characterized by coarse equilibrium and fine deposition. Although departure in stream type was limited to M17-A, M15-B also had some evidence of historical channel straightening. Currently both reaches have observed lateral adjustment processes, but the sediment regimes remain in coarse equilibrium. The beaver activity or lack of channel straightening has kept M14-A, M14-B, M15-A and M16 in a stable condition. Segment M17-B is the only reach assessed with a transport setting by reference. This sediment regime has not undergone any changes due to the excellent geomorphic condition and natural, forested riparian corridor.

Allen (Petty) Brook (T1.02-T1.06): In reference conditions, the assessed reaches found in Allen Brook would all have stable sediment regimes characterized by coarse equilibrium and fine deposition. The current condition remains in coarse equilibrium for reaches/segments T1.02, T1.05 and T1.06-A because of the limited geomorphic impacts and unmanaged buffer. Reaches/Segments T1.03, T1.04, T1.06-B and T1.06-C have undergone major historical channel straightening and are currently have an unconfined source and transport sediment regime. Road crossings in these reaches (Except T1.04) disrupt the sediment regimes further by constricting the channel and causing changes in the natural valley condition.

Unnamed Tributary to Malletts Creek (T6.01-T6.02): Tributary T6 has experienced extensive channel modifications for agricultural purposes. All segments have a sediment regime deviating from the coarse equilibrium and fine transport reference condition. The brook, which once had a broad accessible floodplain, has been pushed up against the western valley wall. Dredging of the channel in T6.01-C has greatly reduced floodplain connectivity and resulted in a fine source and transport sediment regime. Segments T6.01-A and T6.01-B have unconfined source and transport regimes. Major impacts were from straightening, dredging, and beaver activity. Reach T6.02 is a small channel considered to be in coarse equilibrium although upslope urbanization stressors are present.
Figure 5.41 Phase 2 Assessment reference sediment regime map for Malletts Creek and Allen Brook Watershed
Figure 5.42 Phase 2 Assessment existing sediment regime map for Malletts Creek and Allen Brook Watershed
5.3.2 Sensitivity Analysis

The methods outlined in the VTANR Corridor Planning Guide have been used to describe the stream sensitivities of the segments in the Malletts Creek and Allen Brook study area (Figure 5.43). Using the stream geometry and substrate data in conjunction with overall geomorphic stability (RGA score) as determined during the Phase 2 surveys, stream sensitivity ratings have been assigned to each segment (Figure 4.13). Seven (7) segments have heightened sensitivities of “Extreme” due to minor impacts on highly sensitive ES-type streams. The heightened stream sensitivity ratings on two segments, M17-A and T6.01-C, occurred because of stream type departures (STD) and channel degradation resulting from historical channel straightening, and incision.

<table>
<thead>
<tr>
<th>Surface Water</th>
<th>Phase 2 Segment ID</th>
<th>Description of Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malletts Creek Main Stem</td>
<td>M15-B</td>
<td>Straightening, Planform Shifts; Non-Cohesive Substrate</td>
</tr>
<tr>
<td></td>
<td>M17-A</td>
<td>Straightening (Degradation), Planform Shifts, Aggradation</td>
</tr>
<tr>
<td>Allen (Petty) Brook</td>
<td>T1.03</td>
<td>Aggradation, Planform Shifts; Minor Degradation; Channel Constriction</td>
</tr>
<tr>
<td></td>
<td>T1.04</td>
<td>Aggradation, Planform Shifts; Minor Degradation</td>
</tr>
<tr>
<td></td>
<td>T1.06-C</td>
<td>Straightening (Degradation), Planform Shifts</td>
</tr>
<tr>
<td>Unnamed Tributary</td>
<td>T6.01-A</td>
<td>Straightening (Degradation), Planform Shifts; Minor Dredging; Non-Cohesive Substrate</td>
</tr>
<tr>
<td></td>
<td>T6.01-C</td>
<td>Straightening (Degradation), Planform Shifts; Extensive Dredging; Non-Cohesive Substrate</td>
</tr>
<tr>
<td></td>
<td>T6.02</td>
<td>Straightening, Planform Shift; Upslope Stormwater Impacts</td>
</tr>
</tbody>
</table>

Table 5.3 Extremely sensitive segments and descriptions of the specific impacts and adjustments that are occurring to the stream.
Figure 5.43 Phase 2 Assessment priority reaches in the Malletts Creek and Allen Brook Watershed
6.0 PRELIMINARY PROJECT IDENTIFICATION

6.1 STREAM CROSSINGS

Throughout Vermont, undersized bridges and poorly aligned culverts prevent critical sediment and woody debris transport processes and fish and wildlife migration. These conditions result in 1) channel instability and/or damage to infrastructure and personal property, 2) increased flooding, and 3) decreased fish and wildlife population health. A total of eight (8) culverts at road crossings were assessed using the VTDEC methods. None of the assessed culverts are adequately sized to accommodate stream equilibrium conditions. Five (5) of the assessed culverts have widths less than 50% of bankfull channel width and cause significant flood constrictions and reduced aquatic organism passage (AOP). Three (3) culverts have been identified as “high” priorities for replacement or retrofit to address their incompatibility with channel stability and/or AOP. Detailed summary data for all assessed culverts are included in Appendix B, and key information for each structure is summarized below in Table 6.1.
## Table 6.1: Culverts Assessed on Malletts Creek and Allen (Petty) Brook during Phase 2 Assessments and priority for replacement or retrofit

<table>
<thead>
<tr>
<th>Stream Name</th>
<th>Town</th>
<th>Reach/Segment ID</th>
<th>SGA ID</th>
<th>Road Name</th>
<th>Route Number</th>
<th>% Bankfull Width</th>
<th>AOP Coarse Screen</th>
<th>AOP Geomorph Compatability</th>
<th>AOP Retrofit Potential</th>
<th>Overall Priority</th>
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</thead>
<tbody>
<tr>
<td>Malletts Creek Main Stem</td>
<td>Milton</td>
<td>M15</td>
<td>100035000004101</td>
<td>KINGSBURY RD</td>
<td>35</td>
<td>58%</td>
<td>Reduced AOP</td>
<td>Partially Compatible</td>
<td>MML</td>
<td>Moderate</td>
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<tr>
<td></td>
<td></td>
<td>M17-A</td>
<td>100005000004101</td>
<td>EAST RD</td>
<td>5</td>
<td>55%</td>
<td>Reduced AOP</td>
<td>Mostly Compatible</td>
<td>MML</td>
<td>High</td>
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<td></td>
<td>M17-B</td>
<td>70000000004103</td>
<td>FOREST RD (PVT)</td>
<td>NA</td>
<td>48%</td>
<td>Reduced AOP</td>
<td>Mostly Incompatible</td>
<td>MLL</td>
<td>Moderate</td>
</tr>
<tr>
<td>Allen (Petty) Brook</td>
<td>Colchester</td>
<td>T1.03</td>
<td>100010000004051</td>
<td>COON HILL RD</td>
<td>10</td>
<td>21%</td>
<td>Reduced AOP</td>
<td>Mostly Incompatible</td>
<td>LLL</td>
<td>High</td>
</tr>
<tr>
<td>Unnamed Tributary to Malletts Creek</td>
<td>Milton</td>
<td>T1.06-B</td>
<td>10002100004101</td>
<td>SWEENEY FARM RD</td>
<td>21</td>
<td>33%</td>
<td>Full AOP</td>
<td>Mostly Incompatible</td>
<td>MLL</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T1.06-C</td>
<td>100172000004101</td>
<td>ALLEN BK DRIVE</td>
<td>172</td>
<td>35%</td>
<td>Full AOP</td>
<td>Partially Compatible</td>
<td>MLL</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T6.01-C</td>
<td>99000000004103</td>
<td>FARM PATH</td>
<td>2</td>
<td>46%</td>
<td>Reduced AOP</td>
<td>Partially Compatible</td>
<td>MLL</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T6.01-C</td>
<td>100002000004101</td>
<td>MAIN ST</td>
<td>NA</td>
<td>74%</td>
<td>Reduced AOP</td>
<td>Mostly Compatible</td>
<td>MML</td>
<td>Low</td>
</tr>
</tbody>
</table>

### AOP Coarse Screen
- **Green**: Full AOP for all aquatic organisms
- **Gray**: Reduced AOP for all aquatic organisms
- **Orange**: No AOP for all aquatic organisms except adult salmonids
- **Red**: No AOP for all aquatic organisms including adult salmonids

### AOP Geomorph Compatability
- **Green**: Structure is fully compatible geomorphically $< G < 25$
- **Light Green**: Structure is mostly compatible geomorphically $< G < 20$
- **Yellow**: Structure is partially compatible geomorphically $< G < 15$
- **Orange**: Structure is mostly incompatible geomorphically $< G < 10$
- **Red**: Structure is fully incompatible geomorphically $< G < 5$

### AOP Retrofit Potential
- **H**: High probability the existing culvert can be retrofitted
- **M**: Medium probability the existing culvert can be retrofitted
- **L**: Low probability the existing culvert can be retrofitted
- **Position 1 (left)**: For strong swimmers
- **Position 2 (center)**: For moderate swimmers
- **Position 3 (right)**: For weak swimmers
6.2 SITE-SPECIFIC PROJECT OPPORTUNITIES

A list of preliminary, site-level restoration projects for the Malletts Creek and Allen (Petty) Brook study area is provided below in Table 6.2. The project strategy, technical feasibility, and priority for each project are listed by project number and reach/segment. A total of 20 projects were identified to promote the restoration or protection of channel stability and aquatic habitat. The table summarizes key information for each project, including the site stressors and constraints, project strategy, priority, relative costs, and potential partners.

The project locations and categories identified for the study area are included on maps in Appendix C. The 21 projects are further broken down by category as follows: 8 active geomorphic restoration projects; 13 passive geomorphic restoration projects.
<table>
<thead>
<tr>
<th>Stream Name, Reach/Segment, ID #, Location, &amp; Town</th>
<th>Type of Project</th>
<th>Site Description Including Stressors and Constraints</th>
<th>Project or Strategy Description</th>
<th>Hazard Mitigation Priority</th>
<th>Ecological Benefits Priority</th>
<th>Project Benefits</th>
<th>Costs</th>
<th>Potential Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malletts Creek M14 #1 South of Kingsbury Crossing in beaver swamp Milton</td>
<td>Passive Restoration</td>
<td>Entire reach is set in a wide valley with much beaver activity. Likelihood of corridor development or encroachment very low due to ponding from beaver dams.</td>
<td>Corridor protection would ensure long-term protection of healthy wildlife habitat in wide stream corridor.</td>
<td>Low</td>
<td>Moderate</td>
<td>Wildlife habitat protection; Long-term protection for flood and sediment storage in corridor.</td>
<td>Potentially moderate to high costs for easements.</td>
<td>VTDEC; VRC; Town of Milton</td>
</tr>
<tr>
<td>Malletts Creek M15-A #1 South of Kingsbury Crossing Road in beaver swamp Milton</td>
<td>Passive Restoration</td>
<td>Similar to Reach M14. Likelihood of corridor development or encroachment very low due to ponding from beaver dams.</td>
<td>Corridor protection would ensure long-term protection of healthy wildlife habitat in wide stream corridor.</td>
<td>Low</td>
<td>Moderate</td>
<td>Wildlife habitat protection; Long-term protection for flood and sediment storage in corridor.</td>
<td>Potentially moderate to high costs for easements.</td>
<td>VTDEC; VRC; Town of Milton</td>
</tr>
<tr>
<td>Malletts Creek M15-B #1 North and south of Kingsbury Crossing Road Milton</td>
<td>Passive Restoration</td>
<td>Significant historical channel straightening. Left (east) corridor from the upstream reach break to the road crossing downstream is used for pasture or hay production. Some bank erosion and channel migration where there is a lack of buffer (and boundary resistance). Approximately 500 feet of the left bank lacks a buffer &gt; 25 feet.</td>
<td>Plant a wider riparian buffer with native woody vegetation in areas lacking canopy cover. Corridor conservation to take some of the pasture and hay out of production and allow the channel to migrate. Corridor conservation will help mitigate with property loss as the channel migrates.</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Reduced thermal loading; Reduced fine sediment loading; Improved biotic habitat within reach; Reduce loss of property.</td>
<td>Low to moderate costs for buffer restoration; moderate to high cost for easements</td>
<td>WNRC; VTDEC; VRC; Town of Milton; Landowner</td>
</tr>
<tr>
<td>Malletts Creek M15-B #2 Kingsbury Crossing Road Milton</td>
<td>Active Restoration</td>
<td>The box culvert is “partially compatible” with geomorphic stability, and has “reduced” aquatic organism passage (AOP). The culvert width is 58% of the bankfull channel width.</td>
<td>Culvert appears relatively new, so replacement is unlikely. Retrofit with weirs and baffles within structure bottom to encourage varying velocities and accumulation of native substrate.</td>
<td>Low</td>
<td>Moderate</td>
<td>Improved AOP in reach where high quality habitat was observed upstream.</td>
<td>Low to moderate costs for retrofit.</td>
<td>Town of Milton; VFWD; CCRPC</td>
</tr>
</tbody>
</table>
### Table 6.2. Site-specific restoration opportunities

<table>
<thead>
<tr>
<th>Stream Name, Reach/Segment, ID #, Location, &amp; Town</th>
<th>Type of Project</th>
<th>Site Description Including Stressors and Constraints</th>
<th>Project or Strategy Description</th>
<th>Hazard Mitigation Priority</th>
<th>Ecological Benefits Priority</th>
<th>Project Benefits</th>
<th>Costs</th>
<th>Potential Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malletts Creek M16 #1 North of Kingsbury Crossing Road in area of historical beaver activity Milton</td>
<td>Passive Restoration Corridor Protection</td>
<td>Extensive historical beaver activity with some channel incision. Stream corridor natural and not impacted by development. In-stream habitat conditions are &quot;good&quot; and overall wildlife habitat is high quality.</td>
<td>Corridor protection would ensure long-term protection of healthy wildlife habitat in natural stream corridor.</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Wildlife habitat protection; Long-term protection for flood and sediment storage in corridor.</td>
<td>Potentially moderate to high costs for easements.</td>
<td>VTDEC; VRC; Town of Milton</td>
</tr>
<tr>
<td>Malletts Creek M17-A #1 Downstream (west) of East Road crossing Milton</td>
<td>Passive Restoration Corridor Protection</td>
<td>Channel extensively straightened downstream of East Road. Channel may have incised historically but is now aggrading coarse sediment. Lateral channel migration predicted in the future. Corridor vegetation is naturally regenerating into willows, alders, and box elders.</td>
<td>Corridor protection would ensure long-term protection against erosion conflicts as channel migrates laterally.</td>
<td>High</td>
<td>Moderate</td>
<td>Long-term protection for flood and sediment storage in corridor.</td>
<td>Moderate costs for easements.</td>
<td>VTDEC; VRC; Town of Milton</td>
</tr>
<tr>
<td>Malletts Creek M17-A #2 East Road crossing Milton</td>
<td>Active Restoration Culvert Retrofit</td>
<td>The box culvert is &quot;mostly compatible&quot; with geomorphic stability, but has &quot;reduced&quot; aquatic organism passage (AOP). The culvert width is 55% of the bankfull channel width.</td>
<td>Culvert appears relatively new, so replacement is unlikely. Retrofit with weirs and baffles within structure bottom to encourage varying velocities and accumulation of native substrate.</td>
<td>Low</td>
<td>High</td>
<td>Improved AOP in reach where very high quality habitat was observed upstream.</td>
<td>Low to moderate costs for retrofit.</td>
<td>Town of Milton; VFWD; CCRPC</td>
</tr>
<tr>
<td>Malletts Creek M17-B #1 East Road upstream to Forest Road Milton</td>
<td>Passive Restoration Corridor Protection</td>
<td>Stream corridor natural with &quot;good&quot; geomorphic stability and aquatic habitat. Numerous brook trout observed in high quality habitat.</td>
<td>Corridor protection would ensure long-term protection of healthy aquatic and wildlife habitat in natural stream corridor.</td>
<td>Low</td>
<td>High</td>
<td>Wildlife habitat protection; Long-term protection for flood and sediment storage in corridor.</td>
<td>Potentially high costs for easements.</td>
<td>VTDEC; VRC; Town of Milton</td>
</tr>
<tr>
<td>Stream Name, Reach/Segment, ID #, Location, &amp; Town</td>
<td>Type of Project</td>
<td>Site Description Including Stressors and Constraints</td>
<td>Project or Strategy Description</td>
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<td>Potential Partners</td>
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</tr>
<tr>
<td>Malletts Creek M17-B #2 Forest Road crossing Milton</td>
<td>Active Restoration</td>
<td>Culvert is under private drive. The structure is undersized - width is 48% of the bankfull flow width. The constriction has caused sediment deposition and erosion upstream. Structure is “mostly incompatible” with geomorphic stability and has “reduced” aquatic organism passage (AOP).</td>
<td>Replace the structure with a new culvert that is adequately sized and allows for full AOP.</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Reduced erosion and sediment deposition upstream.</td>
<td>Moderate to high costs for design and installation of new structure</td>
<td>Landowner</td>
</tr>
<tr>
<td>Small Tributary to Malletts Creek T6.01 #1 Entire reach from Main Street down to confluence with Malletts Creek Milton</td>
<td>Passive Restoration Buffer Plantings; Corridor Conservation</td>
<td>The entire reach has been straightened and lacks native woody vegetation on left (east) bank. Hay production in eastern corridor. Incision is severe in upper segment (C) where erosion is occurring.</td>
<td>A wider riparian buffer should be created by planting native woody species where buffer width is limited. The corridor should be conserved to help mitigate with property loss as the channel migrates laterally in the future.</td>
<td>High</td>
<td>Moderate</td>
<td>Reduced thermal loading; Reduced fine sediment loading; Allow for natural planform development.</td>
<td>Low to moderate costs for buffer restoration; moderate to high cost for easements</td>
<td>WNRCD; VTDEC; VRC; Town of Milton; Landowner</td>
</tr>
<tr>
<td>Small Tributary to Malletts Creek T6.01 #2 Farm Road crossing west of East Road Milton</td>
<td>Active Restoration Culvert Removal</td>
<td>Culvert is undersized - width is 46% of the bankfull flow width. Culvert is “partially compatible” with geomorphic stability, and has “reduced” aquatic organism passage (AOP). Farm road appears to be used infrequently.</td>
<td>Remove structure.</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Reduced erosion and sediment deposition downstream.</td>
<td>Low costs.</td>
<td>Landowner</td>
</tr>
<tr>
<td>Small Tributary to Malletts Creek T6.02 #1 Housing development upstream of reach Milton</td>
<td>Active Restoration Stormwater Management</td>
<td>Channel adjustments occurring as a result of increased runoff from upslope residential development. Lack of stormwater controls. Channel has migrated considerably in past 10 years according to landowners.</td>
<td>Review stormwater discharge permit for development to determine compliance. Develop stormwater mitigation strategy.</td>
<td>High</td>
<td>Low</td>
<td>Reduced erosion and property loss in downstream reaches; Reduced sediment loading to Malletts Creek.</td>
<td>Potentially moderate to high costs for design and construction of stormwater BMPs.</td>
<td>VTDEC; Town of Milton; Homeowners Association</td>
</tr>
<tr>
<td>Stream Name, Reach/Segment, ID #, Location, &amp; Town</td>
<td>Type of Project</td>
<td>Site Description Including Stressors and Constraints</td>
<td>Project or Strategy Description</td>
<td>Hazard Mitigation Priority</td>
<td>Ecological Benefits Priority</td>
<td>Project Benefits</td>
<td>Costs</td>
<td>Potential Partners</td>
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</tr>
<tr>
<td>Allen (Petty) Brook T1.02 #1 East of Route 7</td>
<td>Passive Restoration</td>
<td>Corridor Protection</td>
<td>Straightened historically, however stream corridor currently natural with “good” geomorphic stability. Corridor naturally revegetating with alders, etc.</td>
<td>Corridor protection would ensure long-term protection against erosion conflicts as channel continues to migrate laterally. Flat, developable land may exist in the northern corridor.</td>
<td>Moderate</td>
<td>Low</td>
<td>Long-term protection for flood and sediment storage in corridor; Reduced erosion conflicts; wildlife habitat protection</td>
<td>Potentially moderate to high costs for easements.</td>
</tr>
<tr>
<td>Allen (Petty) Brook T1.03 #1 Downstream (east) of Coon Hill Road</td>
<td>Passive Restoration</td>
<td>Corridor Protection</td>
<td>Straightened historically (~600 feet), with a long stretch (~1000 ft) of north bank lacking a woody buffer &gt; 25 ft. Lateral adjustments predicted in the future.</td>
<td>Corridor protection would ensure long-term protection against erosion conflicts as channel continues to migrate laterally. Flat, developable land may exist in the eastern corridor.</td>
<td>Moderate</td>
<td>Low</td>
<td>Long-term protection for flood and sediment storage in corridor; Reduced erosion conflicts; wildlife habitat protection</td>
<td>Potentially moderate to high costs for easements.</td>
</tr>
<tr>
<td>Allen (Petty) Brook T1.03 #2 Coon Hill Road crossing</td>
<td>Active Restoration</td>
<td>Culvert Replacement</td>
<td>Culvert is undersized -width is 21% of the bankfull flow width. Culvert is “mostly incompatible” with geomorphic stability, and has “reduced” aquatic organism passage (AOP). Significant sediment deposition and erosion upstream and downstream.</td>
<td>Replace the structure with a new culvert that is adequately sized and allows for full AOP.</td>
<td>High</td>
<td>Moderate</td>
<td>Reduced erosion and sediment deposition upstream.</td>
<td>Moderate to high costs for design and installation of new structure.</td>
</tr>
<tr>
<td>Allen (Petty) Brook T1.04 #1 East of Route 7</td>
<td>Passive Restoration</td>
<td>Corridor Protection</td>
<td>Straightened historically in some sections, however stream corridor currently natural with “fair” geomorphic stability and habitat. Corridor naturally revegetating with woody species.</td>
<td>Corridor protection would ensure long-term protection against erosion conflicts. There is limited flat, developable land in the stream corridor.</td>
<td>Low</td>
<td>Low</td>
<td>Long-term protection for flood and sediment storage in corridor; Reduced erosion conflicts; wildlife habitat protection</td>
<td>Potentially moderate to high costs for easements.</td>
</tr>
<tr>
<td>Allen (Petty) Brook T1.04 #2 Housing development along Route 7</td>
<td>Active Restoration</td>
<td>Stormwater Management</td>
<td>Gully formed along steep side slope down gradient of outfall of stormwater pond serving upslope residential development. Gully is eroding beneath stone-lined ditch delivering sediment to channel and is migrating upslope to the west.</td>
<td>Stabilize gully near the outfall to Allen Brook with additional stone. Current diameter of stone in channel inadequate to control erosion.</td>
<td>High</td>
<td>Low</td>
<td>Reduced erosion and property loss; Reduced sediment loading to Allen Brook.</td>
<td>Low to moderate costs for stabilization.</td>
</tr>
</tbody>
</table>
Table 6.2. Site-specific restoration opportunities

<table>
<thead>
<tr>
<th>Stream Name, Reach/Segment, ID #, Location, &amp; Town</th>
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<th>Ecological Benefits Priority</th>
<th>Project Benefits</th>
<th>Costs</th>
<th>Potential Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen (Petty) Brook T1.05 &amp; T1.06-A #1 East of Route 7 Colchester/Milton</td>
<td>Passive Restoration</td>
<td>Both segments have natural corridors with no major impacts. Floodplain functions and aquatic habitat are excellent.</td>
<td>Corridor protection would ensure long-term conservation of high quality stream corridor and habitat.</td>
<td>Low</td>
<td>High</td>
<td>Long-term protection for flood and sediment storage in corridor; wildlife habitat protection</td>
<td>Potentially moderate to high costs for easements.</td>
<td>VTDEC; VRC; Town of Milton; Town of Colchester</td>
</tr>
<tr>
<td>Allen (Petty) Brook T1.06-B #1 Sweeney Farm Road crossing Milton</td>
<td>Active Restoration</td>
<td>Culvert is undersized - width is 33% of the bankfull flow width. Culvert is &quot;mostly incompatible&quot; with geomorphic stability. Significant sediment deposition and erosion upstream and downstream.</td>
<td>Replace the structure with a new culvert that is adequately sized.</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Reduced erosion and sediment deposition upstream.</td>
<td>Moderate to high costs for design and installation of new structure.</td>
<td>Town of Milton; CCRPC</td>
</tr>
<tr>
<td>Allen (Petty) Brook T1.06-B #2 Downstream (South) of Sweeney Farm Road Milton</td>
<td>Passive Restoration</td>
<td>Approximately 500 feet of the channel is managed as a hay field on both banks. Natural revegetation is occurring along the near bank.</td>
<td>Work with landowner to stop haying within 25 feet of the channel and allow for natural revegetation.</td>
<td>Low</td>
<td>Moderate</td>
<td>Reduced thermal loading; Reduced fine sediment loading; Improved biotic habitat within reach</td>
<td>Low to moderate costs for buffer restoration</td>
<td>VTDEC; Landowner</td>
</tr>
<tr>
<td>Allen (Petty) Brook T1.06-C #1 Downstream (south) of Allen Brook Drive Milton</td>
<td>Passive Restoration</td>
<td>The left (eastern) bank of the channel downstream of the culvert lacks woody buffer vegetation for 300 feet. The buffer may be managed as a hay field; woody species are limited.</td>
<td>A wider buffer should be created. Planting woody species in the 300 foot stretch of bank would improve the bank stability and provide more floodplain roughness and shading.</td>
<td>Low</td>
<td>Moderate</td>
<td>Reduced thermal loading; Reduced fine sediment loading; Improved biotic habitat within reach</td>
<td>Low to moderate costs for buffer restoration</td>
<td>WNRC; LCBP; Landowner</td>
</tr>
</tbody>
</table>
7.0 CONCLUSIONS AND RECOMMENDATIONS

The following are some of the key conclusions and recommendations from this work that will help the CCRPC, the Towns of Milton and Colchester, and VTDEC look forward to additional data collection and restoration planning in the watershed.

• The majority of the watershed land use is comprised of forested land (57.8%) and agricultural land (24.6%). The current land use represents a shift in land use over the last 70 years from a watershed that was once predominately agricultural lands and much less forested. Although the land use has shifted away from agriculture, extensive impacts to the natural channel condition still remain from past land use. Channel straightening is very common in much of the upper Malletts Creek and Allen Brook watershed; over 37% of the reaches have high impact from straightening.

• The watershed has seen an increase in new development pressure over the last 50 years as well as more recent development over the last 10-15 years. Developed land, which occupies 7.2% of the watershed, is most commonly found as low density residential areas. Some higher density industrial and commercial development in Milton between Route 7 and Interstate 89 has taken place. Areas of high density residential development have also taken place in the upper Malletts Creek watershed (e.g., the Hunting Ridge Lane development). Finally, many single family residences have been built on the tops of valley side slopes in close proximity to the stream. Although much of these parcels seem like prime locations for residencies, they could present a hazard if fluvial-induced slope failures occur in the erodible channel margins.

• The soils in the watershed are predominately hydrologic group D-type, which are poor-draining clay soils deposited during the post-glacial lake periods of the Champlain Basin. The hydric soils are usually found as wetlands which occupy a large portion of the Malletts Creek and Allen Brook valleys. Many of these valleys have not been impacted extensively and should be considered for conservation.

• Bridges and culverts were commonly undersized and often had large scour pools downstream of the outlet. The culvert beneath Coon Hill Road in Colchester is causing significant channel instability and is a high priority for replacement. In addition to the Phase 2 assessed structures, additional structures should be assessed throughout the Phase 1 assessment area to ensure no further erosion hazards could result from poorly sized culverts and bridges.

• Impacts to other tributary surface waters in Milton that were not included in this Phase 1 assessment were observed in the field. These tributaries, T3 (draining Beaverbrook residential area) and T5 (along Devino Road), should be considered for additional Phase 1 efforts to determine how watershed and reach-scale stressors have impacted their condition.
• The small tributary entering Malletts Creek from the north in Milton (T6) is unstable in two locations: 1) south of Main Street crossing where the channel was historically straightened and is severely incised (segment T6.01-C); 2) north of Main Street crossing where increased runoff from an upslope residential development is causing channel migration (Reach T6.02). Better stormwater management in the upslope area is highly recommended, and corridor conservation in the lower segment should also be considered.

• Near the Colchester-Milton town line, Allen Brook flows through a nearly pristine area of corridor where stability and habitat was observed in excellent conditions. This area represents a high priority conservation area for protecting intact wildlife habitat, including “reference” aquatic habitat.
8.0 REFERENCES


VCGI (Vermont Center for Geographic Information), 2003, Land Cover/Land Use Spatial Data for Vermont, Imagery dates: 1991 through 1993, Available at: www.vcgl.org

VCGI (Vermont Center for Geographic Information), 2009, 2ft Contours Derived from 2004 Bare Earth LiDAR. Available at: www.vcgl.org
VTANR (Vermont Agency of Natural Resources), 2005, Vermont Dam Inventory, Accessed June, 2008 at: www.vcgi.org


APPENDIX A

PHASE 1 REACH SUMMARY REPORTS
Malletts Creek

Reach is technically part of Lake Champlain, used to connect Malletts Creek and Allen (Pettys) Brook.

1.1 Reach Description:
1.2 Towns: Colchester
1.3 Downstream Latitude: 44.5749126156
1.3 Downstream Longitude: -73.1747553596

Step 2. Stream Type
2.1 Elevation Upstream: 98
2.1 Elevation Downstream: 98
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 560.0 ft. 0.11 Miles
2.3 Valley Width: 0.0
2.4 Channel Length: 645.7 ft. 0.12 Miles
2.5 Channel Slope: 0.02 %
2.6 Sinuosity: 1.15
2.7 Watershed Area: 29.1 Square Miles
2.8 Channel Width: 57.7 feet
2.9 Valley Width: 386.0 feet
2.10 Confinement Ratio: 6.7
2.10 Confinement Type: Broad
2.11 Reference Stream Type: E
   Bedform: Dune-Ripple
   Sub-Class Slope: None
   Bed Material: Sand

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 100.0 %
3.3 Sub-domin. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Flat
3.4 Valley Slope Right: Flat
3.5 Soils
   Hydrologic Group: C 100.0 %
   Flooding: Frequent 100.0 %
   Water Table Deep: 1.5 100.0 %
   Water Table Shallow: 0.0 100.0 %
   Erodibility: 0.0 %

7.4 Comments:
Reach is technically Lake Champlain and used to connect Malletts Creek and Allen Brook which both flow into the lake in the same area.

Phase 1 - Reach Summary Report
Reach ID: M01
SGAT Version: 4.56
Date Last Edited: August, 06 2010
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Wetland
   Current Dominant Land Cover: Forest 48.0 %
   Current Sub-Dominant Land Cover: Crop
4.2 Corridor
   Historic Land Cover: Wetland
   Current Dominant Land Cover: Forest 54.0 %
   Current Sub-Dominant Land Cover: Wetland

4.3 Riparian Buffer
   Left Rank: ft. ft.
   Right Rank: ft. ft.

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
5.2 Bridges and Culverts: 0 0.0 %
   Use: None
   Sub-dominant: None
   Length w/ less than 25 ft.: ft. ft.

5.4 Channel Straightening:
   Left: ft. ft.
   Right: ft. ft.

5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 0.0 ft. 0.0
6.2 Development:
   Road: ft. ft.
   Railroad: ft. ft.
   Berm: ft. ft.
   Improved Path: ft. ft.

6.3 Channel Bars: None
6.4 Meander Migration: None
6.5 Meander Width: N/A Ratio: 0.0
6.6 Wavelength: N/A Ratio: 0.0

Step 7. Windshield Survey
7.1 Bank Erosion:
   0 ft.
7.2 Bank Height:
   0 ft.
7.3 Ice/Debris Jam Potential: Not Evaluated

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Malletts Creek

Basin: Northern Champlain
Stream Name: Malletts Creek Main Stem
Topo Maps: COLCHESTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Mallets Bay

Step 1. Reach Location
Begins at the mouth of the creek with Lake Champlain in large wetland area and ends at confluence with Pond Brook.

Step 2. Stream Type
2.1 Elevation Upstream: 99
2.1 Elevation Downstream: 98
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 4,349.5 ft. 0.82 Miles
2.3 Valley Slope: 0.0
2.4 Channel Length: 4,779.8 ft. 0.91 Miles
2.5 Channel Slope: 0.02 %
2.6 Sinuosity: 1.10
2.7 Watershed Area: 23.6 Square Miles
2.8 Channel Width: 52.7 feet
2.9 Valley Width: 662.5 feet
2.10 Confinement Ratio: 12.6

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 96.0 %
3.3 Sub-dom. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Flat
3.4 Valley Slope Right: Flat
3.5 Soils
   Hydrologic Group: C 96.0 %
   Flooding?: Frequent 96.0 %
   Water Table Deep: 1.5 96.0 %
   Water Table Shallow: 0.0 100.0 %
   Erodibility: slight 3.0 %

7.4 Comments:
Water elevation in the lower portion of the reach is controlled by the lake level and a wetland complex. Area likely to be segmented out if Phase 2 assessments considered.

Phase 1 - Reach Summary Report
Reach ID: M02
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Wetland
   Current Dominant Land Cover: Forest 52.0 %
   Current Sub-Dominant Land Cover: Crop

4.2 Corridor
   Historic Land Cover: Wetland
   Current Dominant Land Cover: Wetland 55.0 %
   Current Sub-Dominant Land Cover: Forest

4.3 Riparian Buffer
   Left Bank: None
   Right Bank: None

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None

5.2 Bridges and Culverts:
   - 5.2.1: 0 0.0 %

5.3 Bank Armoring:
   - 5.3.1: 0.0 0.0 %

5.5 Dredging History:
   - 5.5.1: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 0.0 ft.

6.2 Development:
   - 6.2.1: 0.0 ft.

6.3 Channel Bars:
   - 6.3.1: Point

6.4 Meander Migration:
   - 6.4.1: None

6.5 Meander Width:
   - 6.5.1: 128 ft. Ratio: 2.4

6.6 Wavelength:
   - 6.6.1: 438 ft. Ratio: 8.3

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Debris

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Malletts Creek

Basin: Northern Champlain
Stream Name: Malletts Creek Main Stem
Topo Maps: COLCHESTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Malletts Bay

**Step 1. Reach Location**
From Pond Brook confluence to about 2,600 feet upstream of Route 7 crossing.

**Step 2. Stream Type**
1.3 Downstream Latitude: 44.5676347488
1.3 Downstream Longitude: -73.163429791

**Step 2. Stream Type**
2.1 Elevation Upstream: 106
2.1 Elevation Downstream: 99
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 4,064.5 ft. 0.77 Miles
2.3 Valley Slope: 0.2
2.4 Channel Length: 5,025.0 ft. 0.95 Miles
2.5 Channel Slope: 0.14 %
2.6 Sinuosity: 1.24
2.7 Watershed Area: 19.0 Square Miles
2.8 Channel Width: 47.9 feet
2.9 Valley Width: 1,296.5 feet
2.10 Confinement Ratio: 27.1

**Step 3. Basin Characteristics**
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 81.0 %
3.3 Sub-domin. Geological Mat.: Till
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Hilly
3.5 Soils
   Hydrologic Group: C 61.0 %
   Flooding: Frequent 61.0 %
   Water Table Deep: 1.5 61.0 %
   Water Table Shallow: 0.0 61.0 %
   Erodeability: slight 13.0 %

**Step 4. Land Cover - Reach Hydrology**
4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 53.0 %
   Current Sub-Dominant Land Cover: Crop
4.2 Corridor
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 42.0 %
   Current Sub-Dominant Land Cover: Wetland

4.3 Riparian Buffer
   Left Bank
   Right Bank
   Dominant: >100 26-50
   Sub-dominant: 51-100 >100
   Length w/ less than 25 ft.: 0.0 ft. 1,138.0 ft.

4.4 Ground Water Inputs: Abundant

**Step 5. Instream Channel Modifications**
5.1 Flow Regulation - (old): None
5.2 Bridges and Culverts: 1 0.8 %
5.3 Bank Armoring: 33.7 0.7 %
   Left: 0.0 ft. Right: 33.7 ft.
5.4 Channel Straightening: 501.5 10.0 %
5.5 Dredging History: None

**Step 6. Floodplain Modifications**
6.1 Berms & Roads - old: 0.0 ft. 0.0
   One Side   Both Sides
   Road: 0.0 ft. 0.0 ft.
   Railroad: 0.0 ft. 0.0 ft.
   Berm: 0.0 ft. 0.0 ft.
   Improved Path: 0.0 ft. 0.0 ft.

6.2 Development: 0.0 ft. 0.0 ft.

6.3 Channel Bars: Point
6.4 Meander Migration: Multiple
6.5 Meander Width: 135 ft. Ratio: 2.8
6.6 Wavelength: 296 ft. Ratio: 6.2

**Step 7. Windshield Survey**
7.1 Bank Erosion: 78.02 ft
7.2 Bank Height: 5 ft
7.3 Ice/Debris Jam Potential: Multiple

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Multiple debris jams and low bridge clearance makes debris/ice jam potential a minor impact. The corridor in downstream of Route 7 does not seem to be used as hay fields and preserved as wetlands, Upstream the same should be considered.
Malletts Creek

Basin: Northern Champlain
Stream Name: Malletts Creek Main Stem
Tropo Maps: COLCHESTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Mallets Bay

Step 1. Reach Location
From reach break at slope and confinement change to approximately 750 feet downstream of Middle Road crossing.

1.1 Reach Description:
1.2 Towns: Colchester
1.3 Downstream Latitude: 44.5691026121
1.3 Downstream Longitude: -73.1502948477

Step 2. Stream Type
2.1 Elevation Upstream: 178
2.1 Elevation Downstream: 106
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 2,561.5 ft. 0.49 Miles
2.3 Valley Slope: 2.8
2.4 Channel Length: 2,906.7 ft. 0.55 Miles
2.5 Channel Slope: 2.48 %
2.6 Sinuosity: 1.13
2.7 Watershed Area: 18.5 Square Miles
2.8 Channel Width: 47.3 feet
2.9 Valley Width: 111.5 feet
2.10 Confinement Ratio: 2.4
2.10 Confinement Type: Semi-confined
2.11 Reference Stream Type: B
   Bedform: Step-Pool
   Sub-Class Slope: None
   Bed Material: Cobble

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: Ledge
3.3 Dominant Geological Mat.: Glacial Lake 73.0 %
3.3 Sub-dom. Geological Mat.: Alluvial
3.4 Valley Slope Left: Very Steep
3.4 Valley Slope Right: Steep
3.5 Soils
   Hydrologic Group: Not Rated 49.0 %
   Flooding: None/Rare 80.0 %
   Water Table Deep: 1.5 19.0 %
   Water Table Shallow: 0.0 19.0 %
   Erodibility: slight 13.0 %
7.4 Comments:
Grade control suspected in lower reach where extreme elevation change noted on the LiDAR data.

Phase 1 - Reach Summary Report
Reach ID: M04
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Forest
   Current Dominant Land Cover: Forest 53.0 %
   Current Sub-Dominant Land Cover:
4.2 Corridor
   Historic Land Cover: Forest
   Current Dominant Land Cover: Forest 60.0 %
   Current Sub-Dominant Land Cover:

4.3 Riparian Buffer
   Left Bank
   Right Bank
   Dominant: >100 >100
   Sub-dominant: None None
   Length w / less than 25 ft.: 0.0 ft. 0.0 ft.

4.4 Ground Water Inputs: Minimal

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
   Type: None
   Use:
   5.2 Bridges and Culverts:
   5.3 Bank Armoring: 0.0 0.0 %
   Left: 0.0 ft. Right: 0.0 ft.
   5.4 Channel Straightening: 0.0 0.0 %
   5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old:
   One Side 0.0 ft.
   Both Sides 0.0 ft.
   Road: 0.0 ft. 0.0 ft.
   Railroad: 0.0 ft. 0.0 ft.
   Berm: 0.0 ft. 0.0 ft.
   Improved Path: 0.0 ft. 0.0 ft.
6.2 Development:
6.3 Channel Bars: Point
6.4 Meander Migration: None
6.5 Meander Width: N/A Ratio: 0.0
6.6 Wavelength: N/A Ratio: 0.0

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Not Evaluated

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Malletts Creek

Basin: Northern Champlain
Stream Name: Malletts Creek Main Stem
Techo Maps: COLCHESTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Mallets Bay

Step 1. Reach Location: From reach break downstream of Middle Rd to change in slope and confinement along Middle Rd.

1.1 Reach Description:
1.2 Towns: Colchester
1.3 Downstream Latitude: 44.5698696744
1.3 Downstream Longitude: 73.1437453687

Step 2. Stream Type:
2.1 Elevation Upstream: 184
2.1 Elevation Downstream: 178
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 2,946.5 ft. 0.56 Miles
2.3 Valley Slope: 0.2
2.4 Channel Length: 3,588.6 ft. 0.68 Miles
2.5 Channel Slope: 0.17%
2.6 Sinuosity: 1.22
2.7 Watershed Area: 17.3 Square Miles
2.8 Channel Width: 46.0 feet
2.9 Valley Width: 314.5 feet
2.10 Confinement Ratio: 6.8
2.10 Confinement Type: Broad
2.11 Reference Stream Type: C
   Bedform: Dune-Ripple
   Sub-Class Slope: None
   Bed Material: Sand

Step 3. Basin Characteristics:
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 69.0%
3.3 Sub-dom. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Steep
3.5 Soils
   Hydrologic Group: C 40.0%
   Flooding: Frequent 40.0%
   Water Table Deep: 1.5 40.0%
   Water Table Shallow: 0.0 45.0%
   Erodibility: slight 10.0%

7.4 Comments:
Reach has had historical channel straightening and has a long ditch dug at the west valley toe.

Phase 1 - Reach Summary Report
Reach ID: M05
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 55.0%
   Current Sub-Dominant Land Cover: Crop
4.2 Corridor
   Historic Land Cover:
      Current Dominant Land Cover: Crop 30.0%
      Current Sub-Dominant Land Cover: Forest
4.3 Riparian Buffer
   Left Bank
      Dominant: >100
      Sub-dominant: 26-50
      Length w/ less than 25 ft.: 0.0 ft. 831.0 ft.
   Right Bank
4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
5.2 Bridges and Culverts: 1 0.9%
5.3 Bank Armoring: 55.0 1.5%
   Left: 40.5 ft. Right: 14.6 ft.
5.4 Channel Straightening: 564.9 15.7%
5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old:
   One Side: 0.0 ft. 0.0 ft.
   Both Sides: 0.0 ft. 0.0 ft.
   Road: 0.0 ft. 0.0 ft.
   Railroad: 0.0 ft. 0.0 ft.
   Berm: 0.0 ft. 0.0 ft.
   Improved Path: 0.0 ft. 0.0 ft.
6.2 Development: 0.0 ft. 0.0 ft.
6.3 Channel Bars:
6.4 Meander Migration: Multiple
6.5 Meander Width: 119 ft. Ratio: 2.6
6.6 Wavelength: 262 ft. Ratio: 5.7

Step 7. Windshield Survey
7.1 Bank Erosion: 71.29 ft
7.2 Bank Height: 5 ft
7.3 Ice/Debris Jam Potential: Culvert

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Malletts Creek

Basin: Northern Champlain
Stream Name: Malletts Creek Main Stem
Topo Maps: COLCHESTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Malletts Bay

Step 1. Reach Location
Short reach in confined section.

1.1 Reach Description:
1.2 Towns: Colchester
1.3 Downstream Latitude: 44.5719656065
1.3 Downstream Longitude: -73.1390803704

Step 2. Stream Type
2.1 Elevation Upstream: 214
2.1 Elevation Downstream: 184
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 1,010.5 ft. 0.19 Miles
2.3 Valley Slope: 3.0
2.4 Channel Length: 1,048.9 ft. 0.20 Miles
2.5 Channel Slope: 2.86 %
2.6 Sinuosity: 1.04
2.7 Watershed Area: 17.0 Square Miles
2.8 Channel Width: 45.5 feet
2.9 Valley Width: 109.5 feet
2.10 Confinement Ratio: 2.4
2.10 Confinement Type: Semi-confined

2.11 Reference Stream Type: B
Bedform: Riffle-Pool
Sub-Class Slope: None
Bed Material: Cobble

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Till 54.0 %
3.3 Sub-dom. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Very Steep
3.4 Valley Slope Right: Ext. Steep
3.5 Soils
Hydrologic Group: D 54.0 %
Flooding: None/Rare 99.0 %
Water Table Deep: 6.0 54.0 %
Water Table Shallow: 6.0 54.0 %
Erodibility: Severe 54.0 %

7.4 Comments:
Short reach with coarser substrate and steeper slope.

Phase 1 - Reach Summary Report
Reach ID: M06
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
Historic Land Cover: Forest
Current Dominant Land Cover: Forest 54.0 %
Current Sub-Dominant Land Cover: Crop

4.2 Corridor
Historic Land Cover: Forest
Current Dominant Land Cover: Forest 65.0 %
Current Sub-Dominant Land Cover: Crop

4.3 Riparian Buffer
Left Bank
Dominant: >100
Sub-dominant: 0-25
Length w/ less than 25 ft.: 84.0 ft. 56.0 ft.
Right Bank
Dominant: >100
Sub-dominant: 0-25

4.4 Ground Water Inputs: None

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old):
Type: None
Use:
5.2 Bridges and Culverts: 0 0.0 %
5.3 Bank Armoring: 0.0 0.0 %
Left: 0.0 ft. Right: 0.0 ft.

5.4 Channel Straightening: 0.0 0.0 %
5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old:
One Side: 0.0 ft. 0.0 ft.
Both Sides:
Road: 0.0 ft. 0.0 ft.
Railroad: 0.0 ft. 0.0 ft.
Berm: 0.0 ft. 0.0 ft.
Improved Path: 0.0 ft. 0.0 ft.

6.2 Development: None
6.3 Channel Bars: None
6.4 Meander Migration: None
6.5 Meander Width: N/A Ratio: 0.0
6.6 Wavelength: N/A Ratio: 0.0

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Not Evaluated

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</table>
Malletts Creek

Reach ID: M07

SGAT Version: 4.56

Date Last Edited: February, 10 2011

QA Status: Themes have been checked

Is Reach An Impoundment?: No

Phase 1 - Reach Summary Report

Step 1. Reach Location
From reach break at confinement change to large meander south of Austin House Road.

1.2 Towns: Colchester

1.3 Downstream Latitude: 44.5749090676

1.3 Downstream Longitude: -73.1391030932

Step 2. Stream Type

2.1 Elevation Upstream: 224

2.1 Elevation Downstream: 214

2.1 Is Gradient Gentle?: No

2.2 Valley Length: 1,940.0 ft. 0.37 Miles

2.3 Valley Slope: 0.5

2.4 Channel Length: 3,080.4 ft. 0.58 Miles

2.5 Channel Slope: 0.32 %

2.6 Sinuosity: 1.59

2.7 Watershed Area: 16.9 Square Miles

2.8 Channel Width: 45.5 feet

2.9 Valley Width: 364.0 feet

2.10 Confinement Ratio: 8.0

2.11 Confinement Type: Broad

2.11 Reference Stream Type: C

Bedform: Dune-Ripple

Sub-Class Slope: None

Bed Material: Sand

Step 3. Basin Characteristics

3.1 Alluvial Fan: None

3.2 Grade Control: None

3.3 Dominant Geological Mater.: Alluvial 76.0 %

3.3 Sub-dom. Geological Mater.: Till

3.4 Valley Slope Left: Very Steep

3.4 Valley Slope Right: Steep

3.5 Soils

Hydrologic Group: B 65.0 %

Flooding: Occasional 65.0 %

Water Table Deep: 3.0 65.0 %

Water Table Shallow: 1.5 65.0 %

Erodibility: slight 17.0 %

7.4 Comments:
Reach has had large amounts of straightening and lower buffer width. Great opportunities for restoration on this reach.

4.1 Watershed

Historic Land Cover: Field

Current Dominant Land Cover: Forest 54.0 %

Current Sub-Dominant Land Cover: Crop

4.2 Corridor

Historic Land Cover: Field

Current Dominant Land Cover: Crop 26.0 %

Current Sub-Dominant Land Cover: Forest

4.3 Riparian Buffer

Left Bank: 100

Right Bank: 0

Dominant:

>100 0-25

Sub-dominant:

0-25 >100

Length w / less than 25 ft.: 1,056.0 ft. 2,640.0 ft.

4.4 Ground Water Inputs:

Minimal

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

None

Type:

None

Use:

5.2 Bridges and Culverts:

0

5.3 Bank Armoring:

0

Left:

0.0 ft.

Right:

0.0 ft.

5.4 Channel Straightening:

1334.8

43.3 %

5.5 Dredging History:

None

Step 6. Floodplain Modifications

6.1 Berms & Roads - old:

0.0 ft.

One Side

Both Sides

Road:

0.0 ft.

0.0 ft.

Railroad:

0.0 ft.

0.0 ft.

Berm:

0.0 ft.

0.0 ft.

Improved Path:

0.0 ft.

0.0 ft.

6.2 Development:

0.0 ft.

0.0 ft.

6.3 Channel Bars:

Point

6.4 Meander Migration:

Multiple

6.5 Meander Width:

96 ft. Ratio: 2.1

6.6 Wavelength:

188 ft. Ratio: 4.1

Step 7. Windshield Survey

7.1 Bank Erosion:

0 ft

7.2 Bank Height:

No Data ft

7.3 Ice/Debris Jam Potential: Bend
Malletts Creek

1.1 Reach Description:
1.2 Towns: Colchester
1.3 Downstream Latitude: 44.5787314926
1.3 Downstream Longitude: -73.1353776712

Step 2. Stream Type
2.1 Elevation Upstream: 244
2.1 Elevation Downstream: 224
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 1,713.0 ft. 0.32 Miles
2.3 Valley Slope: 1.2
2.4 Channel Length: 2,147.9 ft. 0.41 Miles
2.5 Channel Slope: 0.93 %
2.6 Sinuosity: 1.25
2.7 Watershed Area: 16.8 Square Miles
2.8 Channel Width: 45.3 feet
2.9 Valley Width: 192.0 feet
2.10 Confinement Ratio: Narrow 4.2

Phase 1 - Reach Summary Report
Reach ID: M08
SGAT Version: 4.56
Date Last Edited: August, 05 2010
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Till 57.0 %
3.3 Sub-dom. Geological Mat.: Alluvial
3.4 Valley Slope Left: Very Steep
3.4 Valley Slope Right: Steep
3.5 Soils
   Hydrologic Group: C 79.0 %
   Flooding: None/Rare 75.0 %
   Water Table Deep: 2.5 54.0 %
   Water Table Shallow: 1.5 54.0 %
   Erodibility: Severe 57.0 %

3.6 Comments:
Coarser substrate and higher slope noted using the high resolution aerial photographs.

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 55.0 %
   Current Sub-Dominant Land Cover: Crop

4.2 Corridor
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 31.0 %
   Current Sub-Dominant Land Cover: Crop

4.3 Riparian Buffer
   Left Bank: >100
   Right Bank: >100
   Dominant: 51-100
   Sub-dominant: 51-100
   Length w/ less than 25 ft.: ft. ft.

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
   Type:
   Use:
   5.2 Bridges and Culverts: 0 0.0 %
   5.3 Bank Armoring: 0.0 0.0 %
   5.4 Channel Straightening: 0.6 %
   5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 0.0 ft. 3.0 ft.
   Road: ft.
   Railroad: ft.
   Berm: ft.
   Improved Path: ft.

6.2 Development:
6.3 Channel Bars: Point
6.4 Meander Migration: None
6.5 Meander Width: 113 ft. Ratio: 2.5
6.6 Wavelength: 361 ft. Ratio: 8.0

Step 7. Windshield Survey
7.1 Bank Erosion: 0
7.2 Bank Height: 0
7.3 Ice/Debris Jam Potential: Not Evaluated

<table>
<thead>
<tr>
<th>4.1</th>
<th>4.2</th>
<th>4.3</th>
<th>5.1</th>
<th>5.2</th>
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</table>
Malletts Creek

Basin: Northern Champlain
Stream Name: Malletts Creek Main Stem
Topo Maps: COLCHESTER, ESSEX CENTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Mallets Bay

Step 1. Reach Location
Long reach in unconfined setting. Extends from downstream of East Road to confluence with T3.01, Beaver Brook.

1.1 Reach Description:
1.2 Towns: Colchester, Milton
1.3 Downstream Latitude: 44.578777745
1.3 Downstream Longitude: -73.129421138

Step 2. Stream Type
2.1 Elevation Upstream: 262
2.1 Elevation Downstream: 244
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 6,422.5 ft. 1.22 Miles
2.3 Valley Slope: 0.3
2.4 Channel Length: 9,573.7 ft. 1.81 Miles
2.5 Channel Slope: 0.19 %
2.6 Sinuosity: 1.49
2.7 Watershed Area: 16.5 Square Miles
2.8 Channel Width: 45.0 feet
2.9 Valley Width: 313.5 feet
2.10 Confinement Ratio: 7.0
2.10 Confinement Type: Broad
2.11 Reference Stream Type: E
   Bedform: Dune-Ripple
   Sub-Class Slope: None
   Bed Material: Sand

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 77.0 %
3.3 Sub-dom. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Very Steep
3.5 Soils
   Hydrologic Group: C 45.0 %
   Flooding: Frequent 41.0 %
   Water Table Deep: 1.5 41.0 %
   Water Table Shallow: 0.0 47.0 %
   Erodibility: slight 10.0 %

7.4 Comments:
Long reach has considerable beaver activity given the low slope and wide valley setting. Downstream of the East Rd crossing a large pool exists due to culvert alignment issues. Upstream of the crossing buffer width issues could be resolved.

Phase 1 - Reach Summary Report
Reach ID: M09
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 56.0 %
   Current Sub-Dominant Land Cover:
   Current Dominant Land Cover: Crop
   Current Sub-Dominant Land Cover:
4.2 Corridor
   Historic Land Cover:
   Current Dominant Land Cover: Forest 25.0 %
   Current Sub-Dominant Land Cover:
4.3 Riparian Buffer
   Left Bank: 51-100
   Right Bank: 51-100
   Dominant:
   Sub-dominant:
   Length w/ less than 25 ft.:
4.4 Ground Water Inputs: Abundant
   854.0 ft. 104.0 ft.
   Type:
   Use:
   5.2 Bridges and Culverts:
   2 0.7 %
   5.3 Bank Armoring:
   73.3 0.8 %
   Left: 0.0 ft. Right: 73.3 ft.
   5.4 Channel Straightening:
   0.0 0.0 %
   5.5 Dredging History:
   None
Step 5. Instream Channel Modifications
6.1 Berms & Roads - old:
   1,837.0 ft. 19.2
   One Side
   Both Sides
   Road:
   1,837.0 ft. 0.0 ft.
   Railroac:
   0.0 ft. 0.0 ft.
   Berm:
   0.0 ft. 0.0 ft.
   Improved Path:
   0.0 ft. 0.0 ft.
   6.2 Development:
   1,073.1 ft. 0.0 ft.
   6.3 Channel Bars:
   Point
   6.4 Meander Migration:
   Neck Cutoff
   6.5 Meander Width:
   146 ft. Rato: 3.2
   6.6 Wavelength:
   197 ft. Ratio: 4.4
Step 7. Windshield Survey
7.1 Bank Erosion:
   No Data
   ft
   ft
   7.2 Bank Height:
7.3 Ice/Debris Jam Potential: Multiple

| 4.1 | 4.2 | 4.3 | 5.1 | 5.2 | 5.3 | 5.4 | 5.5 | 6.1 | 6.2 | 6.3 | 6.4 | 6.5 | 6.6 | 7.1 | 7.3 | Total |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 2   | 2   | 1   | 0   | 0   | 0   | 0   | 0   | 1   | 1   | 0   | 1   | 1   | 2   | 0   | 1   |     |      |
| High| High| Low | N.S.| N.S.| N.S.| N.S.| N.S.| Low | Low | N.S.| Low | Low | High | N.S.| Low |     |      |

Total: 12
**Malletts Creek**

**Phase 1 - Reach Summary Report**

**Reach ID:** M10  
**SGAT Version:** 4.56  
**Date Last Edited:** February, 10 2011  
**QA Status:** Themes have been checked

Is Reach An Impoundment? No

**Step 1. Reach Location**

From confluence with T3 to reach break just upstream of railroad crossing at the confluence with T4.

**1.1 Reach Description:**

1.2 Towns: Milton  
1.3 Downstream Latitude: 44.592507909  
1.3 Downstream Longitude: -73.1196162772

**Step 2. Stream Type**

2.1 Elevation Upstream: 264  
2.1 Elevation Downstream: 262  
2.1 Is Gradient Gentle?: No  
2.2 Valley Length: 1,661.5 ft. 0.31 Miles  
2.3 Valley Slope: 0.1  
2.4 Channel Length: 2,326.4 ft. 0.44 Miles  
2.5 Channel Slope: 0.09 %  
2.6 Sinuosity: 1.40  
2.7 Watershed Area: 12.9 Square Miles  
2.8 Channel Width: 40.3 feet  
2.9 Valley Width: 374.5 feet  
2.10 Confinement Ratio: 9.3  
2.10 Confinement Type: Broad  
2.11 Reference Stream Type: E  
Bedform: Dune-Ripple  
Sub-Class Slope: None  
Bed Material: Sand

**Step 3. Basin Characteristics**

3.1 Alluvial Fan: None  
3.2 Grade Control: None  
3.3 Dominant Geological Mat.: Alluvial 59.0 %  
3.3 Sub-dom. Geological Mat.: Till  
3.4 Valley Slope Left: Flat  
3.4 Valley Slope Right: Steep  
3.5 Soils  
Hydrologic Group: C 59.0 %  
Flooding: Frequent 59.0 %  
Water Table Deep: 1.5 59.0 %  
Water Table Shallow: 0.0 75.0 %  
Erodibility: Moderate 29.0 %

7.4 Comments:

Channel has extensive encroachments/straightening from the adjacent railroad. Buffer width issues are also present and conservation of the right floodplain should be considered.

<table>
<thead>
<tr>
<th>Step 4. Land Cover - Reach Hydrology</th>
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<tbody>
<tr>
<td><strong>4.1 Watershed</strong></td>
</tr>
<tr>
<td>Historic Land Cover: Wetland</td>
</tr>
<tr>
<td>Current Dominant Land Cover: Forest 64.0 %</td>
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<tr>
<td>Current Sub-Dominant Land Cover: Crop</td>
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<tr>
<td><strong>4.2 Corridor</strong></td>
</tr>
<tr>
<td>Historic Land Cover: Field</td>
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<tr>
<td>Current Dominant Land Cover: Crop 35.0 %</td>
</tr>
<tr>
<td>Current Sub-Dominant Land Cover: Wetland</td>
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</tbody>
</table>

4.3 Riparian Buffer  
Left Bank Right Bank  
Dominant: 0-25 51-100  
Sub-dominant: 51-100 >100  
Length w / less than 25 ft.: 605.0 ft. 335.0 ft.

4.4 Ground Water Inputs: Abundant

**Step 5. Instream Channel Modifications**

5.1 Flow Regulation - (old): None  
Type: None  
Use:  
5.2 Bridges and Culverts: 1 0.6 %  
5.3 Bank Armoring: 0.0 0.0 %  
Left: 0.0 ft. Right: 0.0 ft.  
5.4 Channel Straightening: 1,021.9 43.9 %  
5.5 Dredging History: None

**Step 6. Floodplain Modifications**

6.1 Berms & Roads - old: 1,901.5 ft. 81.7  
One Side Both Sides  
Road: 0.0 ft. 0.0 ft.  
Railroad: 1,901.5 ft. 0.0 ft.  
Berm: 0.0 ft. 0.0 ft.  
Improved Path: 0.0 ft. 0.0 ft.  
6.2 Development: 0.0 ft. 0.0 ft.  
6.3 Channel Bars:  
Point  
8.4 Meander Migration: Neck Cutoff  
6.5 Meander Width: 83.0 ft. 2.1  
6.6 Wavelength: 178.0 ft. 4.4

**Step 7. Windshield Survey**

7.1 Bank Erosion: 0 ft  
7.2 Bank Height: No Data ft  
7.3 Ice/Debris Jam Potential: Bridge

<table>
<thead>
<tr>
<th>4.1</th>
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Phase 1 - Reach Summary Report

Reach ID: M11
SGAT Version: 4.56
Date Last Edited: February. 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 1. Reach Location: From confluence with T4 up to change in floodplain encroachments west of East Rd.

1.1 Reach Description:
1.2 Towns: Milton
1.3 Downstream Latitude: 44.5959254005
1.3 Downstream Longitude: -73.1165293

Step 2. Stream Type:
2.1 Elevation Upstream: 273
2.1 Elevation Downstream: 264
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 3,091.5 ft. 0.59 Miles
2.3 Valley Slope: 0.3
2.4 Channel Length: 5,685.5 ft. 1.08 Miles
2.5 Channel Slope: 0.16 %
2.6 Sinuosity: 1.84
2.7 Watershed Area: 7.0 Square Miles
2.8 Channel Width: 30.9 feet
2.9 Valley Width: 889.5 feet
2.10 Confinement Ratio: 28.8
2.11 Confinement Type: Very Broad
2.12 Reference Stream Type: E
2.13 Bedform: Dune-Ripple
2.14 Sub-Class Slope: None
2.15 Bed Material: Sand

Step 3. Basin Characteristics:
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 85.0 %
3.3 Sub-domin. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Flat
3.4 Valley Slope Right: Flat
3.5 Soils
   Hydrologic Group: B 64.0 %
   Flooding: Occasional 64.0 %
   Water Table Deep: 3.0 64.0 %
   Water Table Shallow: 1.5 67.0 %
   Erodibility: slight 7.0 %

7.4 Comments:
Valley is very wide in large wetland complex. The road and the railroad are outside of the corridor on the left and right sides, respectively. The railroad has likely cut off connectivity to an even larger wetland complex to the west.

Step 4. Land Cover - Reach Hydrology:
4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 60.0 %
   Current Sub-Dominant Land Cover: Crop
4.2 Corridor
   Historic Land Cover:
   Current Dominant Land Cover: Forest 46.0 %
   Current Sub-Dominant Land Cover: Wetland
4.3 Riparian Buffer
   Left Bank: >100
   Right Bank: >100
   Length w/ less than 25 ft.: 1,141.0 ft. 0.0 ft.
4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications:
5.1 Flow Regulation - (old): None
   Type: None
   Use:
   5.2 Bridges and Culverts:
      Length: 0.0 ft. Right: 0.0 ft.
   5.3 Bank Armoring: 0.0 ft.
   5.4 Channel Straightening: 0.0
   5.5 Dredging History: None

Step 6. Floodplain Modifications:
6.1 Berms & Roads - old: 928.9 ft. 16.3
   Road: 928.9 ft. 0.0 ft.
   Railroad: 0.0 ft. 0.0 ft.
   Berm: 0.0 ft. 0.0 ft.
   Improved Path: 0.0 ft. 0.0 ft.
6.2 Development:
   Multiple
   6.3 Channel Bars:
   6.4 Meander Migration: Flood Chute
   6.5 Meander Width: 109 ft. Ratio: 3.5
   6.6 Wavelength: 148 ft. Ratio: 4.8

Step 7. Windshield Survey:
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Not Evaluated

<table>
<thead>
<tr>
<th>4.1</th>
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</table>
Malletts Creek

**Basin:** Northern Champlain
**Stream Name:** Malletts Creek Main Stem
**Topo Maps:** ESSEX CENTER
**Watershed:** Lewis Creek, Little Otter, Lake Champlain
**Sub-watershed:** Malletts Bay

**Step 1: Reach Location**
From the reach break west of East Road to about 1,600 feet upstream of the McMullen Culvert crossing.

**1.1 Reach Description:**

**1.2 Towns:** Milton
**1.3 Downstream Latitude:** 44.6025583309
**1.3 Downstream Longitude:** -73.1100810792

**Step 2: Stream Type**

**2.1 Elevation Upstream:** 282
**2.1 Elevation Downstream:** 273
**2.1 Is Gradient Gentle?** No
**2.2 Valley Length:** 3,626.0 ft. 0.69 Miles
**2.3 Valley Slope:** 0.2
**2.4 Channel Length:** 5,447.2 ft. 1.03 Miles
**2.5 Channel Slope:** 0.17%
**2.6 Sinuosity:** 1.50
**2.7 Watershed Area:** 6.9 Square Miles
**2.8 Channel Width:** 30.7 feet
**2.9 Valley Width:** 600.0 feet
**2.10 Confinement Ratio:** 19.6

**2.11 Reference Stream Type:** E
**Bedform:** Dune-Ripple
**Sub-Class Slope:** None
**Bed Material:** Sand

**Step 3: Basin Characteristics**

**3.1 Alluvial Fan:** None
**3.2 Grade Control:** None
**3.3 Dominant Geological Mat.:** Alluvial 53.0%
**3.3 Sub-domin. Geological Mat.:** Glacial Lake
**3.4 Valley Slope Left:** Hilly
**3.4 Valley Slope Right:** Hilly
**3.5 Soils**

| Hydrologic Group | Occasional | Western Table Deep | 3.0 | 65.0 %
|------------------|-------------|-------------------|-----|-------------------|
| Water Table Shallow | 1.5 | 69.0 %

**3.6 Comments:**
Culvert has beaver activity immediately upstream and significant debris which may be problematic during high flows or during ice flows. Channel has good meandering profile with only some buffer issues.

**Phase 1 - Reach Summary Report**

**Reach ID:** M12
**SGAT Version:** 4.56
**Date Last Edited:** February, 10 2011
**QA Status:** Themes have been checked
**Is Reach An Impoundment?** No

**Step 4: Land Cover - Reach Hydrology**

**4.1 Watershed**
**Historic Land Cover:** Field
**Current Dominant Land Cover:** Forest 60.0%
**Current Sub-Dominant Land Cover:** Crop

**4.2 Corridor**
**Historic Land Cover:** Field
**Current Dominant Land Cover:** Forest 23.0%
**Current Sub-Dominant Land Cover:** Crop

**4.3 Riparian Buffer**
**Dominant:** >100 >100
**Sub-dominant:** 0-25 0-25
**Length w / less than 25 ft:** 1,226.0 ft. 319.0 ft.

**4.4 Ground Water Inputs:** Abundant

**Step 5: Instream Channel Modifications**

**5.1 Flow Regulation - (old):** None

**Type:** None
**Use:**
**5.2 Bridges and Culverts:** 2 1.3%
**5.3 Bank Armoring:** 0.0 0.0%
**Left:** 0.0 ft. Right: 0.0 ft.
**5.4 Channel Straightening:** 0.0 0.0%

**5.5 Dredging History:** None

**Step 6: Floodplain Modifications**

**6.1 Berms & Roads - old:** 386.0 ft. 7.1

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<tr>
<th>One Side</th>
<th>Both Sides</th>
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<tbody>
<tr>
<td>Road:</td>
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<tr>
<td>Railroad:</td>
<td>0.0 ft.</td>
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<tr>
<td>Berm:</td>
<td>0.0 ft.</td>
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<td>Improved Path:</td>
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</table>

**6.2 Development:** 0.0 ft. 0.0 ft.

**6.3 Channel Bars:** Multiple

**6.4 Meander Migration:** Multiple

**6.5 Meander Width:** 88 ft. Ratio: 2.9

**6.6 Wavelength:** 180 ft. Ratio: 5.9

**Step 7: Windshield Survey**

**7.1 Bank Erosion:** 0 ft
**7.2 Bank Height:** No Data ft

**7.3 Ice/Debris Jam Potential:** Multiple

<table>
<thead>
<tr>
<th>4.1</th>
<th>4.2</th>
<th>4.3</th>
<th>5.1</th>
<th>5.2</th>
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Malletts Creek

Basin: Northern Champlain
Stream Name: Malletts Creek Main Stem
Topo Maps: ESSEX CENTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Mallets Bay

Step 1. Reach Location
From just upstream of M12 subtributary to area where valley widens considerably.

1.1 Reach Description:
1.2 Towns: Milton
1.3 Downstream Latitude: 44.6111236005
1.3 Downstream Longitude: -73.1047564

Step 2. Stream Type
2.1 Elevation Upstream: 293
2.1 Elevation Downstream: 282
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 2,261.0 ft. 0.43 Miles
2.3 Valley Slope: 0.5
2.4 Channel Length: 3,928.9 ft. 0.74 Miles
2.5 Channel Slope: 0.28 %
2.6 Sinuosity: 1.74
2.7 Watershed Area: 6.2 Square Miles
2.8 Channel Width: 29.2 feet
2.9 Valley Width: 339.0 feet
2.10 Confinement Ratio: 11.6
2.10 Confinement Type: Very Broad
2.11 Reference Stream Type: E
Bedform: Dune-Ripple
Sub-Class Slope: None
Bed Material: Sand

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 85.0 %
3.3 Sub-domin. Geological Mat.: Ice-Contact
3.4 Valley Slope Left: Very Steep
3.4 Valley Slope Right: Ext. Steep
3.5 Soils
Hydrologic Group: C 85.0 %
Flooding: Frequent 85.0 %
Water Table Deep: 1.5 85.0 %
Water Table Shallow: 0.0 85.0 %
Erodibility: slight 12.0 %

7.4 Comments:
The primary channel is accompanied by many smaller channels that weave through a well-vegetated wetland area.

Phase 1 - Reach Summary Report
Reach ID: M13
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
Historic Land Cover: Field
Current Dominant Land Cover: Forest 61.0 %
Current Sub-Dominant Land Cover: Crop
4.2 Corridor
Historic Land Cover: Wetland 40.0 %
Current Dominant Land Cover: Forest
Current Sub-Dominant Land Cover: Field

4.3 Riparian Buffer
Left Bank Right Bank
Dominant: >100 >100
Sub-dominant: 51-100 51-100
Length w / less than 25 ft.: 0.0 ft. 0.0 ft.

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
Type: None
Use:
5.2 Bridges and Culverts: 0 0.0 %
5.3 Bank Armoring: 0.0 0.0 %
Left: 0.0 ft. Right: 0.0 ft.
5.4 Channel Straightening: 0.0 0.0 %
5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 0.0 ft. 0.0
One Side Both Sides
Road: 0.0 ft. 0.0 ft.
Railroad: 0.0 ft. 0.0 ft.
Berm: 0.0 ft. 0.0 ft.
Improved Path: 0.0 ft. 0.0 ft.
6.2 Development: 0.0 ft. 0.0 ft.
6.3 Channel Bars: Point
6.4 Meander Migration: Multiple
6.5 Meander Width: 81 ft. Ratio: 2.8
6.6 Wave Length: 138 ft. Ratio: 4.7

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Not Evaluated

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High Low N.S. N.S. N.S. N.S. N.S. N.S. N.S. N.S. High High N.S. N.S.
Malletts Creek

Phase 1 - Reach Summary Report

Reach ID: M14
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 1. Reach Location
Area of very broad valley up to confluence with T5.02, Hardscrabble Brook.

1.1 Reach Description:
1.2 Towns: Milton
1.3 Downstream Latitude: 44.6172545005
1.3 Downstream Longitude: -73.1054298

Step 2. Stream Type
2.1 Elevation Upstream: 302
2.1 Elevation Downstream: 293
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 1,893.0 ft. 0.36 Miles
2.3 Valley Slope: 0.4
2.4 Channel Length: 2,779.4 ft. 0.53 Miles
2.5 Channel Slope: 0.31 %
2.6 Sinuosity: 1.47
2.7 Watershed Area: 5.8 Square Miles
2.8 Channel Width: 28.3 feet
2.9 Valley Width: 783.0 feet
2.10 Confinement Ratio: 27.6
2.10 Confinement Type: Very Broad
2.11 Reference Stream Type: E
Bedform: Dune-Ripple
Sub-Class Slope: None
Bed Material: Sand

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 99.0 %
3.3 Sub-dom. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Very Steep
3.5 Soils
Hydrologic Group: C 75.0 %
Flooding: Frequent 75.0 %
Water Table Depth: 1.5 75.0 %
Water Table Shallow: 0.0 75.0 %
Erodibility: 0.0 %

7.4 Comments:
The channel has had some evidence of straightening in the upper reach, a large wetland area with a broad valley exists mid-reach.

Reach M14 was segmented into 2 segments M14-A (261ft) and M14-B (2,518ft). Segmentation was done in order to distinguish the large portion of the reach (Segment B) that was impacted by beaver activity and impounded. Segment M14-A was in good condition and had morphology

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Step 4. Land Cover - Reach Hydrology
4.1 Watershed
Historic Land Cover: Field
Current Dominant Land Cover: Forest 62.0 %
Current Sub-Dominant Land Cover: Crop

4.2 Corridor
Historic Land Cover: Field
Current Dominant Land Cover: Crop 47.0 %
Current Sub-Dominant Land Cover: Wetland

4.3 Riparian Buffer
Left Bank: >100
Right Bank: >100
Length w / less than 25 ft.: 0.0 ft.

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
Type: None
Use:
5.2 Bridges and Culverts: 0
5.3 Bank Armoring: 0
Left: 0.0 ft.
Right: 0.0 ft.

5.4 Channel Straightening: 407.6

5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old:
One Side: 0.0 ft.
Both Sides: 0.0 ft.

6.2 Development:
6.3 Channel Bars:
Point
6.4 Meander Migration:
Multiple
6.5 Meander Width: 49 ft.
Ratio: 1.7
6.6 Wavelength: 110 ft.
Ratio: 3.9

Step 7. Windshield Survey
7.1 Bank Erosion:
7.2 Bank Height:
No Data
7.3 Ice/Debris Jam Potential: Debris

4.1 4.2 4.3 5.1 5.2 5.3 5.4 5.5 6.1 6.2 6.3 6.4 6.5 6.6 7.1 7.3 Total
High High N.S. N.S. N.S. N.S. Low N.S. N.S. N.S. N.S. N.S. Low High High N.S. N.S. 10
Malletts Creek

Reach begins at confluence with T5 and extends to approximately 1,000 feet upstream of Kingsbury Road Crossing.

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<th>Step 1. Reach Orientation</th>
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<td>1. Reach Description:</td>
<td>Reach begins at confluence with T5 and extends to approximately 1,000 feet upstream of Kingsbury Road Crossing.</td>
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<tr>
<td>1.2 Towns:</td>
<td>Milton</td>
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<tr>
<td>1.3 Downstream Latitude:</td>
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<tr>
<td>1.3 Downstream Longitude:</td>
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<tr>
<th>Step 2. Stream Type</th>
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<tbody>
<tr>
<td>2.1 Elevation Upstream:</td>
<td>309</td>
</tr>
<tr>
<td>2.1 Elevation Downstream:</td>
<td>302</td>
</tr>
<tr>
<td>2.1 Is Gradient Gentle?:</td>
<td>No</td>
</tr>
<tr>
<td>2.2 Valley Length:</td>
<td>1,910.5 ft.</td>
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<tr>
<td>2.3 Valley Slope:</td>
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<td>2.4 Channel Length:</td>
<td>2,157.7 ft.</td>
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<td>2.5 Channel Slope:</td>
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<td>2.6 Sinuosity:</td>
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<td>2.7 Watershed Area:</td>
<td>4.0 Square Miles</td>
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<td>2.8 Channel Width:</td>
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<td>2.9 Valley Width:</td>
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<td>2.10 Confinement Ratio:</td>
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<tr>
<th>Step 3. Basin Characteristics</th>
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<tbody>
<tr>
<td>3.1 Alluvial Fan:</td>
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<tr>
<td>3.2 Grade Control:</td>
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<tr>
<td>3.3 Dominant Geological Mat.:</td>
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<td>3.3 Sub-geom. Geological Mat.:</td>
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<td>3.4 Valley Slope Left:</td>
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<td>3.4 Valley Slope Right:</td>
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<th>Step 4. Land Cover - Reach Hydrology</th>
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<td>4.1 Watershed</td>
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<td>Historic Land Cover:</td>
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<td>Current Dominant Land Cover:</td>
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<td>Current Sub-Dominant Land Cover:</td>
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<td>4.2 Corridor</td>
<td>Field</td>
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<td>Historic Land Cover:</td>
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<td>Current Sub-Dominant Land Cover:</td>
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<th>Step 5. Instream Channel Modifications</th>
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<td>5.1 Flow Regulation - (old):</td>
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<td>Type:</td>
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<td>5.2 Bridges and Culverts:</td>
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<td>5.3 Bank Armoring:</td>
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<td>Left:</td>
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<td>5.4 Channel Straightening:</td>
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<td>5.5 Dredging History:</td>
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<th>Step 6. Floodplain Modifications</th>
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<td>6.1 Berms &amp; Roads - old:</td>
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<td>One Side</td>
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<td>Road:</td>
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<td>Railroad:</td>
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<tr>
<td>Berm:</td>
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<tr>
<td>Improved Path:</td>
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<td>6.2 Development:</td>
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<td>6.3 Channel Bars:</td>
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<td>6.4 Meander Migration:</td>
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<td>6.5 Meander Width:</td>
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<td>6.6 Wavelength:</td>
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<td>7.1 Bank Erosion:</td>
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<td>7.2 Bank Height:</td>
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<table>
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<tr>
<th>7.3 Ice/Debris Jam Potential:</th>
<th>Culvert</th>
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Reach 15 was segmented into 2 segments M15-A (671ft) and M15-B (1,487ft). Segmentation was done in order to distinguish the area of the reach (Segment A) that was impacted by beaver activity and impounded.

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Malletts Creek

Basin: Northern Champlain
Stream Name: Malletts Creek Main Stem
Trunk Maps: MILTON
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Malletts Bay

Step 1. Reach Location: From reach break up to confluence with T6.

1.1 Reach Description:
1.2 Towns: Milton
1.3 Downstream Latitude: 44.6265755202
1.3 Downstream Longitude: -73.1040082881

Step 2. Stream Type
2.1 Elevation Upstream: 333
2.1 Elevation Downstream: 309
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 2,277.0 ft. 0.43 Miles
2.3 Valley Slope: 1.0
2.4 Channel Length: 3,142.5 ft. 0.60 Miles
2.5 Channel Slope: 0.75 %
2.6 Sinuosity: 1.38
2.7 Watershed Area: 3.9 Square Miles
2.8 Channel Width: 23.9 feet
2.9 Valley Width: 248.0 feet
2.10 Confinement Ratio: 10.4
2.10 Confinement Type: Very Broad
2.11 Reference Stream Type: C
   Bedform: Riffle-Pool
   Sub-Class Slope: None
   Bed Material: Gravel

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 81.0 %
3.3 Sub-dom. Geological Mat.: Ice-Contact
3.4 Valley Slope Left: Very Steep
3.4 Valley Slope Right: Steep
3.5 Soils
   Hydrologic Group: C 86.0 %
   Flooding: Frequent 81.0 %
   Water Table Deep: 1.5 81.0 %
   Water Table Shallow: 0.0 81.0 %
   Erodibility: slight 11.0 %
7.4 Comments:
Several ditched tributary drainages enter the channel from the farm field to the east.

Phase 1 - Reach Summary Report
Reach ID: M16
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Crop 64.0 %
   Current Sub-Dominant Land Cover: Crop
4.2 Corridor
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 50.0 %
   Current Sub-Dominant Land Cover: Crop
4.3 Riparian Buffer
   Left Bank Dominant: >100
   Sub-dominant: 0-25 None
   Length w/ less than 25 ft.: 320.0 ft. 0.0 ft.
4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
   Type: None
   Use:
   5.2 Bridges and Culvert: 0 0.0 %
   5.3 Bank Armoring: 0.0 0.0 %
   Left: 0.0 ft. Right: 0.0 ft.
   5.4 Channel Straightening: 0.0 0.0 %
5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old:
   One Side: 0.0 ft. 0.0 ft.
   Both Sides: 0.0 ft. 0.0 ft.
   Road: 0.0 ft.
   Railroad: 0.0 ft.
   Berm: 0.0 ft.
   Improved Path: 0.0 ft.
   6.2 Development: 0.0 ft.
   6.3 Channel Bars: Multiple
   6.4 Meander Migration: Multiple
   6.5 Meander Width: 99 ft. Ratio: 4.1
   6.6 Wavelength: 72 ft. Ratio: 3.0

Step 7. Windsifeld Survey
7.1 Bank Erosion: 525.12 ft
7.2 Bank Height: 3 ft
7.3 Ice/Debris Jam Potential: Debris

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### Malletts Creek

**Basin:** Northern Champlain  
**Stream Name:** MILTON  
**Watershed:** Lewis Creek, Little Otter, Lake Champlain  
**Sub-watershed:** Malletts Bay

**Step 1. Reach Location**  
Short sub-tributary that extends to the east beyond East Rc.

#### 1.1 Reach Description

**1.2 Towns:** Milton  
**1.3 Downstream Latitude:** 44.6297383066  
**1.3 Downstream Longitude:** -73.1031147133

#### 2. Stream Type

**2.1 Elevation Upstream:** 513  
**2.1 Elevation Downstream:** 324  
**2.1 Is Gradient Gentle?:** No  
**2.2 Valley Length:** 2,423.0 ft.  
**2.3 Valley Slope:** 7.8  
**2.4 Channel Length:** 2,568.2 ft.  
**2.5 Channel Slope:** 7.36 %  
**2.6 Sinuosity:** 1.06  
**2.7 Watershed Area:** 0.2 Square Miles  
**2.8 Channel Width:** 5.9 feet  
**2.9 Valley Width:** 18.0 feet  
**2.10 Confinement Ratio:** 3.1  
**2.10 Confinement Type:** Semi-confined  
**2.11 Reference Stream Type:** A  
**Bedform:** Step-Pool  
**Sub-Clay Slope:** None  
**Bed Material:** Gravel

#### 3. Basin Characteristics

**3.1 Alluvial Fan:** None  
**3.2 Grade Control:** None  
**3.3 Dominant Geological Mat.:** Ice-Contact  
**3.4 Valley Slope Left:** Steep  
**3.4 Valley Slope Right:** Steep  
**3.5 Soils**  
| Hydrologic Group | D | 42.0 % |  
| Flooding | None/Rare | 99.0 % |  
| Water Table Deep | 2.0 | 42.0 % |  
| Water Table Shallow | 0.0 | 43.0 % |  
**Erodibility:** Very Severe  
**7.4 Comments:** Reach is a drainage ditch.

### Phase 1 - Reach Summary Report

**Reach ID:** M16-S1.01  
**SGAT Version:** 4.56  
**Date Last Edited:** February, 10 2011  
**QA Status:** Themes have been checked  
**Is Reach An Impoundment?:** No

**Step 4. Land Cover - Reach Hydrology**

**4.1 Watershed**  
| Historic Land Cover: | Field |  
| Current Dominant Land Cover: | Forest | 35.0 % |  
| Current Sub-Dominant Land Cover: | Crop |  
**4.2 Corridor**  
| Historic Land Cover: | Field |  
| Current Dominant Land Cover: | Crop | 57.0 % |  
| Current Sub-Dominant Land Cover: | Field |  
**4.3 Riparian Buffer**  
| Left Bank | Right Bank |  
| Length w / less than 25 ft.: | 1,883.0 ft. | 1,857.0 ft. |  
| Dominant: | 0-25 | 0-25 |  
| Sub-dominant: | 51-100 | 51-100 |  
| Type | None | None |  
| Use |  
| 5.2 Bridges and Culverts: | 1 | 1.3 % |  
| 5.3 Bank Amoring: | 0.0 | 0.0 % |  
| Left: | 0.0 ft. | Right: | 0.0 ft. |  
| 5.4 Channel Straightening: | 2,521.7 | 98.2 % |  
| 5.5 Dredging History: | None |  

#### 5.1 Flow Regulation - (old): None

#### 5.2 Bridges and Culverts: 1 1.3 %

**Step 5. Instream Channel Modifications**

**5.3 Bank Amoring:** 0.0 ft.  
**Left:** 0.0 ft.  
**Right:** 0.0 ft.  
**5.4 Channel Straightening:** 2,521.7  
**98.2 %**

**5.5 Dredging History:** None

#### 6.1 Berms & Roads - old:

**6.2 Development:** 459.2 ft.  
**6.3 Channel Bars:** No Data

**6.4 Meander Migration:** None  
**6.5 Meander Width:** N/A Ratio: 0.0

**6.6 Wavelength:** N/A Ratio: 0.0

#### 7.1 Bank Erosion:

**7.2 Bank Height:** No Data

**7.3 Ice/Debris Jam Potential:** Not Evaluated

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Malletts Creek

Reach ID: M17
SGAT Version: 4.56
Date Last Edited: February, 21 2011
QA Status: Themes have been checked

Step 1: Reach Location
From confluence with T6 up to slope change at Forest Road crossing.

Step 2: Stream Type

1.3 Downstream Latitude: 44.6316485464
1.3 Downstream Longitude: -73.1029290737

Step 3: Basin Characteristics

3.1 Alluvial Fan: None
3.2 Grade Control: Multiple
3.3 Dominant Geological Mat.: Till 64.0 %
3.4 Valley Slope Left:
3.5 Soils
Hydrologic Group: C 73.0 %
Flooding: None/Rare 91.0 %
Water Table Deep: 2.5 64.0 %
Water Table Shallow: 1.5 76.0 %
Erodibility: Very Severe 79.0 %

4.1 Watershed
Historic Land Cover: Field
Current Dominant Land Cover:
Current Sub-Dominant Land Cover:

4.2 Corridor
Historic Land Cover:
Current Dominant Land Cover:
Current Sub-Dominant Land Cover:

4.3 Riparian Buffer
Dominant:
Sub-dominant:
Length w/ less than 25 ft.:

4.4 Ground Water Inputs:
Abundant

5.1 Flow Regulation - (old):
None

5.2 Bridges and Culverts: 2 1.5 %
5.3 Bank Armoring:
Left: 0.0 ft.

5.4 Channel Straightening:
732.9 14.3 %

5.5 Dredging History:
None

6.1 Berms & Roads - old:
One Side
Road: 109.8 ft.

6.2 Development:
214.6 ft.

6.3 Channel Bars: Point

6.4 Meander Migration: Multiple

6.5 Meander Width:
N/A Ratio: 0.0

6.6 Wavelength:
N/A Ratio: 0.0

Phase 1 - Reach Summary Report

Reach M17 was segmented into 2 segments M17-A (916ft) and M17-B (4,197ft). Segmentation was done to highlight differences in reference stream type and impacts from straightening in segment M17-A. Segment 7.3 Ice/Debris Jam Potential: Culvert
**Malletts Creek**

**Basin:** Northern Champlain

**Topo Maps:** MILTON

**Watershed:** Lewis Creek, Little Otter, Lake Champlain

**Sub-watershed:** Malletts Bay

---

**Phase 1 - Reach Summary Report**

**Reach ID:** M18

**SGAT Version:** 4.56

**Date Last Edited:** February, 10 2011

**QA Status:** Themes have been checked

**Is Reach An Impoundment?:** No

**Step 1. Reach Location**

 Begins at Forest Rd Crossing and ends at the change in confinement and slope approximately 1,000 feet upstream.

**1.1 Reach Description:**

**1.2 Towns:** Milton

**1.3 Downstream Latitude:** 44.6343247822

**1.3 Downstream Longitude:** -73.0885035725

---

**Step 2. Stream Type**

**2.1 Elevation Upstream:** 542

**2.1 Elevation Downstream:** 530

**2.1 Is Gradient Gentle?**: No

**2.2 Valley Length:** 952.0 ft. 0.18 Miles

**2.3 Valley Slope:** 1.3

**2.4 Channel Length:** 1,052.2 ft. 0.20 Miles

**2.5 Channel Slope:** 1.14%

**2.6 Sinuosity:** 1.11

**2.7 Watershed Area:** 2.3 Square Miles

**2.8 Channel Width:** 18.9 feet

**2.9 Valley Width:** 190.0 feet

**2.10 Confinement Ratio:** 10.1

**2.10 Confinement Type:** Very Broad

**2.11 Reference Stream Type:** C

**Bedform:** Riffle-Pool

**Sub-Class Slope:** None

**Bed Material:** Gravel

---

**Step 3. Basin Characteristics**

**3.1 Alluvial Fan:** None

**3.2 Grade Control:** None

**3.3 Dominant Geological Mat.:** Ice-Contact 65.0%

**3.3 Sub-dom. Geological Mat.:** Alluvial

**3.4 Valley Slope Left:** Very Steep

**3.4 Valley Slope Right:** Steep

**3.5 Soils**

**Hydrologic Group:** A 65.0%

**Flooding:** None/Rare 71.0%

**Water Table Deep:** 6.0 71.0%

**Water Table Shallow:** 6.0 65.0%

**Erodibility:** Severe 71.0%

**7.4 Comments:** Short unconfined reach downstream of a large bedrock cascade area (M19).

---

**Step 4. Land Cover - Reach Hydrology**

**4.1 Watershed**

**Current Dominant Land Cover:** Forest 73.0%

**Current Sub-Dominant Land Cover:** Crop

**4.2 Corridor**

**Current Dominant Land Cover:** Crop 31.0%

**Current Sub-Dominant Land Cover:** Forest

---

**4.3 Riparian Buffer**

**Dominant:** >100

**Sub-dominant:** 51-100

**Length w / less than 25 ft.:** 0.0 ft.

**4.4 Ground Water Inputs:** Minimal

---

**Step 5. Instream Channel Modifications**

**5.1 Flow Regulation - (old):** None

**5.2 Bridges and Culverts:** 0 0.0%

**5.3 Bank Armoring:** 0.0 0.0%

**5.4 Channel Straightening:** 0.0 0.0%

**5.5 Dredging History:** None

---

**Step 6. Floodplain Modifications**

**6.1 Berms & Roads - old:** 0.0 ft. 0.0 ft.

**6.2 Development:** 0.0 ft. 0.0 ft.

**6.3 Channel Bars:** No Data

**6.4 Meander Migration:** Migration

**6.5 Meander Width:** 41 ft. Ratio: 2.2

**6.6 Wavelength:** 105 ft. Ratio: 5.6

---

**Step 7. Windshield Survey**

**7.1 Bank Erosion:** 0 ft.

**7.2 Bank Height:** No Data

**7.3 Ice/Debris Jam Potential:** Not Evaluated

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Malletts Creek

Phase 1 - Reach Summary Report

Reach ID: M19
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

1.1 Reach Description:
1.2 Towns: Milton
1.3 Downstream Latitude: 44.6357749631
1.3 Downstream Longitude: -73.0856153071

2.1 Elevation Upstream: 585
2.1 Elevation Downstream: 542
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 651.0 ft. 0.12 Miles
2.3 Valley Slope: 6.6
2.4 Channel Length: 680.7 ft. 0.13 Miles
2.5 Channel Slope: 6.24%
2.6 Sinuosity: 1.06
2.7 Watershed Area: 2.1 Square Miles
2.8 Channel Width: 18.8 feet
2.9 Valley Width: 52.0 feet
2.10 Confinement Ratio: 2.9
2.10 Confinement Type: Semi-confined
2.11 Reference Stream Type: A
   Bedform: Step-Pool
   Sub-Class Slope: None
   Bed Material: Bedrock

3.1 Alluvial Fan: None
3.2 Grade Control: Waterfall
3.3 Dominant Geological Mat.: Till 54.0%
3.3 Sub-domin. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Ext. Steep
3.4 Valley Slope Right: Ext. Steep
3.5 Soils
   Hydrologic Group: D 81.0%
   Flooding: None/Rare 93.0%
   Water Table Deep: 6.0 42.0%
   Water Table Shallow: 2.0 42.0%
   Erodibility: Severe 55.0%

Reach Comments:
Reach is primarily a large bedrock cascade with a straightened channel upstream.

4.1 Watershed
   Historic Land Cover: Forest
   Current Dominant Land Cover: Forest 72.0%
   Current Sub-Dominant Land Cover: Crop

4.2 Corridor
   Historic Land Cover: Forest
   Current Dominant Land Cover: Crop 20.0%
   Current Sub-Dominant Land Cover: Urban

4.3 Riparian Buffer
   Left Bank: None
   Right Bank: None

4.4 Ground Water Inputs:
   Type: None
   Use:
   1.2 Bridges and Culverts: 0.9%
   1.3 Bank Armoring: 0.0%
   1.4 Length w/ less than 25 ft.: 123.0 ft. 163.0 ft.

5.1 Flow Regulation - (old):
   Type: None
   Use:
   5.2 Bridges and Culverts: 1 0.9%
   5.3 Bank Armoring: 0.0%
   5.4 Channel Straightening: 0.0%
   5.5 Dredging History: None

6.1 Berms & Roads - old:
   One Side: 0.0 ft.
   Both Sides: 0.0 ft.

6.2 Development:
   Road: 0.0 ft.
   Railroad: 0.0 ft.
   Berm: 0.0 ft.
   Improved Path: 0.0 ft.

6.3 Channel Bars:
   None

6.4 Meander Migration:
   None

6.5 Meander Width:
   N/A Ratio: 0.0

6.6 Wavelength:
   N/A Ratio: 0.0

7.1 Bank Erosion:
   0 ft

7.2 Bank Height:
   No Data

7.3 Ice/Debris Jam Potential: None

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Malletts Creek

Basin: Northern Champlain
Stream Name: Malletts Creek Main Stem

Topo Maps: MILTON
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Mallets Bay

Step 1. Reach Location: Long reach in very broad valley along Westford Road ends at change in confinement and slope.

1.1 Reach Description:
1.2 Towns: Milton
1.3 Downstream Latitude: 44.6367211005
1.3 Downstream Longitude: -73.0834856

Step 2. Stream Type
2.1 Elevation Upstream: 608
2.1 Elevation Downstream: 585
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 3,601.0 ft. 0.68 Miles
2.3 Valley Slope: 0.6
2.4 Channel Length: 3,711.0 ft. 0.70 Miles
2.5 Channel Slope: 0.62 %
2.6 Sinuosity: 1.03
2.7 Watershed Area: 2.1 Square Miles
2.8 Channel Width: 18.0 feet
2.9 Valley Width: 363.0 feet
2.10 Confinement Ratio: 20.1
2.10 Confinement Type: Very Broad
2.11 Reference Stream Type: E
   Bedform: Dune-Ripple
   Sub-Class Slope: None
   Bed Material: Sand

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Till 49.0 %
3.3 Sub-don. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Hilly
3.5 Soils
   Hydrologic Group: C 45.0 %
   Flooding: None/Rare 84.0 %
   Water Table Deep: 2.5 39.0 %
   Water Table Shallow: 0.0 46.0 %
   Erodibility: Moderate 45.0 %

7.4 Comments:
Culverts might pose as potential impacts for ice jams. The channel is entirely straightened and would likely look like reaches M13 and M14 if it wasn't so heavily impacted by early agriculture. Extensive straightening and no buffer; lots of opportunities for restoration.

Phase 1 - Reach Summary Report
Reach ID: M20
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 73.0 %
   Current Sub-Dominant Land Cover: Crop
4.2 Corridor
   Historic Land Cover: Field
   Current Dominant Land Cover: Crop 24.0 %
   Current Sub-Dominant Land Cover: Field
4.3 Riparian Buffer
   Left Bank Dominant: 0-25
   Left Bank Sub-dominant: None
   Right Bank Dominant: 0-25
   Right Bank Sub-dominant: None
   Length w/ less than 25 ft.: 3,701.0 ft. 3,682.0 ft.
4.4 Ground Water Inputs: Minimal

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
   Type: None
   Use:
   5.2 Bridges and Culverts: 4 2.0 %
   5.3 Bank Armoring: 0.0 0.0 %
   Left: 0.0 ft. Right: 0.0 ft.
   5.4 Channel Straightening: 3,653.9 98.5 %
   5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 0.0 ft. 0.0
   One Side Both Sides
   Road: 0.0 ft. 0.0 ft.
   Railroad: 0.0 ft. 0.0 ft.
   Berm: 0.0 ft. 0.0 ft.
   Improved Path: 0.0 ft. 0.0 ft.
   6.2 Development: 101.4 ft. 0.0 ft.
   6.3 Channel Bars: None
   6.4 Meander Migration: Neck Cutoff
   6.5 Meander Width: 18 ft. Ratio: 1.0
   6.6 Wavelength: 18 ft. Ratio: 1.0

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Culvert

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Malletts Creek

Basin: Northern Champlain
Stream Name: Malletts Creek Main Stem
Topo Maps: MILTON
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Malletts Bay

Step 1. Reach Location
Short reach that begins at the change in confinement and ends at the confluence with T7 near Ted Rd and Westford Rd intersection.

1.1 Reach Description:
1.2 Towns: Milton
1.3 Downstream Latitude: 44.6431066005
1.3 Downstream Longitude: -73.0732848

Step 2. Stream Type
2.1 Elevation Upstream: 624
2.1 Elevation Downstream: 608
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 894.0 ft. 0.17 Miles
2.3 Valley Slope: 1.7
2.4 Channel Length: 1,050.6 ft. 0.20 Miles
2.5 Channel Slope: 1.48 %
2.6 Sinuosity: 1.18
2.7 Watershed Area: 1.6 Square Miles
2.8 Channel Width: 16.0 feet
2.9 Valley Width: 119.0 feet

2.10 Confinement Ratio: 7.4
Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Till 99.0 %
3.3 Sub-dom. Geological Mat.: Alluvial
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Steep
3.5 Soils
   Hydrologic Group: D 69.0 %
   Flooding: None/Rare 100.0 %
   Water Table Deep: 2.0 63.0 %
   Water Table Shallow: 0.0 63.0 %
   Erodibility: Very Severe 99.0 %

7.4 Comments:
NULL

Phase 1 - Reach Summary Report
Reach ID: M21
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 78.0 %
   Current Sub-Dominant Land Cover: Crop

4.2 Corridor
   Historic Land Cover: Forest
   Current Dominant Land Cover: Forest 19.0 %
   Current Sub-Dominant Land Cover: Urban

4.3 Riparian Buffer
   Left Bank
   Right Bank
   Dominant: 100 51-100
   Sub-dominant: 51-100 >100
   Length w / less than 25 ft.: 0.0 ft. 0.0 ft.

4.4 Ground Water Inputs: Minimal
Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old):
   Type: None
   Use:
   5.2 Bridges and Culverts: 0 0.0 %
   5.3 Bank Armoring: 0 0.0 %
   Left: 0.0 ft. Right: 0.0 ft.
   5.4 Channel Straightening: 0.0 0.0 %
   5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old:
   One Side 0.0 ft.
   Both Sides 0.0 ft.
   Road: 0.0 ft.
   Railroad: 0.0 ft.
   Berm: 0.0 ft.
   Improved Path: 0.0 ft.
   6.2 Development: 164.9 ft. 0.0 ft.
   6.3 Channel Bars: No Data
   6.4 Meander Migration: Flood Chute
   6.5 Meander Width: 36 ft. Ratio: 2.3
   6.6 Wavelength: 91 ft. Ratio: 5.7

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft.
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Not Evaluated

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Malletts Creek

Basin: Northern Champlain
Stream Name: Malletts Creek Main Stem
Map: MILTON
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Malletts Bay

Step 1. Reach Location
Reach begins at the confluence with T7 and extends upstream ending about 660 feet downstream of the Brookside Drive crossing.

1.1 Reach Description:

1.2 Towns: Milton
1.3 Downstream Latitude: 44.6440364917
1.3 Downstream Longitude: -73.0701864103

Step 2. Stream Type

2.1 Elevation Upstream: 700
2.1 Elevation Downstream: 624
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 1,190.0 ft. 0.23 Miles
2.3 Valley Slope: 6.4
2.4 Channel Length: 1,297.9 ft. 0.25 Miles
2.5 Channel Slope: 5.89 %
2.6 Sinuosity: 1.09
2.7 Watershed Area: 1.0 Square Miles
2.8 Channel Width: 12.3 feet
2.9 Valley Width: 50.0 feet
2.10 confinement ratio: 3.9
2.10 Confinement Type: Semi-confined
2.11 Reference Stream Type: B
   Bedform: Step-Pool
   Sub-Class Slope: a
   Bed Material: Cobble

Step 3. Basin Characteristics

3.1 Alluvial Fan: None
3.2 Grade Control: Waterfall
3.3 Dominant Geological Mat.: Till 40.0 %
3.3 Sub-dominant. Geological Mat.: Ice-Contact
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Steep
3.5 Soils
   Hydrologic Group: D 67.0 %
   Flooding: None/Rare 100.0 %
   Water Table Deep: 2.0 40.0 %
   Water Table Shallow: 0.0 67.0 %
   Erodibility: Severe 72.0 %

3.4 Comments:
Grade control located in lower reach discerned using LiDAR data and confirmed during windshield surveys.

Phase 1 - Reach Summary Report

Reach ID: M22
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
   Historic Land Cover: Shrub
   Current Dominant Land Cover: Forest 76.0 %
   Current Sub-Dominant Land Cover: Crop

4.2 Corridor
   Historic Land Cover:
   Current Dominant Land Cover: Crop 37.0 %
   Current Sub-Dominant Land Cover: Urban

4.3 Riparian Buffer
   Left Bank
   Length w/ less than 25 ft.: 53.0 ft. Right: 256.0 ft.
   4.4 Ground Water Inputs: Minimal
   Length: 0.0 ft. Right: 0.0 ft.

5.1 Flow Regulation - (old): None
   Type: None
   Use:
   5.2 Bridges and Culverts: 1 1.1 %
   5.3 Bank Armoring: 0.0 0.0 %
   Left: 0.0 ft. Right: 0.0 ft.

5.5 Dredging History: None

5.6 Floodplain Modifications
   6.1 Berms & Roads: 152.2 ft. N/A
   6.2 Development: 290.6 ft. 0.0 ft.
   6.3 Channel Bars: Mid-channel
   6.4 Meander Migration: Flood Chute
   6.5 Meander Width: N/A R: 0.0
   6.6 Wavelength: N/A R: 0.0

Step 7. Windshield Survey

7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Culvert
Malletts Creek

Basin: Northern Champlain
Stream Name: Malletts Creek Main Stem
Topo Maps: MILTON
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Malletts Bay

1.1 Reach Description:
1.2 Towns: Milton
1.3 Downstream Latitude: 44.6437607816
1.3 Downstream Longitude: -73.0657724044

Step 2. Stream Type
2.1 Elevation Upstream: 717
2.1 Elevation Downstream: 700
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 990.0 ft. 0.19 Miles
2.3 Valley Slope: 1.7
2.4 Channel Length: 1,011.9 ft. 0.19 Miles
2.5 Channel Slope: 1.68 %
2.6 Sinuosity: 1.02
2.7 Watershed Area: 0.9 Square Miles
2.8 Channel Width: 12.6 feet
2.9 Valley Width: 202.0 feet
2.10 Confinement Ratio: 16.0
2.10 Confinement Type: Very Broad
2.11 Reference Stream Type: C
    Bedform: Riffle-Pool
    Sub-Class Slope: None
    Bed Material: Gravel

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Glacial Lake 87.0 %
3.3 Sub-dom. Geological Mat.: Till
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Hilly
3.5 Soils
    Hydrologic Group: D 87.0 %
    Flooding: None/Rare 100.0 %
    Water Table Deep: 0.5 87.0 %
    Water Table Shallow: 0.0 87.0 %
    Erodibility: slight 12.0 %

7.4 Comments:
Small culverts, extensive straightening, and no buffer. Lots of opportunities for restoration.

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
    Historic Land Cover: Forest
    Current Dominant Land Cover: Forest 79.0 %
4.2 Corridor
    Historic Land Cover: Field
    Current Dominant Land Cover: Urban 46.0 %
4.3 Riparian Buffer
    Left Bank
    Dominant: 0-25
    Sub-dominant: None
    Length w/ less than 25 ft.: 1,011.0 ft. 1,011.0 ft.
    Right Bank

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
    Type: None
    Use:
5.2 Bridges and Culverts: 3 6.1 %
    Left: 0.0 ft.
    Right: 0.0 ft.
5.3 Bank Armoring: 0.0 0.0 %
    Left: 0.0 ft.
    Right: 0.0 ft.
5.4 Channel Straightening: 1,005.1 99.3 %
5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 23.9 ft. 2.4
    One Side
    Road: 23.9 ft.
    Railroad: 0.0 ft.
    Berm: 0.0 ft.
    Improved Path: 0.0 ft.
    Two Sides
    Development: 0.0 ft.
    Channel Bars: None
    Meander Migr.: None
    Meander Width: 12 ft. Ratio: 1.0
    Wavelength: 12 ft. Ratio: 1.0

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft.
7.2 Bank Height: No Data ft.
7.3 Flow/Debris Jam Potential: Culvert

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|High|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

Phase 1 - Reach Summary Report
Reach ID: M23
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No
Malletts Creek

Basin: Northern Champlain
Stream Name: Mallets Creek Main Stem
Topo Maps: MILTON
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Mallets Bay

Step 1. Reach Location:

From the reach break up to the Westford Road crossing.

1.1 Reach Description:

1.2 Towns: Milton

1.3 Downstream Latitude: 44.6428259005
1.3 Downstream Longitude: -73.0622836

Step 2. Stream Type:

2.1 Elevation Upstream: 766
2.1 Elevation Downstream: 717
2.1 Is Gradient Gentle?: No

2.2 Valley Length: 892.0 ft. 0.17 Miles
2.3 Valley Slope: 5.5
2.4 Channel Length: 940.3 ft. 0.18 Miles
2.5 Channel Slope: 5.21 %
2.6 Sinuosity: 1.05
2.7 Watershed Area: 0.3 Square Miles
2.8 Channel Width: 7.9 feet
2.9 Valley Width: 30.0 feet
2.10 Confinement Ratio: 3.8
2.10 Confinement Type: Semi-confined
2.11 Reference Stream Type: B
   Bedform: Step-Pool
   Sub-Class Slope: a
   Bed Material: Cobble

Step 3. Basin Characteristics:

3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Till 95.0 %
3.3 Sub-dom. Geological Mat.: Ice-Contact
3.4 Valley Slope Left: Hilly
3.4 Valley Slope Right: Hilly
3.5 Soils
   Hydrologic Group: D 87.0 %
   Flooding: None/Rare 100.0 %
   Water Table Deep: 2.0 34.0 %
   Water Table Shallow: 0.0 34.0 %
   Erodibility: Severe 66.0 %
7.4 Comments:

Farm path stream ford crossing mid-reach.

Phase 1 - Reach Summary Report

Reach ID: M24
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked

Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology:

4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 75.0 %
   Current Sub-Dominant Land Cover: Crop

4.2 Corridor
   Historic Land Cover: Shrub
   Current Dominant Land Cover: Crop 35.0 %
   Current Sub-Dominant Land Cover: Forest

4.3 Riparian Buffer
   Left Bank: Abundant
   Right Bank:

Dominant: 100 %
Sub-dominant: 0 %
Length w/ less than 25 ft.: 221.0 ft. 477.0 ft.

4.4 Ground Water Inputs:

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old):
   None

Use:
5.2 Bridges and Culverts: 1 2.1 %
5.3 Bank Amoring: 0.0 0.0 %
   Left: 0.0 ft. Right: 0.0 ft.

5.4 Channel Straightening: 116.0 12.3 %
5.5 Dredging History:

Step 6. Floodplain Modifications
6.1 Berms & Roads - old:
   0.0 ft. 0.0 ft.
   One Side: 0.0 ft. Both Sides: 0.0 ft.
   Road:
   Railroad: 0.0 ft.
   Berm: 0.0 ft.
   Improved Path: 0.0 ft.

6.2 Development:
   77.0 ft. 0.0 ft.
6.3 Channel Bars: None
6.4 Meander Migration:
6.5 Meander Width:
   N/A Ratio: 0.0
6.6 Wavelength:
   N/A Ratio: 0.0

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data
7.3 Ice/Debris Jam Potential: None

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Low | High | High | N.S. | N.S. | Low | N.S. | Unk | Low | N.S. | N.S. | N/A | N/A | N.S. | N.S. |
Malletts Creek

Basin: Northern Champlain
Stream Name: Malletts Creek Main Stem
Topo Maps: MILTON
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Malletts Bay

Step 1. Reach Location
From the Westford Road crossing the reach extends north up the mountain.

1.1 Reach Description:
1.2 Towns: Milton
1.3 Downstream Latitude: 44.6427664882
1.3 Downstream Longitude: -73.0595335878

Step 2. Stream Type
2.1 Elevation Upstream: 912
2.1 Elevation Downstream: 766
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 1,525.0 ft. 0.29 Miles
2.3 Valley Slope: 9.6
2.4 Channel Length: 1,578.0 ft. 0.30 Miles
2.5 Channel Slope: 9.25%
2.6 Sinuosity: 1.03
2.7 Watershed Area: 0.2 Square Miles
2.8 Channel Width: 6.8 feet
2.9 Valley Width: 24.0 feet
2.10 Confinement Ratio: 3.5
2.10 Confinement Type: Semi-confined
2.11 Reference Stream Type: A
   Bedform: Step-Pool
   Sub-Class Slope: None
   Bed Material: Cobble

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Till 50.0 %
3.3 Sub-dom. Geological Mat.: Ice-Contact
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Very Steep
3.5 Soils
   Hydrologic Group: A
   Flooding: None/Rare 100.0 %
   Water Table Depth: 6.0 93.0 %
   Water Table Shallow: 6.0 49.0 %
   Erodibility: Very Severe 99.0 %
3.7 Comments:
   High energy reach with steep slope off of the mountainside the old stone culvert might be inadequately sized.

Phase 1 - Reach Summary Report
Reach ID: M25
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 81.0 %
   Current Sub-Dominant Land Cover: Field
4.2 Corridor
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 50.0 %
   Current Sub-Dominant Land Cover: Field
4.3 Riparian Buffer
   Left Bank: 0.0 ft. 195.0 ft.
   Right Bank: >100 >100
4.4 Ground Water Inputs: Minimal
5.1 Flow Regulation - (old): None
   Type: None
   Use:
   5.2 Bridges and Culverts: 1 2.5 %
   5.3 Bank Armoring: 0.0 0.0 %
   5.4 Channel Straightening: 0.0 0.0 %
   5.5 Dredging History: None
Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 137.8 ft. 8.7
   One Side
   Road: 0.0 ft. 0.0 ft.
   Railroad: 0.0 ft. 0.0 ft.
   Berm: 0.0 ft. 0.0 ft.
   Improved Path: 137.8 ft. 0.0 ft.
6.2 Development: 213.8 ft. 0.0 ft.
6.3 Channel Bars: No Data
6.4 Meander Migration: None
6.5 Meander Width: N/A Ratio: 0.0
6.6 Wavelength: N/A Ratio: 0.0

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data
7.3 Ice/Debris Jam Potential: Culvert

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**Malletts Creek**

**Basin:** Northern Champlain

**Stream Name:** Allen (Petty) Brook

**Topo Maps:** COLCHESTER

**Watershed:** Lewis Creek, Little Otter, Lake Champlain

**Sub-watershed:** Mallets Bay

**Step 1. Reach Location:** From the confluence with M01 (Lake Champlain) to just upstream of the Route 7 crossing.

**1.1 Reach Description:**

**1.2 Towns:** Colchester

**1.3 Downstream Latitude:** 44.5742412712

**1.3 Downstream Longitude:** -73.172950892

**Step 2. Stream Type**

**2.1 Elevation Upstream:** 106

**2.1 Elevation Downstream:** 98

**2.1 Is Gradient Gentle?** No

**2.2 Valley Length:** 4,179.0 ft. 0.79 Miles

**2.3 Valley Slope:** 0.2

**2.4 Channel Length:** 5,023.6 ft. 0.95 Miles

**2.5 Channel Slope:** 0.16 %

**2.6 Sinuosity:** 1.20

**2.7 Watershed Area:** 5.4 Square Miles

**2.8 Channel Width:** 27.4 feet

**2.9 Valley Width:** 748.0 feet

**2.10 Confinement Ratio:** 27.3

**2.11 Reference Stream Type:** E Dune-Ripple

**Bedform:**

**Sub-Class Slope:** None

**Bed Material:** Sand

**Step 3. Basin Characteristics**

**3.1 Alluvial Fan:** None

**3.2 Grade Control:** None

**3.3 Dominant Geological Mat.:** Alluvial 98.0 %

**3.4 Valley Slope Left:** Flat

**3.4 Valley Slope Right:** Flat

**3.5 Soils**

**Hydrologic Group:** C 98.0 %

**Flooding:** Frequent 98.0 %

**Water Table Deep:** 1.5 98.0 %

**Water Table Shallow:** 0.0 98.0 %

**Erodibility:** slight 1.0 %

**7.4 Comments:**

Water elevation in the lower portion of the reach is controlled by the lake level and a wetland complex. Area likely to be segmented out if Phase 2 assessments considered. Also, flow becomes very diffuse downstream of Route 7 likely a segment.

**Phase 1 - Reach Summary Report**

**Reach ID:** T1.01

**SGAT Version:** 4.56

**Date Last Edited:** February, 10 2011

**QA Status:** Themes have been checked

**Is Reach An Impoundment?:** No

**Step 4. Land Cover - Reach Hydrology**

**4.1 Watershed**

**Historic Land Cover:** Forest

**Current Dominant Land Cover:** Forest 40.0 %

**Current Sub-Dominant Land Cover:** Crop

**4.2 Corridor**

**Historic Land Cover:** Wetland

**Current Dominant Land Cover:** Wetland 59.0 %

**Current Sub-Dominant Land Cover:** Forest

**4.3 Riparian Buffer**

**Left Bank:** 0.0 ft. 0.0 ft.

**Right Bank:** >100 0.0 ft.

**Length w/ less than 25 ft.:** 51-100 0.0 ft.

**4.4 Ground Water Inputs:** Abundant

**Step 5. Instream Channel Modifications**

**5.1 Flow Regulation - (old):** None

**Type:** None

**Use:**

**5.2 Bridges and Culverts:** 1 0.7 %

**5.3 Bank Armoring:** 0.0 0.0 %

**Left:** 0.0 ft. Right: 0.0 ft.

**5.4 Channel Straightening:** 250.1 5.0 %

**5.5 Dredging History:** None

**Step 6. Floodplain Modifications**

**6.1 Berms & Roads - old:** 0.0 ft. 0.0 ft.

**Type:** None

**Use:**

**6.2 Development:** 0.0 ft. 0.0 ft.

**6.3 Channel Bars:** None

**6.4 Meander Migration:** Avulsion

**6.5 Meander Width:** 107 ft. Ratio: 3.9

**6.6 Wavelength:** 347 ft. Ratio: 12.7

**Step 7. Windshield Survey**

**7.1 Bank Erosion:** 0

**7.2 Bank Height:** No Data

**7.3 Ice/Debris Jam Potential:** Culvert

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Malletts Creek

1. Stream Name: Allen (Petty) Brook
2. Watershed: Lewis Creek, Little Otter, Lake Champlain
3. Sub-watershed: Malletts Bay

Phase 1 - Reach Summary Report

- Rook ID: T1.02
- SGAT Version: 4.56
- Date Last Edited: February, 10 2011
- QA Status: Themes have been checked
- Is Reach An Impoundment?: No

From the reach break upstream of the Route 7 Crossing up to the confluence with T1.51.

1.1 Reach Description:

1.2 Towns: Colchester

1.3 Downstream Latitude: 44.5750778524
1.4 Downstream Longitude: -73.1580100315

2. Stream Type

2.1 Elevation Upstream: 108
2.2 Valley Length: 1,032.0 ft.
2.3 Valley Slope: 0.2
2.4 Channel Length: 1,602.6 ft.
2.5 Channel Slope: 0.12%
2.6 Sinuosity: 1.55
2.7 Watershed Area: 4.4 Square Miles
2.8 Channel Width: 16.4 feet
2.9 Valley Width: 305.0 feet

2.10 Confinement Ratio: 18.6

3. Basin Characteristics

3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 66.0 %
3.4 Valley Slope Left: Ext. Steep
3.5 Soils
   Hydrologic Group: C 66.0 %
   Flooding: Frequent 66.0 %
   Water Table Deep: 1.5 66.0 %
   Water Table Shallow: 0.0 66.0 %
   Erodibility: slight 10.0 %

3.7 Comments: Reach has had some straightening near the road.

4. Land Cover - Reach Hydrology

4.1 Watershed
   Historic Land Cover: Shrub
   Current Dominant Land Cover: Forest 41.0 %
   Current Sub-Dominant Land Cover: Crop

4.2 Corridor
   Historic Land Cover: Field
   Current Dominant Land Cover: Crop 49.0 %
   Current Sub-Dominant Land Cover: Forest

4.3 Riparian Buffer
   Left Bank Dominant: >100
   Right Bank Dominant: >100
   Length w/ less than 25 ft.: 0.0 ft.
   Sub-dominant: None 51-100

4.4 Ground Water Inputs: Abundant

5. Instream Channel Modifications

5.1 Flow Regulation - (old): None
5.2 Bridges and Culverts: 0 0.0 %
5.3 Bank Armoring: 0.0 0.0 %
5.4 Channel Straightening: 945.3 59.0 %
5.5 Dredging History: None

6. Floodplain Modifications

6.1 Berms & Roads - old: 0.0 ft.
6.2 Development: 0.0 ft.
6.3 Channel Bars: Point
6.4 Meander Migration: Neck Cutoff
6.5 Meander Width: 75 ft. Ratio: 4.0
6.6 Wavelength: 130 ft. Ratio: 7.9

7. Windshield Survey

7.1 Bank Erosion: 192.08 ft
7.2 Bank Height: 2 ft
7.3 Ice/Debris Jam Potential: None

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Malletts Creek

Basin: Northern Champlain
Stream Name: Allen (Perry) Brook
Topo Maps: COLCHESTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Malletts Bay

Step 1. Reach Location
From the reach break approximately 800 feet downstream of Coon Hill Rd up to the confluence with T1.S.2.01.

1.1 Reach Description:
1.2 Towns: Colchester
1.3 Downstream Latitude: 44.5769886829
1.3 Downstream Longitude: -73.1552913695

Step 2. Stream Type
2.1 Elevation Upstream: 116
2.1 Elevation Downstream: 108
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 1,006.0 ft. 0.36 Miles
2.3 Valley Slope: 0.4
2.4 Channel Length: 2,706.3 ft. 0.51 Miles
2.5 Channel Slope: 0.30 %
2.6 Sinuosity: 1.42
2.7 Watershed Area: 3.8 Square Miles
2.8 Channel Width: 17.0 feet
2.9 Valley Width: 191.0 feet
2.10 Confinement Ratio: 11.2

2.10 Confinement Type: Very Broad
2.11 Reference Stream Type: E
BEDFORM: Dune-Ripple
Sub-Class Slope: None
Bed Material: Sand

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat: Alluvial 100.0 %
3.3 Sub-dom. Geological Mat: Glacial Lake
3.4 Valley Slope Left: Ext. Steep
3.4 Valley Slope Right: Very Steep
3.5 Soils
Hydrologic Group: Not Rated 58.0 %
Flooding: Frequent 100.0 %
Water Table Deep: 1.5 41.0 %
Water Table Shallow: 0.0 41.0 %
Erodibility: 0.0 %

7.4 Comments:
The lower portion of the reach has some buffer impacts on the left side, but otherwise the reach is well buffered. The crossing at Coon Hill Road has several problems. The culvert is undersized which is causing erosion and scour downstream. Also, the water backs up upstream causing aggradation and bank scour. This culvert is a high-priority for replacement.

Phase 1 - Reach Summary Report
Reach ID: T1.03
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
Historic Land Cover: Shrub
Current Dominant Land Cover: Forest 39.0 %
Current Sub-Dominant Land Cover:
Current Sub-Dominant Land Cover:

4.2 Corridor
Historic Land Cover:
Current Dominant Land Cover: Crop 42.0 %
Current Sub-Dominant Land Cover:

4.3 Riparian Buffer
Left Bank Right Bank
Dominant: >100 >100
Sub-dominant: 0-25 51-100
Length w/ less than 25 ft.: 983.0 ft. 0.0 ft.

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
Type: None
Use:
5.2 Bridges and Culverts: 1 1.9 %
5.3 Bank Armoring:
Left: 0.0 ft. Right: 0.0 ft.
5.4 Channel Straightening: 606.7 22.4 %
5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 0.0 ft. 0.0
6.2 Development:
6.3 Channel Bars: Multiple
6.4 Meander Migration: Neck Cutoff
6.5 Meander Width: 51 ft. Ratio: 3.0
6.6 Wavelength: 96 ft. Ratio: 5.6

Step 7. Winshield Survey
7.1 Bank Erosion: 741.47 ft
7.2 Bank Height: 3 ft
7.3 Ice/Debris Jam Potential: Culvert

|   | 4.1 | 4.2 | 4.3 | 5.1 | 5.2 | 5.3 | 5.4 | 5.5 | 6.1 | 6.2 | 6.3 | 6.4 | 6.5 | 6.6 | 7.1 | 7.3 |
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|   | High| High| High| N.S.| N.S.| High| N.S.| Unk.| N.S.| High| Low| Low| High| High| High| Total |
|   | 2   | 2   | 2   | 0   | 0   | 2   | 0   | 0   | 2   | 1   | 1   | 1   | 2   | 2   | 2   | 18   |
Malletts Creek

Phase 1 - Reach Summary Report

Reach ID: T1.04
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 1. Reach Location
From the reach break to the VAST trail crossing in the woods east of Wiley Rd.

1.1 Reach Description:

1.2 Towns: Colchester

1.3 Downstream Latitude: 44.5813842404
1.3 Downstream Longitude: -73.1593557555

2. Step 2. Stream Type

2.1 Elevation Upstream: 143
2.1 Elevation Downstream: 116
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 4,019.0 ft. 0.76 Miles
2.3 Valley Slope: 0.7
2.4 Channel Length: 5,392.1 ft. 1.02 Miles
2.5 Channel Slope: 0.50 %
2.6 Sinuosity: 1.34
2.7 Watershed Area: 2.9 Square Miles
2.8 Channel Width: 15.2 feet
2.9 Valley Width: 146.0 feet
2.10 Confinement Ratio: 9.6
2.10 Confinement Type: Broad
2.11 Reference Stream Type: E
Bedform: Dune-Ripple
Sub-Class Slope: None
Bed Material: Sand

Step 3. Basin Characteristics

3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Glacial Lake 65.0%
3.3 Sub-dom. Geological Mat.: Alluvial
3.4 Valley Slope Left: Very Steep
3.4 Valley Slope Right: Very Steep
3.5 Soils
Hydrologic Group: Not Rated 58.0%
Flooding: None/Rare 79.0%
Water Table Deep: 2.0 27.0%
Water Table Shallow: 0.5 25.0%
Erodibility: Moderate 40.0%

7.4 Comments:
Reach has minor buffer impacts at upstream break where the VAST trail parallels the channel for only 45 ft.

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: Field
Current Dominant Land Cover: Forest 37.0%
Current Sub-Dominant Land Cover:

4.2 Corridor
Historic Land Cover: Wetland
Current Dominant Land Cover: Forest 69.0%
Current Sub-Dominant Land Cover:

4.3 Riparian Buffer
Left Bank Dominant: >100
Right Bank Dominant: >100
Sub-dominant: None 0-25
Length w/ less than 25 ft.: 0.0 ft. 45.0 ft.

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): None
Type: None
Use:
5.2 Bridges and Culverts: 0 0.0%
5.3 Bank Amortizing: 0.0 0.0%
Left: 0.0 ft. Right: 0.0 ft.
5.4 Channel Straightening: 1,153.8 21.4%
5.5 Dredging History: None

Step 6. Floodplain Modifications

6.1 Berms & Roads - old:
One Side: Both Sides
Road: 0.0 ft. 0.0 ft.
Railroad: 0.0 ft. 0.0 ft.
Berm: 0.0 ft. 0.0 ft.
Improved Path: 0.0 ft. 0.0 ft.
6.2 Development: 0.0 ft. 0.0 ft.
6.3 Channel Bars: Point
6.4 Meander Migration: Multiple
6.5 Meander Width: 60 ft. Rgt: 3.9
6.6 Wavelength: 107 ft. Rgt: 7.0

Step 7. Windshield Survey

7.1 Bank Erosion: 624.18 ft
7.2 Bank Height: 2 ft
7.3 Ice/Debris Jam Potential: Debris

|    | 4.1 | 4.2 | 4.3 | 5.1 | 5.2 | 5.3 | 5.4 | 5.5 | 6.1 | 6.2 | 6.3 | 6.4 | 6.5 | 6.6 | 7.1 | 7.3 | Total |
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High | High | N.S. | N.S. | N.S. | High | N.S. | N.S. | N.S. | N.S. | Low | Low | Low | Low | N.S. |
Malletts Creek

Basin: Northern Champlain
Flow Name: Allen (Potty) Brook
Upstream: COLCHESTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Malletts Bay

Step 1. Reach Location
From the reach break with T1.04 up to the slight change in confinement 1,610 feet due east of the Brentwood Drive and Route 7 intersection.

Step 2. Stream Type
2.1 Elevation Upstream: 150
2.1 Elevation Downstream: 143
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 1,630.0 ft. 0.31 Miles
2.3 Valley Slope: 0.4
2.4 Channel Length: 1,860.2 ft. 0.35 Miles
2.5 Channel Slope: 0.38 %
2.6 Sinuosity: 1.14
2.7 Watershed Area: 2.7 Square Miles
2.8 Channel Width: 14.0 feet
2.9 Valley Width: 86.0 feet
2.10 Confinement Ratio: 6.1
2.11 Reference Stream Type: E
Bedform: Dune-Ripple
Sub-Class Slope: None
Bed Material: Sand

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Ice-Contact 61.0 %
3.3 Sub-domin. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Very Steep
3.4 Valley Slope Right: Very Steep
3.5 Soils
Hydrologic Group: A 61.0 %
Flooding: None/Rare 100.0 %
Water Table Depth: 0.0 63.0 %
Water Table Shallow: 6.0 63.0 %
Erodibility: Very Severe 76.0 %

7.4 Comments:
VAST trail bridge looks problematic and large debris pile located at stream bend downstream of structure. This pile is outside of the channel (in floodplain) and is not currently influencing the channel stability and is not expected to do so in the near future. Otherwise the reach isolated with little problems.

Phase 1 - Reach Summary Report
Reach ID: T1.05
SGAT Version: 4.56
Date Last Edited: February, 21 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
Historic Land Cover: Field
Current Dominant Land Cover: Crop
Current Sub-Dominant Land Cover: Crop

4.2 Corridor
Historic Land Cover: Forest
Current Dominant Land Cover: Forest
Current Sub-Dominant Land Cover: Crop

4.3 Riparian Buffer
Left Bank
Right Bank
Dominant: >100 >100
Sub-dominant: None None
Length w/ less than 25 ft.: 0.0 ft. 0.0 ft.

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
Type: None
Use:
5.2 Bridges and Culverts: 1 0.8 %
5.3 Bank Armoring: 0.0 0.0 %
5.4 Channel Straightening: 0.0 0.0 %
5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 0.0 ft. 0.0 ft

Step 7. Windshield Survey
7.1 Bank Erosion: 149.32 ft
7.2 Bank Height: 3 ft
7.3 Ice/Debris Jam Potential: Bridge

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Malletts Creek

Reach: T1.06
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

1.1 Reach Description:
1.2 Towns: Milton
1.3 Downstream Latitude: 44.5948898193
1.3 Downstream Longitude: -73.1600577237

Step 2. Stream Type
2.1 Elevation Upstream: 171
2.1 Elevation Downstream: 150
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 1,630.0 ft.
2.3 Valley Slope: 1.3
2.4 Channel Length: 4,572.9 ft.
2.5 Channel Slope: 0.46 %
2.6 Sinuosity: 2.81
2.7 Watershed Area: 2.6 Square Miles
2.8 Channel Width: 12.8 feet
2.9 Valley Width: 153.0 feet
2.10 Confinement Ratio: 12.0
2.11 Reference Stream Type: E
   Bedform: Dune-Ripple
   Sub-Class Slope: None
   Bed Material: Sand

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Control Grade: None
3.3 Dominant Geological Mat.: Ice-Contact 74.0 %
3.3 Sub-dom. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Very Steep
3.5 Valley Slope Right: Very Steep
3.5 Soils
   Hydrologic Group: A 57.0 %
   Flooding: None/Rare 100.0 %
   Water Table Deep: 6.0 57.0 %
   Water Table Shallower: 6.0 57.0 %
   Erodibility: Very Severe 78.0 %

7.4 Comments:
Lower portion of the reach is isolated with few impacts however upper portion has straightening and buffer impacts.

Reach T1.06 was segmented into 3 segments T1.06-A (2,816ft), T1.06-B (1,009ft), and T1.06-C (747ft). Segmentation was done to highlight reference habitat conditions in segment T1.06-A. Segment T1.06-B was not assessed fully because of property access issues and T1.06-C had

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Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 38.0 %
   Current Sub-Dominant Land Cover: Crop

4.2 Corridor
   Historic Land Cover: Forest
   Current Dominant Land Cover: Crop 26.0 %
   Current Sub-Dominant Land Cover: Forest

4.3 Riparian Buffer
   Left Bank: >100
   Right Bank: >100

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
   Type: None
   Use: None
   Bridges and Culverts: 0
   5.3 Bank Armoring: 0.0
   0.0 %

5.4 Channel Straightening: 594.0
   13.0 %

5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 1,041.6 ft.
   One Side: 22.8
   Both Sides:
   Road: 1,041.6 ft.
   Railroad: 0.0 ft.
   Berm: 0.0 ft.
   Improved Path: 0.0 ft.

6.2 Development: 350.5 ft.
   0.0 ft.

6.3 Channel Bars: Point

6.4 Meander Migration: Multiple

6.5 Meander Width: 42 ft. Rate: 3.3

6.6 Wavelength: 75 ft. Rate: 5.9

Step 7. Windshield Survey
7.1 Bank Erosion: 421.39 ft

7.2 Bank Height: 3 ft

7.3 Ice/Debris Jam Potential: Culvert
From the confluence with Allen Brook reach T1.06 730 feet due south of the Route 7 and Sweeney Farm Rd intersection up to the reach break 200 ft upstream of the detention pond.

**Step 4. Land Cover - Reach Hydrology**

4.1 Watershed
- Field
- Urban: 43.0%
- Crop

4.2 Corridor
- Wetland
- Urban: 34.0%
- Crop

4.3 Riparian Buffer
- Left Bank
- Right Bank
- Dominant: 0-25
- Sub-dominant: 26-50
- Length w/ less than 25 ft: 657.0 ft

4.4 Ground Water Inputs: Minimal

**Step 5. Stream Channel Modifications**

5.1 Flow Regulation - (old): Impoundment
- Large Run of River
- Use: Other

5.2 Bridges and Culverts
- Left: 0.0 ft
- Right: 0.0 ft

5.3 Bank Armoring
- 0.0 ft

5.4 Channel Straightening
- 727.0 ft

5.5 Dredging History: None

**Step 6. Floodplain Modifications**

6.1 Berms & Roads - old: 0.0 ft
- One Side
- Both Sides

6.2 Development: 0.0 ft

6.3 Channel Bars: No Data

6.4 Meander Migration: None

6.5 Meander Width: 11 ft

6.6 Wavelength: 11 ft

**Step 7. Windshield Survey**

7.1 Bank Erosion: 0 ft

7.2 Bank Height: No Data ft

7.3 Ice/Debris Jam Potential: Culvert

| 4.1 | 4.2 | 4.3 | 5.1 | 5.2 | 5.3 | 5.4 | 5.5 | 5.6 | 5.7 | 5.8 | 5.9 | 6.0 | 6.1 | 6.2 | 6.3 | 6.4 | 6.5 | 6.6 | 6.7 | 6.8 | 6.9 | 7.0 | 7.1 | 7.2 | 7.3 | Total |
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Instream detention basin occupies most of the reach length. Not worth further assessment.
Malletts Creek

Phase 1 - Reach Summary Report

Reach ID: T1.07
SGAT Version: 4.56
Date Last Edited: November, 10 2010
QA Status: Themes have been checked
Is Reach An Impoundment: No

Reach extends from upstream of Allen Brook Rd and ends at the confluence of T1.53.

Step 1. Reach Location

1.1 Reach Description:
1.2 Towns: Milton
1.3 Downstream Latitude: 44.6031518631
1.3 Downstream Longitude: -73.1583108942

Step 2. Stream Type

2.1 Elevation Upstream: 186
2.1 Elevation Downstream: 171
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 1,119.0 ft. 0.21 Miles
2.3 Valley Slope: 1.3
2.4 Channel Length: 1,344.5 ft. 0.25 Miles
2.5 Channel Slope: 1.12 %
2.6 Sinuosity: 1.20
2.7 Watershed Area: 1.5 Square Miles
2.8 Channel Width: 15.6 feet
2.9 Valley Width: 119.0 feet
2.10 Confinement Ratio: 7.6

2.10 Confinement Type: Broad
2.11 Reference Stream Type: C
   Bedform: Riffle-Pool
   Sub-Class Slope: None
   Bed Material: Gravel

Step 3. Basin Characteristics

3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Ice-Contact 67.0 %
3.3 Sub-domin, Geological Mat.: Till
3.4 Valley Slope Left: Very Steep
3.4 Valley Slope Right: Ext. Steep
3.5 Soils
   Hydrologic Group: B 67.0 %
   Flooding: None/Rare 100.0 %
   Water Table Deep: 3.0 67.0 %
   Water Table Shallow: 1.5 67.0 %
   Erodibility: 0.0 %

7.4 Comments:
Isolated reach with minor impacts.

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
   Historic Land Cover: Forest
   Current Dominant Land Cover: Forest 53.0 %
   Current Sub-Dominant Land Cover: Crop

4.2 Corridor
   Historic Land Cover: Forest
   Current Dominant Land Cover: Forest 36.0 %
   Current Sub-Dominant Land Cover: Crop

4.3 Riparian Buffer
   Left Bank
   Right Bank
   Dominant: >100
   Sub-dominant: 51-100
   Length w/ less than 25 ft.: ft. ft.

4.4 Ground Water Inputs: Minimal

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): None

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: 0.0 ft. 0.0 ft.
   Road: ft. ft.
   Railroad: ft. ft.
   Berm: ft. ft.
   Improved Path: ft. ft.

Step 7. Windshield Survey

7.1 Bank Erosion: 0
7.2 Bank Height: 0

7.3 Ice/Debris Jam Potential: No Data

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<th>4.1</th>
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High | Low | N.D. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | High | High | N.S. | N.S. |
Malletts Creek

Stream Name: Northern Champlain
Topo Maps: COLCHESTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Malletts Bay

Step 1. Reach Location
Reach begins at the confluence with T1.S3 and ends at the confluence with T1.S4 approximately 240 feet upstream of the Petty Brook Road crossing.

Step 2. Stream Type
2.1 Elevation Upstream: 192
2.1 Elevation Downstream: 186
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 1,142.0 ft. 0.22 Miles
2.3 Valley Slope: 0.5
2.4 Channel Length: 1,295.6 ft. 0.25 Miles
2.5 Channel Slope: 0.46%
2.6 Sinuosity: 1.13
2.7 Watershed Area: 1.0 Square Miles
2.8 Channel Width: 130 feet
2.9 Valley Width: 141.0 feet
2.10 Confinement Ratio: 10.9
2.10 Confinement Type: Very Broad
2.11 Reference Stream Type: E
   Bedform: Dune-Ripple
   Sub-Class Slope: None
   Bed Material: Sand

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Ice-Contact: 77.0%
3.3 Sub-domin. Geological Mat.: Till
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Steep
3.5 Soils
   Hydrologic Group: A 75.0%
   Flooding: None/Rare 100.0%
   Water Table Deep: 6.0 88.0%
   Water Table Shallow: 6.0 88.0%
   Erodibility: slight 22.0%
3.4 Comments:
   Culvert crossing small and could cause impounding if blocked by debris/ice.

Phase 1 - Reach Summary Report
Reach ID: T1.08
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 44.0%
   Current Sub-Dominant Land Cover: Crop
4.2 Corridor
   Historic Land Cover: Wetland
   Current Dominant Land Cover: Forest 42.0%
   Current Sub-Dominant Land Cover: Crop
4.3 Riparian Buffer
   Left Bank: >100
   Right Bank: >100
   Dominant: 51-100
   Sub-dominant: 51-100
   Length w/ less than 25 ft.: 0.0 ft.
4.4 Ground Water Inputs: Minimal
Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
   Type: None
   Use:
   5.2 Bridges and Culverts: 1 4.0%
   5.3 Bank Armoring: 0.0 0.0%
   Left: 0.0 ft. Right: 0.0 ft.
   5.4 Channel Straightening: 0.0 0.0%
   5.5 Dredging History: None
Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 0.0 ft. 0.0
   One Side: 0.0 ft. 0.0 ft.
   Both Sides: 0.0 ft. 0.0 ft.
   Road: 0.0 ft. 0.0 ft.
   Railroad: 0.0 ft. 0.0 ft.
   Berm: 0.0 ft. 0.0 ft.
   Improved Path: 0.0 ft. 0.0 ft.
   6.2 Development: 0.0 ft. 0.0 ft.
   6.3 Channel Bars: No Data
   6.4 Meander Migration: None
   6.5 Meander Width: 32 ft. Ratio: 2.5
   6.6 Wavelength: 62 ft. Ratio: 4.8
Step 7. Windfield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Culvert

| 4.1 | 4.2 | 4.3 | 5.1 | 5.2 | 5.3 | 5.4 | 5.5 | 6.1 | 6.2 | 6.3 | 6.4 | 6.5 | 6.6 | 7.1 | 7.3 | Total |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1   | 2   | 2   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 2   | 2   | 0   | 1   | 9   |
Malletts Creek

Basin: Northern Champlain
Stream Name: Allen (Petty) Brook
Topo Maps: COLCHESTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Malletts Bay

Step 1. Reach Location
From the confluence with T1.S4 the reach extends up the valley to the east of Andrea Lane, ending 790 feet to the east of the northern most intersection with Route 7.

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
    Historic Land Cover: Forest
    Current Dominant Land Cover: Forest 52.0 %
    Current Sub-Dominant Land Cover: Crop

4.2 Corridor
    Historic Land Cover: Forest
    Current Dominant Land Cover: Urban 26.0 %
    Current Sub-Dominant Land Cover: Crop

4.3 Riparian Buffer
    Left Bank: >100
    Right Bank: >100

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
    Type: None
    Use:
    5.2 Bridges and Culverts: 1 0.5 %
    5.3 Bank Armoring: 0.0 0.0 %
    Left: 0.0 ft Right: 0.0 ft

5.4 Channel Straightening: 148.5 3.7 %

5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 0.0 ft
    One Side 0.0 ft
    Both Sides 0.0 ft

Road: 0.0 ft
Railroad: 0.0 ft
Berm: 0.0 ft
Improved Path: 0.0 ft

6.2 Development: 0.0 ft
6.3 Channel Bars: No Data
6.4 Meander Migration: Braiding
6.5 Meander Width: 32 ft Ratio: 2.8
6.6 Wavelength: 67 ft Ratio: 5.9

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data ft

7.3 Ice/Debris Jam Potential: Not Evaluated

|   | 4.1 | 4.2 | 4.3 | 5.1 | 5.2 | 5.3 | 5.4 | 5.5 | 6.1 | 6.2 | 6.3 | 6.4 | 6.5 | 6.6 | 7.1 | 7.3 | Total |
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|   | 2   | 2   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 2   | 0   | 9    |

Lower reach has one crossing and some straightening, but upstream very little in the corridor.
### Phase 1 - Reach Summary Report

**Reach ID:** T1.10  
**SGAT Version:** 4.56  
**Date Last Edited:** February, 10 2011  
**QA Status:** Themes have been checked  
**Is Reach An Impoundment?:** No

The reach extends to the east crossing over Forbes Rd and Racine Rd, eroding approximately 350 feet to the east of the Racine Rd crossing.

#### Step 4. Land Cover - Reach Hydrology

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<thead>
<tr>
<th>4.1 Watershed</th>
<th>Forest</th>
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<tbody>
<tr>
<td>Historic Land Cover:</td>
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<td>Current Dominant Land Cover:</td>
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<td>Current Sub-Dominant Land Cover:</td>
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<td>4.2 Corridor</td>
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<td>Current Sub-Dominant Land Cover:</td>
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<td>4.3 Riparian Buffer</td>
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<td>Sub-dominant:</td>
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<td>Length w / less than 25 ft:</td>
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<td>Ground Water Inputs:</td>
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#### Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): None

| Type: None |
| Use:       |
| 5.2 Bridges and Culverts: 2 3.7% |
| 5.3 Bank Armoring: 0.0 0.0% |
| Left: 0.0 ft Right: 0.0 ft |
| 5.4 Channel Straightening: 684.5 27.7% |

#### Step 6. Floodplain Modifications

6.1 Berms & Roads - old: 0.0 ft 0.0 ft

<table>
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<tr>
<th>One Side</th>
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<tr>
<td>Road: 0.0 ft</td>
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<tr>
<td>Railroad: 0.0 ft</td>
<td>0.0 ft</td>
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<tr>
<td>Berm: 0.0 ft</td>
<td>0.0 ft</td>
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<tr>
<td>Improved Path: 0.0 ft</td>
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</table>

#### Step 7. Windshield Survey

7.1 Bank Erosion: 0 ft 7.2 Bank Height: No Data ft

#### Ice/Debris Jam Potential: Culvert

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<tr>
<th>Ice/Debris Jam Potential</th>
<th>Culvert</th>
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### Malletts Creek

**Basin:** Northern Champlain  
**Stream Name:** Allen (Petty) Brook  
**Topo Maps:** COLCHESTER  
**Watershed:** Lewis Creek, Little Otter, Lake Champlain  
**Sub-watershed:** Malletts Bay

#### Step 1. Reach Location

1.1 Reach Description:

1.2 Towns: Milton

1.3 Downstream Latitude: 44.6147163507  
1.3 Downstream Longitude: -73.1488038091

#### Step 2. Stream Type

2.1 Elevation Upstream: 318  
2.1 Elevation Downstream: 230  
2.1 Is Gradient Gentle?: No

2.2 Valley Length: 2,297.0 ft 0.44 Miles  
2.3 Valley Slope: 3.8

2.4 Channel Length: 2,471.8 ft 0.47 Miles  
2.5 Channel Slope: 3.56 %  
2.6 Sinuosity: 1.08  
2.7 Watershed Area: 0.5 Square Miles  
2.8 Channel Width: 93 feet  
2.9 Valley Width: 45.0 feet

2.10 Confinement Ratio: 4.8

2.10 Confinement Type: Narrow  
2.11 Reference Stream Type: C  
2.11 Bedform: Riffle-Pool  
2.11 Sub-Channel Slope: b  
2.11 Bed Material: Gravel

#### Step 3. Basin Characteristics

3.1 Alluvial Fan: None  
3.2 Grade Control: None  
3.3 Dominant Geological Material: Till 38.0 %  
3.3 Sub-dominant Geological Material: Glacial Lake  
3.4 Valley Slope Left: Very Steep  
3.4 Valley Slope Right: Ext. Steep  
3.5 Soils

| Hydrologic Group: | D | 39.0 %  
| Flooding: | None/Rare | 100.0 %  
| Water Table Deep: | 6.0 | 66.0 %  
| Water Table Shallow: | 6.0 | 66.0 %  
| Erodibility: | Severe | 66.0 %  

7.4 Comments:

Lower reach well buffered, but upper reach extensively straightened with two culverts.

<table>
<thead>
<tr>
<th>4.1</th>
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| High | High | High | N.S. | N.S. | High | N.S. | Unk | Low | N.S. | N.A | N/A | N.S. | Low |  |   |   |
Malletts Creek

Basin: Northern Champlain
Stream Name: COLCHESTER
Topo Maps: Lewis Creek, Little Otter, Lake Champlain
Watershed: Malletts Bay
Sub-watershed: Malletts Bay

Step 1. Reach Location: From the confluence with the main stem of Allen (Petty) Brook the reach extends to the northeast ending where the channel hits the forest.

Step 2. Stream Type:
2.1 Elevation Upstream: 116
2.1 Elevation Downstream: 108
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 574.0 ft. 0.11 Miles
2.3 Valley Slope: 1.4
2.4 Channel Length: 656.4 ft. 0.12 Miles
2.5 Channel Slope: 1.22%
2.6 Sinuosity: 1.14
2.7 Watershed Area: 0.6 Square Miles
2.8 Channel Width: 10.3 feet
2.9 Valley Width: 166.0 feet
2.10 Confinement Ratio: 18.0
2.10 Confinement Type: Very Broad
2.11 Reference Stream Type: C
Bedform: Riffle-Pool
Sub-Class Slope: None
Bed Material: Gravel

Step 3. Basin Characteristics:
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 100.0%
3.3 Sub-dom., Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Hilly
3.4 Valley Slope Right: Ext. Steep
3.5 Soils
Hydrologic Group: C 100.0%
Flooding: Frequent 100.0%
Water Table Deep: 1.5 100.0%
Water Table Shallow: 0.0 100.0%
Erodibility: 0.0%

7.4 Comments:
Some buffer issues that could addressed.

Phase 1 - Reach Summary Report
Reach ID: T1.S1.01
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
Historic Land Cover: Shrub
Current Dominant Land Cover: Forest 56.0%
Current Sub-Dominant Land Cover: Crop
4.2 Corridor
Historic Land Cover: Field
Current Dominant Land Cover: Forest 23.0%
Current Sub-Dominant Land Cover: Crop

4.3 Riparian Buffer
Left Bank Right Bank
Dominant: >100 0-25
Sub-dominant: 26-50 None
Length w/ less than 25 ft.: 0.0 ft. 614.0 ft.

4.4 Ground Water Inputs: None

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
Type: None
Use:
5.2 Bridges and Culverts: 0 0.0%
5.3 Bank Armoring: 0.0 0.0%
Left: 0.0 ft. Right: 0.0 ft.
5.4 Channel Straightening: 0.0 0.0%
5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old:
One Side Both Sides
Road: 0.0 ft. 0.0 ft.
Railroad: 0.0 ft. 0.0 ft.
Berm: 0.0 ft. 0.0 ft.
Improved Path: 0.0 ft. 0.0 ft.
6.2 Development: 0.0 ft. 0.0 ft.
6.3 Channel Bars: No Data
6.4 Meander Migration: Flood Chute
6.5 Meander Width: 30 ft. Ratio: 2.9
6.6 Wavelength: 78 ft. Ratio: 7.6

Step 7. Windecheid Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Not Evaluated

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Malletts Creek

Reach ID: T1.S1.02
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Phase 1 - Reach Summary Report

Reach Location: From the reach break the channel extends to the northwest in the forest. The reach ends at the change in slope approximately 400 feet to the southwest of a pond.

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
- Historic Land Cover: Shrub
- Current Dominant Land Cover: Forest 56.0%
- Current Sub-Dominant Land Cover: Crop

4.2 Corridor
- Historic Land Cover: Shrub
- Current Dominant Land Cover: Forest 31.0%
- Current Sub-Dominant Land Cover: Crop

4.3 Riparian Buffer
- Left Bank: >100
- Right Bank: >100

4.4 Ground Water Inputs: None

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
- Type: None
- Use: None

5.2 Bridges and Culverts: 1
- Length w/ less than 25 ft.: 0.0 ft.

5.3 Bank Armoring: 0.0
- Left: 0.0 ft.
- Right: 0.0 ft.

5.4 Channel Straightening: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 0.0 ft.
- One Side: 0.0 ft.
- Both Sides: 0.0 ft.

Step 7. Winshield Survey
- 7.1 Bank Erosion: 0 ft
- 7.2 Bank Height: No Data ft
- 7.3 Ice/Debris Jam Potential: Not Evaluated

Reach well buffered and isolated with little impacts.

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High | Low  | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | Unk. | N.S. | N.S. | N.S. | Low  | N.S. | N.S. | N.S. |
Malletts Creek

Reach ID: T1.S1.03
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Phase 1 - Reach Summary Report

Step 1. Reach Location
T1.S1.03 extends to the east ending at the Middle Road crossing.

Step 2. Stream Type

1.3 Downstream Latitude: 44.5814976934
1.3 Downstream Longitude: -73.1461425917

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Glacial Lake 95.0%
3.3 Sub-dom. Geological Mat.: Till
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Very Steep
3.5 Soils

Hydrologic Group: D 83.0%
Flooding: None/Rare 100.0%
Water Table Deep: 2.0 79.0%
Water Table Shallow: 0.0 41.0%
Erodibility: Very Severe 82.0%

Some straightening in the upper reach.

Step 2.3 Stream Type

2.1 Elevation Upstream: 250
2.1 Elevation Downstream: 200
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 1,941.0 ft. 0.37 Miles
2.3 Valley Slope: 2.6
2.4 Channel Length: 2,158.8 ft. 0.41 Miles
2.5 Channel Slope: 2.32%
2.6 Sinuosity: 1.11
2.7 Watershed Area: 0.4 Square Miles
2.8 Channel Width: 8.5 feet
2.9 Valley Width: 134.0 feet
2.10 Confinement Ratio: 15.8

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: Field
Current Dominant Land Cover: Forest 48.0%
Current Sub-Dominant Land Cover: Crop

4.2 Corridor
Historic Land Cover: Field
Current Dominant Land Cover: Forest 10.0%
Current Sub-Dominant Land Cover: Field

4.3 Riparian Buffer
Left Bank: >100
Right Bank: >100
Dominant: 0.25
Sub-Dominant: 51-100
Length w/ less than 25 ft.: 778.0 ft.

4.4 Ground Water Inputs: Minimal

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
Type: None
Use:
5.2 Bridges and Culverts: 1 1.2%
5.3 Bank Armoring: 0.0 0.0%
Left: 0.0 ft. Right: 0.0 ft.

5.4 Channel Straightening: 499.1 23.1%
5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old:
0.0 ft. 0.0
One Side Both Sides
Road: 0.0 ft. 0.0 ft.
Railroad: 0.0 ft. 0.0 ft.
Berm: 0.0 ft. 0.0 ft.
Improved Path: 0.0 ft. 0.0 ft.

6.2 Development: 0.0 ft. 0.0 ft.
6.3 Channel Bars: No Data
6.4 Meander Migration: None
6.5 Meander Width: 42 ft. Ratio: 5.0
6.6 Wavelength: 106 ft. Ratio: 12.5

Step 7. Windshield Survey
7.1 Bank Erosion: No Data ft
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Culvert

<table>
<thead>
<tr>
<th>4.1</th>
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Malletts Creek

Basin: Northern Champlain
Topo Maps: COLCHESTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Malletts Bay

Step 1. Reach Location
Short reach in the confined area beginning at the confluence with Allen Brook extending 600 feet to the northeast.

1.1 Reach Description:
1.2 Towns: Colchester
1.3 Downstream Latitude: 44.5813672763
1.3 Downstream Longitude: -73.1592118625

Step 2. Stream Type
2.1 Elevation Upstream: 172
2.1 Elevation Downstream: 116

2.2 Valley Length: 573.0 ft. 0.11 Miles
2.3 Valley Slope: 9.8
2.4 Channel Length: 678.6 ft. 0.13 Miles

2.5 Channel Slope: 8.25 %
2.6 Sinuosity: 1.18
2.7 Watershed Area: 0.8 Square Miles
2.8 Channel Width: 11.6 feet
2.9 Valley Width: 27.0 feet

2.10 Confinement Ratio: 2.3
2.10 Confinement Type: Semi-confined

2.11 Reference Stream Type: A
    Bedform: Cascade
    Sub-CLASS Slope: None
    Bed Material: Boulder

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: Ledge
3.3 Dominant Geological Mat.: Ice-Contact 78.0 %
3.3 Sub-dom. Geological Mat.: Alluvial
3.4 Valley Slope Left: Ext. Steep
3.4 Valley Slope Right: Ext. Steep
3.5 Soils
    Hydrologic Group: A 78.0 %
    Flooding: None/Rare 78.0 %
    Water Table Deep: 6.0 70.0 %
    Water Table Shallow: 6.0 78.0 %
    Erodibility: Very Severe 78.0 %

7.4 Comments:
Isolated reach with large grade control discerned from LiDAR data.

Phase 1 - Reach Summary Report
Reach ID: T1.S2.01
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
    Historic Land Cover: Forest
    Current Dominant Land Cover: Forest 45.0 %
    Current Sub-Dominant Land Cover: Crop

4.2 Corridor
    Historic Land Cover: Forest
    Current Dominant Land Cover: Forest 83.0 %
    Current Sub-Dominant Land Cover: Crop

4.3 Riparian Buffer
    Left Bank: >100
    Right Bank: >100
    Length w/ less than 25 ft.: 0.0 ft.

4.4 Ground Water Inputs: None

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
    Type: None
    Use:
5.2 Bridges and Culverts: 0 0.0 %
5.3 Bank Armoring: 0.0 0.0 %
    Left: 0.0 ft.
    Right: 0.3 ft.

5.4 Channel Straightening: 0.0 0.0 %
5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 0.0 ft.
    One Side: 0.0 ft.
    Both Sides: 0.3 ft.
    Road: 0.0 ft.
    Railroad: 0.0 ft.
    Berm: 0.0 ft.
    Improved Path: 0.0 ft.

6.2 Development: 0.0 ft.
6.3 Channel Bars: No Data
6.4 Meander Migration: None
6.5 Meander Width: N/A Ratio: 0.0
6.6 Wavelength: N/A Ratio: 0.0

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data
7.3 Ice/Debris Jam Potential: Not Evaluated

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High High N.S. N.S. N.S. N.S. N.S. N.S. N.S. N.S. N.S. N.A. N.A. N.S. N.S. N.S. 2
Malletts Creek

Baseline: Northern Champlain
Stream Name: COLCHESTER
Topo Maps: Lewis Creek, Little Otter, Lake Champlain
Watershed: Malletts Bay
Sub-watershed:

Step 1. Reach Location
From reach break at change in confinement T1.S2.02 extends to northwest ending at beaver dam area and change in slope.

1.1 Reach Description:
1.2 Towns: Colchester
1.3 Downstream Latitude: 44.5829608016
1.3 Downstream Longitude: -73.1587345383

Step 2. Stream Type
2.1 Elevation Upstream: 178
2.1 Elevation Downstream: 172
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 767.0 ft. 0.15 Miles
2.3 Valley Slope: 0.8
2.4 Channel Length: 842.4 ft. 0.16 Miles
2.5 Channel Slope: 0.71 %
2.6 Sinuosity: 1.10
2.7 Watershed Area: 0.7 Square Miles
2.8 Channel Width: 11.5 feet
2.9 Valley Width: 90.0 feet
2.10 Confinement Ratio: Broad
2.10 Confinement Type: E
2.11 Reference Stream Type: Dune-Ripple
Bedform: None
Sub-Class Slope: Sand
Bed Material:

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Ice-Contact 99.0 %
3.3 Sub-domin. Geological Mat.: Alluvial
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Steep
3.5 Soils
Hydrologic Group: A 99.0 %
Flooding: None Rare 100.0 %
Water Table Deep: 6.0 100.0 %
Water Table Shallow: 6.0 100.0 %
Erodibility: Very Severe 77.0 %
3.4 Comments: Some impacts to the buffer with extensive beaver activity upslope.

Phase 1 - Reach Summary Report
Reach ID: T1.S2.02
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
Historic Land Cover: Field
Current Dominant Land Cover: Forest 45.0 %
Current Sub-Dominant Land Cover: Crop

4.2 Corridor
Historic Land Cover: Field
Current Dominant Land Cover: Forest 27.0 %
Current Sub-Dominant Land Cover: Field

4.3 Riparian Buffer
Left Bank: >100
Right Bank: >100

4.4 Ground Water Inputs:
Type: Minimal

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
Type: None

5.2 Bridges and Culverts:
Left: 0.0 ft. Right: 0.0 ft.

5.3 Bank Armoring:
Left: 0.0 ft. Right: 0.0 ft.

5.4 Channel Straightening: 0.0
5.5 Downstream History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old:

One Side Both Sides
Road: 0.0 ft. 0.0 ft.
Railroad: 0.0 ft. 0.0 ft.
Berm: 0.0 ft. 0.0 ft.
Improved Path: 0.0 ft. 0.0 ft.

6.2 Development:
6.3 Channel Bars: No Data
6.4 Meander Migration: Multiple
6.5 Meander Width: 25.0 ft. R. 2.2
6.6 Wavelength: 73.0 ft. R. 6.3

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data
7.3 Ice/Debris Jam Potential: Not Evaluated

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High High High N.S. N.S. N.S. N.S. N.S. Unk. N.S. N.S. Low High Low N.S. N.S.
Malletts Creek

Phase 1 - Reach Summary Report

Reach ID: T1.S2.03
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Reach is impounded mostly by beaver activity; it ends at the confluence with T1.S2.03.t1.01.

Step 1. Reach Location

1.1 Reach Description:
1.2 Towns: Colchester
1.3 Downstream Latitude: 44.5844721005
1.3 Downstream Longitude: -73.1605927

Step 2. Stream Type
2.1 Elevation Upstream: 190
2.1 Elevation Downstream: 178
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 1,603.0 ft. 0.30 Miles
2.3 Valley Slope: 0.7
2.4 Channel Length: 1,874.2 ft. 0.35 Miles
2.5 Channel Slope: 0.64 %
2.6 Sinuosity: 1.17
2.7 Watershed Area: 0.7 Square Miles
2.8 Channel Width: 11.3 feet
2.9 Valley Width: 186.0 feet
2.10 Confinement Ratio: 16.5
2.10 Confinement Type: Very Broad
2.11 Reference Stream Type: E
   Bedform: Dune-Ripple
   Sub-Class Slope: None
   Bed Material: Sand

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 45.0 %
3.3 Sub-dom. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Very Steep
3.5 Soils
   Hydrologic Group: C 45.0 %
   Flooding: None/Rare 54.0 %
   Water Table Deep: 1.5 45.0 %
   Water Table Shallow: 0.0 72.0 %
   Eroded: Moderate 42.0 %
7.4 Comments: Extensive beaver activity.

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 44.0 %
   Current Sub-Dominant Land Cover: Crop

4.2 Corridor
   Historic Land Cover: Wetland
   Current Dominant Land Cover: Crop 45.0 %
   Current Sub-Dominant Land Cover: Forest

4.3 Riparian Buffer
   Left Bank
   Right Bank
   Length w/ less than 25 ft.: 144.0 ft.

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
   Type: None
   Use:
   5.2 Bridges and Culverts:
      Dominant: >100 >100
      Sub-dominant: 51-100 51-100
      Left: 0.0 ft. Right: 0.0 ft.
   5.3 Bank Armoring:
      Dominant: 0.0 0.0 %
      Sub-dominant: 0.0 0.0 %
   5.4 Channel Straightening: 284.5 15.2 %
   5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old:
   0.0 ft. 0.0 ft.
   One Side Both Sides
   Road: 0.0 ft. 0.0 ft.
   Railroad: 0.0 ft. 0.0 ft.
   Berm: 0.0 ft. 0.0 ft.
   Improved Path: 0.0 ft. 0.0 ft.
   6.2 Development:
      0.0 ft. 0.0 ft.
6.3 Channel Bars: No Data
6.4 Meander Migration: Neck Cutoff
6.5 Meander Width: 33 ft. Ratio: 2.9
6.6 Wavelength: 78 ft. Ratio: 6.9

Step 7. Winshield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Not Evaluated

| 4.1 | 4.2 | 4.3 | 5.1 | 5.2 | 5.3 | 5.4 | 5.5 | 6.1 | 6.2 | 6.3 | 6.4 | 6.5 | 6.6 | 7.1 | 7.3 | Total |
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   High High Low N.S. N.S. Low N.S. Unk. N.S. N.S. Low High Low N.S. N.S. |
Phase 1 - Reach Summary Report

Reach ID: T1.S2.03.11.01
SGAT Version: 4.56
Date Last Edited: August, 05 2010
QA Status: Themes have been checked

Is Reach An Impoundment?: No

From confluence with T1.S2.03 rec extends up towards Coon Hill Rd near the intersection with Galvin Hill Rd.

4.1 Watershed
- Historic Land Cover: Field
- Current Dominant Land Cover: Forest 40.0 %
- Current Sub-Dominant Land Cover: Crop

4.2 Corridor
- Historic Land Cover: Field
- Current Dominant Land Cover: Crop 33.0 %
- Current Sub-Dominant Land Cover: Forest

4.3 Riparian Buffer
- Left Bank: >100 ft.
- Right Bank: >100 ft.
- Dominant: 26-50 ft.
- Sub-dominant: 51-100 ft.

4.4 Ground Water Inputs: Minimal

5.1 Flow Regulation - (old):
Type: None
Use:
- 5.2 Bridges and Culverts: 0 ft. 0.0 %
- 5.3 Bank Armoring: 0.0 ft. 0.0 %

5.4 Channel Straightening:
- Length w/ less than 25 ft.: ft.
- 5.5 Dredging History: None

6.1 Berms & Roads - old:
- Road: ft.
- Railroad: ft.
- Berm: ft.
- Improved Path: ft.

6.2 Development:
- 6.3 Channel Bars: No Data
- 6.4 Meander Migration: None
- 6.5 Meander Width: 23 ft. Ratio: 3.1
- 6.6 Wavelength: 71 ft. Ratio: 9.5

7.1 Bank Erosion:
- 7.2 Bank Height:
- 7.3 Ice/Debris Jam Potential: Not Evaluated

| High | High | N.D. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. |
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Malletts Creek

Phase 1 - Reach Summary Report

Reach ID: T1.S2.03.11.02
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

From the reach break at the slope change up to about 175 feet upstream of the Coon Hill Rd crossing.

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
- Historic Land Cover: Shrub
- Current Dominant Land Cover: Forest 43.0%
- Current Sub-Dominant Land Cover: Crop

4.2 Corridor
- Historic Land Cover: Shrub
- Current Dominant Land Cover: Urban 50.0%
- Current Sub-Dominant Land Cover: Crop

4.3 Riparian Buffer
- Left Bank: Dominant: 51-100 8.7%
- Right Bank: Sub-dominant: 51-100
- Length w/ less than 25 ft.: 0.0 ft.

4.4 Ground Water Inputs: Minimal

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
- Type: None
- Use: None
- Bridges and Culverts: 1 8.7%
- Bank Armoring: 0.0%

5.3 Channel Straightening: 0.0%
5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 0.0 ft.
- One Side: 0.0 ft.
- Both Sides: 0.0 ft.

6.2 Development: 0.0 ft.
6.3 Channel Bars: No Data
6.4 Meander Migration: None
6.5 Meander Width: N/A Ratio: 0.0
6.6 Wavelength: N/A Ratio: 0.0

Step 7. Windshield Survey
7.1 Bank Erosion: ft
7.2 Bank Height: No Data
7.3 Ice/Debris Jam Potential: Culvert

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Malletts Creek

Basin: Northern Champlain
Stream Name: 
Topo Maps: COLCHESTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Malletts Bay

Step 1. Reach Location
Reach extends up to the northeast in the farm field, where it is more of a straightened ditch.

1.1 Reach Description:
1.2 Towns: Cochester, Milton
1.3 Downstream Latitude: 44.5880878477
1.3 Downstream Longitude: -73.1572584664

Step 2. Stream Type
2.1 Elevation Upstream: 217
2.1 Elevation Downstream: 190
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 2,524.0 ft. 0.48 Miles
2.3 Valley Slope: 1.1
2.4 Channel Length: 2,772.3 ft. 0.53 Miles
2.5 Channel Slope: 0.97 %
2.6 Sinuosity: 1.10
2.7 Watershed Area: 0.4 Square Miles
2.8 Channel Width: 8.3 feet
2.9 Valley Width: 193.0 feet
2.10 Confinement Ratio: 23.3
2.10 Confinement Type: Very Broad
2.11 Reference Stream Type: E
   Bedform: Dune-Ripple
   Sub-Class Slope: None
   Bed Material: Sand

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geologic Mat.: Glacial Lake 79.0 %
3.3 Sub-dom. Geologic Mat.: Alluvial
3.4 Valley Slope Left: Hilly
3.4 Valley Slope Right: Hilly
3.5 Soils
   Hydrologic Group: D 72.0 %
   Flooding: None/Rare 79.0 %
   Water Table Deep: 2.0 56.0 %
   Water Table Shallow: 0.0 90.0 %
   Erodibility: Severe 55.0 %

7.4 Comments:
Extensive straightening throughout reach and lots of beaver activity in upper reach.

Phase 1 - Reach Summary Report
Reach ID: T1.S2.04
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Forest 49.0 %
   Current Sub-Dominant Land Cover: Crop

4.2 Corridor
   Historic Land Cover: Field
   Current Dominant Land Cover: Crop 38.0 %
   Current Sub-Dominant Land Cover: Forest

4.3 Riparian Buffer
   Left Bank
   Dominant: 0-25
   Sub-dominant: 26-50
   Length w/ less than 25 ft.: 2,203.0 ft.
   1,864.0 ft.

4.4 Ground Water Inputs: Minimal

5.1 Flow Regulation - (old):
   Type: None
   Use:
   5.2 Bridges and Culverts: 0 0.0 %
   5.3 Bank Armoring: 0.0 0.0 %
   5.4 Channel Straightening: 2,771.8 100.0 %

5.5 Dredging History: None

6.1 Berms & Roads - old:
   One Side
   Road: 0.0 ft.
   Railroad: 0.0 ft.
   Berm: 0.0 ft.
   Improved Path: 0.0 ft.

6.2 Development:
   0.0 ft.

6.3 Channel Bars:
   None

6.4 Meander Migration:
   None

6.5 Meander Width:
   8 ft. Ratio: 1.0

6.6 Wavelength:
   8 ft. Ratio: 1.0

Step 7. Windsfield Survey
7.1 Bank Erosion:
   0 ft
7.2 Bank Height:
   No Data ft
7.3 Ice/Debris Jam Potential: None

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Malletts Creek

Basin: Northern Champlain
Stream Name: COLCHESTER
Watershed: Lewis Creek, Little Otter, Lake Champlain
Sub-watershed: Mallets Bay

Step 1. Reach Location
From the confluence with Allen Brook the reach extends to the east ending at a beaver dam approximately 1,000 feet upstream of the Petty Brook Rd crossing.

Step 2. Stream Type
2.1 Elevation Upstream: 224
2.1 Elevation Downstream: 186
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 2,385.0 ft.
2.2 Valley Slope: 1.6
2.4 Channel Length: 3,032.6 ft.
2.5 Channel Slope: 1.25 %
2.6 Sinuosity: 1.27
2.7 Watershed Area: 0.5 Square Miles
2.8 Channel Width: 9.3 feet
2.9 Valley Width: 139.0 feet
2.10 Confinement Ratio: 14.9
2.10 Confinement Type: Very Broad
2.11 Reference Stream Type: C
   Bedform: Riffle-Pool
   Sub-Class Slope: None
   Bed Material: Gravel

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 38.0 %
3.3 Sub-dom. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Very Steep
3.5 Soils
   Hydrologic Group: C 46.0 %
   Flooding: None/Rare 61.0 %
   Water Table Deep: 1.5 38.0 %
   Water Table Shallow: 0.0 50.0 %
   Erodibility: Moderate 29.0 %
3.4 Comments: Isolated reach with few impacts.

Phase 1 - Reach Summary Report
Reach ID: T1.S3.01
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Shrub
   Current Dominant Land Cover: Forest 76.0 %
   Current Sub-Dominant Land Cover: Crop
4.2 Corridor
   Historic Land Cover: Shrub
   Current Dominant Land Cover: Forest 37.0 %
   Current Sub-Dominant Land Cover: Crop
4.3 Riparian Buffer
   Left Bank
   Dominant: >100
   Sub-dominant: None
   Length w / less than 25 ft.: 0.0 ft.
   Right Bank
   Dominant: >100
   Sub-dominant: None
   Length w / less than 25 ft.: 0.0 ft.
4.4 Ground Water Inputs: Abundant
4.5 Flow Regulation - (old): None
   Type: None
4.6 Bridges and Culverts: 1 1.2 %
   Bank Armoring: 0.0 0.0 %
   Left: 0.0 ft.
   Right: 0.0 ft.
4.7 Channel Straightening: 47.9 1.6 %
4.8 Dredging History: None

Step 5. Instream Channel Modifications
6.1 Berms & Roads - old:
   One Side
   Road: 0.0 ft.
   Railroad: 0.0 ft.
   Berm: 0.0 ft.
   Improved Path: 0.0 ft.
   Both Sides
   Development: 0.0 ft.
6.3 Channel Bars: No Data
6.4 Meander Migration: None
6.5 Meander Width: 43 ft. Ratio: 4.6
6.6 Wavelength: 98 ft. Ratio: 10.5

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Culvert

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Malletts Creek

Basin: Northern Champlain
Stream Name: COLCHESTER
Topo Maps: Lewis Creek, Little Otter, Lake Champlain
Watershed: Malletts Bay
Sub-watershed:

Step 1. Reach Location
From the confluence with Allen Brook the reach extends to the northwest, crossing over Route 7 and then heads to the north following Route 7.

Step 2. Stream Type
2.1 Elevation Upstream: 291
2.1 Elevation Downstream: 193
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 3,315.0 ft., 0.63 Miles
2.3 Valley Slope: 3.0
2.4 Channel Length: 3,719.1 ft., 0.70 Miles
2.5 Channel Slope: 2.64%
2.6 Sinuosity: 1.12
2.7 Watershed Area: 0.2 Square Miles
2.8 Channel Width: 6.5 feet
2.9 Valley Width: 131.0 feet
2.10 Confinement Ratio: 20.2
2.10 Confinement Type: Very Broad
2.11 Reference Stream Type: E
   Bedform: Dune-Ripple
   Sub-Class Slope: b
   Bed Material: Sand

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Glacial Lake 53.0 %
3.3 Sub-dom. Geological Mat.: Till
3.4 Valley Slope Left: Hilly
3.4 Valley Slope Right: Hilly
3.5 Soils
   Hydrologic Group: B 41.0 %
   Flooding: None/Rare 81.0 %
   Water Table Deep: 6.0 35.0 %
   Water Table Shallow: 6.0 35.0 %
   Erodibility: Moderate 50.0 %
7.4 Comments:
Extensive straightening in upper reach; mostly a wetland.

Phase 1 - Reach Summary Report
Reach ID: T1.S4.01
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
   Historic Land Cover: Field
   Current Dominant Land Cover: Crop 30.0 %
   Current Sub-Dominant Land Cover: Field
4.2 Corridor
   Historic Land Cover: Field
   Current Dominant Land Cover: Crop 26.0 %
4.3 Riparian Buffer
   Left Bank
      Dominant: 0-25
      Sub-dominant: 25-50
   Right Bank
      Dominant: 0-25
      Sub-dominant: 25-50
Length w/ less than 25 ft.: 2,003.0 ft., 3,003.0 ft.
4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
   Type: None
   Use:
      5.2 Bridges and Culverts: 2 2.0 %
      5.3 Bank Armoring:
         Left: 0.0 ft.
         Right: 0.0 ft.
      5.4 Channel Straightening: 2,372.2 63.8 %
      5.5 Dredging History: None

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 1,051.3 ft., 28.3
   One Side
   Both Sides
      Road: 502.2 ft.
      Railroad: 0.0 ft.
      Berm: 549.2 ft.
      Improved Path: 0.0 ft.
      6.2 Development: 356.8 ft.
      6.3 Channel Bars: No Data
      6.4 Meander Migration: None
      6.5 Meander Width: 6 ft. Ratio: 1.0
      6.6 Wave Length: 6 ft. Ratio: 1.0

Step 7. Windshield Survey
7.1 Bank Erosion: 0 ft
7.2 Bank Height: No Data ft
7.3 Ice/Debris Jam Potential: Culvert

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Malletts Creek

Basin: Northern Champlain
Stream Name: MILTON
Topo Maps: Lewis Creek, Little Otter, Lake Champlain
Watershed: Malletts Bay
Sub-watershed:

Step 1. Reach Location: From the confluence with the main stem the reach extends to the north on the west side of East Rd ending just upstream of the Main St crossing.

1.1 Reach Description:
1.2 Towns: Milton
1.3 Downstream Latitude: 46.6317864546
1.3 Downstream Longitude: -73.1029975789

Step 2. Stream Type:
2.1 Elevation Upstream: 364
2.1 Elevation Downstream: 333
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 2,647.0 ft. 0.50 Miles
2.3 Valley Slope: 1.2
2.4 Channel Length: 2,587.4 ft. 0.54 Miles
2.5 Channel Slope: 1.08 %
2.6 Sinuosity: 1.08
2.7 Watershed Area: 0.6 Square Miles
2.8 Channel Width: 10.8 feet
2.9 Valley Width: 391.0 feet
2.10 Confinement Ratio: 36.3
2.10 Confinement Type: Very Broad
2.11 Reference Stream Type: E
Bedform: Dune-Ripple
Sub-Classes Slope: None
Bed Material: Sand

Step 3. Basin Characteristics:
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 44.0 %
3.3 Sub-dom. Geological Mat.: Ice-Contact
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Steep
3.5 Soils
Hydrologic Group: C 47.0 %
Flooding: None/Rare 55.0 %
Water Table Depth: 1.5 81.0 %
Water Table Shallow: 0.0 52.0 %
Erodibility: slight 5.0 %

7.4 Comments:
Extensive straightening throughout.

Reach T6.01 was segmented into 3 segments T6.01-A (994ft), T6.01-B (460ft), and T6.01-C (1,403ft). Segmentation was done to highlight ponding from beaver activity in T6.01-B and to separate degradation impacts from above and below the ponding. Segment T6.01-C was completely entrenched and incised, while T6.01-A had a lower degree of incision and

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Phase 1 - Reach Summary Report

Reach ID: T6.01
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 4. Land Cover - Reach Hydrology
4.1 Watershed
Historic Land Cover: Field
Current Dominant Land Cover: Forest 46.0 %
Current Sub-Dominant Land Cover: Crop
4.2 Corridor
Historic Land Cover: Field
Current Dominant Land Cover: Crop 32.0 %
Current Sub-Dominant Land Cover: Field

4.3 Riparian Buffer
Left Bank
Dominant: 0-25
Sub-dominant: 51-100
Length w / less than 25 ft.: 2,098.0 ft.

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications
5.1 Flow Regulation - (old): None
Use:
5.2 Bridges and Culverts: 2 2.7 %
5.3 Bank Armoring: 0.0 0.0 %
5.4 Channel Straightening: 2,537.3 88.8 %
5.5 Dredging History: Dredging

Step 6. Floodplain Modifications
6.1 Berms & Roads - old: 0.0 ft. 0.0
6.2 Development: 0.0 ft. 0.0 ft.
6.3 Channel Bars: Point
6.4 Meander Migration: Avulsion
6.5 Meander Width: 10 ft. Ratio: 1.0
6.6 Wavelength: 10 ft. Ratio: 1.0

Step 7. Windshield Survey
7.1 Bank Erosion: 493.7 ft
7.2 Bank Height: 3 ft
7.3 Ice/Debris Jam Potential: Culvert
Malletts Creek

Phase 1 - Reach Summary Report

Reach ID: T6.02
SGAT Version: 4.56
Date Last Edited: February, 10 2011
QA Status: Themes have been checked
Is Reach An Impoundment?: No

Step 1. Reach Location
From the Main St Crossing the reach extends to the north, ending 600 feet downstream of the North Rd crossing.

1.1 Reach Description:

1.2 Towns: Milton

1.3 Downstream Latitude: 44.6389377007
1.3 Downstream Longitude: -73.1015312573

Step 2. Stream Type

2.1 Elevation Upstream: 370
2.1 Elevation Downstream: 364
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 571.0 ft. 0.11 Miles
2.3 Valley Slope: 1.1
2.4 Channel Length: 609.7 ft. 0.12 Miles
2.5 Channel Slope: 0.98 %
2.6 Sinuosity: 1.07
2.7 Watershed Area: 0.4 Square Miles
2.8 Channel Width: 8.4 feet
2.9 Valley Width: 143.0 feet

2.10 Confinement Ratio: 16.9

2.11 Confinement Type: Very Broad

3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Alluvial 76.0 %
3.3 Sub-dom. Geological Mat.: Till
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Steep
3.5 Soils

Hydrologic Group: C 97.0 %
Flooding: Frequent 76.0 %
Water Table Deep: 1.5 76.0 %
Water Table Shallow: 0.0 76.0 %
Erodibility: slight 22.0 %

7.4 Comments:
Extensive straightening.

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Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover: Field
Current Dominant Land Cover: Forest 70.0 %
Current Sub-Dominant Land Cover: Crop

4.2 Corridor

Historic Land Cover: Field
Current Dominant Land Cover: Crop 58.0 %
Current Sub-Dominant Land Cover: Forest

4.3 Riparian Buffer

Left Bank: 0-25 >100
Right Bank: None 0-25

Length w / less than 25 ft.: 609.0 ft. 95.0 ft.

4.4 Ground Water Inputs: Abundant

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): None

Type: None

Use:

5.2 Bridges and Culverts: 0 0.0 %
5.3 Bank Armoring: 0.0 0.0 %

5.4 Channel Straightening: 609.2 99.9 %

5.5 Dredging History: None

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: 0.0 ft. 0.0 ft.

6.2 Development: 577.4 ft. 0.0 ft.

6.3 Channel Bars: None

6.4 Meander Migration: Avulsion

6.5 Meander Width: 8 ft. Ratio: 1.0

6.6 Wavelength: 8 ft. Ratio: 1.0

Step 7. Windshield Survey

7.1 Bank Erosion: 68.62 ft
7.2 Bank Height: 1 ft

7.3 Ice/Debris Jam Potential: Debris
Malletts Creek

Phase 1 - Reach Summary Report

Reach ID: T6.S1.01
SGAT Version: 4.56
Date Last Edited: February 10, 2011
QA Status: Themes have been checked

Is Reach An Impoundment?: No

Step 1. Reach Location
From confluence with T6.01 reach extends to the east along Westford Rd.

Step 2. Stream Type
2.1 Elevation Upstream: 414
2.1 Elevation Downstream: 364
2.1 Is Gradient Gentle?: No
2.2 Valley Length: 880.0 ft. 0.17 Miles
2.3 Valley Slope: 5.7
2.4 Channel Length: 895.1 ft. 0.17 Miles
2.5 Channel Slope: 5.59 %
2.6 Sinuosity: 1.02
2.7 Watershed Area: 0.1 Square Miles
2.8 Channel Width: 43 feet
2.9 Valley Width: 15.0 feet
2.10 Confinement Ratio: 3.5
2.10 Confinement Type: Semi-confined
2.11 Reference Stream Type: B
   Bedform: Riffle-Pool
   Sub-Class Slope: a
   Bed Material: Gravel

Step 3. Basin Characteristics
3.1 Alluvial Fan: None
3.2 Grade Control: None
3.3 Dominant Geological Mat.: Till 51.0 %
3.3 Sub-domin. Geological Mat.: Glacial Lake
3.4 Valley Slope Left: Steep
3.4 Valley Slope Right: Steep
3.5 Soils
   Hydrologic Group: C 96.0 %
   Flooding: None/Rare 89.0 %
   Water Table Deep: 2.5 88.0 %
   Water Table Shallow: 1.5 88.0 %
   Erodibility: Severe 51.0 %

7.4 Comments:
Tributary is more of a wetland drainage to the development than a fortified stream channel. The stream type designation was chosen to best represent to slope, but the valley is poorly defined.

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APPENDIX B
PHASE 2 DATA SUMMARY AND REPORTS
(INCLUDES CULVERT DATA SUMMARY)
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report  Malletts Creek

| Stream:       | Mallets Creek Main Stem | SGAT Version: | 4.56 |
| Reach:        | M14-A                    | Organization: | Fitzgerald Environmental |
| Segment Length(ft): | 261                      | Observers:    | EPF, SPP |
| Rain:         | Yes                      | Completion Date: | 10/13/2010 |
| Quality Control Status - Consultant: | Provisional |
| Quality Control Status - Staff:         | Provisional |

Step 0 - Location: From reach break at change in confinement to the very large beaver dam 261 feet upstream.

Step 5 - Notes: Segment M14-A was assessed to characterize the channel conditions in commonly observed in the areas of beaver activity. Although the upper segment is completely impounded by beaver activity it was necessary to capture the channel geometry where a fluvial system exists. The cross-section that was taken on this segment was the primary thread of the reach, however, many small channels exist to the north where flows travel over the floodplain because of the beaver dam.

Step 7 - Narrative: Channel slightly starved of sediment because of beaver dam, but condition is very natural.

### Step 1. Valley and Floodplain

| 1.1 Segmentation: | Other Reason |
| 1.2 Alluvial Fan: | None         |
| 1.3 Corridor Encroachments: |
| Length (ft): | One Height | Both Height |
| Berm: | 0 | 0 |
| Road: | 0 | 0 |
| Railroad: | 0 | 0 |
| Imp. Path: | 0 | 0 |
| Dev.: | 0 | 0 |

| 1.4 Adjacent Side |
| Hillside Slope: | Steep | Very Steep |
| Continuous w/ Bank: | Never | Sometimes |
| Within 1 Bankfull W: | Never | Sometimes |
| Texture: | N.E. | Sand |

| 1.5 Valley Features |
| Valley Width (ft): | 783 |
| Width Determination: | Measured |
| Confinement Type: | VB |
| In Rock Gorge: | No |
| Human Caused Change in Valley Width?: | No |
Step 2. Stream Channel

2.1 Bankfull Width (ft.): 10.50
2.2 Max Depth (ft.): 3.20
2.3 Mean Depth (ft.): 2.10
2.4 Floodprone Width (ft.): 440.00
2.5 Aband. Floodpl (ft.): 3.20
Human Elev FloodPln (ft.):
2.6 Width/Depth Ratio: 5.00
2.7 Entrenchment Ratio: 49.10
2.8 Incision Ratio: 1.00
Human Elevated Inc. Rat.: 0.00
2.9 Sinuosity: Moderate
2.10 Riffles Type: Not Applicable

Step 3. Riparian Features

3.1 Stream Banks
Bank Texture
Upper Left Right
Material Type: Sand Sand
Consistency: Non-cohesive Non-cohesive

3.2 Riparian Buffer
Buffer Width Dominant Sub-Dominant
< 100 None
100 None
25 Shrub/Herb
Buffer Vegetation Type Dominant Sub-Dominant

3.3 Riparian Corridor
Corridor Land Dominant Sub-Dominant
Shrubs/Herb Shrub/Legacy
Sub-Dominant Shrub/Legacy
W less than 25 Shrub/Legacy
Buffer Vegetation Type Dominant Sub-Dominant
Shrubs/Herb Shrub/Legacy
Sub-Dominant Shrub/Legacy
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report  Mallets Creek

Stream: Mallets Creek Main Stem  Reach: M14-A

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: Abundant
4.2 Adjacent Wetlands: Abundant
4.3 Flow Status: Moderate
4.4 # of Debris Jams: 1

4.5 Flow Regulation Type: None
4.6 Up/Down Strm flow reg.: None
(ol) Upstrm Flow Reg.: None

4.7 Stormwater Inputs: None
Field Ditch: Road Ditch:
Other: Tile Drain:
Overland Flow: Urb Strm Wtr Pipe:

4.8 Channel Constrictions: None

4.9 # of Beaver Dams: 0
Affected Length (ft): 0

Step 5. Channel Bed and Planform Changes

5.1 Bar Types
Diagonal: 0
Mid: 0
Point: 1
Side: 0

5.2 Other Features
Neck Cutoff: 0
Avulsion: 0
Head Cuts: 0

5.3 Steep Riffles and Head Cuts
Steep Riffles: 0

5.4 Stream Ford or Animal Crossing: No
5.5 Straightening: None
5.6 Straightening Length (ft.): 0
5.7 Trib Rejuv.: No
5.8 Dredging: None

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:
6.2 Pool Substrate:
6.3 Pool Variability:

6.4 Sediment Deposition: Stream Gradient Type
Left Right
6.5 Channel Flow Status: 6.6 Channel Alteration:
6.7 Channel Sinuosity: 6.8 Bank Stability:
6.9 Bank Vegetation Protection
6.10 Riparian Veg. Zone Width:

Total Score:

Habitat Rating:

Habitat Stream Condition:

Step 7. Rapid Geomorphic Assessment Data

Confinement Type

<table>
<thead>
<tr>
<th>Unconfined Score</th>
<th>STD</th>
<th>Historic</th>
<th>Geomorphic Rating</th>
<th>Channel Evolution Model</th>
<th>Channel Evolution Stage</th>
<th>Geomorphic Condition</th>
<th>Stream Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Channel Degradation</td>
<td>16</td>
<td>None</td>
<td>No</td>
<td>0.82</td>
<td>F</td>
<td></td>
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<tr>
<td>7.2 Channel Aggradation</td>
<td>18</td>
<td>None</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7.3 Widening Channel</td>
<td>16</td>
<td>None</td>
<td>No</td>
<td></td>
<td>I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.4 Change in Planform</td>
<td>16</td>
<td>None</td>
<td>Yes</td>
<td>Good</td>
<td></td>
<td></td>
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<tr>
<td>Total Score</td>
<td>66</td>
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</tr>
</tbody>
</table>
Phase 2 Segment Summary Report  Malletts Creek

Stream: Malletts Creek Main Stem  Reach: M14-B  Segment Length(ft): 2,518  Rain: Yes

SGAT Version: 4.56  Organization: Fitzgerald Environmental  Observers: EPF, SPP

Completion Date: Provisional  Quality Control Status - Consultant: Provisional  Why Not Assessed: beaver dam

Step 0 - Location: From start of the beaver dam impoundment up to the reach break with M15

Step 5 - Notes: Segment impounded by beaver activity and only assessed for bank and buffer conditions.

Step 7 - Narrative:

Step 1. Valley and Floodplain

<table>
<thead>
<tr>
<th>Length (ft)</th>
<th>One</th>
<th>Height</th>
<th>Both</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berm</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Road</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Railroad</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Imp. Path</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dev.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

1.1 Segmentation: Other Reason
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

1.4 Adjacent Side
Hillside Slope: Steep  Very Steep
Continuous w/ Bank: Never  Never
Within 1 Bankfull W: Never  Never
Texture: N.E.  N.E.

1.5 Valley Features
Valley Width(ft): 783
Width Determination: Measured
Confinement Type: VB
In Rock Gorge: No
Human Caused Change in Valley Width?: No
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report  Malletts Creek

Stream: Malletts Creek Main Stem  Reach: M14-B

**Step 2. Stream Channel**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bankfull Width (ft.)</td>
<td></td>
</tr>
<tr>
<td>Max Depth (ft.)</td>
<td></td>
</tr>
<tr>
<td>Mean Depth (ft.)</td>
<td></td>
</tr>
<tr>
<td>Flood prone Width (ft.)</td>
<td></td>
</tr>
<tr>
<td>Abandoned Floodplain (ft.)</td>
<td></td>
</tr>
<tr>
<td>Elevated Floodplain (ft.)</td>
<td></td>
</tr>
<tr>
<td>Width/Depth Ratio:</td>
<td>0.00</td>
</tr>
<tr>
<td>Entrenchment Ratio:</td>
<td>0.00</td>
</tr>
<tr>
<td>Incision Ratio:</td>
<td>0.00</td>
</tr>
<tr>
<td>Human Elevated Inc. Rat.:</td>
<td>0.00</td>
</tr>
<tr>
<td>Bedrock</td>
<td>%</td>
</tr>
<tr>
<td>Boulder</td>
<td>%</td>
</tr>
<tr>
<td>Cobble</td>
<td>%</td>
</tr>
<tr>
<td>Coarse Gravel</td>
<td>%</td>
</tr>
<tr>
<td>Fine Gravel</td>
<td>%</td>
</tr>
<tr>
<td>Sand</td>
<td>%</td>
</tr>
<tr>
<td>Silt and Smaller</td>
<td>%</td>
</tr>
<tr>
<td>Silt/Clay Present</td>
<td>%</td>
</tr>
<tr>
<td>Detritus</td>
<td>%</td>
</tr>
<tr>
<td># Large Woody Debris:</td>
<td></td>
</tr>
<tr>
<td>2.11 Riffle/Step Spacing:</td>
<td></td>
</tr>
<tr>
<td>2.12 Substrate Composition</td>
<td></td>
</tr>
<tr>
<td>2.13 Average Largest Particle on Bed:</td>
<td></td>
</tr>
<tr>
<td>2.14 Stream Type</td>
<td>E</td>
</tr>
<tr>
<td>2.15 Sub-reach Stream Type</td>
<td></td>
</tr>
<tr>
<td>Field Measured Slope:</td>
<td></td>
</tr>
<tr>
<td>Reference Stream Type:</td>
<td></td>
</tr>
<tr>
<td>Reference Bed Material:</td>
<td></td>
</tr>
<tr>
<td>Reference Subclass Slope:</td>
<td></td>
</tr>
<tr>
<td>Reference Bedform:</td>
<td></td>
</tr>
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</table>

**Step 3. Riparian Features**

<table>
<thead>
<tr>
<th>Bank Erosion</th>
<th>Erosion Length (ft.)</th>
<th>Erosion Height (ft.)</th>
<th>Revetment Type</th>
<th>Revetment Length</th>
<th>Mtd-Channel Canopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>0.0</td>
<td>0.0</td>
<td>None</td>
<td>0.0</td>
<td>Open</td>
</tr>
<tr>
<td>Right</td>
<td>0.0</td>
<td>0.0</td>
<td>None</td>
<td>0.0</td>
<td>26-50</td>
</tr>
</tbody>
</table>

| Material Type: Upper | Sand | Sand |
| Material Type: Lower | Silt | Silt |
| Consistency: Upper   | Non-cohesive | Non-cohesive |
| Consistency: Lower   | Non-cohesive | Non-cohesive |

**3.2 Riparian Buffer**

<table>
<thead>
<tr>
<th>Buffer Width</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant</td>
<td>&gt;100</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>W less than 25</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Buffer Vegetation Type</th>
<th>Dominant</th>
<th>Sub-Dominant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shrubs/Sapling</td>
<td>Herbaceous</td>
</tr>
<tr>
<td></td>
<td>Shrubs/Sapling</td>
<td>Herbaceous</td>
</tr>
</tbody>
</table>

**3.3 Riparian Corridor**

<table>
<thead>
<tr>
<th>Corridor Land</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant</td>
<td>Shrubs/Sapling</td>
<td>Shrubs/Sapling</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>W less than 25</td>
<td>(Legacy)</td>
<td>Amount</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>Dominant</th>
<th>Sub-Dominant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shrubs/Sapling</td>
<td>Herbaceous</td>
</tr>
<tr>
<td></td>
<td>Shrubs/Sapling</td>
<td>Herbaceous</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Failures</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gullies</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mass Failures</th>
<th>Height</th>
<th>Gullies Number</th>
<th>Gullies Length</th>
</tr>
</thead>
</table>
Stream: Malletts Creek Main Stem  Reach: M14-B

**Step 4. Flow & Flow Modifiers**

4.1 Springs / Seeps: Abundant
4.2 Adjacent Wetlands: Abundant
4.3 Flow Status: Moderate
4.4 # of Debris Jams: 0
4.5 Flow Regulation Type: None
   Flow Reg. Use:
   Impoundments:
   Impoundment Loc.:
4.6 Up/Down Stnm flow reg.:
   (old) Upstrn Flow Reg.:
   None
4.7 Stormwater Inputs None
   Field Ditch:
   Road Ditch:
   Other:
   Tile Drain:
   Ovland Flow:
   Urb Stnm Wtr Pipe:
4.9 # of Beaver Dams: 1
   Affected Length (ft.): 2518

4.8 Channel Constrictions: None

**Step 5. Channel Bed and Planform Changes**

5.1 Bar Types Diagonal:
   Mid:
   Delta:
   Point:
   Island:
   Side:
   Braiding: 0
5.2 Other Features Neck Cutoff: 1
   Flood chutes: 1
   Avulsion: 0
   5.3 Steep Riffles and Head Cuts
   Head Cuts: 0
   Sleep Riffles: 0
   Trib Rejv.: 0
5.4 Stream Ford or Animal Crossing: No
5.5 Straightening: Straightening
   Straightening Length (ft.): 408
5.5 Dredging: None

**Step 6. Rapid Habitat Assessment Data**

6.1 Epifaunal Substrate - Avl.:
6.2 Pool Substrate:
6.3 Pool Variability:
   Total Score:
   Habitat Rating:
   Habitat Stream Condition:
6.4 Sediment Deposition: Stream Gradient Type
   Left
   Right
6.5 Channel Flow Status:
6.6 Channel Alteration:
6.7 Channel Sinuosity:
6.8 Bank Stability:
6.9 Bank Vegetation Protection:
6.10 Riparian Veg. Zone Width:

**Step 7. Rapid Geomorphic Assessment Data**

<table>
<thead>
<tr>
<th>Score</th>
<th>STD</th>
<th>Historic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geomorphic Rating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel Evolution Model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel Evolution Stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geomorphic Condition: Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stream Sensitivity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VT DEC 103 South Main Street Waterbury, VT 05671
### Phase 2 Segment Summary Report  
**Malletts Creek**

**Stream:** Mallets Creek Main Stem  
**Reach:** M15-A  
**Segment Length(ft):** 671  
**Rain:** Yes  

**SGAT Version:** 4.56  
**Organization:** Fitzgerald Environmental  
**Observers:** EPF, SPP  
**Completion Date:** 10/13/2010  
**Quality Control Status - Consultant:** Provisional  
**Quality Control Status - Staff:** Provisional  
**Why Not Assessed:** beaver dam

**Step 0 - Location:** From reach break at confluence with T5.01 to segment break at end of impoundment 671 feet upstream.

**Step 5 - Notes:** Segment impounded by beaver activity and only assessed for bank and buffer conditions.

**Step 7 - Narrative:**

### Step 1. Valley and Floodplain

<table>
<thead>
<tr>
<th>1.1 Segmentation:</th>
<th><strong>Other Reason</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Alluvial Fan:</td>
<td><strong>None</strong></td>
</tr>
<tr>
<td>1.3 Corridor Encroachments:</td>
<td></td>
</tr>
<tr>
<td><strong>Length (ft)</strong></td>
<td><strong>One</strong></td>
</tr>
<tr>
<td>Berm:</td>
<td>0</td>
</tr>
<tr>
<td>Road:</td>
<td>0</td>
</tr>
<tr>
<td>Railroad:</td>
<td>0</td>
</tr>
<tr>
<td>Imp. Path:</td>
<td>0</td>
</tr>
<tr>
<td>Dev.:</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.4 Adjacent Side</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillside Slope:</td>
<td>Very Steep</td>
<td>Steep</td>
</tr>
<tr>
<td>Continuous w/ Bank:</td>
<td>Never</td>
<td>Never</td>
</tr>
<tr>
<td>Within 1 Bankfull W:</td>
<td>Never</td>
<td>Never</td>
</tr>
<tr>
<td>Texture:</td>
<td>N.E.</td>
<td>N.E.</td>
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</table>

<table>
<thead>
<tr>
<th>1.5 Valley Features</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Valley Width (ft):</td>
<td>351</td>
<td></td>
</tr>
<tr>
<td>Width Determination:</td>
<td>Measured</td>
<td></td>
</tr>
<tr>
<td>Confinement Type:</td>
<td>VB</td>
<td></td>
</tr>
<tr>
<td>In Rock Gorge:</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Human Caused Change in Valley Width?:</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

VT DEC • 103 South Main Street • Waterbury, VT 05671
Stream Geomorphic Assessment
Agency of Natural Resources
Phase 2 Segment Summary Report
Malletts Creek

Stream: Malletts Creek Main Stem
Reach: M15-A

Step 2. Stream Channel

2.1 Bankfull Width (ft.): 2.11 Rifle/Step Spacing:
2.2 Max Depth (ft.): 2.12 Substrate Composition
2.3 Mean Depth (ft.):
2.4 Flood prone Width (ft.):
2.5 Aband. Floodpln (ft.):
2.6 Width/Depth Ratio: 0.00
2.7 Entrenchment Ratio: 0.00
2.8 Incision Ratio: 0.00
2.9 Sinuosity:
2.10 Riffles Type:

Step 3. Stream Channel

2.13 Average Largest Particle on
Bed:
Bar:
2.14 Stream Type Stream Type: E
Bed Material: Sand
Subclass Slope: None
Bed Form: Dune-Ripple
Field Measured Slope:
2.15 Sub-reach Stream Type Reference Stream Type:
Reference Bed Material:
Reference Subclass Slope:
Reference Bedform:

Step 3. Riparian Features

3.1 Stream Banks
Bank Texture
Upper Left Right
Material Type: Sand Sand
Consistency: Non-cohesive Non-cohesive
Lower
Material Type: Silt Silt
Consistency: Non-cohesive Non-cohesive

Typical Bank Slope: Moderate
Bank Erosion
Erosion Length (ft.): 0.0 0.0
Erosion Height (ft.): 0.0 0.0
Revetment Type: None None
Revetment Length: 0.0 0.0
Canopy %: 1-25 1-25
Mid-Channel Canopy: Open

3.2 Riparian Buffer

Buffer Width Left Right Corridor Land
Dominant >100 >100 Dominant
Sub-Dominant None None Sub-Dominant
W less than 25 0 0 (Legacy)
Buffer Vegetation Type
Dominant Shrub/Sapling Shrub/Sapling
Sub-Dominant Herbaceous Herbaceous

3.3 Riparian Corridor

Left Right
Shrub/Sapling Shrub/Sapling Mass Failures
None None Forest Height
Amount Mean Height Guilles Number 0
Failures None Guilles Length 0

VT DEC • 103 South Main Street • Waterbury, VT 05671
Stream Geomorphic Assessment
Agency of Natural Resources
Phase 2 Segment Summary Report Malletts Creek

Stream: Mallets Creek Main Stem Reach: M15-A

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: Abundant
4.2 Adjacent Wetlands: Abundant
4.3 Flow Status: Moderate
4.4 # of Debris Jams: 0

4.5 Flow Regulation Type: None
Flow Reg. Use: Held Uitch
Impoundments: None
Impoundment Loc.: Hoad Uitch:

4.6 Up/Down Strm flow reg.: None
(old) Upstrm Flow Reg.: None

4.7 Stormwater Inputs None
Overland Flow: Urb Strm Wtr Pipe:

4.9 # of Beaver Dams: 1
Affected Length (ft): 580

4.8 Channel Constrictions: None

Step 5. Channel Bed and Planform Changes

5.1 Bar Types Diagonal:
Mid: Delta:
Point: Island:
Side: Braiding: 0

5.2 Other Features
Flood chutes: 0
5,3 Steep Riffles and Head Cuts: 0
Sleep Riffles: 0

5.4 Stream Ford or Animal Crossing: No
Avulsion: 0

5.5 Straightening: Straightening Length (ft.):
5.6 Stream Gradient Type: Left Right

5.7 Channel Sinuosity: 6.1 Epifaunal Substrate - Avl.:
5.8 Bank Stability:

6.1 Channel Flow Status:
6.6 Channel Alteration:
6.7 Channel Sinuosity:
6.8 Bank Vegetation Protection:
6.9 Riparian Veg. Zone Width:

6.10 Riparian Veg. Zone Width:

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:
6.2 Pool Substrate:
6.3 Pool Variability:

Total Score: Habitat Rating:
Habitat Stream Condition:

Step 7. Rapid Geomorphic Assessment Data

Score STD Historic

Confinement Type
7.1 Channel Degradation
7.2 Channel Aggradation
7.3 Widening Channel
7.4 Change in Planform

Total Score

Geomorphic Rating
Channel Evolution Model
Channel Evolution Stage
Geomorphic Condition Good
Stream Sensitivity
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report  Malletts Creek

Stream: Malletts Creek Main Stem  SGAT Version: 4.56
Reach: M15-B  Organization: Fitzgerald Environmental
Segment Length(ft): 1,487  Observers: EPF, SPP
Rain: Yes  Completion Date: 10/13/2010

Step 0 - Location: From end of impoundment up to the sharp channel bend several hundred feet upslope of the Kingsbury Road crossing

Step 5 - Notes: Channel historically straightened, which dramatically impacted both the overall geomorphic and habitat conditions. Slightly coarser, foreign substrate was observed downstream of the Kingsbury Rd. culvert, which suggest that the previous culvert might have had an erosion problem or a blowout. There is minor channel encroachment near the Kingsbury road crossing, but the driveway does not seem to be significantly impacting the floodplain function.

Step 7 - Narrative: Vertical changes in the channel were not observed in the cross-section, however minor incision was noted upstream of Kingsbury Road. Channel straightening has dramatically changed the planform of the segment, and future adjustments will be lateral. Channel is trying to redevelop a more stable planform and additional sinuosity, by eroding the outside meander bends, and some flood chutes and neck cutoffs.

1.1 Segmentation: Other Reason
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:
<table>
<thead>
<tr>
<th>Length (ft)</th>
<th>One</th>
<th>Height</th>
<th>Both</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berm:</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Road:</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Railroad:</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Imp. Path:</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dev.:</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

1.6 Grade Controls: None

1.4 Adjacent Side
1.5 Valley Features
<table>
<thead>
<tr>
<th>Left</th>
<th>Right</th>
<th>Valley Width (ft):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Steep</td>
<td>Very Steep</td>
<td>351</td>
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</tbody>
</table>

Continuous w/ Bank:
<table>
<thead>
<tr>
<th>Within 1 Bankfull W:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
</tr>
</tbody>
</table>

Texture:
<table>
<thead>
<tr>
<th>N.E.</th>
<th>Sand</th>
</tr>
</thead>
</table>

In Rock Gorge: No

Human Caused Change in Valley Width?: No
# Stream Geomorphic Assessment

**Agency of Natural Resources**

**Phase 2 Segment Summary Report**  
**Malletts Creek**

<table>
<thead>
<tr>
<th>Stream:</th>
<th>Malletts Creek Main Stem</th>
<th>Reach:</th>
<th>M15-B</th>
</tr>
</thead>
</table>

## Step 2. Stream Channel

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Measurement</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Bankfull Width (ft.)</td>
<td>18.50</td>
<td>2.11 Riffle/Step Spacing: 140 ft.</td>
<td>2.13 Average Largest Particle on Bed: 1.7 inches</td>
</tr>
<tr>
<td>2.2 Max Depth (ft.)</td>
<td>2.40</td>
<td>2.12 Substrate Composition</td>
<td></td>
</tr>
<tr>
<td>2.3 Mean Depth (ft.)</td>
<td>1.95</td>
<td>Bedrock: 0.0 %</td>
<td>Bar: 1.5 inches</td>
</tr>
<tr>
<td>2.4 Flood prone Width (ft.)</td>
<td>412.50</td>
<td>Boulder: 0.0 %</td>
<td>2.14 Stream Type</td>
</tr>
<tr>
<td>2.5 Aband. Floodpn (ft.)</td>
<td>2.40</td>
<td>Cobble: 0.0 %</td>
<td>Stream Type: E</td>
</tr>
<tr>
<td>Human Elev FloodPn (ft.)</td>
<td>Coarse Gravel: 24.0 %</td>
<td>Bed Material: Gravel</td>
<td></td>
</tr>
<tr>
<td>2.6 Width/Depth Ratio</td>
<td>9.49</td>
<td>Fine Gravel: 36.0 %</td>
<td>Subclass Slope: None</td>
</tr>
<tr>
<td>2.7 Entrenchment Ratio</td>
<td>22.30</td>
<td>Sand: 36.0 %</td>
<td>Bed Form: Ripple-Pool</td>
</tr>
<tr>
<td>2.8 Incision Ratio</td>
<td>1.00</td>
<td>Silt and Smaller: 4.0 %</td>
<td>Field Measured Slope:</td>
</tr>
<tr>
<td>Human Elev Inc. Rat.</td>
<td>0.00</td>
<td>Silt/Clay Present: Yes</td>
<td>2.15 Sub-reach Stream Type</td>
</tr>
<tr>
<td>2.9 Sinuosity</td>
<td>Moderate</td>
<td>Detritus: 10.0 %</td>
<td>Reference Stream Type:</td>
</tr>
<tr>
<td>2.10 Riffles Type</td>
<td>Complete</td>
<td># Large Woody Debris: 52</td>
<td>Reference Bed Material:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reference Subclass Slope:</td>
</tr>
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<td></td>
<td></td>
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<td>Reference Bedform:</td>
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## Step 3. Riparian Features

### 3.1 Stream Banks

<table>
<thead>
<tr>
<th>Bank Texture</th>
<th>Bank Erosion</th>
<th>Left</th>
<th>Right</th>
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<tbody>
<tr>
<td>Upper</td>
<td>Erosion Length (ft.):</td>
<td>87.4</td>
<td>62.1</td>
</tr>
<tr>
<td>Material Type</td>
<td>Sand</td>
<td>Left</td>
<td>Right</td>
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<tr>
<td>Consistency</td>
<td>Non-cohesive</td>
<td>Non-cohesive</td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>Erosion Height (ft.):</td>
<td>4.0</td>
<td>3.3</td>
</tr>
<tr>
<td>Material Type</td>
<td>Gravel</td>
<td>Left</td>
<td>Right</td>
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<td>Consistency</td>
<td>Non-cohesive</td>
<td>Non-cohesive</td>
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### 3.2 Riparian Buffer

<table>
<thead>
<tr>
<th>Buffer Width</th>
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<tbody>
<tr>
<td>Dominant</td>
<td>51-100</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>0-25</td>
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<tr>
<td>W less than 25</td>
<td>463</td>
<td>0</td>
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### 3.3 Riparian Canopy

<table>
<thead>
<tr>
<th>Buffer Vegetation Type</th>
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<tbody>
<tr>
<td>Dominant</td>
<td>Shrub/Sapling</td>
<td>Shrub/Sapling</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>Herbaceous</td>
<td>Deciduous</td>
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<table>
<thead>
<tr>
<th>Riparian Corridor</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass Failures</td>
<td>21.07</td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>10.0</td>
<td></td>
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</tbody>
</table>
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report

Malletts Creek

Stream: Malletts Creek Main Stem  Reach: M15-B

Step 4. Flow & Flow Modifiers

- 4.1 Springs / Seeps: Minimal
- 4.2 Adjacent Wetlands: Abundant
- 4.3 Flow Status: Moderate
- 4.4 # of Debris Jams: 0
- 4.5 Flow Regulation Type: None
- Impoundment Loc.: None
- Impoundments: None
- 4.6 Up/Down Strm flow reg.: None
- (old) Upstrm Flow Reg.: None
- 4.7 Stormwater Inputs None
- Field Ditch: Road Ditch:
- Other: Tile Drain:
- Overland Flow: Urb Strm Wtr Pipe:
- 4.9 # of Beaver Dams: 0
- Affected Length (ft.): 0

4.8 Channel Constrictions:

<table>
<thead>
<tr>
<th>Type</th>
<th>Photo Width Taken?</th>
<th>GPS Taken?</th>
<th>Channel Constriction?</th>
<th>Floodprone Constriction?</th>
<th>Problems</th>
<th>Deposition Below</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instream Culvert</td>
<td>14</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
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</table>

Step 5. Channel Bed and Planform Changes

- 5.1 Bar Types
  - Diagonal: 0
  - Delta: 0
  - Island: 6
  - Braiding: 4
- 5.2 Other Features
  - Neck Cutoff: 2
  - Avulsion: 0
  - Head Cuts: 0
  - Steep Riffles: 0
  - Trib Rejuv.: No
- 5.3 Steep Riffles and Head Cuts
  - Steep Riffles: 0
- 5.4 Stream Ford or Animal Crossing: No
- 5.5 Straightening: Straightening
- 5.5 Straightening Length (ft.): 1,450
- 5.5 Dredging: None

Step 6. Rapid Habitat Assessment Data

- 6.1 Epifaunal Substrate - Avl.: Stream Gradient Type
- 6.2 Pool Substrate:
- 6.3 Pool Variability:
- 6.4 Sediment Deposition: Left
- 6.5 Channel Flow Status:
- 6.6 Channel Alteration:
- 6.7 Channel Sinuosity:
- 6.8 Bank Stability:
- 6.9 Bank Vegetation Protection
- 6.10 Riparian Veg. Zone Width:

Total Score: 0
Habitat Rating: 0.00
Habitat Stream Condition:

Step 7. Rapid Geomorphic Assessment Data

<table>
<thead>
<tr>
<th>Confinement Type</th>
<th>Unconfined Score</th>
<th>STD</th>
<th>Historic</th>
<th>Geomorphic Rating</th>
<th>Channel Evolution Model</th>
<th>Channel Evolution Stage</th>
<th>Geomorphic Condition</th>
<th>Stream Sensitivity</th>
<th>Deposition Below</th>
</tr>
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<tbody>
<tr>
<td>7.1 Channel Degradation</td>
<td>11</td>
<td>None</td>
<td>Yes</td>
<td>Geomorphic Rating</td>
<td>0.57</td>
<td>F</td>
<td>I</td>
<td>Fair</td>
<td>Extreme</td>
</tr>
<tr>
<td>7.2 Channel Aggradation</td>
<td>11</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Model</td>
<td>F</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.3 Widening Channel</td>
<td>13</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Stage</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.4 Change in Planform</td>
<td>11</td>
<td>None</td>
<td>No</td>
<td>Geomorphic Condition</td>
<td>Fair</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Score</td>
<td>46</td>
<td></td>
<td></td>
<td>Stream Sensitivity</td>
<td>Extreme</td>
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Stream Geomorphic Assessment
Agency of Natural Resources
February, 21 2011

Phase 2 Segment Summary Report  Malletts Creek

Stream: Malletts Creek Main Stem
Reach: M16-0
Segment Length(ft): 3,142
Rain: Yes

SGAT Version: 4.56
Organization: Fitzgerald Environmental
Observers: EPF, SPP
Completion Date: 10/13/2010
Quality Control Status - Consultant: Provisional
Quality Control Status - Staff: Provisional

Step 0 - Location: From the reach break upstream of the Kingsbury Road Crossing up to a change in slope at the confluence with tributary T6.01.

Step 5 - Notes: Reach has had significant historical beaver activity, which has led to some instability in the form of minor headcuts. However, these changes are natural and would be expected after major base level drops when beaver dams breach. The channel has is currently degrading through the substrate that has aggraded behind these breached beaver dams. At the upstream end near the confluence with T6.01 and M17 the channel receives a high sediment load from the high energy channel in M17-A/M17-B. This sediment appears aggrading rapidly, because of the historical channel straightening in segment M17-A. C-type was chosen for this reach because some areas with wider geometry were noted in the field. The current width-to-depth ratio is within the confidence limits of the Rosgen designations for C-type channels.

Step 7 - Narrative: Degradation through sediment that has aggraded behind (breached) beaver dams and planform shifts. These impacts are natural and CEM remains in stage I.

---

1.1 Segmentation: None
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

<table>
<thead>
<tr>
<th>Length (ft)</th>
<th>Berm</th>
<th>Road</th>
<th>Railroad</th>
<th>Imp. Path</th>
<th>Dev.</th>
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</thead>
<tbody>
<tr>
<td>One Height</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Both Height</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

1.4 Adjacent Side

<table>
<thead>
<tr>
<th>Hillside Slope</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Steep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steep</td>
<td></td>
<td></td>
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</tbody>
</table>

1.5 Valley Features

<table>
<thead>
<tr>
<th>Continuous w/ Bank</th>
<th>Within 1 Bankfull W</th>
<th>Texture</th>
<th>Valley Width (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sometimes</td>
<td>Sometimes</td>
<td>N.E.</td>
<td>248</td>
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</table>

1.6 Grade Controls: None
Step 2. Stream Channel

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Bankfull Width (ft.)</td>
<td>19.50</td>
</tr>
<tr>
<td>Max Depth (ft.)</td>
<td>3.00</td>
</tr>
<tr>
<td>Mean Depth (ft):</td>
<td>1.92</td>
</tr>
<tr>
<td>Floodprone Width (ft):</td>
<td>107.00</td>
</tr>
<tr>
<td>Aband. Floodprne (ft):</td>
<td>3.70</td>
</tr>
<tr>
<td>Human Elev FloodPIn (ft):</td>
<td></td>
</tr>
<tr>
<td>Width/Depth Ratio:</td>
<td>10.16</td>
</tr>
<tr>
<td>Entrenchment Ratio:</td>
<td>5.49</td>
</tr>
<tr>
<td>Incision Ratio:</td>
<td>1.23</td>
</tr>
<tr>
<td>Human Elevated Inc. Rat.:</td>
<td>0.00</td>
</tr>
<tr>
<td>Sinuosity:</td>
<td>Moderate</td>
</tr>
<tr>
<td>Riffles Type:</td>
<td>Complete</td>
</tr>
<tr>
<td>Rifle/Step Spacing:</td>
<td>135 ft.</td>
</tr>
<tr>
<td>Substrate Composition</td>
<td></td>
</tr>
<tr>
<td>Bedrock:</td>
<td>0.0 %</td>
</tr>
<tr>
<td>Cobble:</td>
<td>10.0 %</td>
</tr>
<tr>
<td>Coarse Gravel:</td>
<td>42.0 %</td>
</tr>
<tr>
<td>Fine Gravel:</td>
<td>16.0 %</td>
</tr>
<tr>
<td>Sand:</td>
<td>22.0 %</td>
</tr>
<tr>
<td>Silt and Smaller:</td>
<td>4.0 %</td>
</tr>
<tr>
<td>Silt/Clay Present:</td>
<td>Yes</td>
</tr>
<tr>
<td>Detritus:</td>
<td>10.0 %</td>
</tr>
<tr>
<td># Large Woody Debris:</td>
<td>73</td>
</tr>
<tr>
<td>Average Largest Particle on Bed:</td>
<td>12 inches</td>
</tr>
<tr>
<td>Bar:</td>
<td>3 inches</td>
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Step 3. Riparian Features

Bank Texture: Sand

<table>
<thead>
<tr>
<th>Upper Material Type:</th>
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<th>Right</th>
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<tbody>
<tr>
<td>Erosion Length (ft.):</td>
<td>241.2</td>
<td>283.9</td>
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<tr>
<td>Erosion Height (ft.):</td>
<td>3.1</td>
<td>3.6</td>
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<tr>
<td>Revetment Type:</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Revetment Length:</td>
<td>0.0</td>
<td>0.0</td>
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<table>
<thead>
<tr>
<th>Lower Material Type:</th>
<th>Gravel</th>
<th>Gravel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canopy %:</td>
<td>26-50</td>
<td>51-75</td>
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3.2 Riparian Buffer

<table>
<thead>
<tr>
<th>Buffer Width</th>
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<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant</td>
<td>&gt;100</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>0-25</td>
<td>None</td>
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<tr>
<td>W less than 25</td>
<td>320</td>
<td>0</td>
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<table>
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<tr>
<th>Buffer Vegetation Type</th>
<th>Dominant</th>
<th>Sub-Dominant</th>
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</thead>
<tbody>
<tr>
<td>Shrub Sapling</td>
<td>Shrub Sapling</td>
<td></td>
</tr>
<tr>
<td>Herbaceous</td>
<td>Herbaceous</td>
<td></td>
</tr>
</tbody>
</table>

3.3 Riparian Corridor

<table>
<thead>
<tr>
<th>Mass Failures</th>
<th>Forest</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>Mean Height</td>
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</tr>
<tr>
<td>None</td>
<td>Gullies Number</td>
<td>0</td>
</tr>
<tr>
<td>None</td>
<td>Gullies Length</td>
<td>0</td>
</tr>
</tbody>
</table>
# Stream Geomorphic Assessment

**Agency of Natural Resources**

### Phase 2 Segment Summary Report

**Stream:** Mallets Creek Main Stem  
**Reach:** M16-0

### Step 4. Flow & Flow Modifiers

- **4.1 Springs / Seeps:** Abundant
- **4.2 Adjacent Wetlands:** Abundant
- **4.3 Flow Status:** Moderate
- **4.4 # of Debris Jams:** 1
- **4.5 Flow Regulation Type:** None
- **Flow Reg. Use:** None
- **Impoundments:** None
- **Impoundment Loc.:** None
- **4.6 Up/Down Strm flow reg.:** None
- **(old) Upstrm Flow Reg.:** None
- **4.7 Stormwater Inputs:** None
- **Field Ditch:** Road Ditch:
- **Other:** Tile Drain:
- **Overland Flow:** Urb Strm Wtr Pipe:
- **4.9 # of Beaver Dams:** 0
- **Affected Length (ft.):** 0

### Step 5. Channel Bed and Planform Changes

- **5.1 Bar Types**
  - **Diagonal:** 0
  - **5.2 Other Features**
  - **Neck Cutoff:** 1
- **Mid:** 12
- **Delta:** 0
- **Flood chutes:** 0
- **Avulsion:** 1
- **Head Cuts:** 3
- **6.5 Straightening:** None
- **Straightening Length (ft.):** 0
- **6.6 Channel Alteration:**
- **6.7 Channel Sinuosity:**
- **6.8 Bank Stability:**
- **6.9 Bank Vegetation Protection:**
- **6.10 Riparian Veg. Zone Width:**

### Step 6. Rapid Habitat Assessment Data

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sediment Deposition</td>
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<tr>
<td>Channel Flow Status</td>
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<tr>
<td>Channel Alteration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel Sinuosity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank Stability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank Vegetation Protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riparian Veg. Zone Width</td>
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</tr>
</tbody>
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### Step 7. Rapid Geomorphic Assessment Data

<table>
<thead>
<tr>
<th>Confinement Type</th>
<th>Unconfined Score</th>
<th>STD</th>
<th>Historic</th>
<th>Geomorphic Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Channel Degradation</td>
<td>13</td>
<td>None</td>
<td>No</td>
<td>Geomorphic Rating</td>
</tr>
<tr>
<td>7.2 Channel Aggradation</td>
<td>14</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Model</td>
</tr>
<tr>
<td>7.3 Widening Channel</td>
<td>13</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Stage</td>
</tr>
<tr>
<td>7.4 Change in Planform</td>
<td>12</td>
<td>None</td>
<td>No</td>
<td>Geomorphic Condition</td>
</tr>
<tr>
<td>Total Score</td>
<td>52</td>
<td></td>
<td></td>
<td>Stream Sensitivity</td>
</tr>
</tbody>
</table>

**Habitat Stream Condition:**

- **Total Score:** 0.00

- **Habitat Rating:**

- **Step 6. Rapid Habitat Assessment Data**

- **Step 7. Rapid Geomorphic Assessment Data**

---

VT DEC • 103 South Main Street • Waterbury, VT 05671
Phase 2 Segment Summary Report  

**Malletts Creek**

**Stream:** Mallets Creek Main Stem  
**Reach:** M17-A  
**Segment Length (ft):** 916  
**Rain:** Yes  

**SGAT Version:** 4.56  
**Organization:** Fitzgerald Environmental  
**Observers:** EPF, SPP  
**Completion Date:** 10/28/2010  
**Quality Control Status - Consultant:** Provisional  
**Quality Control Status - Staff:** Provisional

**Step 0 - Location:** From confluence with T6.01 downstream of East Road to approximately 400 feet upstream of the East Rd Crossing.

**Step 5 - Notes:** Segment historically had a single thread that meandered in the open valley, however, straightening altered the channel planform and now the system has a high transport capacity. Large bars have formed at the top of the downstream reach as a result of this transport.

**Step 7 - Narrative:** Vertical changes in the channel were not observed in the cross-section, however minor incision was noted upstream and downstream of the cross-section location. Channel straightening has dramatically changed the planform of the segment, and future adjustments will be lateral.

The degradation STD refers to the departure from a C-type channel to an E-type. As more sediment aggrades and sinuosity increases this segment will likely regain C-type morphology.

### Step 1. Valley and Floodplain

<table>
<thead>
<tr>
<th>1.1 Segmentation:</th>
<th>Other Reason</th>
<th>1.4 Adjacent Side</th>
<th>Left</th>
<th>Right</th>
<th>1.5 Valley Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Alluvial Fan:</td>
<td>None</td>
<td>Hillside Slope:</td>
<td>Hilly</td>
<td>Hilly</td>
<td>Valley Width (ft):</td>
</tr>
<tr>
<td>1.3 Corridor Encroachments:</td>
<td></td>
<td>Continuous w/ Bank:</td>
<td>Never</td>
<td>Sometimes</td>
<td>Measured</td>
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<td>Length (ft)</td>
<td>One</td>
<td>Height</td>
<td>Both</td>
<td>Height</td>
<td>Width Determination:</td>
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<tr>
<td>Berm:</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>Confinement Type:</td>
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<tr>
<td>Road:</td>
<td>110</td>
<td>8</td>
<td>0</td>
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<td>In Rock Gorge:</td>
</tr>
<tr>
<td>Railroad:</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>Human Caused Change in Valley Width?:</td>
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<td>Imp. Path:</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Dev.:</td>
<td>215</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.6 Grade Controls: None
## Stream Geomorphic Assessment

### Agency of Natural Resources

**Phase 2 Segment Summary Report**

**Malletts Creek**

**Stream:** Malletts Creek Main Stem  
**Reach:** M17-A

### Step 2. Stream Channel

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Bankfull Width (ft.)</td>
<td>19.00</td>
</tr>
<tr>
<td>2.2 Max Depth (ft.)</td>
<td>2.70</td>
</tr>
<tr>
<td>2.3 Mean Depth (ft)</td>
<td>2.18</td>
</tr>
<tr>
<td>2.4 Floodprone Width (ft.)</td>
<td>617.00</td>
</tr>
<tr>
<td>2.5 Aband. Floodpl (ft.)</td>
<td>3.00</td>
</tr>
<tr>
<td>Human Elev Floodpl (ft.)</td>
<td>Coarse Gravel: 36.0%</td>
</tr>
<tr>
<td>2.6 Width/Depth Ratio:</td>
<td>Fine Gravel: 13.0%</td>
</tr>
<tr>
<td>2.7 Entrenchment Ratio:</td>
<td>32.47</td>
</tr>
<tr>
<td>2.8 Incision Ratio:</td>
<td>1.11</td>
</tr>
<tr>
<td>Human Elevated Inc. Rat.</td>
<td>0.00</td>
</tr>
<tr>
<td>2.9 Sinuosity:</td>
<td>Low</td>
</tr>
<tr>
<td>2.10 Riffles Type:</td>
<td>Eroded</td>
</tr>
</tbody>
</table>

### Step 3. Riparian Features

#### 3.1 Stream Banks

<table>
<thead>
<tr>
<th>Bank Type</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material Type</td>
<td>Mix</td>
<td>Mix</td>
</tr>
<tr>
<td>Consistency</td>
<td>Non-cohesive</td>
<td>Non-cohesive</td>
</tr>
<tr>
<td>Lower</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consistency</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Typical Bank Slope: Steep

<table>
<thead>
<tr>
<th>Bank Erosion</th>
<th>Left</th>
<th>Right</th>
<th>Bank Vegetation Type</th>
<th>Dominant</th>
<th>Near Bank Vegetation Type</th>
<th>Dominant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erosion Length (ft.)</td>
<td>100.0</td>
<td>44.7</td>
<td>Shrubs/Sapling</td>
<td>Shrubs/Sapling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion Height (ft.)</td>
<td>3.0</td>
<td>3.0</td>
<td>Herbaceous</td>
<td>Herbaceous</td>
<td></td>
<td></td>
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</table>

#### 3.2 Riparian Buffer

<table>
<thead>
<tr>
<th>Buffer Width</th>
<th>Left</th>
<th>Right</th>
<th>Corridor Land</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant</td>
<td>51-100</td>
<td>51-100</td>
<td>Dominant</td>
<td>Shrubs/Sapling</td>
<td>Shubs/Sapling</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>&gt;100</td>
<td>&gt;100</td>
<td>Sub-dominant</td>
<td>Forest</td>
<td>Residential</td>
</tr>
<tr>
<td>W less than 25</td>
<td>0</td>
<td>0</td>
<td>(Legacy)</td>
<td>Amount</td>
<td>Mean Height</td>
</tr>
<tr>
<td>Buffer Vegetation Type</td>
<td>Shubs/Sapling</td>
<td>Shubs/Sapling</td>
<td>Gullies</td>
<td>None</td>
<td>Gullies Length</td>
</tr>
<tr>
<td>Dominant</td>
<td>Shubs/Sapling</td>
<td>Shubs/Sapling</td>
<td>Gullies</td>
<td>None</td>
<td>Gullies Length</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>Deciduous</td>
<td>Deciduous</td>
<td>Gullies</td>
<td>None</td>
<td>Gullies Length</td>
</tr>
</tbody>
</table>

#### 3.3 Riparian Corridor

<table>
<thead>
<tr>
<th>Sub-Dominant</th>
<th>Dominant</th>
<th>W less than 25</th>
<th>Buffer Vegetation Type</th>
<th>Left</th>
<th>Right</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shubs/Sapling</td>
<td>Shubs/Sapling</td>
<td>&gt;100</td>
<td>Dominant</td>
<td>Shrubs/Sapling</td>
<td>Shubs/Sapling</td>
<td>47.64</td>
<td>8.0</td>
</tr>
<tr>
<td>Shubs/Sapling</td>
<td>Shubs/Sapling</td>
<td>0</td>
<td>(Legacy)</td>
<td>Amount</td>
<td>Mean Height</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>None</td>
<td>None</td>
<td>Gullies</td>
<td>None</td>
<td>One</td>
<td>8.0</td>
<td>Gullies Length</td>
<td>0</td>
</tr>
</tbody>
</table>
Stream Geomorphic Assessment
Agency of Natural Resources
Phase 2 Segment Summary Report
Malletts Creek

Stream: Malletts Creek Main Stem
Reach: M17-A

Step 4. Flow & Flow Modifiers

- 4.1 Springs / Seeps: Minimal
- 4.2 Adjacent Wetlands: Minimal
- 4.3 Flow Status: Moderate
- 4.4 # of Debris Jams: 1
- 4.5 Flow Regulation Type: None
- 4.6 Up/Down Stream flow reg: None
- 4.7 Stormwater Inputs None
- Flow Reg. Use: Impoundments: None
- Impoundment Loc.: None
- (old) Upstrm Flow Reg: None
- Field Ditch: Road Ditch:
- Other: Tile Drain:
- Overland Flow: Urb Strm Wtr Pipe:
- 4.9 # of Beaver Dams: 0
- Affected Length (ft): 0

4.8 Channel Constrictions:

<table>
<thead>
<tr>
<th>Type</th>
<th>Photo</th>
<th>GPS</th>
<th>Channel</th>
<th>Floodprone</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instream Culvert</td>
<td>11</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Step 5. Channel Bed and Planform Changes

- 5.1 Bar Types
  - Diagonal: 0
  - Delta: 0
  - Island: 2
  - Braiding: 1
- 5.2 Other Features: Neck Cutoff: 0
- 5.3 Steep Riffles and Head Cuts: Head Cuts: 0
- 5.4 Stream Ford or Animal Crossing: No
- 5.5 Straightening: 1
- Straightening Length (ft): 733
- 5.6 Channel Alteration: Trib Rejuv: No
- 5.7 Channel Sinuosity: 0
- 5.8 Bank Stability: Left
- 5.9 Bank Vegetation Protection: Right

Step 6. Rapid Habitat Assessment Data

- 6.1 Epifaunal Substrate - Avl.: 0
- 6.2 Pool Substrate:
- 6.3 Pool Variability:
- Total Score: 0
- 6.4 Sediment Deposition: Stream Gradient Type
- 6.5 Channel Flow Status:
- 6.6 Channel Alteration:
- 6.7 Channel Sinuosity:
- 6.8 Bank Stability:
- 6.9 Bank Vegetation Protection:
- 6.10 Riparian Veg. Zone Width:

Habitat Rating: 0.00
Habitat Stream Condition:

Step 7. Rapid Geomorphic Assessment Data

- Confinement Type
  - 7.1 Channel Degradation Score 12 Other Yes Geomorphic Rating 0.63
  - 7.2 Channel Aggradation Score 14 None No Channel Evolution Model F
  - 7.3 Widening Channel Score 13 None No Channel Evolution Stage I
  - 7.4 Change in Planform Score 11 None No Geomorphic Condition Fair
  - Total Score 50 Stream Sensitivity Extreme
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report  Malletts Creek

Stream: Malletts Creek Main Stem  SGAT Version: 4.56
Reach: M17-B  Organization: Fitzgerald Environmental
Segment Length(ft): 4,197  Observers: EPF, SPP
Rain: Yes  Completion Date: 10/28/2010
Quality Control Status - Consultant: Provisional
Quality Control Status - Staff: Provisional

Step 0 - Location: From segment break upslope of the east road crossing up to the reach break with M18 at immediately upstream of the Forest Rd. Crossing.

Step 5 - Notes: Segment is stable with some natural braiding noted where the channel confinement changes to a narrow setting. These areas were not worth segmenting out because they were frequent and short, however, the sub-dominant bedform was selected as "braided." Habitat was excellent with many brook trout observed.

Where the valley widens the channel becomes less entrenched (but likely still close to 2.2 ratio in many cases) with a higher width-to-depth ratio (WDR) and where the valley pinches there is greater entrenchment and the WDR is lower. In some short stretches (as captured in the cross-sections), the entrenchment and width to depth ratios may be on the cusp of a "C" type, while in other areas they might suggest and "A" type (with low width to depth ratios). However, the average channel slope is 4.2%, and field observations of the entire reach suggest that B-type geometry best characterizes the channel form.

Flood chutes were naturally occurring and not indicative of severe planform adjustments.

Step 7 - Narrative: See Step 5.

---

Step 1. Valley and Floodplain

1.1 Segmentation: Other Reason
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:
   Length (ft) One Height Both Height
   Berm: 0 0 0
   Road: 0 0 0
   Railroad: 0 0 0
   Imp. Path: 0 0 0
   Dev.: 0 0 0

1.4 Adjacent Side
   Hillside Slope: Extr. Steep
   Continuous w/ Bank: Sometimes
   Within 1 Bankfull W: Sometimes
   Texture: Mixed

1.5 Valley Features
   Valley Width (ft): 75
   Width Determination: Measured
   In Rock Gorge: No
   Confinement Type: SC
   Human Caused Change in Valley Width?: No

1.6 Grade Controls:

<table>
<thead>
<tr>
<th>Type</th>
<th>Location</th>
<th>Total Height</th>
<th>Total Height Above Water</th>
<th>Photo Taken?</th>
<th>GPS Taken?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ledge</td>
<td>Mid-segment</td>
<td>2.0</td>
<td>1.0</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Waterfall</td>
<td>Mid-segment</td>
<td>10.0</td>
<td>8.0</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Waterfall</td>
<td>Mid-segment</td>
<td>15.0</td>
<td>14.0</td>
<td>Yes</td>
<td></td>
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</tbody>
</table>
### Stream Geomorphic Assessment

**Agency of Natural Resources**

**Phase 2 Segment Summary Report**

**Malletts Creek**

**Stream:** Malletts Creek Main Stem  
**Reach:** M17-B

#### Step 2. Stream Channel

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Bankfull Width (ft.)</td>
<td>21.50</td>
<td>2.11 Riffle/Step Spacing</td>
<td>70 ft.</td>
</tr>
<tr>
<td>2.2 Max Depth (ft.)</td>
<td>2.85</td>
<td>2.12 Substrate Composition</td>
<td></td>
</tr>
<tr>
<td>2.3 Mean Depth (ft.)</td>
<td>2.22</td>
<td>Bedrock</td>
<td>0.0 %</td>
</tr>
<tr>
<td>2.4 Flood prone Width (ft.)</td>
<td>47.00</td>
<td>Boulder</td>
<td>6.0 %</td>
</tr>
<tr>
<td>2.5 Aband. Floodpn (ft.)</td>
<td>2.85</td>
<td>Cobble</td>
<td>45.0 %</td>
</tr>
<tr>
<td>Human Elev FloodPN (ft.)</td>
<td></td>
<td>Coarse Gravel</td>
<td>27.0 %</td>
</tr>
<tr>
<td>2.6 Width/Depth Ratio</td>
<td>9.68</td>
<td>Fine Gravel</td>
<td>10.0 %</td>
</tr>
<tr>
<td>2.7 Entrenchment Ratio</td>
<td>2.19</td>
<td>Sand</td>
<td>12.0 %</td>
</tr>
<tr>
<td>2.8 Incision Ratio</td>
<td>1.00</td>
<td>Silt and Smaller</td>
<td>0.0 %</td>
</tr>
<tr>
<td>Human Elevated Inc. Rat.</td>
<td>0.00</td>
<td>Silt/Clay Present</td>
<td>Yes</td>
</tr>
<tr>
<td>2.9 Sinuosity</td>
<td>Moderate</td>
<td>Detritus</td>
<td>20.0 %</td>
</tr>
<tr>
<td>2.10 Riffles Type</td>
<td>Complete</td>
<td># Large Woody Debris</td>
<td>169</td>
</tr>
<tr>
<td>2.13 Average Largest Particle on Bed</td>
<td>13.2 inches</td>
<td>Bar</td>
<td>4.5 inches</td>
</tr>
<tr>
<td>Stream Type</td>
<td>B</td>
<td>Bed Material</td>
<td>Cobble</td>
</tr>
<tr>
<td>Subclass Slope</td>
<td>a</td>
<td>Bed Form</td>
<td>Step-Pool</td>
</tr>
<tr>
<td>Field Measured Slope</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.15 Sub-reach Stream Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Stream Type</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Bed Material</td>
<td>Cobble</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Subclass Slope</td>
<td>a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Bedform</td>
<td>Step-Pool</td>
<td></td>
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</tr>
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</table>

#### Step 3. Riparian Features

**3.1 Stream Banks**

<table>
<thead>
<tr>
<th>Bank Texture</th>
<th>Bank Erosion</th>
<th>Erosion Length (ft.)</th>
<th>Erosion Height (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td>Left</td>
<td>Right</td>
<td>Left</td>
</tr>
<tr>
<td>Material Type</td>
<td>Mix</td>
<td>Mix</td>
<td>45.2</td>
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<tr>
<td>Consistency</td>
<td>Non-cohesive</td>
<td>Non-cohesive</td>
<td>Deciduous</td>
</tr>
<tr>
<td>Revetment Type</td>
<td>None</td>
<td>None</td>
<td>Bank Canopy</td>
</tr>
<tr>
<td>Revetment Length</td>
<td>0.0</td>
<td>0.0</td>
<td>76-100</td>
</tr>
</tbody>
</table>

**Typical Bank Slope:** Steep

**3.2 Riparian Buffer**

<table>
<thead>
<tr>
<th>Buffer Width</th>
<th>Left</th>
<th>Right</th>
<th>Corridor Land</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant</td>
<td>&gt;100</td>
<td>&gt;100</td>
<td>Dominant Forest</td>
<td>Forest</td>
<td></td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>None</td>
<td>None</td>
<td>Sub-dominant Shrub</td>
<td>Shrub</td>
<td></td>
</tr>
<tr>
<td>W less than 25</td>
<td>0</td>
<td>0</td>
<td>(Legacy) Amount</td>
<td>Mean Height</td>
<td></td>
</tr>
<tr>
<td>Buffer Vegitation Type</td>
<td></td>
<td></td>
<td></td>
<td>Mid-Channel Canopy: Closed</td>
<td></td>
</tr>
</tbody>
</table>

**Dominant**
- Mixed Trees
- Shrubs/Sapling

**Sub-Dominant**
- Mixed Trees
- Shrubs/Sapling

**3.3 Riparian Corridor**

<table>
<thead>
<tr>
<th>Forest</th>
<th>Forest</th>
<th>Mass Failures</th>
<th>Height</th>
<th>Guiles Number</th>
<th>Guiles Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left 216.57</td>
<td>Right 59.96</td>
<td>30.9</td>
<td>40.0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: Abundant
4.2 Adjacent Wetlands: Minimal
4.3 Flow Status: Moderate
4.4 # of Debris Jams: 7

4.5 Flow Regulation Type: None
4.6 Up/Down Stream flow reg.: None

Impoundments: None
Impoundment Loc.: None

Field Ditch: Road Ditch:
Other: Tile Drain:
Overland Flow: Urb Strm Wtr Pipe:

4.7 Stormwater Inputs: None
4.8 # of Beaver Dams: 0
Affected Length (ft.): 0

4.8 Channel Constrictions:

<table>
<thead>
<tr>
<th>Type</th>
<th>Width</th>
<th>Photo Taken?</th>
<th>GPS Taken?</th>
<th>Channel Constriction?</th>
<th>Floodprone Constriction?</th>
<th>Problems</th>
<th>Deposition Above</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instream Culvert</td>
<td>9.5</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Step 5. Channel Bed and Planform Changes

5.1 Bar Types
- Diagonal: 0
- Delta: 3
- Island: 3
- Braiding: 2

5.2 Other Features
- Neck Cutoff: 0
- Avulsion: 3
- Head Cuts: 0
- Steep Riffles: 1

5.3 Steep Riffles and Head Cuts
- Neck Cutoff: 0
- Avulsion: 3
- Head Cuts: 0
- Steep Riffles: 1

5.4 Stream Ford or Animal Crossing: No
5.5 Straightening: None
5.5 Dredging: None

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.: 6.4 Sediment Deposition:
- Stream Gradient Type: Left

6.2 Pool Substrate:
- 6.5 Channel Flow Status: 6.8 Bank Stability:
- 6.6 Channel Alteration: 6.9 Bank Vegetation Protection

6.3 Pool Variability:
- 6.7 Channel Sinuosity: 6.10 Riparian Veg. Zone Width:

Total Score: 0
Habitat Rating: 0.00

Habitat Stream Condition:

Step 7. Rapid Geomorphic Assessment Data

<table>
<thead>
<tr>
<th>Confinement Type</th>
<th>Confined Score</th>
<th>STD</th>
<th>Historic</th>
<th>Description</th>
<th>Score</th>
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<tbody>
<tr>
<td>7.1 Channel Degradation</td>
<td>18</td>
<td>None</td>
<td>No</td>
<td>Geomorphic Rating</td>
<td>0.82</td>
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<tr>
<td>7.2 Channel Aggradation</td>
<td>16</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Model</td>
<td>F</td>
</tr>
<tr>
<td>7.3 Widening Channel</td>
<td>16</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Stage</td>
<td>I</td>
</tr>
<tr>
<td>7.4 Change in Planform</td>
<td>16</td>
<td>None</td>
<td>No</td>
<td>Geomorphic Condition</td>
<td>Good</td>
</tr>
</tbody>
</table>

Total Score: 66
Stream Sensitivity: Moderate
Stream Geomorphic Assessment  
Agency of Natural Resources

Phase 2 Segment Summary Report  
Malletts Creek

Stream:  
Reach:  
Segment Length(ft):  994  
Rain:  Yes

SGAT Version: 4.56  
Organization: Fitzgerald Environmental  
Observers: EPF, SPP  
Completion Date: 10/28/2010  
Quality Control Status - Consultant: Provisional  
Quality Control Status - Staff: Provisional

Step 0 - Location:  From reach break at confluence with Main Stem reach M17-A up to large beaver dam near power line right of way.

Step 5 - Notes:  Segment has been historically impacted by extensive beaver activity (per 2004 aerial imagery) and is now adjusting to changes in base level as old beaver dams breach and new ones are formed. Some haying was conducted in the past along the east corridor adjacent to East Road, but no haying was done this year. Several small headcuts were observed (as a result of beaver activity), but incision is only minor and the floodplain is still accessible, especially in the lower reach. The incision observed seemed to be degrading material that was previously aggraded by past beaver activity.

Step 7 - Narrative:  Some historic straightening has produced limited incision because of extensive beaver activity in the lower reach.

### Step 1. Valley and Floodplain

<table>
<thead>
<tr>
<th>1.1 Segmentation:</th>
<th>Flow Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Alluvial Fan:</td>
<td>None</td>
</tr>
<tr>
<td>1.3 Corridor Encroachments:</td>
<td>Length (ft)</td>
</tr>
<tr>
<td>Berm:</td>
<td>0</td>
</tr>
<tr>
<td>Road:</td>
<td>0</td>
</tr>
<tr>
<td>Railroad:</td>
<td>0</td>
</tr>
<tr>
<td>Imp. Path:</td>
<td>0</td>
</tr>
<tr>
<td>Dev.:</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.4 Adjacent Side</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillside Slope:</td>
<td>Flat</td>
<td>Extr.Step</td>
</tr>
<tr>
<td>Continuous w/ Bank:</td>
<td>Never</td>
<td>Never</td>
</tr>
<tr>
<td>Within 1 Bankfull W:</td>
<td>N.E.</td>
<td>N.E.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>1.5 Valley Features</th>
<th>Width Determination:</th>
<th>Confinement Type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valley Width (ft):</td>
<td>Measured</td>
<td>VB</td>
</tr>
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</table>

Human Caused Change in Valley Width?: Yes

VT DEC  ●  103 South Main Street  ●  Waterbury, VT 05671
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report

Malletts Creek

Stream: Reach: T6.01-A

**Step 2. Stream Channel**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Left</th>
<th>Right</th>
<th>Bedding</th>
<th>Width/Depth Ratio</th>
<th>Sinuosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Bankfull Width (ft.)</td>
<td>8.60</td>
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<tr>
<td>2.2 Max Depth (ft.)</td>
<td>2.40</td>
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<tr>
<td>2.3 Mean Depth (ft.)</td>
<td>1.59</td>
<td></td>
<td>0.0 %</td>
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<tr>
<td>2.4 Floodplain Width (ft.)</td>
<td>339.00</td>
<td></td>
<td>0.0 %</td>
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<tr>
<td>2.5 Aband. Floodplain (ft.)</td>
<td>2.97</td>
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<tr>
<td>Human Elev Floodplain (ft.)</td>
<td></td>
<td></td>
<td>5.0 %</td>
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</tr>
<tr>
<td>2.6 Width/Depth Ratio</td>
<td>5.41</td>
<td></td>
<td>15.0 %</td>
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<td>2.7 Sinuosity</td>
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<td>62.0 %</td>
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<tr>
<td>2.8 Incision Ratio</td>
<td>1.24</td>
<td></td>
<td>18.0 %</td>
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</tr>
<tr>
<td>Human Elevated Inc. Rat.</td>
<td>0.00</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>2.10 Riffles Type</td>
<td>Not Applicable</td>
<td></td>
<td># Large Woody Debris: 21</td>
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**Step 3. Riparian Features**

<table>
<thead>
<tr>
<th>Bank Texture</th>
<th>Bank Erosion</th>
<th>Near Bank Vegetation</th>
<th>Canopy %</th>
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</thead>
<tbody>
<tr>
<td>Joper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>Right</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material Type</td>
<td>Erosion Length (ft.)</td>
<td>Erosion Height (ft.)</td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>173.3</td>
<td>82.4</td>
<td>1-25</td>
</tr>
<tr>
<td>Non-cohesive</td>
<td></td>
<td></td>
<td>26-50</td>
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<td>Consistency</td>
<td>Revetment Type</td>
<td>Revetment Length</td>
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<tr>
<td>Non-cohesive</td>
<td>None</td>
<td>None</td>
<td>0</td>
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<tr>
<td>Lower</td>
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<tr>
<td>Material Type</td>
<td>Revetment Length</td>
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<tr>
<td>Sand</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
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<tr>
<td>Non-cohesive</td>
<td></td>
<td></td>
<td>0</td>
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</table>

**3.2 Riparian Buffer**

<table>
<thead>
<tr>
<th>Buffer Width</th>
<th>Left</th>
<th>Right</th>
<th>Corridor Land</th>
</tr>
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<tbody>
<tr>
<td>Dominant</td>
<td>&gt;100</td>
<td>&gt;100</td>
<td>Dominant</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>51-100</td>
<td>None</td>
<td>Sub-dominant</td>
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<tr>
<td>W less than 25</td>
<td>234</td>
<td>0</td>
<td>(Legacy)</td>
</tr>
<tr>
<td>Buffer Vegetation Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dominant</td>
<td>Shrubs/Sapling</td>
<td>Shrubs/Sapling</td>
<td></td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>Herbaceous</td>
<td>Mixed Trees</td>
<td></td>
</tr>
</tbody>
</table>

**3.3 Riparian Corridor**

<table>
<thead>
<tr>
<th>Riparian Corridor</th>
<th>Left</th>
<th>Right</th>
<th>Mass Failures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant</td>
<td>Shrubs/Sapling</td>
<td>Shrubs/Sapling</td>
<td></td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>Hay</td>
<td>Forest</td>
<td>Height</td>
</tr>
<tr>
<td>W less than 25</td>
<td>Amount</td>
<td>Mean Height</td>
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</tr>
<tr>
<td>Buffer Vegetation Type</td>
<td>Gullies Number</td>
<td>Gullies Length</td>
<td></td>
</tr>
<tr>
<td>Dominant</td>
<td>Gullies</td>
<td></td>
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<tr>
<td>Sub-Dominant</td>
<td>None</td>
<td>None</td>
<td>0</td>
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</tbody>
</table>

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Stream Geomorphic Assessment
Agency of Natural Resources
Phase 2 Segment Summary Report
Malletts Creek

Stream: 
Reach: T6.01-A

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: Abundant
4.2 Adjacent Wetlands: Abundant
4.3 Flow Status: Moderate
4.4 # of Debris Jams: 1

4.5 Flow Regulation Type: None
Flow Reg. Use: Impoundments: None
Impoundment Loc.: None
4.6 Up/Down Stn flow reg.: None
(old) Upstrom Flow Reg.: None

4.7 Stormwater Inputs None
Field Ditch: Road Ditch: 
Other: 
Overland Flow: Urb Strm Wtr Pipe: 0
4.9 # of Beaver Dams: 0
Affected Length (ft): 0

4.8 Channel Constrictions: None

Step 5. Channel Bed and Planform Changes

5.1 Bar Types Diagonal: 0
Mid: 0
Point: 6
Side: 0

5.2 Other Features Neck Cutoff: 0
Flood chutes: 0
Avulsion: 0
5.3 Steep Riffles and Head Cuts Head Cuts: 2
Steep Riffles: 0

5.4 Stream Ford or Animal Crossing: No
5.5 Straightening: Straightening
Straightening Length (ft.): 674
5.5 Dredging: Dredging

Step 6. Rapid Habitat Assessment Data

6.1 Epifaulnal Substrate - Avl.: 0
6.2 Pool Substrate:
6.3 Pool Variability:
Total Score: 0
Habitat Rating: 0.00
Habitat Stream Condition:

6.4 Sediment Deposition: Stream Gradient Type Left Right
6.5 Channel Flow Status: 6.6 Channel Alteration:
6.7 Channel Sinuosity: 6.8 Bank Stability:
6.9 Bank Vegetation Protection
6.10 Riparian Veg. Zone Width:

Step 7. Rapid Geomorphic Assessment Data

<table>
<thead>
<tr>
<th>Confinement Type</th>
<th>Unconfined</th>
<th>Score</th>
<th>STD</th>
<th>Historic</th>
<th>Geomorphic Rating</th>
<th>Channel Evolution Model</th>
<th>Channel Evolution Stage</th>
<th>Geomorphic Condition</th>
<th>Stream Sensitivity</th>
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</thead>
<tbody>
<tr>
<td>7.1 Channel Degradation</td>
<td>10</td>
<td>None</td>
<td>Yes</td>
<td>Geomorphic Rating</td>
<td>0.63</td>
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<tr>
<td>7.2 Channel Aggradation</td>
<td>15</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Model</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.3 Widening Channel</td>
<td>13</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Stage</td>
<td>II</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7.4 Change in Planform</td>
<td>12</td>
<td>None</td>
<td>No</td>
<td>Geomorphic Condition</td>
<td>Fair</td>
<td></td>
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<td></td>
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<tr>
<td>Total Score</td>
<td>50</td>
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<td></td>
<td>Stream Sensitivity</td>
<td>Extreme</td>
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Phase 2 Segment Summary Report  

Malletts Creek

Stream: T6.01-B
Reach: T6.01-B
Segment Length(ft): 460
Rain: Yes

SGAT Version: 4.56
Organization: Fitzgerald Environmental
Observers: EPF, SPP
Completion Date: 10/28/2010
Quality Control Status - Consultant: Provisional
Quality Control Status - Staff: Provisional
Why Not Assessed: beaver dam

Step 0 - Location: The impounded section begins at the power line ROW and ends at the tributary which enters from the East.
Step 5 - Notes: Segment is impacted by beaver activity and was only assessed for bank and buffer conditions.
Step 7 - Narrative:

1.1 Segmentation: Flow Status
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:
Length (ft) One Height Both Height
Berm: 0 0
Road: 0 0
Railroad: 0 0
 IMP. Path: 0 0
Dev.: 0 0

1.6 Grade Controls: None

Step 1. Valley and Floodplain

1.4 Adjacent Side
Hillside Slope:
Continuous w/ Bank: Flat Never
Within 1 Bankfull W: N.E. Never
Texture: N.E.
Left Right

1.5 Valley Features
Valley Width (ft): 290
Width Determination: Measured
Confinement Type: VB
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes
Stream: Malletts Creek

**Step 2. Stream Channel**

- 2.11 Riffle/Step Spacing: 2.12 Substrate Composition
  - Bedrock: %
  - Boulder: %
  - Cobble: %
  - Coarse Gravel: %
  - Fine Gravel: %
  - Sand: %
  - Silt and Smaller: %
  - Detritus: %
  - # Large Woody Debris:

2.13 Average Largest Particle on Bed:

- Stream Type: G
- Bed Material: Sand
- Subclass Slope: c
- Bed Form: Plane Bed
- Field Measured Slope:

2.14 Stream Type:

- Reference Stream Type:
- Reference Bed Material:
- Reference Subclass Slope:
- Reference Bedform:

2.15 Sub-reach Stream Type:

**Step 3. Riparian Features**

3.1 Stream Banks

Bank Texture

Upper Material Type: Sand, Sand

- Left: Non-cohesive, Non-cohesive
- Right: Non-cohesive, Non-cohesive

Lower Material Type: Silt, Silt

- Consistency: Cohesive, Cohesive

3.2 Riparian Buffer

- Buffer Width
  - Dominant: 0-25
  - Sub-Dominant: W less than 25
  - Vegetation: Dominant: Herbaceous, Sub-Dominant: Invasives

- Corridor Land
  - Left: Dominant
  - Right: Shrub/Sapling, Invasives

3.3 Riparian Corridor

- Left: Hay, None
- Right: Shrub/Sapling, Tree, Mean Height

- Failures
  - Amount: 0
  - Height: 0
  - Gullies Number: 0
  - Gullies Length: 0

**VT DEC**

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Stream Geomorphic Assessment
Agency of Natural Resources
Phase 2 Segment Summary Report

**Malletts Creek**
Reach: T6.01-B

### Step 4. Flow & Flow Modifiers

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Springs / Seeps:</td>
<td>Minimal</td>
</tr>
<tr>
<td>4.2 Adjacent Wetlands:</td>
<td>Abundant</td>
</tr>
<tr>
<td>4.3 Flow Status:</td>
<td>Moderate</td>
</tr>
<tr>
<td>4.4 # of Debris Jams:</td>
<td>0</td>
</tr>
<tr>
<td>4.5 Flow Regulation Type:</td>
<td>None</td>
</tr>
<tr>
<td>Flow Reg. Use:</td>
<td></td>
</tr>
<tr>
<td>Impoundments:</td>
<td>None</td>
</tr>
<tr>
<td>Impoundment Loc.:</td>
<td></td>
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<tr>
<td>4.6 Up/Down Strm flow reg.:</td>
<td>None</td>
</tr>
<tr>
<td>(old) Upstrm Flow Reg.:</td>
<td>None</td>
</tr>
<tr>
<td>4.7 Stormwater Inputs:</td>
<td>None</td>
</tr>
<tr>
<td>Field Ditch:</td>
<td>Road Ditch:</td>
</tr>
<tr>
<td>Other:</td>
<td>Tile Drain:</td>
</tr>
<tr>
<td>Overland Flow:</td>
<td>Urb Strm Wtr Pipe:</td>
</tr>
<tr>
<td>4.9 # of Beaver Dams:</td>
<td>1</td>
</tr>
<tr>
<td>Affected Length (ft):</td>
<td>450</td>
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### Step 5. Channel Bed and Planform Changes

<table>
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<tr>
<th>Feature</th>
<th>Value</th>
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<tbody>
<tr>
<td>5.1 Bar Types:</td>
<td>Diagonal</td>
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<td>Mid:</td>
<td>Delta:</td>
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<tr>
<td>Point:</td>
<td>Island:</td>
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<tr>
<td>Side:</td>
<td>Braiding:</td>
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<tr>
<td>5.2 Other Features:</td>
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</tr>
<tr>
<td>Flood chutes:</td>
<td>0</td>
</tr>
<tr>
<td>Avulsion:</td>
<td>0</td>
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<tr>
<td>5.3 Steep Riffles and Head Cuts</td>
<td></td>
</tr>
<tr>
<td>Head Cuts:</td>
<td>0</td>
</tr>
<tr>
<td>5.4 Stream Ford or Animal Crossing:</td>
<td>No</td>
</tr>
<tr>
<td>5.5 Straightening:</td>
<td>Straightening</td>
</tr>
<tr>
<td>Straightening Length (ft.):</td>
<td>460</td>
</tr>
<tr>
<td>5.6 Steep Riffles:</td>
<td>0</td>
</tr>
<tr>
<td>5.7 Trib Rejuv.:</td>
<td>No</td>
</tr>
<tr>
<td>5.8 Dredging:</td>
<td>Dredging</td>
</tr>
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</table>

### Step 6. Rapid Habitat Assessment Data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 Epifaunal Substrate - Avl.;</td>
<td></td>
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</tr>
<tr>
<td>6.2 Pool Substrate:</td>
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</tr>
<tr>
<td>6.3 Pool Variability:</td>
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<tr>
<td>Total Score:</td>
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<tr>
<td>Habitat Rating:</td>
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<tr>
<td>Habitat Stream Condition:</td>
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### Step 7. Rapid Geomorphic Assessment Data

<table>
<thead>
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<th>Feature</th>
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<tbody>
<tr>
<td>Confinement Type</td>
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<tr>
<td>7.1 Channel Degradation</td>
<td></td>
</tr>
<tr>
<td>7.2 Channel Aggradation</td>
<td></td>
</tr>
<tr>
<td>7.3 Widening Channel</td>
<td></td>
</tr>
<tr>
<td>7.4 Change in Planforml Total Score</td>
<td></td>
</tr>
</tbody>
</table>

Score | STD | Historic
--- | --- | ---

Geomorphic Rating
Channel Evolution Model
Channel Evolution Stage
Geomorphic Condition
Stream Sensitivity

VT DEC • 103 South Main Street • Waterbury, VT 05671
Phase 2 Segment Summary Report  Malletts Creek

Stream: T6.01-C  SGAT Version: 4.56
Reach:  Fitzgerald Environmental
Segment Length(ft): 1,403  Observers: EPF, SPP
Rain: Yes  Completion Date: 10/28/2010

Quality Control Status - Consultant: Provisional
Quality Control Status - Staff: Provisional

Step 0 - Location: From tributary entering from the east to immediately upstream of the Main Street Crossing.

Step 5 - Notes: Extensive dredging and channel straightening with little buffer resistance has led to a highly incised G-type channel with low slope. It seems probable that a large headcut migrated upstream causing the incision, because three small headcuts were observed downstream of the Main St crossing. These features were armored with coarse material and the incision reduced dramatically. Both sides of the channel were likely healthy, functioning wetlands, until the base level drop in water elevation caused the adjacent floodplain (wetland) to dry. Additional erosion and channel migration is anticipated.

Step 7 - Narrative: Channel already incised and in late stage II of the CEM. Segment will likely enter stage III of the CEM and experience widening and planform shifts in the future.

1.1 Segmentation:  Channel Dimensions
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

<table>
<thead>
<tr>
<th>Length (ft)</th>
<th>One</th>
<th>Height</th>
<th>Both</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berm</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Road</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Railroad</td>
<td>0</td>
<td>0</td>
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<td>Imp. Path</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Dev.</td>
<td>0</td>
<td>0</td>
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1.4 Adjacent Side
1.5 Valley Features

<table>
<thead>
<tr>
<th></th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillside Slope</td>
<td>Hilly</td>
<td>Very Steep</td>
</tr>
<tr>
<td>Continuous w/ Bank</td>
<td>Never</td>
<td>Never</td>
</tr>
<tr>
<td>Within 1 Bankfull W:</td>
<td>Never</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Texture:</td>
<td>N.E.</td>
<td>N.E.</td>
</tr>
</tbody>
</table>

Valley Width (ft): 215  Width Determination: Measured
Confinement Type: VB
In Rock Gorge: No
Human Caused Change in Valley Width?: No

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Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report
Malletts Creek

Stream: T6.01-C

Step 2, Stream Channel

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>2.1 Bankfull Width (ft.)</td>
<td>8.80</td>
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<tr>
<td>2.2 Max Depth (ft.)</td>
<td>2.15</td>
</tr>
<tr>
<td>2.3 Mean Depth (ft.)</td>
<td>0.55</td>
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<tr>
<td>2.4 Floodprone Width (ft.)</td>
<td>14.00</td>
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<tr>
<td>2.5 Aband. Floodpl (ft.)</td>
<td>5.55</td>
</tr>
<tr>
<td>Human Elev Flood Pin (ft.)</td>
<td></td>
</tr>
<tr>
<td>2.6 Width/Depth Ratio</td>
<td>9.26</td>
</tr>
<tr>
<td>2.7 Entrenchment Ratio</td>
<td>1.59</td>
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<tr>
<td>2.8 Incision Ratio</td>
<td>2.77</td>
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<tr>
<td>Human Elevated Inc. Rat.</td>
<td>0.00</td>
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<tr>
<td>2.9 Sinuosity</td>
<td>Low</td>
</tr>
<tr>
<td>2.10 Riffles Type</td>
<td>Not Applicable</td>
</tr>
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| Step 3, Riparian Features

3.1 Stream Banks

<table>
<thead>
<tr>
<th>Bank Texture</th>
<th>Left</th>
<th>Right</th>
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<tbody>
<tr>
<td>Upper</td>
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<tr>
<td>Material Type</td>
<td>Sand</td>
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<td>Consistency</td>
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<tr>
<td>Bank Erosion</td>
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<td></td>
</tr>
<tr>
<td>Erosion Length (ft.)</td>
<td>212.7</td>
<td>25.3</td>
</tr>
<tr>
<td>Erosion Height (ft.)</td>
<td>3.5</td>
<td>4.0</td>
</tr>
<tr>
<td>Revetment Type</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Revetment Length;</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Material Type;</td>
<td>Sand</td>
<td>Sand</td>
</tr>
<tr>
<td>Consistency;</td>
<td>Non-cohesive</td>
<td>Non-cohesive</td>
</tr>
</tbody>
</table>

3.2 Riparian Buffer

<table>
<thead>
<tr>
<th>Buffer Width</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant</td>
<td>0-25</td>
<td>0-25</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>None</td>
<td>26-50</td>
</tr>
<tr>
<td>W less than 25</td>
<td>1,403</td>
<td>756</td>
</tr>
<tr>
<td>Buffer Vegetation Type</td>
<td>Herbaceous</td>
<td>Herbaceous</td>
</tr>
</tbody>
</table>

3.3 Riparian Corridor

<table>
<thead>
<tr>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hay</td>
<td>Hay</td>
</tr>
<tr>
<td>None</td>
<td>Shrub/Sapling</td>
</tr>
<tr>
<td>(Legacy)</td>
<td>Mean Height</td>
</tr>
<tr>
<td>Failures</td>
<td>Gullies Number</td>
</tr>
<tr>
<td>Gullies</td>
<td>Gullies Length</td>
</tr>
<tr>
<td>None</td>
<td>0</td>
</tr>
</tbody>
</table>

Typical Bank Slope: Undercut
Dominant: Herbaceous, Herbaceous
Sub-dominant: Bare, Invasives
Bank Canopy:
Coastal Canopy: 0-125
Mid-Channel Canopy: Open

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Stream Geomorphic Assessment

Agency of Natural Resources

Phase 2 Segment Summary Report

Malletts Creek

Stream: 
Reach: T6.01-C

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: Minimal
4.2 Adjacent Wetlands: Minimal
4.3 Flow Status: Moderate
4.4 # of Debris Jams: 0

4.5 Flow Regulation Type: None
4.6 Up/Down Stream Flow Reg.: None
4.7 Stormwater Inputs
Field Ditch: 1
Road Ditch: 0
Other: 0
Tile Drain: 0
Overland Flow: 0
Urb Strom Wtr Pipe: 0

(0ld) Upstrm Flow Reg.: None
4.9 # of Beaver Dams: 0

Affected Length (ft.): 0

4.8 Channel Constrictions:

<table>
<thead>
<tr>
<th>Type</th>
<th>Photo Taken</th>
<th>GPS Taken</th>
<th>Channel Constriction?</th>
<th>Floodprone Constriction?</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instream Culvert</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Scour Above</td>
</tr>
<tr>
<td>Instream Culvert</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Scour Above, Scour Below</td>
</tr>
</tbody>
</table>

Step 5. Channel Bed and Planform Changes

5.1 Bar Types
- Diagonal: 0
- Delta: 0
- Island: 0
- Braiding: 0

5.2 Other Features
- Neck Cutoff: 0
- Avulsion: 1

5.3 Steep Riffles and Head Cuts: 3
- Head Cuts: 3
- Trib Rejv.: No

5.4 Stream Ford or Animal Crossing: No
5.5 Straightening: Straightening

5.6 Stream Length (ft.): 1,403
5.7 Dredging: Dredging

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.: Left
6.2 Pool Substrate: Left
6.3 Pool Variability: Left
Total Score: 0

6.4 Sediment Deposition: Stream Gradiant Type
6.5 Channel Flow Status: 6.8 Bank Stability:
6.6 Channel Alteration: 6.9 Bank Vegetation Protection

6.7 Channel Sinuosity: 6.10 Riparian Veg. Zone Width:

Habitat Rating: 0.00
Habitat Stream Condition:

Step 7. Rapid Geomorphic Assessment Data

<table>
<thead>
<tr>
<th>Confinement Type</th>
<th>Unconfined Score</th>
<th>STD</th>
<th>Historic</th>
<th>Geomorphic Rating</th>
<th>Channel Evolution Model</th>
<th>Channel Evolution Stage</th>
<th>Geomorphic Condition</th>
<th>Stream Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Channel Degradation</td>
<td>3</td>
<td>E to G</td>
<td>No</td>
<td>Geomorphic Rating</td>
<td>0.44</td>
<td>F</td>
<td>II</td>
<td>Fair</td>
</tr>
<tr>
<td>7.2 Channel Aggradation</td>
<td>14</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Model</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.3 Widening Channel</td>
<td>9</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Stage</td>
<td>II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.4 Change in Planform</td>
<td>9</td>
<td>None</td>
<td>No</td>
<td>Geomorphic Condition</td>
<td>Fair</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Score: 35

VT DEC • 103 South Main Street • Waterbury, VT 05671
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report  Malletts Creek

Stream:  
Reach:  T6.02-0  
Segment Length(ft):  609  
Rain:  Yes  
SGAT Version:  4.56  
Organization:  Fitzgerald Environmental  
Observers:  EPF, SPP  
Completion Date:  10/28/2010  
Quality Control Status - Consultant:  Provisional  
Quality Control Status - Staff:  Provisional

Step 0 - Location:  From upstream of the Main Street crossing to approximately 700 feet downstream of the North Road crossing.

Step 5 - Notes:  The Hunting Ridge Lane development area upslope may lack proper stormwater management practices and could be increasing the flashiness of the stream. The increased impermeable cover can cause water to rapidly runoff into the tributary carrying sediment and causing planform shifts in this reach. One avulsion was noted in reach T6.02. A minor knickpoint was observed in the lower reach just upstream of the culvert crossing. This feature will not likely migrate because of the large willow tree's roots that cover the stream channel. This feature may actually be a result of the small channel formed over the bulging willow roots (growing out into the watercourse) – it is not a feature of concern with respect to future channel adjustments.

Much of the lower portion of the reach is behaving more like a wetland than a channel. Flow is diffuse and broad where the vegetation is entirely herbaceous. The wetland becomes a defined channel upstream where the vegetation becomes wooded.

Step 7 - Narrative:  Vertical changes in the channel (with exception of a small knickpoint) were not observed in the cross-section. Channel adjustments have largely been lateral in this reach due to changes in upslope hydrology. See Step 5 for further narrative. In the absence of channel incision or abandoned floodplain, CEM stage I was chosen.

### Step 1. Valley and Floodplain

<table>
<thead>
<tr>
<th>1.1 Segmentation:</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Alluvial Fan:</td>
<td>None</td>
</tr>
<tr>
<td>1.3 Corridor Encroachments:</td>
<td></td>
</tr>
<tr>
<td><strong>Length (ft)</strong></td>
<td><strong>One Height</strong></td>
</tr>
<tr>
<td>Berm:</td>
<td>0</td>
</tr>
<tr>
<td>Road:</td>
<td>0</td>
</tr>
<tr>
<td>Railroad:</td>
<td>0</td>
</tr>
<tr>
<td>Imp. Path:</td>
<td>0</td>
</tr>
<tr>
<td>Dev.:</td>
<td>577</td>
</tr>
<tr>
<td>1.4 Adjacent Side</td>
<td>Left</td>
</tr>
<tr>
<td>Hillside Slope:</td>
<td>Hilly</td>
</tr>
<tr>
<td>Continuous w/ Bank:</td>
<td>Never</td>
</tr>
<tr>
<td>Within 1 Bankfull W:</td>
<td>Never</td>
</tr>
<tr>
<td>Texture:</td>
<td>N.E.</td>
</tr>
<tr>
<td>1.5 Valley Features</td>
<td>Valley Width (ft):</td>
</tr>
<tr>
<td>Confinement Type:</td>
<td>VB</td>
</tr>
<tr>
<td>Human Caused Change in Valley Width?:</td>
<td>No</td>
</tr>
</tbody>
</table>

VT DEC • 103 South Main Street • Waterbury, VT 05671
### Step 2. Stream Channel

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bankfull Width (ft.)</td>
<td>7.00</td>
<td></td>
</tr>
<tr>
<td>Max Depth (ft.)</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>Mean Depth (ft):</td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td>Flood prone Width (ft.)</td>
<td>135.00</td>
<td></td>
</tr>
<tr>
<td>Abandoned Floodplain (ft.)</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>Elevation Flood Pln (ft.)</td>
<td>8.97</td>
<td></td>
</tr>
<tr>
<td>Entrenchment Ratio</td>
<td>19.29</td>
<td></td>
</tr>
<tr>
<td>Incision Ratio</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Elevated Inc. Rat.</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Sinuosity</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Riffles Type</td>
<td>Not Applicable</td>
<td></td>
</tr>
</tbody>
</table>

#### 2.11 Riffle/Step Spacing
- **Bed:** N/A
- **Bar:** N/A
- **Stream Type:** E
- **Bed Material:** Sand
- **Subclass Slope:** None
- **Reference Stream Type:**
- **Reference Bed Material:**
- **Reference Subclass Slope:**
- **Reference Bedform:**

#### 2.12 Substrate Composition
- **Cobble:** 0.0%
- **Fine Gravel:** 65.0%
- **Silt and Smaller:** 30.0%
- **Detritus:** 20.0%
- **Large Woody Debris:** 13%
- **Coarse Gravel:** 0.0%
- **Sand:** 65.0%

#### 2.13 Average Largest Particle on Stream Bed
- **Bed Material:**

### Step 3. Riparian Features

#### 3.1 Stream Banks

<table>
<thead>
<tr>
<th>Bank Texture</th>
<th>Upper</th>
<th>Right</th>
<th>Material Type</th>
<th>Consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Left</td>
<td>Right</td>
<td>Sand</td>
<td>Non-cohesive</td>
</tr>
<tr>
<td></td>
<td>Non-cohesive</td>
<td>Non-cohesive</td>
<td>Non-cohesive</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bank Erosion</th>
<th>Erosion Length (ft.): 68.6</th>
<th>Erosion Height (ft.): 1.0</th>
<th>Revetment Type: None</th>
<th>Revetment Length: 0.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>Right</td>
<td></td>
<td>Bank Canopy</td>
<td></td>
</tr>
<tr>
<td>Herbaceous</td>
<td>Herbaceous</td>
<td>Deciduous</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 3.2 Riparian Buffer

<table>
<thead>
<tr>
<th>Buffer Width</th>
<th>Dominant</th>
<th>Sub-Dominant</th>
<th>W less than 25</th>
<th>Buffer Vegetation Type</th>
<th>Dominant</th>
<th>Sub-Dominant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Right</td>
<td></td>
<td></td>
<td></td>
<td>Herbaceous</td>
<td>Shrubs/Sapling</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td></td>
<td></td>
<td></td>
<td>Deciduous</td>
<td>Shrubs/Sapling</td>
</tr>
</tbody>
</table>

#### 3.3 Riparian Corridor

<table>
<thead>
<tr>
<th>Residential</th>
<th>Forest</th>
<th>Mass Failures</th>
<th>Bare</th>
<th>Residential</th>
<th>Height</th>
<th>Gullies Number</th>
<th>Gullies Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>Mean Height</td>
<td></td>
<td></td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VT DEC ● 103 South Main Street ● Waterbury, VT 05671
### Stream Geomorphic Assessment

**Agency of Natural Resources**  
**Phase 2 Segment Summary Report**  
**Mallets Creek**

<table>
<thead>
<tr>
<th>Stream:</th>
<th>Reach:</th>
<th>T6.02-0</th>
</tr>
</thead>
</table>

#### Step 4. Flow & Flow Modifiers

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Springs / Seeps</td>
<td>Abundant</td>
</tr>
<tr>
<td>4.2 Adjacent Wetlands</td>
<td>Abundant</td>
</tr>
<tr>
<td>4.3 Flow Status</td>
<td>Moderate</td>
</tr>
<tr>
<td>4.4 # of Debris Jams</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5 Flow Regulation Type</td>
<td>None</td>
</tr>
<tr>
<td>Field Ditch</td>
<td>Road Ditch</td>
</tr>
<tr>
<td>Other</td>
<td>Tile Drain</td>
</tr>
<tr>
<td>Overland Flow</td>
<td>Urb Strm Wtr Pipe</td>
</tr>
<tr>
<td>4.6 Up/Down Strm flow reg.</td>
<td>None</td>
</tr>
<tr>
<td>(old) Upstrm Flow Reg.</td>
<td>None</td>
</tr>
<tr>
<td>4.9 # of Beaver Dams</td>
<td>0</td>
</tr>
<tr>
<td>Affected Length (ft)</td>
<td>0</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.8 Channel Constrictions</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Step 5. Channel Bed and Planform Changes

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1 Bar Types</td>
<td>Diagonal: 0</td>
</tr>
<tr>
<td>Mid</td>
<td>0</td>
</tr>
<tr>
<td>Point</td>
<td>0</td>
</tr>
<tr>
<td>Side</td>
<td>0</td>
</tr>
<tr>
<td>5.2 Other Features</td>
<td>Neck Cutoff: 0</td>
</tr>
<tr>
<td>Flood chutes</td>
<td>0</td>
</tr>
<tr>
<td>Head Cuts</td>
<td>1</td>
</tr>
<tr>
<td>5.3 Steep Riffles and Head Cuts</td>
<td>Head Cuts: 1</td>
</tr>
<tr>
<td>Sleep Riffles</td>
<td>0</td>
</tr>
<tr>
<td>Trib Rejuv:</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.4 Stream Ford or Animal Crossing</td>
<td>No</td>
</tr>
<tr>
<td>5.5 Straightening</td>
<td>Straightening</td>
</tr>
<tr>
<td>5.5 Straightening Length (ft)</td>
<td>609</td>
</tr>
<tr>
<td>5.5 Dredging</td>
<td>None</td>
</tr>
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</table>

#### Step 6. Rapid Habitat Assessment Data

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 Epifaunal Substrate - Avl.</td>
<td></td>
</tr>
<tr>
<td>6.2 Pool Substrate</td>
<td></td>
</tr>
<tr>
<td>6.3 Pool Variability</td>
<td></td>
</tr>
<tr>
<td>Total Score</td>
<td>0</td>
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<tr>
<td>Habitat Rating</td>
<td>0.00</td>
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</tbody>
</table>

| Habitat Stream Condition | |

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.4 Sediment Deposition</td>
<td>Stream Gradient Type</td>
</tr>
<tr>
<td>6.5 Channel Flow Status</td>
<td>6.8 Bank Stability</td>
</tr>
<tr>
<td>6.6 Channel Alteration</td>
<td>6.9 Bank Vegetation Protection</td>
</tr>
<tr>
<td>6.7 Channel Sinuosity</td>
<td>6.10 Riparian Veg. Zone Width</td>
</tr>
</tbody>
</table>

#### Step 7. Rapid Geomorphic Assessment Data

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Channel Degradation</td>
<td>8</td>
</tr>
<tr>
<td>7.2 Channel Aggradation</td>
<td>15</td>
</tr>
<tr>
<td>7.3 Widening Channel</td>
<td>14</td>
</tr>
<tr>
<td>7.4 Change in Planform</td>
<td>6</td>
</tr>
<tr>
<td>Total Score</td>
<td>43</td>
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</table>

<table>
<thead>
<tr>
<th>Confinement Type</th>
<th>Unconfined</th>
<th>Score</th>
<th>STD</th>
<th>Historic</th>
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<tbody>
<tr>
<td>Geomorphic Rating</td>
<td>0.54</td>
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<tr>
<td>Channel Evolusion Model</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel Evolusion Stage</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geomorphic Condition</td>
<td>Fair</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stream Sensitivity</td>
<td>Extreme</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VT DEC • 103 South Main Street • Waterbury, VT 05671
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report  Malletts Creek

Stream: Allen (Patty) Brook  SGAT Version: 4.56
Reach: T1.02-0  Organization: Fitzgerald Environmental
Segment Length(ft): 1,602  Observers: EPF, SPP
Rain: Yes  Completion Date: 10/12/2010

Quality Control Status - Consultant: Provisional
Quality Control Status - Staff: Provisional

Step 0 - Location: From just upstream of the Route 7 Crossing to the reach break at the confluence with tributary T1.S1.

Step 5 - Notes: Reach is in good shape and well-buffered with a very accessible floodplain throughout. Cross-section was taken at a location parallel to the valley wall so the extent of the VW was measured using a range finder.

Step 7 - Narrative: This channel was extensively straightened and pushed up the valley wall to the southeast. Straightening occurred in ~60% of reach. Although there was no obvious evidence of abandoned terraces and only minor incision in the cross-section, anthropogenic manipulation of the planform will cause future adjustments to be lateral.

1.1 Segmentation: None
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:
   Length (ft)  One Height  Both Height
   Berm: 0 0
   Road: 0 0
   Railroad: 0 0
   Imp. Path: 0 0
   Dev.: 0 0

1.6 Grade Controls: None

Step 1, Valley and Floodplain

1.4 Adjacent Side
   Hillside Slope: Very Steep Extr.Steep
   Continuous w/ Bank: Sometimes Sometimes
   Within 1 Bankfull W: Sometimes Sometimes
   Texture: N.E. N.E.

1.5 Valley Features
   Valley Width (ft): 305
   Width Determination: Measured
   Confinement Type: VB
   In Rock Gorge: No
   Human Caused Change in Valley Width?: No
Stream Geomorphic Assessment

Agency of Natural Resources

Phase 2 Segment Summary Report  Malletts Creek

Stream: Allen (Petty) Brook  Reach: T1.02-0

Step 2. Stream Channel

2.1 Bankfull Width (ft.): 16.40  2.11 Riffle/Step Spacing: 2.13 Average Largest Particle on Bed: N/A
2.2 Max Depth (ft.): 3.85  2.12 Substrate Composition Bar: N/A
2.3 Mean Depth (ft.): 2.49  Bedrock: 0.0 %
2.4 Floodpron Width (ft.): 100.00  Boulders: 0.0 %  2.14 Stream Type
2.5 Aband. Floodpl (ft.): 4.35  Cobble: 0.0 %  Stream Type: E
Human Elev Floodpl (ft.): Coarse Gravel: 0.0 %  Bed Material: Sand
2.6 Width/Depth Ratio: 6.59  Fine Gravel: 5.0 %  Subclass Slope: None
2.7 Entrenchment Ratio: 11.59  Sand: 60.0 %  Bed Form: Dune-Ripple
2.8 Incision Ratio: 1.13  Silt and Smaller: 35.0 %  Field Measured Slope:
Human Elev Inc. Rat.: 0.00  Silt/Clay Present: No  2.15 Sub-reach Stream Type
2.9 Sinuosity: High  Detritus: 15.0 %  Reference Stream Type:
2.10 Riffles Type: Not Applicable  # Large Woody Debris: 3  Reference Bed Material:
Reference Subclass Slope:
Reference Bedform:

Step 3. Riparian Features

3.1 Stream Banks

Bank Texture

<table>
<thead>
<tr>
<th>Location</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material Type:</td>
<td>Silt</td>
<td>Silt</td>
</tr>
<tr>
<td>Consistency:</td>
<td>Non-cohesive</td>
<td>Non-cohesive</td>
</tr>
<tr>
<td>Erosion Length (ft.):</td>
<td>105.5</td>
<td>76.6</td>
</tr>
<tr>
<td>Erosion Height (ft.):</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Revetment Type:</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Revetment Length:</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Canopy %:</td>
<td>1-25</td>
<td>1-25</td>
</tr>
</tbody>
</table>

Reference Bank Erosion: Herbaceous

3.2 Riparian Buffer

<table>
<thead>
<tr>
<th>Buffer Width</th>
<th>Left</th>
<th>Right</th>
<th>Corridor Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant</td>
<td>&gt;100</td>
<td>&gt;100</td>
<td>Dominant</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>None</td>
<td>51-100</td>
<td>Sub-dominant</td>
</tr>
<tr>
<td>W less than 25</td>
<td>0</td>
<td>0</td>
<td>(Legacy)</td>
</tr>
<tr>
<td>Vegetation Type</td>
<td>Herbaceous</td>
<td>Herbaceous</td>
<td></td>
</tr>
<tr>
<td>Dominant</td>
<td></td>
<td></td>
<td>Shrub/Sapling</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>Mixed Trees</td>
<td>Shrub/Sapling</td>
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3.3 Riparian Corridor

<table>
<thead>
<tr>
<th>Buffer Vegetation Type</th>
<th>Left</th>
<th>Right</th>
<th>Failures</th>
<th>Amount</th>
<th>Mean Height</th>
<th>Gullies Number</th>
<th>Gullies Length</th>
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</thead>
<tbody>
<tr>
<td>Dominant</td>
<td></td>
<td></td>
<td>Shrub/Sapling</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>Herbaceous</td>
<td>Shrub/Sapling</td>
<td>None</td>
<td>Gullies</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report  Malletts Creek

Stream: Allen (Psey) Brook  Reach: T1.02-0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: Minimal  4.5 Flow Regulation Type: None
4.2 Adjacent Wetlands: Abundant  Flow Reg. Use: None
4.3 Flow Status: Moderate  Impoundments: None
4.4 # of Debris Jams: 0  Impoundment Loc.: None
4.6 Up/Down Stnrm flow reg.: None  4.7 Stormwater Inputs: None
(old) Upstrm Flow Reg.:  Field Ditch: Road Ditch:

4.8 Channel Constrictions: None  Other: Tile Drain:

Step 5. Channel Bed and Planform Changes

5.1 Bar Types  Diagonal: 0  5.2 Other Features  Neck Cutoff: 1
Mid: 1  Delta: 0  Flood chutes: 0  Avulsion: 0
Point: 4  Island: 0  5.3 Steep Riffles and Head Cuts: Head Cuts: 0
Side: 0  Braiding: 0  5.4 Stream Ford or Animal Crossing: No
Steep Riffles: 0  Trib Rejv.: None  5.5 Straightening: Straightening
5.6 Straightening Length (ft.): 945  5.5 Dredging: None

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Av.: 6.4 Sediment Deposition: Stream Gradient Type
6.2 Pool Substrate: 6.5 Channel Flow Status: 6.8 Bank Stability:
6.3 Pool Variability: 6.6 Channel Alteration: 6.9 Bank Vegetation Protection
Total Score: 0  6.7 Channel Sinuosity: 6.10 Riparian Veg. Zone Width:
Habitat Rating: 0.00
Habitat Stream Condition:

Step 7. Rapid Geomorphic Assessment Data

<table>
<thead>
<tr>
<th>Confinement Type</th>
<th>Unconfined</th>
<th>Score</th>
<th>STD</th>
<th>Historic</th>
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</thead>
<tbody>
<tr>
<td>7.1 Channel Degradation</td>
<td>15</td>
<td>None</td>
<td>No</td>
<td>Geomorphic Rating: 0.79</td>
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<tr>
<td>7.2 Channel Aggradation</td>
<td>16</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Model: F</td>
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<tr>
<td>7.3 Widening Channel</td>
<td>16</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Stage: I</td>
</tr>
<tr>
<td>7.4 Change in Planform</td>
<td>16</td>
<td>None</td>
<td>No</td>
<td>Geomorphic Condition: Good</td>
</tr>
</tbody>
</table>
Total Score: 63
Stream Sensitivity: High
Phase 2 Segment Summary Report  Malletts Creek

Stream: Allen (Petty) Brook  SGAT Version: 4.56
Reach: T1.03-0  Organization: Fitzgerald Environmental
Segment Length(ft): 2,706  Observers: EPF, SPP
Rain: Yes  Completion Date: 10/12/2010

Provisional  Quality Control Status - Consultant:
Provisional  Quality Control Status - Staff:

Step 0 - Location: From the reach break at the confluence with T1.S1 up to the confluence with T1.S2

Step 5 - Notes: The lower portion of the reach has some buffer impacts on the left side, but otherwise the reach is well buffered. The crossing at Coon Hill Road has several problems. The culvert is undersized which is causing erosion and scour downstream. Also, the water backs up upstream causing aggradation and bank scour. This culvert is a high-priority for replacement.

Step 7 - Narrative: Channel has some adjustments associated with historical channel straightening and the undersized structure at Coon Hill Road.

Prior incision as observed in the small bench noted in the cross-section has arrested by small areas of cohesive clay in the channel. Widening will follow as the channel begins to regain planform and stability. CEM stage III best describes the processes observed in the field.

1.1 Segmentation: None  1.4 Adjacent Side Left  Right  1.5 Valley Features
1.2 Alluvial Fan: None  Hillside Slope: Extr.Stee  Steep
1.3 Corridor Encroachments:

<table>
<thead>
<tr>
<th>Length (ft)</th>
<th>One Height</th>
<th>Both Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berm:</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Road:</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Railroad:</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Imp. Path:</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dev.:</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

1.6 Grade Controls: None

Step 1. Valley and Floodplain

<table>
<thead>
<tr>
<th>Continuous w/ Bank:</th>
<th>Within 1 Bankfull W:</th>
<th>Texture:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sometimes</td>
<td>Sometimes</td>
<td>N.E.</td>
</tr>
</tbody>
</table>

Valley Width (ft): 191  Confinement Type: VB

Width Determination: Measured  In Rock Gorge: No

Human Caused Change in Valley Width?: No
Stream Geomorphic Assessment
Agency of Natural Resources
Phase 2 Segment Summary Report
Malletts Creek

Stream: Allen (Petty) Brook  Reach: T1.03-0

**Step 2. Stream Channel**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Bankfull Width (ft.)</td>
<td>17.00</td>
<td>2.11 Riffle/Step Spacing:</td>
<td></td>
</tr>
<tr>
<td>2.2 Max Depth (ft.)</td>
<td>3.90</td>
<td>2.12 Substrate Composition</td>
<td></td>
</tr>
<tr>
<td>2.3 Mean Depth (ft):</td>
<td>2.81</td>
<td>2.04 Bedrock:</td>
<td>0.0 %</td>
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<tr>
<td>2.4 Flood prone Width (ft.)</td>
<td>167.00</td>
<td>2.13 Average Largest Particle on Bed: N/A</td>
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</tr>
<tr>
<td>2.5 Aband. Floodpln (ft.):</td>
<td>4.60</td>
<td>2.14 Stream Type:</td>
<td>E</td>
</tr>
<tr>
<td>2.6 Width/Depth Ratio:</td>
<td>6.05</td>
<td>2.15 Sub-reach Stream Type:</td>
<td></td>
</tr>
<tr>
<td>2.7 Entrenchment Ratio:</td>
<td>9.82</td>
<td>Field Measured Slope:</td>
<td></td>
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<tr>
<td>2.8 Incision Ratio:</td>
<td>1.18</td>
<td>2.15 Sub-reach Stream Type:</td>
<td></td>
</tr>
<tr>
<td>Human Elevated Inc. Rat.:</td>
<td>0.00</td>
<td>Reference Stream Type:</td>
<td></td>
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<tr>
<td>2.9 Sinuosity:</td>
<td>Moderate</td>
<td>Reference Bed Material:</td>
<td></td>
</tr>
<tr>
<td>2.10 Riffles Type:</td>
<td>Not Applicable</td>
<td>Reference Subclass Slope:</td>
<td></td>
</tr>
<tr>
<td></td>
<td># Large Woody Debris: 82</td>
<td>Reference Bedform:</td>
<td></td>
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</tbody>
</table>

**Step 3. Riparian Features**

<table>
<thead>
<tr>
<th>Bank Texture</th>
<th>Bank Erosion</th>
<th>Erosion Length (ft.)</th>
<th>Erosion Height (ft.)</th>
<th>Substrate</th>
<th>Revetment Type</th>
<th>Revetment Length</th>
<th>Bank Canopy</th>
<th>Canopy %</th>
<th>Mid-Channel Canopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td>Left</td>
<td>311.6</td>
<td>3.4</td>
<td>Silt</td>
<td>Non-cohesive</td>
<td>0.0</td>
<td>None</td>
<td>26-50</td>
<td>Open</td>
</tr>
<tr>
<td></td>
<td>Right</td>
<td>429.8</td>
<td>4.2</td>
<td>Silt</td>
<td>Non-cohesive</td>
<td>0.0</td>
<td>None</td>
<td>26-50</td>
<td></td>
</tr>
<tr>
<td>Material Type</td>
<td>Silt</td>
<td>3.4</td>
<td>4.2</td>
<td>Herbaceous</td>
<td>Herbaceous</td>
<td>26-50</td>
<td>Bank Canopy</td>
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</tbody>
</table>

**3.2 Riparian Buffer**

<table>
<thead>
<tr>
<th>Buffer Width</th>
<th>Left</th>
<th>Right</th>
<th>Corridor Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant</td>
<td>&gt;100</td>
<td>&gt;100</td>
<td>Shrub/Sapling</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>0-25</td>
<td>51-100</td>
<td>Shrub/Sapling</td>
</tr>
<tr>
<td>W less than 25</td>
<td>983</td>
<td>0</td>
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**3.3 Riparian Corridor**

<table>
<thead>
<tr>
<th>Mass Failures</th>
<th>Hay</th>
<th>Forest</th>
<th>Mass Failures</th>
<th>Hay</th>
<th>Forest</th>
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</thead>
<tbody>
<tr>
<td>Left</td>
<td>Right</td>
<td>Amount</td>
<td>Mean Height</td>
<td>Gullies Number</td>
<td>0</td>
</tr>
<tr>
<td>Right</td>
<td>8.0</td>
<td>Multiple</td>
<td>8.0</td>
<td>Gullies Length</td>
<td>0</td>
</tr>
</tbody>
</table>

VT DEC • 103 South Main Street • Waterbury, VT 05671
Stream Geomorphic Assessment

Agency of Natural Resources

Phase 2 Segment Summary Report

Mallets Creek

Stream: Allen (Patty) Brook
Reach: T1.03-0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: Minimal
4.2 Adjacent Wetlands: Abundant
4.3 Flow Status: Moderate
4.4 # of Debris Jams: 2

4.5 Flow Regulation Type: None
Field Ditch: Road Ditch:
Impoundments: None
Other: Tile Drain:
Impoundment Loc.: None
Overland Flow: Urb Strm Wtr Pipe:
4.6 Up/Down Strm flow reg.: None
4.9 # of Beaver Dams: 0
(old) Upstrm Flow Reg.: None
Affected Length (ft): 0

4.8 Channel Constrictions:

<table>
<thead>
<tr>
<th>Type</th>
<th>Instream Culvert</th>
<th>Photo Taken?</th>
<th>GPS Taken?</th>
<th>Channel Constriction?</th>
<th>Floodprone Constriction?</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>5</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Deposition Above, Deposition Below, Scour Above, Scour Below</td>
</tr>
</tbody>
</table>

Step 5. Channel Bed and Planform Changes

5.1 Bar Types
- Diagonal: 0
- Delta: 2
- Island: 11
- Braiding: 2

5.2 Other Features
- Neck Cutoff: 1
- Avulsion: 0
- Head Cuts: 0
- Trib Rejv.: No

5.3 Steep Riffles and Head Cuts
- Steep Riffles: 0

5.4 Stream Ford or Animal Crossing: No
5.5 Straightening: Straightening
Straightening Length (ft): 607

5.6 Sedimentary Deposition: No

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl:
6.2 Pool Substrate:
6.3 Pool Variability:
6.4 Channel Flow Status:
6.5 Channel Alteration:
6.6 Channel Sinuosity:
Total Score:
Habitat Rating:
Habitat Stream Condition:

Step 7. Rapid Geomorphic Assessment Data

<table>
<thead>
<tr>
<th>Confinement Type</th>
<th>Unconfined Score</th>
<th>STD</th>
<th>Historic</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Channel Degradation</td>
<td>14</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>7.2 Channel Aggradation</td>
<td>10</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>7.3 Widening Channel</td>
<td>12</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>7.4 Change in Planform</td>
<td>10</td>
<td>None</td>
<td>No</td>
</tr>
</tbody>
</table>

Total Score: 46

Geomorphic Rating: 0.57
Channel Evolution Model: F
Channel Evolution Stage: III
Geomorphic Condition: Fair
Stream Sensitivity: Extreme

VT DEC • 103 South Main Street • Waterbury, VT 05671
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report  Malletts Creek

Stream: Allen (Petty) Brook  SGAT Version: 4.56
Reach: T1.04-0  Organization: Fitzgerald Environmental
Segment Length(ft): 5,392  Observers: EPF, SPP
Rain: Yes  Completion Date: 10/12/2010

Step 0 - Location: From the large beaver dam at the confluence with tributary T1.52

Step 5 - Notes: The lower half of the reach has a buffer that is characterized more by shrubs and WADs, while the upper half has more trees. This change in vegetation along with a slight change in valley conditions causes the channel geometry to change slightly. Two cross-sections were taken, however, in both cross-sections the morphology indicated E-type. Throughout the reach the dominat bedform observed is dune-ripple, with only some sections resembling more of a riffle-pool type.

Step 7 - Narrative: Reach is mostly stable but shows some areas of incision, widening, and planform shifts - likely caused by historical straightening. Despite the low-moderate incision ratio, there is evidence of abandoned floodplains in this low-gradient reach. Stage II of the CEM best describes the processes observed as this reach begins to widen and develop a stable planform.

---

Step 1. Valley and Floodplain

1.1 Segmentation: None  1.4 Adjacent Side Left Right
1.2 Alluvial Fan: None  Hillside Slope: Very Steep Very Steep
1.3 Corridor Encroachments:

<table>
<thead>
<tr>
<th>Length (ft)</th>
<th>One</th>
<th>Height</th>
<th>Both</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berm:</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road:</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Railroad:</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imp. Path:</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dev.:</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.6 Grade Controls: None

Valley Width (ft): 146  Width Determination: Measured
Confinement Type: BD
In Rock Gorge: No

Human Caused Change in Valley Width?: No
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report
Malletts Creek

Stream: Allen (Petty) Brook
Reach: T1.04-0

Step 2. Stream Channel

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>2.1 Bankfull Width (ft.)</td>
<td>15.20</td>
<td></td>
</tr>
<tr>
<td>2.2 Max Depth (ft.)</td>
<td>3.20</td>
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</tr>
<tr>
<td>2.3 Mean Depth (ft.)</td>
<td>2.05</td>
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</tr>
<tr>
<td>2.4 Flood prone Width (ft.)</td>
<td>116.00</td>
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</tr>
<tr>
<td>2.5 Aband. Floodprn (ft.)</td>
<td>4.30</td>
<td></td>
</tr>
<tr>
<td>Human Elev FloodPln (ft.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.6 Width/Depth Ratio</td>
<td>7.41</td>
<td></td>
</tr>
<tr>
<td>2.7 Entrenchment Ratio</td>
<td>7.63</td>
<td></td>
</tr>
<tr>
<td>2.8 Incision Ratio</td>
<td>1.34</td>
<td></td>
</tr>
<tr>
<td>Human Elevated Inc. Rat.</td>
<td>0.00</td>
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</tr>
<tr>
<td>2.9 Sinuosity</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>2.10 Riffles Type</td>
<td>Not Applicable</td>
<td></td>
</tr>
<tr>
<td>1.11 Substrate Composition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.12 Average Largest Particle on</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bed: N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bar: N/A</td>
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<td></td>
</tr>
<tr>
<td>1.14 Stream Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coarse Gravel: 5.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bed Material: Sand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subclass Slope: None</td>
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<td></td>
</tr>
<tr>
<td>Bed Form: Dune-Ripple</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.15 Sub-reach Stream Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silt and Smaller: 28.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field Measured Slope:</td>
<td></td>
<td></td>
</tr>
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</table>

Step 3. Riparian Features

3.1 Stream Banks

<table>
<thead>
<tr>
<th>Bank Textures</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material Type: Sand</td>
<td>Sand</td>
<td>Sand</td>
</tr>
<tr>
<td>Consistency: Non-cohesive</td>
<td>Non-cohesive</td>
<td>Non-cohesive</td>
</tr>
<tr>
<td>Erosion Length (ft.):</td>
<td>474.7</td>
<td>149.5</td>
</tr>
<tr>
<td>Erosion Height (ft.):</td>
<td>2.8</td>
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<td>Revetment Type: None</td>
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<td>Revetment Length:</td>
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</tr>
<tr>
<td>Canopy %:</td>
<td>26-50</td>
<td>26-50</td>
</tr>
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</table>

3.2 Riparian Buffer

<table>
<thead>
<tr>
<th>Buffer Width</th>
<th>Left</th>
<th>Right</th>
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<td>Gullies</td>
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3.3 Riparian Corridor

<table>
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<tbody>
<tr>
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<td>Sub-Dominant</td>
<td>Shrub/Sapling</td>
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</table>

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Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report

Malletts Creek

Stream: Allen (Petty) Brook
Reach: T1.04-0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: Abundant
4.2 Adjacent Wetlands: Abundant
4.3 Flow Status: Moderate
4.4 # of Debris Jams: 3

4.5 Flow Regulation Type: None
4.6 Up/Down Stnm flow reg.: None

4.7 Stormwater Inputs
Field Ditch: 0
Road Ditch: 0
Other: 0
Tile Drain: 0
Overland Flow: 1
Urb Stnm Wtr Pipe: 0

4.8 Channel Constrictions: None

4.9 # of Beaver Dams: 3
Affected Length (ft.): 1050

Step 5. Channel Bed and Planform Changes

5.1 Bar Types
Diagonal: 0
Mid: 2
Delta: 0
Point: 9
Side: 1

5.2 Other Features
Flood chutes: 2
Head Cuts: 0
Steep Riffles and Head Cuts: 0

5.3 Steep Riffles and Head Cuts
Trib Rejtv.: No

5.4 Stream Ford or Animal Crossing: No
5.5 Straightening: Straightening
Straightening Length (ft.): 1,154

5.6 Channel Alteration:
6.1 Epifaunal Substrate - Avl.: 6.4 Sediment Deposition:
6.2 Pool Substrate:
6.3 Pool Variability:
Total Score: 0
6.7 Channel Sinuosity:

Habitat Rating: 0.00
Habitat Stream Condition:

Step 6. Rapid Habitat Assessment Data

6.8 Bank Stability:
6.9 Bank Vegetation Protection:
6.10 Riparian Veg. Zone Width:

Left Right
Stream Gradient Type: L L

Step 7. Rapid Geomorphic Assessment Data

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<tr>
<th>Confinement Type</th>
<th>Unconfined Score</th>
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Phase 2 Segment Summary Report  Malletts Creek

Stream: Allen (Petty) Brook  SGAT Version: 4.56
Reach: T1.05-0  Organization: Fitzgerald Environmental
Segment Length(ft): 1,860  Observers: EPF, SPP
Rain: Yes  Completion Date: 10/19/2010

Step 0 - Location: From the reach break at the VAST trail crossing up the change in confinement.
Step 5 - Notes: Reach is in reference condition with excellent dune-ripple formation and abundant habitat.
Step 7 - Narrative: Very stable reach with an abundance of wood and excellent riparian buffers.

1.1 Segmentation: None
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:
   Length (ft)    | One | Height | Both | Height
   Berm: 0 | 0 | 0
   Road: 0 | 0 | 0
   Railroad: 0 | 0 | 0
   Imp. Path: 0 | 0 | 0
   Dev.: 0 | 0 | 0

1.6 Grade Controls: None

Step 1. Valley and Floodplain
1.4 Adjacent Side
   Left | Right
   Hillside Slope: Very Steep | Very Steep
   Continuous w/ Bank: Sometimes | Sometimes
   Within 1 Bankfull W: Sometimes | Sometimes
   Texture: Sand | Sand

1.5 Valley Features
   Valley Width (ft): 86
   Confinement Type: NW
   In Rock Gorge: No
   Human Caused Change in Valley Width?: No

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### Step 2. Stream Channel

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<thead>
<tr>
<th>Parameter</th>
<th>Measurement</th>
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<tr>
<td>Bedrock</td>
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<tr>
<td>Boulder</td>
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<tr>
<td>Cobble</td>
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</tr>
<tr>
<td>Coarse Gravel</td>
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<tr>
<td>Fine Gravel</td>
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<td>Sand</td>
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<td>Silt and Smaller</td>
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<td>Silt/Clay Present</td>
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<td>Large Woody Debris</td>
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<td>Average Largest Particle on Bed</td>
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<tr>
<td>Stream Type</td>
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<td>Reference Bed Material</td>
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<td></td>
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<td>Reference Subclass Slope</td>
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<tr>
<td>Reference Bedform</td>
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### Step 3. Riparian Features

#### 3.1 Stream Banks

**Bank Texture**
- **Upper Material Type:** Sand
- **Consistency:** Non-cohesive
- **Right Material Type:** Sand
- **Consistency:** Non-cohesive

#### 3.2 Riparian Buffer

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<tr>
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#### 3.3 Riparian Corridor

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<td>Mass Failures</td>
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<td>Height</td>
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Stream Geomorphic Assessment
Agency of Natural Resources
Phase 2 Segment Summary Report  Mallets Creek
Stream: Allen (Petty) Brook  Reach: T1.05-0

Step 4. Flow & Flow Modifiers
4.1 Springs / Seeps: Abundant  4.5 Flow Regulation Type: None  4.7 Stormwater Inputs
4.2 Adjacent Wetlands: Abundant  Flow Reg. Use: Field Ditch: 0  Road Ditch: 0
4.3 Flow Status: Moderate  Impoundments: None  Other: 0  Tile Drain: 0
4.4 # of Debris Jams: 10  Impoundment Loc.: Overland Flow: 1  Urb Strm Wtr Pipe: 0
4.6 Up/Down Strm flow reg.: None  4.9 # of Beaver Dams: 0
(old) Upstrm Flow Reg.: None  Affected Length (ft): 0
4.8 Channel Constrictions: None

Step 5. Channel Bed and Planform Changes
5.1 Bar Types  Diagonal: 0  5.2 Other Features  Neck Cutoff: 0  5.4 Stream Ford or Animal Crossing: No
Mid: 0  Delta: 1  Flood chutes: 0  Avulsion: 0  5.5 Straightening: None
Point: 16  Island: 0  5.3 Steep Riffles and Head Cuts  Head Cuts: 0  Straightening Length (ft.): 0
Side: 0  Braiding: 0  5.6 Steep Riffles: None  5.5 Dredging: None

Step 6. Rapid Habitat Assessment Data
6.1 Epifaunal Substrate - A/A.: 6.4 Sediment Deposition: Stream Gradient Type
6.2 Pool Substrate: 6.5 Channel Flow Status: 6.8 Bank Stability:
6.3 Pool Variability: 6.6 Channel Alteration: 6.9 Bank Vegetation Protection

Total Score: 0  6.7 Channel Sinuosity: 6.10 Riparian Veg. Zone Width:
Habitat Rating: 0.00
Habitat Stream Condition:

Step 7. Rapid Geomorphic Assessment Data

<table>
<thead>
<tr>
<th>Confinement Type</th>
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<th>Score</th>
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<td>No</td>
<td>Channel Evolution Stage</td>
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<td>Stream Sensitivity</td>
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Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report  Malletts Creek

Stream: Allen (Petty) Brook  SGAT Version: 4.56
Reach: T106-A  Organization: Fitzgerald Environmental
Segment Length(ft): 2,816  Observers: EPF, SPP
Rain: Yes  Completion Date: 10/19/2010

Quality Control Status - Consultant: Provisional
Quality Control Status - Staff: Provisional

Step 0 - Location: From reach break at change in confinement up to property restriction upslope of tributary confluence with T106.T1.01.
Step 5 - Notes: Reach is in excellent condition because of the wide buffer. Future stormwater systems for the development near Route 7 should be monitored as to not impact the great habitat/geomorphically stable reach. Neck cutoffs are natural part of sinuous system and abundant beaver activity.
Step 7 - Narrative: Great buffers and abundance of woody debris stabilize the segment. Upper end of segment has less forest cover and some beaver activity. The reduced cover has resulted in some tight meander bends that might be neck-cutoffs soon.

1.1 Segmentation: Property Access
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

<table>
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<tr>
<th>Length (ft)</th>
<th>Berm</th>
<th>One</th>
<th>Height</th>
<th>Both</th>
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1.4 Adjacent Side

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<tr>
<th>Hillside Slope:</th>
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<td>Very Steep</td>
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<thead>
<tr>
<th>Continuous w/ Bank:</th>
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<td>Sometimes</td>
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1.5 Valley Features

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<tr>
<td>In Rock Gorge:</td>
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</table>

| Human Caused Change in Valley Width?: | No |

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Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report
Malletts Creek

Stream: Allen (Petty) Brook  Reach: T1.06-A

**Step 2. Stream Channel**

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<th>Parameter</th>
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<tr>
<td>Bankfull Width (ft.)</td>
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**Step 3. Riparian Features**

<table>
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<th>3.1 Stream Banks</th>
<th>Bank Erosion Length (ft.): 164.9 122.8</th>
<th>Erosion Height (ft.): 3.0 3.1</th>
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**3.2 Riparian Buffer**

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<th>Corridor Land</th>
<th>Left</th>
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<th>Corridor Land</th>
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<tbody>
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<td>Sub-Dominant</td>
<td>None</td>
<td>None</td>
<td>Sub-dominant</td>
<td>Shrubs/Sapling</td>
<td>Shrubs/Sapling</td>
<td>Height</td>
<td>25.0</td>
<td>15.0</td>
</tr>
<tr>
<td>W less than 25</td>
<td>0</td>
<td>1</td>
<td>Legacy</td>
<td>Amount</td>
<td>Mean Height</td>
<td>Gullies Number</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Buffer Vegetation Type</td>
<td>Dominant</td>
<td>Mixed Trees</td>
<td>Failures</td>
<td>Multiple</td>
<td>20.0</td>
<td>Gullies Length</td>
<td>0</td>
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<tr>
<td>Sub-Dominant</td>
<td>Shrubs/Sapling</td>
<td>Shrubs/Sapling</td>
<td>Gullies</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Stream Geomorphic Assessment
Agency of Natural Resources
Phase 2 Segment Summary Report
Malletts Creek
February 21, 2011

Phase 2 Segment Summary Report

**Stream:** Allen (Patty) Brook
**Reach:** T1.06-A

### Step 4. Flow & Flow Modifiers

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Springs / Seeps:</td>
<td>Abundant</td>
</tr>
<tr>
<td>4.2 Adjacent Wetlands:</td>
<td>Abundant</td>
</tr>
<tr>
<td>4.3 Flow Status:</td>
<td>Moderate</td>
</tr>
<tr>
<td>4.4 # of Debris Jams:</td>
<td>17</td>
</tr>
<tr>
<td>4.5 Flow Regulation Type:</td>
<td>None</td>
</tr>
<tr>
<td>4.6 Up/Down Strm flow reg.:</td>
<td>None</td>
</tr>
<tr>
<td>(old) Upstrm Flow Reg.:</td>
<td>None</td>
</tr>
<tr>
<td>4.7 Stormwater Inputs:</td>
<td>None</td>
</tr>
<tr>
<td>Field Ditch:</td>
<td>Road Ditch:</td>
</tr>
<tr>
<td>Other:</td>
<td>Tile Drain:</td>
</tr>
<tr>
<td>Overland Flow:</td>
<td>Urb Strm Wtr Pipe:</td>
</tr>
<tr>
<td>4.9 # of Beaver Dams:</td>
<td>2</td>
</tr>
<tr>
<td>Affected Length (ft.):</td>
<td>65</td>
</tr>
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### Step 5. Channel Bed and Planform Changes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>5.1 Bar Types Diagonal:</td>
<td>0</td>
</tr>
<tr>
<td>5.2 Other Features</td>
<td></td>
</tr>
<tr>
<td>Neck Cutoff:</td>
<td>2</td>
</tr>
<tr>
<td>5.3 Stream Riffles and Head Cuts</td>
<td>0</td>
</tr>
<tr>
<td>Head Cuts:</td>
<td>0</td>
</tr>
<tr>
<td>5.4 Stream Ford or Animal Crossing:</td>
<td>Yes</td>
</tr>
<tr>
<td>5.5 Straightening:</td>
<td>None</td>
</tr>
<tr>
<td>5.6 Widening Channel:</td>
<td>None</td>
</tr>
<tr>
<td>5.7 Channel Sinuosity:</td>
<td>0</td>
</tr>
<tr>
<td>5.8 Bank Stability:</td>
<td></td>
</tr>
<tr>
<td>5.9 Bank Vegetation Protection</td>
<td></td>
</tr>
<tr>
<td>Total Score:</td>
<td>0</td>
</tr>
<tr>
<td>Habitat Rating:</td>
<td>0.00</td>
</tr>
<tr>
<td>Habitat Stream Condition:</td>
<td></td>
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### Step 6. Rapid Habitat Assessment Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 Epifaunal Substrate - Avl.</td>
<td></td>
</tr>
<tr>
<td>6.2 Pool Substrate:</td>
<td></td>
</tr>
<tr>
<td>6.3 Pool Variability:</td>
<td></td>
</tr>
<tr>
<td>Total Score:</td>
<td>0</td>
</tr>
<tr>
<td>Habitat Rating:</td>
<td>0</td>
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<tr>
<td>Habitat Stream Condition:</td>
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</table>

### Step 7. Rapid Geomorphic Assessment Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Score</th>
<th>STD</th>
<th>Historic</th>
<th>Geomorphic Rating</th>
<th>Channel Evolution Model</th>
<th>Channel Evolution Stage</th>
<th>Geomorphic Condition</th>
<th>Stream Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Channel Degradation</td>
<td>16</td>
<td>None</td>
<td>No</td>
<td>0.76</td>
<td>F</td>
<td>I</td>
<td>Good</td>
<td>High</td>
</tr>
<tr>
<td>7.2 Channel Aggradation</td>
<td>16</td>
<td>None</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.3 Widening Channel</td>
<td>15</td>
<td>None</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.4 Change in Planform</td>
<td>14</td>
<td>None</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Score</td>
<td>61</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report  Malletts Creek

Stream: Allen (Potty) Brook  SGAT Version: 4.56
Reach: T1.06-B  Organization: Fitzgerald Environmental
Segment Length(ft): 1,009  Observers: EPF, SPP
Rain: Yes  Completion Date: 10/19/2010

Quality Control Status - Consultant: Provisional
Quality Control Status - Staff: Provisional
Why Not Assessed: no property access

Step 0 - Location: From segment break just upstream of confluence with subtributary T1.06.t1.01 to segment break 110 ft upstream of the Sweeney Farm Rd Crossing
Step 5 - Notes: Property access restricted a full RGA assessment on this segment, however banks and buffers were assessed from the road and using GIS. Also, the culvert was assessed at the Sweeny Farm Road crossing because the stream is in the ROW of the road in the public domain.
Step 7 - Narrative:

1.1 Segmentation: Property Access
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:
   Length(ft)  One Height  Both Height
   Berm: 0 0
   Road: 665 12 0
   Railroad: 0 0
   Imp. Path: 0 0
   Dev.: 350 0
1.6 Grade Controls: None

Step 1, Valley and Floodplain
1.4 Adjacent Side
   Hillside Slope: Left Steep  Right Steep
   Continuous w/ Bank: Sometimes  Sometimes
   Within 1 Bankfull W: Sometimes  Sometimes
Texture: N.E.  N.E.
1.5 Valley Features
   Valley Width (ft): 170
   Width Determination: Measured
   Confinement Type: VB
   In Rock Gorge: No
   Human Caused Change in Valley Width?: Yes
Stream Geomorphic Assessment

Agency of Natural Resources

Phase 2 Segment Summary Report

Malletts Creek

Stream: Allen (Petty) Brook
Reach: T1.06-B

**Step 2. Stream Channel**

2.1 Bankfull Width (ft.):
2.11 Riffles/Step Spacing:
2.12 Substrate Composition
2.13 Average Largest Particle on
Bed:
Bar:

2.2 Max Depth (ft.):

2.3 Mean Depth (ft.):

2.4 Floodprone Width (ft.):

2.5 Aband. Floodpln (ft.):

2.6 Width/Depth Ratio: 0.00

2.7 Entrenchment Ratio: 0.00

2.8 Incision Ratio: 0.00

2.9 Sinuosity:

2.10 Riffles Type:

2.11 Boulder: %

2.12 Cobble: %

2.13 Coarse Gravel: %

2.14 Fine Gravel: %

2.15 Sand:

2.16 Bed Material:

2.17 Subclass Slope:

2.18 Bed Form:

2.19 Stream Type:

2.20 Field Measured Slope:

2.21 Sub-reach Stream Type:

2.22 Reference Stream Type:

2.23 Reference Bed Material:

2.24 Reference Subclass Slope:

2.25 Reference Bedform:

**Step 3. Riparian Features**

3.1 Stream Banks

Bank Texture

Upper

Material Type: Sand
Consistency: Non-cohesive

Left:

Right:

Erosion Length (ft.): 0.0
Erosion Height (ft.): 0.0

Revetment Type: None
Revetment Length: 0.0

Dominant:

Herbaceous

Herbaceous

Sub-dominant:

Shrubs/Sapling

Shrubs/Sapling

Bank Canopy:

Mid-Channel Canopy:

Open

3.2 Riparian Buffer

Buffer Width

Dominant:

0-25

Sub-Dominant:

26-50

W less than 25:

708

852

Buffer Vegetation Type

Dominant: Herbaceous

Sub-Dominant: Mixed Trees

3.3 Riparian Corridor

Corridor Land

Dominant:

Hay

Residential

Gullies Number: 0

Sub-dominant:

Residential

Bare

Amount

Mean Height

Gullies Length: 0

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Stream: Allen (Pett) Brook  Reach: T1.06-B

**Step 4. Flow & Flow Modifiers**

- 4.1 Springs / Seeps: Minimal
- 4.2 Adjacent Wetlands: Minimal
- 4.3 Flow Status: Moderate
- 4.4 # of Debris Jams: 0
- 4.5 Flow Regulation Type: None
- 4.6 Up/Down Strm flow reg.: None
- 4.7 Stormwater Inputs: None
- 4.8 Channel Constrictions:

**Step 5. Channel Bed and Planform Changes**

<table>
<thead>
<tr>
<th>Type</th>
<th>Width</th>
<th>Taken?</th>
<th>GPS Taken?</th>
<th>Channel Constriction?</th>
<th>Floodprone Constriction?</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instream Culvert</td>
<td>6.5</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Deposition Above, Scour Below</td>
</tr>
<tr>
<td>5.1 Bar Types</td>
<td>Diagonal: 5.2 Other Features</td>
<td>Neck Cutoff: 0</td>
<td>5.4 Stream Ford or Animal Crossing: No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid: Delta:</td>
<td>Flood chutes: 0</td>
<td>Avulsion: 0</td>
<td>5.5 Straightening: Straightening</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Point: Island:</td>
<td>5.3 Steep Riffles and Head Cuts</td>
<td>Head Cuts: 0</td>
<td>Straightening Length (ft.): 195</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side: Braiding: 0</td>
<td>Steep Riffles: 0</td>
<td>Trib Rejuv.: 0</td>
<td>5.5 Dredging: None</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Step 6. Rapid Habitat Assessment Data**

- 6.1 Epifaunal Substrate - Avl.:
- 6.2 Pool Substrate:
- 6.3 Pool Variability:
- Total Score:

Habitat Rating: Habitat Stream Condition:

**Step 7. Rapid Geomorphic Assessment Data**

<table>
<thead>
<tr>
<th>Confinement Type</th>
<th>Score</th>
<th>STD</th>
<th>Historic</th>
<th>Geomorphic Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Channel Degradation</td>
<td>Channel Evolution Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2 Channel Aggradation</td>
<td>Channel Evolution Stage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.3 Widening Channel</td>
<td>Geomorphic Condition</td>
<td>Fair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.4 Change in Planform</td>
<td>Stream Sensitivity</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Stream Geomorphic Assessment
Agency of Natural Resources

Phase 2 Segment Summary Report  Malletts Creek

Stream: Allen (Patty) Brook  SGAT Version: 4.56
Reach: T1.06-C  Organization: Fitzgerald Environmental
Segment Length(ft): 747  Observers: EPF, SPP
Rain: Yes  Completion Date: 10/19/2010

Provisional  Provisional
Quality Control Status - Consultant:
Quality Control Status - Staff:

Step 0 - Location: From segment break upstream of Sweeny Farm Road to the reach break upstream of Allen Brook Drive.

Step 5 - Notes: This segment has been heavily manipulated by humans and as a result the geomorphic and habitat conditions have been reduced dramatically. The lack of full-sized trees and dense shrubs in the riparian buffer leave the channel open to thermal loading and the banks free to erode.

The Allen Brook Crossing spans the road and floodprone/valley constriction is anthropogenic in nature. The Sweeny Farm Road Crossing (in Segment T1.06-B) also has a considerable amount of fill that span the valley. These sites significantly change the shape and function of the valley so "yes" is checked for human caused change to valley width. Adding a HE-IR would be difficult in this setting because it is difficult to determine natural versus unnatural grades, however some human-elevated floodplain is present.

Step 7 - Narrative: Channel straightening and reduced buffer width leading to impacted condition with adjustments to planform and degradation.

### 1.1 Segmentation: Property Access

### 1.2 Alluvial Fan: None

### 1.3 Corridor Encroachments:

<table>
<thead>
<tr>
<th>Length (ft)</th>
<th>One Height</th>
<th>Both Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berm:</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Road:</td>
<td>377</td>
<td>15</td>
</tr>
<tr>
<td>Railroad:</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Imp. Path:</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dev.:</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### 1.6 Grade Controls: None

#### Step 1. Valley and Floodplain

<table>
<thead>
<tr>
<th>1.4 Adjacent Side</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillside Slope:</td>
<td>Steep</td>
<td>Very Steep</td>
</tr>
<tr>
<td>Continuous w/ Bank:</td>
<td>Never</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Within 1 Bankfull W:</td>
<td>Sometimes</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Texture:</td>
<td>N.E.</td>
<td>N.E.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.5 Valley Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valley Width (ft): 153</td>
</tr>
<tr>
<td>Width Determination: Measured</td>
</tr>
<tr>
<td>Confinement Type: VB</td>
</tr>
</tbody>
</table>

Human Caused Change in Valley Width?: Yes

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Stream Geomorphic Assessment
Agency of Natural Resources
Phase 2 Segment Summary Report  Malletts Creek

Stream: Allen (Pett) Brook  Reach: T1.06-C

### Step 2. Stream Channel

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Bankfull Width (ft.)</td>
<td>12.70</td>
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</tr>
<tr>
<td>2.2 Max Depth (ft.)</td>
<td>2.60</td>
<td></td>
</tr>
<tr>
<td>2.3 Mean Depth (ft.)</td>
<td>1.61</td>
<td></td>
</tr>
<tr>
<td>2.4 Floodprime Width (ft.)</td>
<td>155.00</td>
<td></td>
</tr>
<tr>
<td>2.5 Aband. Floodpn (ft.)</td>
<td>3.10</td>
<td></td>
</tr>
<tr>
<td>Human Elev FloodFln (ft.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.6 Width/Depth Ratio</td>
<td>7.89</td>
<td></td>
</tr>
<tr>
<td>2.7 Entrenchment Ratio</td>
<td>12.20</td>
<td></td>
</tr>
<tr>
<td>2.8 Incision Ratio</td>
<td>1.19</td>
<td></td>
</tr>
<tr>
<td>Human Elevated Inc.Rat.</td>
<td>0.00</td>
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</tr>
<tr>
<td>2.9 Sinuosity</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>2.10 Riffles Type</td>
<td>Not Applicable</td>
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</tr>
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</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.11 Riffle/Step Spacing</td>
<td>2.13 Average Largest Particle on Bed: N/A</td>
<td></td>
</tr>
<tr>
<td>2.12 Substrate Composition</td>
<td>0.0 %</td>
<td>Bar: N/A</td>
</tr>
<tr>
<td>Bedrock</td>
<td>0.0 %</td>
<td>Stream Type: E</td>
</tr>
<tr>
<td>Boulder</td>
<td>5.0 %</td>
<td>Bed Material: Sand</td>
</tr>
<tr>
<td>Coarse Gravel</td>
<td>9.0 %</td>
<td>Subclass Slope: None</td>
</tr>
<tr>
<td>Fine Gravel</td>
<td>71.0 %</td>
<td>Bed Form: Plane Bed</td>
</tr>
<tr>
<td>Sand</td>
<td>15.0 %</td>
<td>Field Measured Slope:</td>
</tr>
<tr>
<td>Silt and Smaller</td>
<td>Yes</td>
<td>2.15 Sub-reach Stream Type</td>
</tr>
<tr>
<td>Silt/Clay Present</td>
<td>10.0 %</td>
<td>Reference Stream Type:</td>
</tr>
<tr>
<td>Detritus</td>
<td># Large Woody Debris: 8</td>
<td>Reference Bed Material:</td>
</tr>
<tr>
<td>Reference Subclass Slope:</td>
<td></td>
<td>Reference Bedform:</td>
</tr>
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</table>

### Step 3. Riparian Features

#### Bank Texture

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Consistency</th>
<th>Erosion Length (ft.)</th>
<th>Erosion Height (ft.)</th>
<th>Revetment Type</th>
<th>Revetment Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td>Left</td>
<td>Right</td>
<td>Left</td>
<td>Right</td>
<td>Left</td>
</tr>
<tr>
<td>Sand</td>
<td>Non-cohesive</td>
<td>Non-cohesive</td>
<td>51.4</td>
<td>82.3</td>
<td>Dominant</td>
</tr>
<tr>
<td>Sand</td>
<td>Non-cohesive</td>
<td>Non-cohesive</td>
<td>3.0</td>
<td>3.0</td>
<td>Sub-dominant</td>
</tr>
</tbody>
</table>

#### Typical Bank Slope: Undercut

<table>
<thead>
<tr>
<th>Bank Erosion</th>
<th>Near Bank Vegetation Type</th>
<th>Dominant</th>
<th>Sub-dominant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>Right</td>
<td>Herbaceous</td>
<td>Herbaceous</td>
</tr>
<tr>
<td>Herbaceous</td>
<td>Shrubs/Sapling</td>
<td>Shrubs/Sapling</td>
<td></td>
</tr>
<tr>
<td>Shrubs/Sapling</td>
<td>Shrubs/Sapling</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Material Type: Sand
Consistency: Non-cohesive

<table>
<thead>
<tr>
<th>Bank Erosion</th>
<th>Near Bank Vegetation Type</th>
<th>Dominant</th>
<th>Sub-dominant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>Right</td>
<td>Herbaceous</td>
<td>Herbaceous</td>
</tr>
<tr>
<td>Herbaceous</td>
<td>Shrubs/Sapling</td>
<td>Shrubs/Sapling</td>
<td></td>
</tr>
<tr>
<td>Shrubs/Sapling</td>
<td>Shrubs/Sapling</td>
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<td></td>
</tr>
</tbody>
</table>

#### Consistency: Non-cohesive

#### 3.2 Riparian Buffer

<table>
<thead>
<tr>
<th>Buffer Width</th>
<th>Left</th>
<th>Right</th>
<th>Corridor Land</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant</td>
<td>0-25</td>
<td>0-25</td>
<td>Dominant</td>
<td>Residential</td>
<td>Residential</td>
</tr>
<tr>
<td>Sub-Dominant</td>
<td>26-50</td>
<td>26-50</td>
<td>Sub-dominant</td>
<td>Shrubs/Sapling</td>
<td>Shrubs/Sapling</td>
</tr>
<tr>
<td>W less than 25</td>
<td>619</td>
<td>652</td>
<td>(Legacy)</td>
<td>Amount</td>
<td>Mean Height</td>
</tr>
<tr>
<td>Buffer Vegetation Type</td>
<td>Failures</td>
<td>None</td>
<td>Gullies Number</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

#### Dominant | Herbaceous | Herbaceous |
| Shrubs/Sapling | Shrubs/Sapling |

#### Sub-Dominant | Shrubs/Sapling | Shrubs/Sapling |

#### 3.3 Riparian Corridor

<table>
<thead>
<tr>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>Residential</td>
</tr>
<tr>
<td>Shrubs/Sapling</td>
<td>Shrubs/Sapling</td>
</tr>
<tr>
<td>Mean Height</td>
<td>Gullies Number</td>
</tr>
<tr>
<td>Gullies Length</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>
Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: Minimal
4.2 Adjacent Wetlands: Abundant
4.3 Flow Status: Moderate
4.4 # of Debris Jams: 3

4.5 Flow Regulation Type: None
4.6 Up/Down Stream flow reg.: None
(old) Upstream Flow Reg.: None

4.7 Stormwater Inputs
Field Ditch: 1
Road Ditch: 0
Other: 0
Tile Drain: 0
Overland Flow: 0
Urb Stm Wtr Pipe: 1

4.9 # of Beaver Dams: 0
Affected Length (ft.): 0

4.8 Channel Constrictions:

<table>
<thead>
<tr>
<th>Instream Culvert</th>
<th>Photo Taken?</th>
<th>GPS Taken?</th>
<th>Channel Constriction?</th>
<th>Floodprone Constriction?</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Width</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagonal</td>
<td>7</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Scour Below</td>
</tr>
<tr>
<td>Neck Cutoff</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Mid</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delta</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flood chutes</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avulsion</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Point</td>
<td>1</td>
<td>Island</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.3 Steep Riffles and Head Cuts</td>
<td>Head Cuts: 0</td>
<td>Straightening Length (ft.): 399</td>
<td>Straightening:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side</td>
<td>0</td>
<td>Braiding</td>
<td>0</td>
<td>Trib Rejv.: No</td>
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<tr>
<td>Steep Riffles</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Step 5. Channel Bed and Planform Changes

5.1 Bar Types
- Diagonal: 0
- Delta: 0
- Point: 1
- Side: 0

5.2 Other Features
- Neck Cutoff: 0
- Avulsion: 0
- Head Cuts: 0
- Trib Rejv.: No

5.4 Stream Ford or Animal Crossing: No

5.5 Straightening: Straightening
- Straightening Length (ft.): 399

5.6 Sediment Deposition: Stream Gradient Type
- Left
- Right

6.1 Epifaunal Substrate - Avl.:
- Total Score: 0
- Habitat Rating: 0.00

6.2 Pool Substrate:
- 6.3 Pool Variability:
- 6.4 Channel Flow Status:
- 6.5 Channel Alteration:
- 6.6 Bank Stability:
- 6.7 Channel Sinuosity:
- 6.8 Bank Vegetation Protection
- 6.9 Riparian Veg. Zone Width:

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:
- Total Score: 0
- Habitat Rating: 0.00

Step 7. Rapid Geomorphic Assessment Data

Confinement Type
- 7.1 Channel Degradation: 10
- 7.2 Channel Aggradation: 14
- 7.3 Widening Channel: 15
- 7.4 Change in Planform: 12

<table>
<thead>
<tr>
<th>Confinement</th>
<th>Unconfined</th>
<th>Score</th>
<th>STD</th>
<th>Historic</th>
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<tbody>
<tr>
<td>7.1 Channel Degradation</td>
<td>10</td>
<td>None</td>
<td>Yes</td>
<td>Geomorphic Rating</td>
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<tr>
<td>7.2 Channel Aggradation</td>
<td>14</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Model</td>
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<tr>
<td>7.3 Widening Channel</td>
<td>15</td>
<td>None</td>
<td>No</td>
<td>Channel Evolution Stage</td>
</tr>
<tr>
<td>7.4 Change in Planform</td>
<td>12</td>
<td>None</td>
<td>No</td>
<td>Geomorphic Condition</td>
</tr>
</tbody>
</table>

Total Score 51
- Stream Sensitivity: Extreme
STRUCTURE SUMMARY DATA
# Stream Geomorphic Assessment

**Agency of Natural Resources**

**Mallets Creek Culvert Summary Report**

<table>
<thead>
<tr>
<th>SgalID</th>
<th>7000000000004103</th>
<th>Local SgalID</th>
<th>VOBCIT struct_num</th>
<th>Project Name</th>
<th>Longitude</th>
<th>Reach VTID</th>
<th>Stream Name Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observers</td>
<td>EPF (FEA), SPP (FEA)</td>
<td>Assessment Date: 10/28/2010</td>
<td>Latitude: 44.6343</td>
<td>Mallets Creek</td>
<td>-73.08852</td>
<td>M17</td>
<td>Mallets Creek Main Stem</td>
</tr>
<tr>
<td>Town</td>
<td>Milton</td>
<td>Road Type: Gravel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>Forest Road Crossing (Private)</td>
<td>Channel Width: 19.86</td>
<td>Material: Steel Corrugated</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>Road Name</td>
<td>FOREST RD (PVT)</td>
<td>Culvert Length: 27</td>
<td>Number of culverts: 1</td>
<td>No</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Culvert Height: 9</td>
<td>Culvert Overflow Pipe: No</td>
<td>Skewed to roadway?</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Culvert Width: 9.5</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>High Flow Stage</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### General Information

- **Floodplain filled by roadway approaches**: Entirely
- **Obstructions at the opening of the structure**: None
- **Steep riffle present immediately upstream of structure**: No
- **If channel avulses, stream will**:
  - **Downstream**: Cross Road, No
  - **Upstream**: Downstream bank heights are substantially higher than upstream bank heights
  - **Stepped Footers**: Maximum pool depth

### Culvert Information

- **Material**: Steel Corrugated
- **Number of culverts**: 1
- **Culvert Overflow Pipe**: No
- **Skewed to roadway?**: No

### Geomorphic Information

- **Structure is located at significant break in valley slope**: Yes
- **Culvert slope as compared with channel slope is significantly**: Same
- **Estimated distance avulsion would follow road**: Sharp Bend
- **Angle of stream flow approaching structure**:
  - **Cross Road**: No
  - **Upstream**: Water depth in culvert (at outlet) 0.8 At Grade
  - **Downstream**: Backwater Length (measured from outlet) 0

### Vegetation

- **Dominant Bed Material**: Gravel, Cobble
- **Type of Sediment Deposits**: Point, None
- **Material Present throughout**: No, No
- **Elevation of sediment deposits >= 1/2 bankfull**: No, No
- **Bank Erosion**: Low, None
- **Hard Bank Armoring**: Intact, Intact
- **Stream bed scour causing undermining around or under structure**: Culvert, Culvert
- **Beaver Dam near Structure**: No, No
- **Beaver Dam distance (ft.)**:

### Other Information

- **Spatial location data collected with GPS?**: Yes
- **Photos taken?**: Yes

---

VT DEC • 103 South Main Street • Waterbury, VT 05671
Stream Geomorphic Assessment  
Agency of Natural Resources

Comments: Structure has a rusted out bottom on the downstream end (left side); Old culvert remains at the crossing site perhaps the structure blew out historically.

Bridge Summary Report

**General Information**

<table>
<thead>
<tr>
<th>SgaiD</th>
<th>200007000004052</th>
<th>Local SgaiD</th>
<th>VOBCIT</th>
<th>struct_num</th>
<th>Project Name</th>
<th>Reach VTID</th>
<th>Stream Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observers</td>
<td>EPF (FEA), SPP (FEA)</td>
<td>Assessment Date</td>
<td>1/1/0001</td>
<td></td>
<td>Mallets Creek</td>
<td>-73.15832</td>
<td>Mallets Creek</td>
</tr>
<tr>
<td>Town</td>
<td>Colchester</td>
<td>Latitude</td>
<td>44.576506</td>
<td></td>
<td></td>
<td></td>
<td>Allen (Petty Brook)</td>
</tr>
<tr>
<td>Location</td>
<td>Route 7 crossing near auto dealership</td>
<td>Road Type</td>
<td>Paved</td>
<td></td>
<td></td>
<td></td>
<td>25.11</td>
</tr>
<tr>
<td>High Flow Stage</td>
<td>No</td>
<td>Channel Width</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Concrete</td>
</tr>
<tr>
<td>Bridge Width</td>
<td>36</td>
<td>Material</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Concrete</td>
</tr>
<tr>
<td>Bridge Clearance</td>
<td>6</td>
<td>Number of bridge piers/arches</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Concrete</td>
</tr>
<tr>
<td>Bridge/Arch Span</td>
<td>11.5</td>
<td>Skewed to roadway?</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
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</table>

**Geomorphic Information**

<table>
<thead>
<tr>
<th>General Information</th>
<th>Partially</th>
<th>Structure is located at significant break in valley slope</th>
<th>No</th>
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</thead>
<tbody>
<tr>
<td>Upstream</td>
<td>None</td>
<td>Estimated distance avulsion would follow road</td>
<td></td>
</tr>
<tr>
<td>Downstream</td>
<td>Yes</td>
<td>Angle of stream flow approaching structure</td>
<td>Channelized</td>
</tr>
<tr>
<td>Cross Road</td>
<td>Straight</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In Structure</th>
<th>Sand</th>
<th>Sayde, No</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upstream</td>
<td>No</td>
<td>Bank Erosion</td>
<td>Low</td>
</tr>
<tr>
<td>Downstream</td>
<td>None</td>
<td>I land Bank Armoring</td>
<td>None</td>
</tr>
<tr>
<td>In Structure</td>
<td>None</td>
<td>Stream bed scour causing undermining around or under structure</td>
<td>None</td>
</tr>
<tr>
<td>Beaver Dam near Structure</td>
<td>Yes</td>
<td>Sayde, No</td>
<td>No</td>
</tr>
<tr>
<td>Beaver Dam distance (ft.)</td>
<td>150</td>
<td>Sayde, No</td>
<td>No</td>
</tr>
</tbody>
</table>
### Stream Geomorphic Assessment

**Agency of Natural Resources**

**Vegetation**

<table>
<thead>
<tr>
<th>Upstream</th>
<th>Downstream</th>
<th>In Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbaceous/Grass</td>
<td>Herbaceous/Grass</td>
<td></td>
</tr>
</tbody>
</table>

**Dominant Vegetation Type - Left**
Herbaceous/Grass

**Dominant Vegetation Type - Right**
Herbaceous/Grass

**Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?**
- Yes
- No
- Yes

**Vegitation Band - Left**
Yes

**Vegitation Band - Right**
Yes

**Wildlife**
- Roadkill: None
- Outside Structure: None
- Inside Structure: None

**Other Information**
- Photos taken? Yes

**Spatial location data collected with GPS?** Yes

**Comments** Structure is in good shape, however a steep riffle of coarse gravel has formed upstream of the structure and there is a 3.5' deep pool within the structure.

### Culvert Summary Report

#### Mallots Creek

<table>
<thead>
<tr>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SgaID</strong></td>
</tr>
<tr>
<td><strong>Local SgaID</strong></td>
</tr>
<tr>
<td><strong>Observer</strong></td>
</tr>
<tr>
<td><strong>Town</strong></td>
</tr>
<tr>
<td><strong>Location</strong></td>
</tr>
<tr>
<td><strong>Assessment Date</strong></td>
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<tr>
<td><strong>Latitude</strong></td>
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<td><strong>VOBCIT</strong></td>
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<tr>
<td><strong>Project Name</strong></td>
</tr>
<tr>
<td><strong>Longitude</strong></td>
</tr>
<tr>
<td><strong>Reach VTID</strong></td>
</tr>
<tr>
<td><strong>Road Name</strong></td>
</tr>
<tr>
<td><strong>Road Type</strong></td>
</tr>
<tr>
<td><strong>Stream Name</strong></td>
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</tbody>
</table>

#### General Information

<table>
<thead>
<tr>
<th>Culvert Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Culvert Length</strong></td>
</tr>
<tr>
<td><strong>Culvert Height</strong></td>
</tr>
<tr>
<td><strong>Culvert Width</strong></td>
</tr>
</tbody>
</table>

**High Flow Stage** No

<table>
<thead>
<tr>
<th>Channel Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

#### Geomorphic Information

**Entirely**
- Structure is located at significant break in valley slope
- Culvert slope as compared with channel slope is significantly

**Deformation**
- Estimated distance avulsion would follow road
- Angle of stream flow approaching structure

**Cross Road**
- Channelized
- Straight

**Upstream**
- Steep riffle present immediately upstream of structure
- If channel avulses, stream will

**Downstream**
- Water depth in culvert (at outlet)
- Culvert outlet invert
- Backwater Length (measured from outlet)
- Backwater Length (measured from outlet)
**Stream Geomorphic Assessment**

**Agency of Natural Resources**

<table>
<thead>
<tr>
<th>Dominant Bed Material</th>
<th>Upstream</th>
<th>Downstream</th>
<th>In Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sand</td>
<td>Gravel</td>
<td>None</td>
</tr>
</tbody>
</table>

| Bedrock Present       | No       | No         | None         |
|                       |          |            |              |

<table>
<thead>
<tr>
<th>Type of Sediment Deposits</th>
<th>Upstream</th>
<th>Downstream</th>
<th>In Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
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<table>
<thead>
<tr>
<th>Material Present throughout</th>
<th>Upstream</th>
<th>Downstream</th>
<th>In Structure</th>
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</thead>
<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Elevation of sediment deposits &gt;= 1/2 bankfull</th>
<th>Upstream</th>
<th>Downstream</th>
<th>In Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Bank Erosion     | Low      | Low        |            |
| Hard Bank Armoring | None   | None       |            |

<table>
<thead>
<tr>
<th>Stream bed scour causing undermining around or under structure</th>
<th>Upstream</th>
<th>Downstream</th>
<th>In Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Beaver Dam near Structure</th>
<th>Upstream</th>
<th>Downstream</th>
<th>In Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Beaver Dam distance (ft.)</th>
<th>Upstream</th>
<th>Downstream</th>
<th>In Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</table>

### Vegetation

<table>
<thead>
<tr>
<th>Dominant Vegetation Type - Left</th>
<th>Upstream</th>
<th>Downstream</th>
<th>In Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbaceous/Grass</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dominant Vegetation Type - Right</th>
<th>Upstream</th>
<th>Downstream</th>
<th>In Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbaceous/Grass</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

<table>
<thead>
<tr>
<th>Végétation Band - Left</th>
<th>Upstream</th>
<th>Downstream</th>
<th>In Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Végétation Band - Right</th>
<th>Upstream</th>
<th>Downstream</th>
<th>In Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

### Wildlife

<table>
<thead>
<tr>
<th>Roadkill</th>
<th>Outside Structure</th>
<th>Inside Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

### Other Information

Spatial location data collected with GPS? Yes Photos taken? Yes

Comments: Culvert is an old tank which is undersized. The lip of the tank is causing some backwatering and erosion of the road is present.

### Culvert Summary Report

#### General Information

<table>
<thead>
<tr>
<th>SgAID</th>
<th>100005000004101</th>
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</thead>
<tbody>
<tr>
<td>Local SgAID</td>
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</tr>
<tr>
<td>VOBCIT struct. num</td>
<td>Mallets Creek</td>
</tr>
<tr>
<td>Project Name</td>
<td>Mallets Creek</td>
</tr>
<tr>
<td>Longitude</td>
<td>-73.10121</td>
</tr>
<tr>
<td>Reach VTID</td>
<td>M17</td>
</tr>
<tr>
<td>Stream Name</td>
<td>Mallets Creek Main Stem</td>
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</table>

<table>
<thead>
<tr>
<th>Observers</th>
<th>EPF (FEA), SPP (FEA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town</td>
<td>Milton</td>
</tr>
<tr>
<td>Location</td>
<td>East Road crossing about 2,500 feet south of intersection with Westford Road.</td>
</tr>
<tr>
<td>Road Name</td>
<td>EAST RD</td>
</tr>
<tr>
<td>Road Type</td>
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<tr>
<td>High Flow Stage</td>
<td>No</td>
</tr>
<tr>
<td>Channel Width</td>
<td>19.86</td>
</tr>
</tbody>
</table>

| Culvert Length | 30 |
| Culvert Height | 5  |
| Culvert Width  | 11 |

#### Culvert Information

<table>
<thead>
<tr>
<th>Culvert Information</th>
<th>Material</th>
<th>Number of culverts</th>
<th>Culvert Overflow Pipe</th>
<th>Skewed to roadway?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>1</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
**General**
- Floodplain filled by roadway approaches: **Upstream**
- Obstructions at the opening of the structure: **Cross Road**
- Steep riffle present immediately upstream of structure: **Yes**
- If channel avulses, stream will: **No**

**Downstream**
- Pool present immediately downstream of structure: **Yes**
- Downstream bank heights are substantially higher than upstream bank heights: **0.2 ft.**
- Stepped Footers: **Yes**
- Maximum pool depth: **1.5 ft.**

**Geomorphic Information**
- Entirely Structure is located at significant break in valley slope: **No**
- Culvert slope as compared with channel slope is significantly: **Same**
- Estimated distance avulsion would follow road: **Mild Bend**
- Angle of stream flow approaching structure: **0.05 At Grade**

**Upstream**
- Water depth in culvert (at outlet): **0.1 ft.**

**In Structure**
- Water depth in culvert (at outlet): **None**

**Vegetation**
- Dominant Vegetation Type - Left: **Shrub/Sealing**
- Dominant Vegetation Type - Right: **Shrub/Sealing**
- Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?: **No**
- Vegetation Band - Left: **Yes**
- Vegetation Band - Right: **No**

**Wildlife**
- Roadkill: **None**
- Outside Structure: **None**
- Inside Structure: **None**

**Other Information**
- Spatial location data collected with GPS?: **Yes**
- Photos taken?: **Yes**

**Comments**
- **Structure is recent and has no major problems.**

**Culvert Summary Report**

**Mallets Creek**

**General Information**
- SgaID: 1000020000040101 Local SgaID: 100020000040101
- Observers: EPF (FEA), SPP (FEA)
- Assessment Date: 10/28/2010
- Latitude: 44.63872
- longitude: 73.10106
- Reach VTID: T6.01
- Project Name: Mallets Creek
- Stream Name: Unnamed Tributary to Mallets Creek

**Culvert Information**
- Road Name: MAIN ST
- Road Type: Paved
- Channel Width: 10.78
- Material: Concrete
- Number of Culverts: 1

**Roadway**
- High Flow Stage: **No**
- Culvert Length: **60 ft.**
- Culvert Height: **4 ft.**
## Stream Geomorphic Assessment

**Agency of Natural Resources**

**Culvert Width**: 8
**Culvert Overflow Pipe**: Skewed to roadway?

### Geomorphic Information

**General**
- Floodplain filled by roadway approaches: Entirely
- Obstructions at the opening of the structure: None
- Steep riffle present immediately upstream of structure: No
- If channel avulses, stream will:
  - **Upstream**: Cross Road
  - **Downstream**: Pool present immediately downstream of structure
- Downstream bank heights are substantially higher than upstream bank heights: No
- Stepped Footer:
  - Maximum pool depth: No

### Upstream
- **Dominant Bed Material**: Gravel
- **Bedrock Present**: No
- **Type of Sediment Deposits**: None
- **Material Present throughout Elevation of sediment deposits >= 1/2 bankfull**: No
- **Bank Erosion**: No
- **Hard Bank Armoring**: None
- **Stream bed scour causing undermining around or under structure**: None
- **Beaver Dam near Structure**: No
- **Beaver Dam distance (ft.)**: No

### Downstream
- **Water depth in culvert (at outlet)**: No
- **Culvert outlet invert**: No
- **Backwater Length (measured from outlet)**: No

### In Structure
- **Backwater Length (measured from outlet)**: 0.1

### Vegetation
- **Dominant Vegetation Type - Left**: Herbaceous/Grass
- **Dominant Vegetation Type - Right**: Herbaceous/Grass
- Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?
  - **Vegetation Band - Left**: No
  - **Vegetation Band - Right**: No

### Wildlife
- **Roadkill**: None
- **Outside Structure**: None
- **Inside Structure**: None

### Other Information
- **Spatial location data collected with GPS?**: Yes
- **Photos taken?**: Yes
- **Comments**: A small headcut is located upstream of the structure where willow roots are stabilizing its progression upslope. Limited buffer up and downstream of the structure.

### Culvert Summary Report

**Mallets Creek**

**Sgaid**: 10003500004101
**Local Sgaid**: Local Sgaid

**VOBCIT**
- **struct_num**: VOB
- **Project Name**: Mallets Creek
- **Longitude**: -73.10483
- **Reach VTIID**: M15
- **Stream Name**: Mallets Creek Main Stream

**Observers**
- EPF (FEA), SPP (FEA)

**Town**
- **Latitude**: 44.62343
- Milton

**Location**
- Kingsbury Road Crossing of segment M15-B

**Road Name**
- **Road Type**: Gravel

**High Flow Stage**: No

**Channel Width**: 24.13
### General Information

**Material**
- Number of Culverts: 1
- Culvert Overflow Pipe: No
- Skewed to roadway?: No

**Geomorphic Information**

**Floodplain filled by roadway approaches**
- Entirely: No

**Obstructions at the opening of the structure**
- None: Yes

**Steep riffle present immediately upstream of structure**
- No: Yes

**If channel avulses, stream will follow road**
- No: Yes

**Pool present immediately downstream of structure**
- No: Yes

**Downstream bank heights are substantially higher than upstream bank heights**
- No: Yes

**Stepped Footers**
- None: Yes

**Maximum pool depth**
- 0.3: At Grade

**Dominant Bed Material**
- Upstream: Gravel
- Downstream: Sand

**Bedrock Present**
- None: Yes

**Type of Sediment Deposits**
- None: No

**Material Present throughout**
- None: No

**Elevation of sediment deposits >= 1/2 bankfull**
- None: Yes

**Bank Erosion**
- None: Yes

**Hard Bank Armoring**
- Failing: Yes

**Stream bed scour causing undermining around or under structure**
- None: Yes

**Beaver Dam near Structure**
- None: Yes

**Beaver Dam distance (ft.)**
- None: Yes

**Dominant Vegetation Type - Left**
- Upstream: Herbaceous/Grass
- Downstream: Herbaceous/Grass

**Dominant Vegetation Type - Right**
- Upstream: Herbaceous/Grass
- Downstream: Herbaceous/Grass

**Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?**
- No: Yes

**Vegetation Band - Left**
- Yes: No

**Vegetation Band - Right**
- Yes: No

**Wildlife**
- Roadkill: None
- Outside Structure: None

**Other Information**
- Spatial location data collected with GPS?: Yes
- Photos taken?: Yes

### Comments
Structure appears to be new; old structure must have blown out, because of abundance of unnatural angular coarse gravel downstream.

### Culvert Summary Report

<table>
<thead>
<tr>
<th>SglID</th>
<th>100010000004051</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local SglID</td>
<td></td>
</tr>
<tr>
<td>VOBCIT struct_num</td>
<td></td>
</tr>
<tr>
<td>Project Name</td>
<td>Mallets Creek</td>
</tr>
<tr>
<td>Longitude</td>
<td>-73.15721</td>
</tr>
<tr>
<td>Reach VTID</td>
<td>T1.03</td>
</tr>
<tr>
<td>Stream Name</td>
<td>Allen (Petty) Brook</td>
</tr>
<tr>
<td>Channel Width</td>
<td>23.46</td>
</tr>
</tbody>
</table>

**VT DEC • 103 South Main Street • Waterbury, VT 05671**
# Stream Geomorphic Assessment

## Agency of Natural Resources

**Culvert Information**

<table>
<thead>
<tr>
<th>Material</th>
<th>Number of culverts</th>
<th>Culvert Overflow Pipe</th>
<th>Skewed to roadway?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Corrugated</td>
<td>1</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**General**

<table>
<thead>
<tr>
<th>Floodplain filled by roadway approaches</th>
<th>Entirely</th>
<th>Structure is located at significant break in valley slope</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstructions at the opening of the structure</td>
<td>Wood debris</td>
<td>Estimated distance avulsion would follow road</td>
<td>Lower</td>
</tr>
<tr>
<td>Steep riffle present immediately upstream of structure</td>
<td>No</td>
<td>Angle of stream flow approaching structure</td>
<td>Mild Bend</td>
</tr>
<tr>
<td>If channel avulses, stream will</td>
<td>Unsure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Downstream**

<table>
<thead>
<tr>
<th>Pool present immediately downstream of structure</th>
<th>Yes</th>
<th>Water depth in culvert (at outlet)</th>
<th>1.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream bank heights are substantially higher than upstream bank heights</td>
<td>No</td>
<td>Culvert outlet invert</td>
<td></td>
</tr>
<tr>
<td>Stepped Footers</td>
<td>1.6 ft.</td>
<td>Backwater Length (measured from outlet)</td>
<td></td>
</tr>
<tr>
<td>Maximum pool depth</td>
<td>3.7 ft.</td>
<td>Backwater Length (measured from outlet)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dominant Bed Material</th>
<th>Sand</th>
<th>Gravel</th>
<th>Gravel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedrock Present</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Type of Sediment Deposits</td>
<td>Point,Side</td>
<td>Side</td>
<td>None</td>
</tr>
<tr>
<td>Material Present throughout</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Elevation of sediment deposits &gt;= 1/2 bankfull</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Bank Erosion</td>
<td>High</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Hard Bank Armoring</td>
<td>None</td>
<td>Failing</td>
<td></td>
</tr>
<tr>
<td>Stream bed scour causing undermining around or under structure</td>
<td>Culvert</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Beaver Dam near Structure</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Beaver Dam distance (ft.)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Vegetation**

<table>
<thead>
<tr>
<th>Dominant Vegetation Type - Left</th>
<th>Herbaceous/Grass</th>
<th>Shrub/Sapling</th>
<th>Shrub/Sapling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant Vegetation Type - Right</td>
<td>Herbaceous/Grass</td>
<td>Shrub/Sapling</td>
<td>Shrub/Sapling</td>
</tr>
</tbody>
</table>

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

<table>
<thead>
<tr>
<th>Vegetation Band - Left</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetation Band -Right</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

**Wildlife**

<table>
<thead>
<tr>
<th>Roadkill</th>
<th>Outside Structure</th>
<th>Inside Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

**Other Information**

| Spatial location data collected with GPS? | Yes | Photos taken? | Yes |

**Comments**

Culvert is undersized considerably and is at a much lower grade than the channel. Because of the small size a lot of scour downstream and aggradation and scour upstream has occurred. The upstream end is blocked by LWD and deformed on the DS end. US and DS a lot of scour around the culvert is evident.

## Culvert Summary Report

**Mallets Creek**

**General Information**

<table>
<thead>
<tr>
<th>SgaID</th>
<th>100021000040101</th>
<th>Local SgaID</th>
<th>V3BCIT struct_num</th>
<th>Project Name</th>
<th>Reach VTID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observers</td>
<td>EPF (FEA), SPP (FEA)</td>
<td>Assessment Date</td>
<td>10/19/2010</td>
<td>Mallets Creek</td>
<td>T1.06</td>
</tr>
<tr>
<td>Town</td>
<td>Milton</td>
<td>Latitude</td>
<td>44.60239</td>
<td>Longitude</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>Sweeny Farm Road Crossing</td>
<td></td>
<td></td>
<td>Reach VTID</td>
<td></td>
</tr>
</tbody>
</table>

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VERMONT

Stream Geomorphic Assessment
Agency of Natural Resources

Road Name: SWEENY FARM RD
High Flow Stage: No
Culvert Length: 50
Culvert Height: 3.6
Culvert Width: 6.5

Road Type: Paved
Channel Width: 19.83

Culvert Information:
Material: Tank
Number of culverts: 1
Culvert Overflow Pipe: No
Skewed to roadway: No

General
Floodplain filled by roadway approaches: Entirely
Obstructions at the opening of the structure: None
Steep riffle present immediately upstream of structure: Yes
If channel avulses, stream will: Unsure

Upstream
Dominant Bed Material: Sand
Bedrock Present: No
Type of Sediment Deposits: None
Material Present throughout: No
Elevation of sediment deposits >= 1/2 bankfull: No
Bank Erosion: Low
Hard Bank Armoring: Intact
Stream bed scour causing undermining around or under structure: No
Beaver Dam near Structure: No
Beaver Dam distance (ft.): No

Downstream
Water depth in culvert (at outlet): 0.8
Culvert outlet invert: At Grade
Backwater Length (measured from outlet): 0

In Structure
Dominant Bed Material: Sand
Bedrock Present: No
Type of Sediment Deposits: Side, Mid-channel
Material Present throughout: Yes
Elevation of sediment deposits >= 1/2 bankfull: Yes
Bank Erosion: Low
Hard Bank Armoring: Intact
Stream bed scour causing undermining around or under structure: Culvert
Beaver Dam near Structure: No
Beaver Dam distance (ft.): No

Vegetation
Dominant Vegetation Type - Left: Shrub/Sealing
Dominant Vegetation Type - Right: Shrub/Sealing
Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?: No
Vegetation Band - Left: No
Vegetation Band - Right: No

Wildlife
Roadkill: None
Outside Structure: None
Inside Structure: None

Other Information
Spatial location data collected with GPS?: Yes
Photos taken?: Yes

Comments
Structure is a cut tank that was likely 6.5' round originally, no it is nearly half filled with sediment. It is a 3.6' half cylinder. Some failing rip-rap and old bridge abutments upstream are aggrading sediment.

Culvert Summary Report
Mallets Creek

SgID: 100172000004101
Local SgID: VOB CIT
struct num: Mallets Creek
Project Name: -73.15954

Observers
EPF (FEA), SPP (FEA)
Milton

Assessment Date: 10/19/2010
Latitude: 44.60286
Longitude: 73.15954

VT DEC • 103 South Main Street • Waterbury, VT 05671
Stream Geomorphic Assessment
Agency of Natural Resources

<table>
<thead>
<tr>
<th>Location</th>
<th>Allen Brook Drive Crossing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Name</td>
<td>Paved</td>
</tr>
<tr>
<td>Road Type</td>
<td>Channel Width</td>
</tr>
<tr>
<td>High Flow Stage</td>
<td>Material</td>
</tr>
<tr>
<td>Culvert Length</td>
<td>Number of culverts</td>
</tr>
<tr>
<td>Culvert Height</td>
<td>Culvert Overflow Pipe</td>
</tr>
<tr>
<td>Culvert Width</td>
<td>Skewed to roadway?</td>
</tr>
<tr>
<td>T1.06</td>
<td>Steel Corrugated</td>
</tr>
<tr>
<td>Allen (Petty)</td>
<td>1</td>
</tr>
<tr>
<td>Brook</td>
<td>No</td>
</tr>
<tr>
<td>19.83</td>
<td>Yes</td>
</tr>
</tbody>
</table>

General
Floodplain filled by roadway approaches
- Entirely

Obstructions at the opening of the structure
- Upstream None
- No
- Estimated distance avulsion would follow road
- Angle of stream flow approaching structure
- Channelized
- Straight

Downstream
- Pool present immediately downstream of structure
- No
- Water depth in culvert (at outlet) 0.4
- Culvert outlet invert At Grade
- Backwater Length (measured from outlet) 0

Dominant Bed Material
- Upstream Gravel
- Downstream Sand
- In Structure Sand

Bedrock Present
- No

Type of Sediment Deposits
- None
- Mid-channel
- None

Material Present throughout
Elevation of sediment deposits >= 1/2 bankfull
- No
- Yes
- No

Bank Erosion
- Low

Hard Bank Armoring
- None

Stream bed scour causing undermining around or under structure
- None

Beaver Dam near Structure
- No

Beaver Dam distance (ft.)

Vegetation
Dominant Vegetation Type - Left
- Upstream Herbaceous/Grass
- Downstream Herbaceous/Grass

Dominant Vegetation Type - Right
- In Structure Herbaceous/Grass

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?
Vegetation Band - Left
- No

Vegetation Band - Right
- No

Wildlife
Roadkill
- Outside Structure None
- Inside Structure None

Other Information
Spatial location data collected with GPS? Yes
Photos taken? Yes

Comments Structure placed under a very large amount of fill that occupies the entire valley. Several stormwater inputs were noted on the upstream end of the structure.
APPENDIX C

STRESSOR AND PROJECT IDENTIFICATION MAPS
T1.04 Project #2 Stormwater Management
Hazard Mitigation Priority: High
Ecological Benefits Priority: Low

T1.05

T1.04 Project #1 Corridor Protection
Hazard Mitigation Priority: Low
Ecological Benefits Priority: Low

Stressor & Project ID Map
Allen (Petty) Brook Reach T1.04 & T1.05

Fitzgerald Environmental Associates, LLC