

Fitzgerald Environmental Associates, LLC.

Applied Watershed Science & Ecology

Alder Brook Watershed Phase I and II Stream Geomorphic Assessment Report

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1.0 Executive Summary

This report summarizes Phase I and II stream geomorphic assessment data collected by Fitzgerald Environmental Associates, LLC (FEA) for the Alder Brook watershed in Essex, Vermont. The watershed has a drainage area of 10.4 square miles and represents approximately 30% of the entire Town area, making it an important planning unit within the Town. Urbanization in the Alder Brook watershed has increased during the past 10 years, and urban land now covers approximately 10% of the watershed area. Although ANR's monitoring of the Alder Brook biotic community during the past 10 years indicates a waterway in good to fair condition, recent observations of the physical stability of the channel below Route 15 suggest that the channel is experiencing rapid adjustment. The goal of this analysis is to better understand the current physical state of Alder Brook in the context of historic impacts and current development pressures, through the identification of watershed scale and reach scale stressors.

In order to understand the current physical changes occurring in the watershed, an analysis of the historic impacts to the Alder Brook watershed was conducted. This analysis revealed that the main stem of Alder Brook in the Essex Town center once flowed (naturally) into the Browns River to the north. A man-made diversion for milling purposes, and later a flood in 1830 permanently diverted the channel into its present-day location through the steep sand ravines to the Winooski River. This diversion had an extreme effect on the physical stability of the lower watershed, and on the amount of sediment delivered to the Winooski River at the confluence. Historical aerial photographs from the 1930's indicate that the stream corridor was still recovering from this drastic change over 100 years later.

Today, 175 years after this human induced watershed impact, there are signs that areas of the stream corridor below Route 15 have since recovered. Despite this recovery, changes in land use in the lower watershed since the 1960's combined with the recent construction of Route 289 (Circ) have introduced new sources of stressors to this sensitive area. The field observations conducted during the Phase II geomorphic assessment indicate that the combination of steep, highly erodible terrain and uncontrolled stormwater discharges from residential areas have dramatically increased the delivery of sediment to the channel. In addition, berm encroachment on the floodplain and sediment delivered to the channel from the Circ construction have caused areas of sediment accumulation that are migrating through the channel network as sediment "slugs". These areas of increased sedimentation are causing lateral adjustments in the channel, which are in turn degrading in-stream habitat conditions.

Alder Brook corridor conditions above Essex Center reveal a different set of stressors related to historic impacts from agriculture, including channel straightening and removal of buffer vegetation. Large areas of land once used for agriculture in this part of the watershed have since redeveloped forest cover. Where

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agricultural land uses are still found, impacts include limited buffer vegetation and grazing cattle along the stream channel. However, there has been an overall recovery of floodplain connectivity since these historic agricultural impacts, which has led to a recovery of channel stability and physical habitat across many of the middle and upper reaches.

A discussion of restoration project opportunities specific to each reach of the watershed has been provided in Section 5 of this report. In addition, general recommendations for restoration strategies (with a focus on the lower watershed zone) at larger scales within the watershed have been addressed. These include strategies that could form the basis for town level planning and zoning to address the sediment regime stressors affecting channel equilibrium conditions in the lower reaches. Recommendations for future monitoring of geomorphic stability and biotic habitat in the Alder Brook watershed are also included in this report. Summarized, these recommendations include the following needs:

- 1. Assess and prioritize the impacts of gullies in Reaches M05 and M06 below Essex Center for future remediation efforts similar to those currently being implemented on Fern Hollow Road.
- 2. Address the need for stormwater runoff control for discharges to gullies in reaches M05 and M06 and develop a plan for long-term implementation of infiltration structures.
- 3. Assessment of tributaries that appear to be delivering large amounts of sediment to the main stem (thereby degrading biotic habitat) in Reaches M02, M03, and M05.
- 4. Develop a watershed-wide stream corridor protection strategy for reaches susceptible to future encroachment, whereby a belt width of six times the channel width is used as a basis for the corridor.
- 5. Continued monitoring of the channel below the stormwater discharges from the Clover Road neighborhood where no runoff control structures were noted.
- 6. Restoration of natural, woody vegetation along specific areas of stream bank to lower summer stream temperatures and increase beneficial organic inputs to the channel.
- 7. Prioritize areas in Reaches M12 and M14 for keeping grazing cattle away from stream channel using fencing.

2.0 Introduction and Project Overview

The Essex Waterways Association (EWA) is a community group that formed in 2005 under the direction of Dr. Suzanne Levine, a UVM professor of Aquatic Ecology and an Essex resident. The mission of EWA is to work towards protecting the waterways in the town through watershed assessments and community outreach, and the group has identified three watersheds within the Essex town limits that will be the focus of various sampling efforts. These watersheds are Indian Brook, Sunderland Brook, and Alder Brook. Both Indian and Sunderland Brooks are included on the EPA 303d list as impaired waterways due to "stormwater runoff". The Vermont Agency of Natural Resources (ANR) is currently involved in a process of developing clean-up plans (known as Total Maximum Daily Loads) to address biological impairment in these streams. However, comparatively less is known about the physical and biotic health of the Alder Brook watershed. FEA was retained by EWA in April 2005 to conduct Phase I and II stream geomorphic assessments for the Alder Brook watershed.

The Alder Brook watershed (see maps in Appendix 1) is a small tributary of the Winooski River, located almost entirely within the Town of Essex. Approximately 30% of the Town land area is drained by the Alder Brook watershed, with another 50% drained by Indian and Sunderland Brooks and the Browns River, thus making the Alder Brook watershed an important ecological planning unit within the Town. The watershed encompasses an area of 10.4 square miles, with 11.6 miles of stream channel from headwaters to mouth. The steep headwaters of Alder Brook are found in mostly unaltered, forested terrain north of Rollin Irish Road in Jericho. In the middle section of the watershed, Alder Brook becomes a low gradient channel winding through a mix of agricultural, forested, and residential land uses before entering the village of Essex Center. From the village down to the outlet, Alder Brook becomes much steeper as its valley cuts sharply through geologic sand features before reaching the Winooski River valley.

The overall land cover of the watershed contains a mix of agricultural, residential and commercial (urban), and forested lands (Table 1). A review of historic aerial photos reveals that the land cover has undergone significant recovery of forest since the early 1900's, especially in the middle and upper sections of the watershed.

Table 1. Alder Brook Watershed Land Use [†]							
Open*	Forest	Urban	Water/Other				
49.6%	39.7%	10.5%	0.2%				

† 2002 LandSAT imagery from UVM's Spatial Analysis Lab

* Includes agricultural land and urban lawns

Because of economic growth in Chittenden County and the desirability of the Essex community for residential and commercial development, urban land use has begun to occupy a larger share of the watershed land cover in the past decade. Analysis of 2002 imagery shows that urban land use now occupies over 10 percent of the land cover, approaching a level that is typically associated with decline in water quality and biotic integrity (CWP, 2003). Biotic sampling (of fish and macroinvertebrates) conducted within the past 5 years in Alder Brook show a condition of good to fair (VTDEC, 2005). However, observations of the habitat conditions in the channel taken during this sampling suggest that upstream sedimentation may be adversely affecting the biota of the lower watershed. Further sampling of macroinvertebrates was conducted by ANR in fall 2006 and results of the sampling will be available sometime in spring 2007.

Given the above mentioned concerns about the Alder Brook watershed, the goal of this project is to better understand the state of the physical health of Alder Brook in the context of development pressures in the watershed. The collection of stream geomorphic assessment data will aid in determining the watershed scale and reach scale stressors on the health of Alder Brook. Phase I (remotely sensed) and Phase II (field observations) geomorphic assessment data have been collected and analyzed for 15 reaches of the main stem of the brook, and are summarized in Section 5 of this report.

3.0 Watershed Background

3.1 Geologic Background

The Alder Brook watershed lies in the Champlain Valley and its surficial geology and soils have been shaped by three dominant processes of the landscape since the last period of glaciation: 1) Retreat of the Laurentide Ice Sheet; 2) Presence of Lake Vermont/Champlain Sea; 3) Deposition from the Winooski River. Each of these historic geologic processes help 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. This retreat (melting faster than moving southward), and the southward movement that proceeded it, left a barren landscape with glacial till soils. During the retreat of the glaciers, a large freshwater lake formed as the meltwater draining to the north was blocked by the remaining "tongue" of ice in the northern Champlain Valley. This lake, which later became brackish, persisted for approximately 4,000 years at an elevation of 620 feet above sea level (Wright, 2003).

The presence of this lake had a profound effect on the soils that are found in the Alder Brook watershed, especially in the lower section below the Route 15 crossing. During this historic period of Lake Vermont, the surface elevation of the water extended north in the Alder Brook watershed near Bowman's Corner in Jericho. Due to the quiescent waters of the lake, large amounts of fine and coarse sediment settled in these areas, leaving behind the silty and sandy 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 Alder Brook above Rollin Irish Road, where till soils are dominant. The surficial geology of the remaining lower part of the watershed is dominated by a mix of sands and coarse gravels associated with deposition in the Lake. In the lower section of the watershed below Route 15 this is most evident, where the soils are nearly 100% coarse sand. This area represents an ancient delta of the Winooski River where sands were deposited when the elevation of the lake was approximately 600 feet.

Table 2 provides a summary of the riparian corridor soil properties and valley side slopes at the reach scale. Note that in the lower part of the watershed (Reaches M01 through M07), the erodibility of the soils is very high and the side slopes of the valley are very steep. This combination of characteristics provides for the erosive and dynamic conditions that are observed in the lower reaches (discussed more in section 5). In the upper part of the watershed (Reaches M08 through M13), the stream corridor is found in a flat valley with a combination of alluvial deposits and glacial lake deposits characterized by fine silts and sands.

Table 2. Alder Brook Geology and Soils Summary											
	Geo	logic M	Iaterials		Soil Prope	erties		Valley Side Slopes			
Reach ID	Dominant			Hydrologic Group	%			Left	Right		
M01	Alluvial	83	Glacial Lake	С	78	Slight	16	Flat	Steep		
M02	Ice-Contact	55	Glacial Lake	В	89	Very Severe	99	Very Steep	Very Steep		
M03	Ice-Contact	100	NA	В	86	Very Severe	99	Very Steep	Steep		
M04	Ice-Contact	100	NA	В	100	Very Severe	88	Very Steep	Very Steep		
M05	Ice-Contact	95	Glacial Lake	В	100	Moderate	29	Steep	Steep		
M06	Ice-Contact	59	Glacial Lake	В	100	Severe	56	Steep	Very Steep		
M07	Glacial Lake	96	Ice-Contact	D	71	Very Severe	96	Very Steep	Very Steep		
M08	Alluvial	73	Glacial Lake	С	74	Slight	4	Flat	Flat		
M09	Alluvial	71	Glacial Lake	С	71	Moderate	26	Hilly	Hilly		
M10	Alluvial	75	Glacial Lake	С	78	Slight	20	Flat	Flat		
M11	Alluvial	80	Glacial Lake	С	87	Slight	3	Flat	Hilly		
M12	Alluvial	81	Glacial Lake	С	81	Slight	13	Flat	Flat		
M13	Alluvial	67	Glacial Lake	С	73	Slight	4	Flat	Flat		
M14	Till	73	Alluvial	D	64	Severe	73	Steep	Steep		
M15	Till	98	Ice-Contact	D	85	Very Severe	99	Steep	Steep		

3.2 Watershed Zones and Reach Delineation

The same historic geologic events described above that shaped the soil characteristics along the channel network of Alder Brook also created the changes in topography and slope in the watershed that are observed today. These changes in topography, slope, and soils were the basis for the reach delineation that was carried out in the Phase I remote sensing analysis of watershed. Below is a discussion of the macro-scale watershed zones that have been delineated and described in this report, and Table 3 provides a summary of Phase I generated statistics for all reaches in the Alder Brook watershed.

	Table 3. Alder Brook Phase I Reference Reach Summary Statistics											
	Drainage Valley		Valley Channel Channel		Channel		Reference	Channel				
Reach ID	Area (mi ²)	Width (ft)	Туре	Width (ft)	Slope (%)	Sinuosity	Stream Type	Bedform				
M01	10.4	340	Broad	36.8	0.6	1.4	С	Riffle-Pool				
M02	10.4	137	Narrow	32.0	0.7	1.0	С	Riffle-Pool				
M03	10.1	157	Narrow	36.2	1.0	1.1	С	Riffle-Pool				
M04	9.0	158	Narrow	34.4	0.9	1.2	С	Riffle-Pool				
M05	8.8	125	Semi-Confined	34.0	0.8	1.4	С	Riffle-Pool				
M06	8.3	192	Narrow	33.3	0.7	1.3	С	Riffle-Pool				
M07	7.9	190	Narrow	32.5	3.7	1.1	В	Step-Pool				
M08	7.9	443	Very Broad	32.4	0.1	1.5	Е	Dune-Ripple				
M09	6.4	306	Very Broad	29.7	0.2	1.2	С	Riffle-Pool				
M10	6.0	449	Very Broad	18.0	0.1	1.4	Е	Dune-Ripple				
M11	5.1	462	Very Broad	16.0	0.1	1.5	Е	Dune-Ripple				
M12	3.6	318	Very Broad	23.1	0.1	1.3	Е	Dune-Ripple				
M13	2.8	391	Very Broad	9.0	0.3	1.4	Е	Dune-Ripple				
M14	0.8	60	Narrow	15.0	2.9	1.1	В	Plane Bed				
M15	0.3	20	Semi-Confined	7.7	3.8	1.1	В	Step-Pool				

In the lower zone of the watershed, confining valley characteristics dominate the stream corridor where the channel has historically formed deep ravines through the sand delta deposits. For these reaches (M01 through M07), the average slope of the channel is 1.2%, and cobble and gravel bottomed channels with riffle-pool bedform are found (Montgomery and Buffington, 1997). In this zone, the average width of the valley is approximately 200 feet, resulting in stream geometry associated with B and C type channels (Rosgen, 1994). Further detailed descriptions of the reaches found in this watershed zone, and the associated Phase I and II observations, are found in Section 5 of this report. Maps depicting reach delineations and watershed boundaries are found in Appendix 1.

In the middle watershed zone, found above the Route 15 crossing in the flat alluvial valley along Towers and Chapin Roads, the valley setting and geologic characteristics are dramatically different. For these reaches (M08 through M13), the average slope of the channel is 0.2% and sinuous, sand bottomed channels with dune-ripple bedform prevail. In this zone of the watershed, the valley is much wider, resulting in stream geometry associated with E type channels. One reach (M12) was not assessed during the Phase II field surveys due to lack of property access. Further detailed descriptions of the reaches found in this watershed zone, and the associated Phase I and II observations, are found in Section 5 of this report. Maps depicting reach delineations and watershed boundaries are found in Appendix 1.

In the upper headwaters zone of the watershed, found above Rollin Irish Road in Jericho, the stream valley and corridor characteristics change again for the final two reaches of the watershed (M14 and M15). The average channel slope of these two headwaters reaches is 3.3% and small, cobble and gravel bottomed channels are found. The average width of the narrow valley in this zone of the watershed is 60 feet, resulting in stream geometry associated with A and B type channels with plane bedform. Further detailed descriptions of the reaches found in this watershed zone, and the associated Phase I and II observations, are found in Section 5 of this report. Maps depicting reach delineations and watershed boundaries are found in Appendix 1.

3.3 Land Use History

The Alder Brook watershed, like much of the state of Vermont, was largely devoid of forest vegetation in the middle part of the 1800's. 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 that 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 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. These photos also aid in understanding the extent of channel straightening that occurred in the middle watershed zone, and the degree to which the natural sinuosity of the channel has recovered.

Provided below is a series of aerial photographs with discussion that helps illustrate the changes in land cover that have occurred since the 1930's in the watershed. The historic photos were taken in 1937 during the Soil Conservation Service (SCS) inventory of the state, while the current aerial photography was flown in 1999 as part of Vermont State Government's modern-day inventory.



Figure 1. SCS 1937 Aerial Photograph of Lower Reaches (M01 & M02)

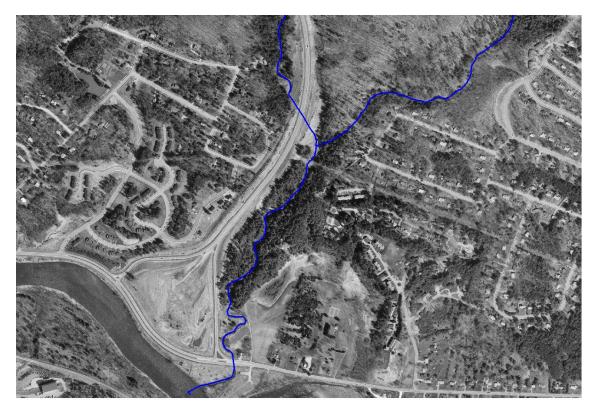


Figure 2. 1999 Aerial Photograph of Lower Reaches (M01 & M02)



Figure 3. SCS 1937 Aerial Photograph of Lower Reaches (M03 & M04)



Figure 4. 1999 Aerial Photograph of Lower Reaches (M03 & M04)

Figures 1 through 4 depict Reaches M01 through M04 of the lower watershed zone. Note that the change in land cover in these reaches of the watershed is different from that in the area immediately below Essex Center (see Figures 5 and 6). In this lower zone, a large percentage of the recovering forest has been converted to residential areas, and the construction of Route 289 has directly encroached upon the stream channel corridor. Detailed review of the channel location over the 60 year period reveals that it has changed little since the 1930's, suggesting that the watershed scale impacts to the channel from the initial clearing in the 1800's had been ameliorated over time.

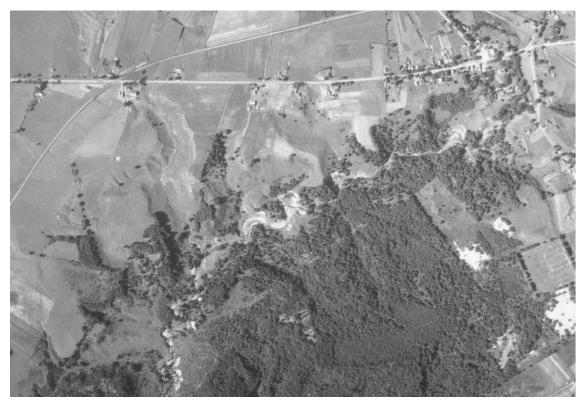


Figure 5. 1937 SCS Aerial Photograph of Lower Reaches (M05 & M06)

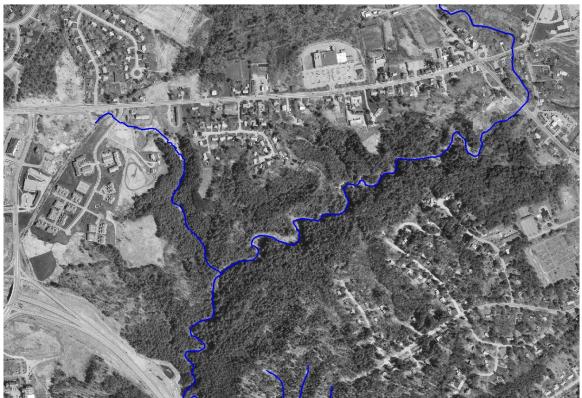


Figure 6. 1999 Aerial Photograph of Lower Reaches (M05 & M06)



Figure 7. 1937 SCS Aerial Photograph of Middle Reaches (M07 & M08)

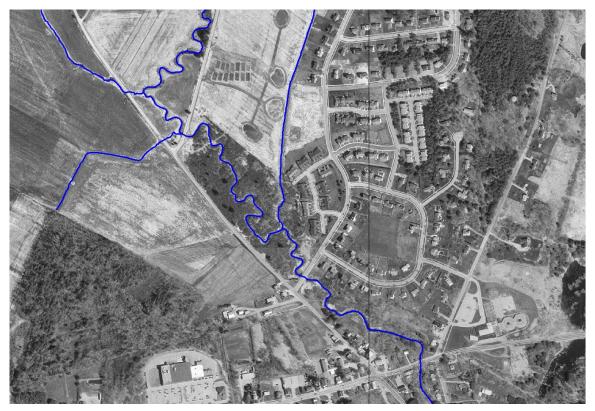


Figure 8. 1999 Aerial Photograph of Middle Reaches (M07 & M08)

Figures 5 and 6 depict the uppermost reaches of the lower watershed zone (M05 and M06). The land cover surrounding the stream corridor in this area has undergone marked recovery from its denuded state in the 1930's. Much of the current forest cover is still in the initial stages of recover, as noted in the dominance of softwoods (white pine). However, large areas of residential development to the north and south of the stream corridor, and in the vicinity of Essex Center, have converted forest cover to dispersed areas of impervious cover (e.g., roadways and rooftops). This current day conversion is partly driving the watershed-scale impacts to water quality that were observed in the lower watershed zone during the Phase II field assessments. The effect of this impact will be described in great detail in Section 5 of this report.

Similarly, Figures 7 and 8 illustrate some areas of forest recovery above Essex Center, however large areas of once pervious farmland to the northwest of the stream corridor have been replaced by residential land use. These areas discharge stormwater runoff to the channel below Clover Road, and appear to be adversely affecting water quality and channel stability in downstream reaches. Also noteworthy in Figures 7 and 8 is the similarity of channel location and sinuosity over the 60 year time period, despite the historic clearing along the stream corridor. This similarity suggests that the recovery of the landscape

from agricultural impacts did not drastically change the sediment and hydrologic regimes of Alder Brook during this time period.

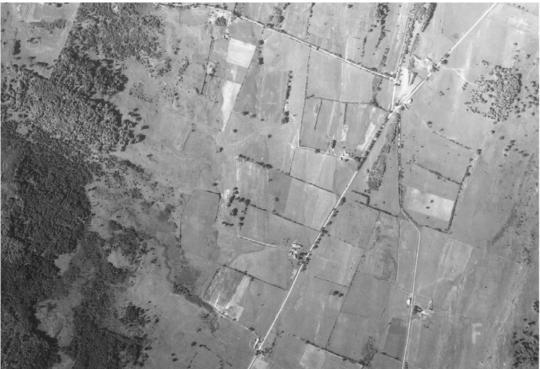


Figure 9. 1937 SCS Aerial Photograph of Upper Reaches (M13 & M14)

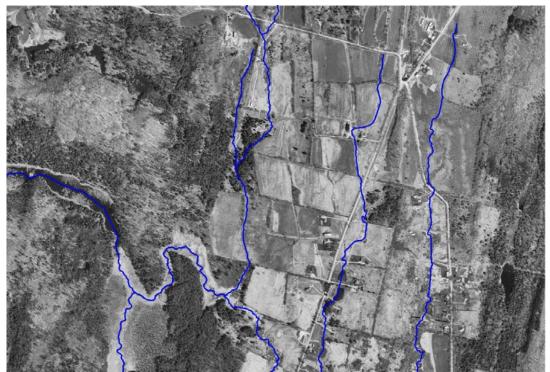


Figure 10. 1999 Aerial Photograph of Upper Reaches (M13 & M14)

Figure 9 and 10 illustrate the large-scale recovery of the forest landscape in the headwaters reaches. This area of the watershed, which has flat and rolling terrain with silty-clay soils suitable for agriculture, was nearly 100% cleared in the 1800s. It has since recovered to approximately 60% forest cover, with the remaining land use being mostly pasture and hayfields for dairy farms.

3.4 Flood History

Some of the larger rivers in Chittenden County, such as the Winooski and Browns, have detailed historical accounts of flooding and channel avulsions, due to the fact that their large size has caused significant property damage. On the other hand, Alder Brook is a waterway of much smaller scale than these rivers, and the same detailed accounts do not exist. However, one account published on a historical website describes a flood of 1830 in the Town of Essex that apparently caused the Alder Brook channel to change course:

'In 1804 Mr. PELTON leased of David MORGAN the right to flow land on Alder Brook, and built a saw-mill on the bank west of Lysander WOODWORTH's. This brook, so called from the immense grove of alders on its bank, was then a very small stream, quite shallow, emptying in Brown's River, in the northeast part of the town. Mr. PELTON diverted this brook from its natural course, carrying the water in a flume to a reservoir dam a few miles below the present gulf cross-way. In this saw-mill some of the lumber used in building the meeting-house was prepared. At this time there was no gulf, but in the great freshet of 1830 the brook became a mighty power, swept off bridges, dams and mills, cut for itself a new channel well toward a hundred feet below the original bed and forced its way over all opposing obstacles until it mingled its waters with the Winooski, many miles away, in an entirely opposite direction from its original mouth. This was one of the most destructive calamities the town ever witnessed, and from which the "Center" never recovered.' (Roots Web, 2006)

Historical survey maps (see Figure 11) from the time period prior to the freshet of 1830 depict the flow of Alder Brook from Essex Center in two directions: both into the Browns River *and* into the steep ravine towards the Winooski River. It is likely that the diversion flume that carried water to the reservoir and mill below is depicted in blue in this survey, since this survey was conducted prior to the flood that permanently diverted the channel into its present-day location. It seems likely that the manipulation of the channel to divert water away from the Browns River also led to the complete diversion (during the flood) of the channel to the present location. However, it should be noted that the original channel location was separated from the current ravine by only a small elevation gradient, perhaps less than 10

feet. Without topographical surveys of the Essex Center prior to the diversion and flood of the early 1830's, it is impossible to know whether or not the original channel ever accessed this ravine naturally during flood events, or if the ravine had been at least partially formed prior to the 1830 flood.

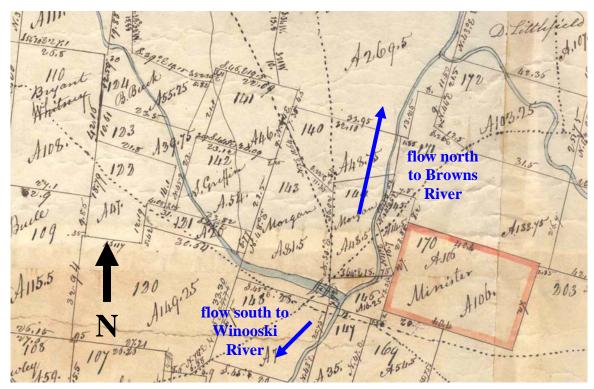


Figure 11. Johnson Survey (ca. 1815) of Essex Center

In addition, a review of the 1999 aerial photograph with topographic contours overlain (see Figure 12) reveals the old channel location to the Browns River. This channel can be clearly seen to the north where it nears the Browns River, and the topography indicates where the channel once turned from the east to the north outside of Essex Center. This old channel, although overgrown by vegetation, can be observed in the field today. The channel continues to maintain mostly stagnant surface waters (likely fed by groundwater inputs) and has been colonized by beavers over the years. Further discussion of the diversion and flood are found below in Section 3.5.

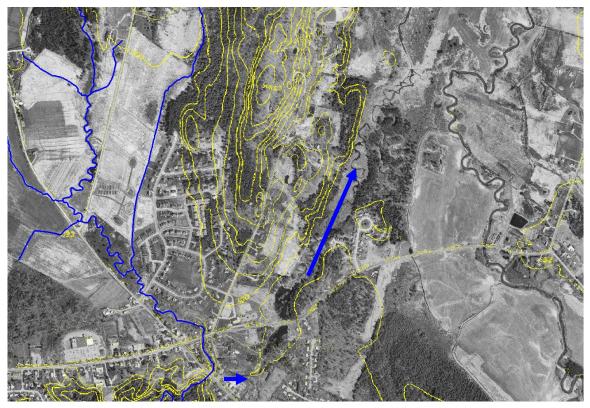


Figure 12. 1999 Aerial Photograph Depicting Abandoned Channel to Browns River

3.5 Channel and Floodplain Management History

The impact of the flume diversion and subsequent flood of 1830 was certainly the greatest historic channel management impact of man on the Alder Brook watershed. The watershed, which once encompassed an area of approximately 8 square miles, increased in drainage area to 10.5 square miles at the current day mouth to the Winooski River; an increase of 32%. It is perhaps impossible to know to what degree the ravines emptying into the Winooski River existed prior to the flood of 1830, since no topographic surveys from this time are available. It is likely, however, that a small watercourse did exist in this area, since the drainage area of 2.5 square miles was sufficient for the development of a small stream.

Whether or not any natural sand ravines in the lower part of the watershed existed prior to 1830 is an important consideration with respect to the age of the channel evolution and change. However, even if there was a small stream and ravine in the lower watershed, it is clear that the full diversion of Alder Brook towards the Winooski River had an extreme effect on channel development and sediment generation. Figures 5 and 6 depict the area of Alder Brook below the town center in 1937 and 1999. In the 1937 photograph many mass failures (seen as white reflectance of the exposed sandy soils) can be

seen along this stretch of the stream. Numerous areas of incised channel and adjacent failing slopes indicate that the stream corridor, and the sandy slopes surrounding it, were still recovering from the channel diversion of 1830 (it is also possible that the great flood of 1927 had some effect of further destabilizing the channel). The 1999 photograph contrasts with the 1937, as natural revegetation of the riparian corridor can be seen, as well as a stabilization of many of the mass failures along the corridor.

The diversion also had important implications for the long-term health of the Browns and Winooski Rivers. This diversion reduced the Alder Brook drainage area to the Browns River by 8 square miles, effectively altering the sediment and hydrologic regimes of that river downstream of Essex Center. The addition of 8 square miles of drainage area to the Winooski River likely had a significant impact on the river ecosystem, especially with the amount of fine sediment (sands) that was delivered from the ravine cutting.

Historic photography from 1937 of the middle and upper part of the watershed above Route 15 also indicates that significant channel straightening occurred in areas that were heavily cleared for agriculture. Portions of the channel in reaches M09 through M14 were straightened, probably in the late 1800's or early 1900's. Figure 13 depicts a section of the channel in Reach M10 upstream of the Col. Page Road crossing. In some of the reaches in this zone of the watershed, the channel has undergone little planform change since the 1930's (M09 and M10), whereas other reaches have migrated considerably. The effect of historic straightening and its consequences for the sediment regimes is discussed in further detail in Section 5 of this report.



Figure 13. 1937 Aerial Photograph of Channel Straightening in Reach M10

4.0 Methods

4.1 Phase I and II Geomorphic Assessment Methodology

The data collection process for remotely sensed data (Phase I) and direct field observations (Phase II) followed ANR's Stream Geomorphic Assessment (SGA) Protocols (VTANR, 2006). All metadata for sources of data used during the Phase I analysis are found on ANR's Database Management System (DMS) website (<u>https://anrnode.anr.state.vt.us/ssl/sga/security/frmlogin.cfm</u>). Land Cover data from UVM's Spatial Analysis Lab was used to develop the land use data used in Tables 1 and 5. Some additional sources of historical maps and information have been used and noted throughout the report. Much of the historical information is available through UVM's Bailey-Howe Library on the ground floor in the Special Collections Room.

Some additional data have been included from my MSc. thesis research (Fitzgerald et al., 2006) in order to compare the geomorphic conditions of Alder Brook with other small streams in Chittenden County. The data from this research are currently unpublished but have been cited in the references and are available by contacting me directly. These data will likely be published by April of 2007.

4.2 QA/QC Summary

Included in Appendix 2 is a summary of the Quality Assurance-Quality Control (QA/QC) conducted on the Phase I and II data. This summary highlights any changes in data collection or possible data discrepancies for sections in the database. This summary is useful mostly for those who are reviewing details of the data and links between the Phase I and II datasets. All general questions about data collection methods can be answered by referencing ANR's SGA Protocols (VTDEC, 2006).

5.0 Results

The following section presents the results of the Phase I and II SGA data for Alder Brook. Section 5.1 summarizes watershed scale stressors on the physical stability and habitat conditions of the brook and discusses broad approaches to addressing these stressors. Section 5.2 summarizes reach scale stressors and, for applicable reaches, includes project identification information specific to the reach. Reach scale data from the Phase II observations are provided as summary sheets in Appendix 3. Reaches for which no Phase II data were collected (not assessed in field) have no summary sheets included. Reach summary statistics and channel geometry data are found respectively in Appendices 4 and 5. Plots of channel cross sections are found in Appendix 6.

5.1 Watershed Scale Stressors

The division of the Alder Brook watershed into three different zones (as described in Section 3.2) allows for a logical approach to addressing the hydrologic and sediment regime stressors at the watershed scale. Discussion of these stressors is organized below for the lower, middle, and upper zones of the watershed. Many of the tables found in this section contain information relevant to each of the watershed zones, and are referenced throughout.

5.1.1 Lower Watershed Zone: Reaches M01 – M06

The lower watershed zone stream corridor, found below the Route 15 crossing, is characterized by steep valley side slopes and highly erodible sandy soils. The historic diversion of Alder Brook at the Route 15 crossing, as discussed in Section 3.5, has shaped the form and features of this watershed zone. The combination of a new severely increased hydrologic regime (excess water) and the inherently erodible parent material caused extreme historic incision and failing slopes along the stream corridor (see Figure 5). Some of these failing slopes have remained unstable over time, and were observed during the field assessments. However, the stream corridor and the channel features within it have shown remarkable recovery over the 175 years since the water diversion. ANR's biomonitoring results from the 1990's for this watershed zone indicate biotic communities in good condition (see Appendix 8). Channel geometry data indicate that some reaches in this watershed zone have reestablished equilibrium conditions where rapid reforestation occurred in the absence of urban development through the 1900's (see Appendix 5).

Current day stressors to the hydrologic and sediment regimes are caused largely by: 1) the residential development outside of the corridor on the upper sand flats; 2) floodplain encroachment and straightening from the Circ. Many of these residential neighborhoods were constructed in the 1960's and 1970's and lacked the stormwater controls mandated by current state regulations. As a result, stormwater runoff increased both the amount of discharge to the main stem during channel forming flow events, as well as the amount of fine and coarse sediment delivery through gullying. The watershed-level impacts to both regimes, with a focus on the current-day stressors, are discussed separately below.

Hydrologic Regime

Despite ongoing adjustments in the channel network below Route 15 due to the historic diversion, there are some signs that the immediate channel boundary conditions have regained quasiequilibrium conditions since 1830. This is most evident in Reaches M01 and M02, where bankfull channel width is close to the predicted width from the Regional Hydraulic Geometry Curves (VTDEC, 2001). Current day impacts, both from stormwater discharges and corridor encroachment have begun to cause additional adjustments along the channel network. Mapping of stormwater discharges by Essex Town indicates that over 20 significant stormwater outfalls are found below Route 15. Many of these discharges predate rigorous regulation of stormwater runoff, and are adversely affecting the hydrologic regime. Urbanization along the stream corridor and in the upslope sand flats has increased significantly since the construction of the Circ Highway. This has caused both floodplain encroachment and filling, and increased runoff volume. Table 4 summarizes the degree of upslope urbanization and other land use types draining to the lower reaches. As noted previously, the percentage of urban land use is near or above 10% for many of the lower reaches; a level that has been associated with decline of biotic integrity in other small watersheds in Chittenden County (Fitzgerald et al., 2006).

	Table 4. Upslope Watershed Land Use and Corridor Encroachments											
Reach		Upslope Wate	ershed Land Us	se .	Corridor Encroachment (ft)							
ID	Open	Forest	Urban	Water/Other	Berm	Road	Total					
M01	49.6%	39.7%	10.5%	0.2%	302		302					
M02	49.5%	39.8%	10.4%	0.2%	64	301	365					
M03	50.1%	39.6%	10.0%	0.2%	1090	237	1327					
M04	53.4%	38.1%	8.2%	0.3%	535	327	862					
M05	54.2%	37.4%	8.1%	0.3%	487	162	649					
M06	54.9%	37.7%	7.2%	0.3%								
M07	56.0%	37.5%	6.2%	0.3%	551	791	1342					
M08	56.2%	37.6%	5.9%	0.3%	376	117	493					
M09	53.6%	42.0%	4.0%	0.4%	142		142					
M10	51.6%	44.2%	3.8%	0.4%								
M11	44.9%	51.5%	3.1%	0.5%								
M12	43.1%	53.2%	3.1%	0.6%								
M13	34.2%	63.0%	2.1%	0.8%								
M14	45.5%	52.7%	1.5%	0.4%	447	0	447					
M15	21.4%	77.2%	0.7%	0.7%								

-- Indicates value of 0

Sediment Regime

The altered sediment regime in the lower watershed zone is causing severe adjustments in many reaches due to: 1) the inherent erodibility of the watershed and corridor soils; 2) uncontrolled stormwater discharges; 3) floodplain encroachment. Uncontrolled stormwater discharges originating from residential areas, such as Fern Hollow Road, have created deep gullies that continue to transport exorbitant amounts of coarse and fine sands to the main channel. An attempt to quantify the amount of sediment delivered to the main channel from the Fern Hollow Gully (see Figure 22 on page 31 for location) is included in Table 5. Measurements collected by

Table 5. Fern Hollow Gully Sediment Delivery									
Gully	Average	Average	Volume	Loads Per Year					
Length (ft)	Width (ft)	Depth (ft)	Sediment (ft ³)	Loads of Sediment*	Since 1970**				
1,600	21.8	6.8	235,723	582	16				

Suzanne Levine and other EWA volunteers for 43 cross-sections along the length of the gully provide a basis for estimating the amount of sediment exported to Alder Brook.

* based on truck with 15 cubic yard capacity

** total load averaged over 36 years

These data indicate that the gully has exported over 235,000 cubic feet of sediment to the downstream channel since the road and man-made drainage system were installed in 1970 (approximate year based on Essex town records). To put this into perspective using lay terms, this equates to 582 dumptruck loads of sediment. Without knowing the temporal scale at which the gully incised, a calculation for average loading per year indicates that the equivalent of 16 dumptruck loads per year has be delivered to Alder Brook since the initiation of the gully. There is little doubt that the impact from this gully, along with that of other similar gullies observed in this watershed zone, have contributed to the severe lateral channel adjustments and degradation of biotic habitat. In addition, a field survey of ephemeral drainages nearby the Fern Hollow gully that do not receive concentrated stormwater discharge show no signs of incision or gully development. This comparison supports the idea that the gully was initiated independently from any tributary rejuvenation caused by the diversion of 1830 and subsequent incision in the main stem of Alder Brook; the real cause of this impact is from inadequate stormwater management on extremely sensitive soils.

Phase II observations confirm that the gullying and other sedimentation impacts associated with the Circ Highway have affected the bed stability and habitat conditions of the channel. Table 6 summarizes the frequency of sedimentation features found across all reaches of the watershed. The greatest three reach values found in each category (of features per stream mile) have been highlighted in this table to indicate the spatial scale of these adjustments. Note that eight of the total nine sedimentation indicator values are found below Route 15. The degree to which this sedimentation is having deleterious effects on channel stability and physical habitat conditions is described in further detail in the reach scale results in Section 5.2 of this report.

	Table 6. Reach Sedimentation Indicators											
Reach	Reach Stream		DJ	# Bar	BF*	# Mass	MF					
of Segment	Miles	Jams (DJ)	per mile	Features (BF*)	per mile	Failures (MF)	per mile					
M01	0.31	1	3	14	45							
M02	0.44	8	18	20	46	7	16					
M03-A	0.47	7	15	25	53	5	11					
М03-В	0.32	3	9	10	32	5	16					
M04	0.47	12	25	19	40	5	11					
M05	0.50	13	26	17	34	8	16					
M06	0.87	20	23	32	37	11	13					
M07	0.36	3	8	3	8							
M08-A	0.27											
M08-C	0.68	5	7	8	12							
M09-A	0.13	2	16	6	48	1	8					
M09-C	0.55	7	13	11	20							
M10	0.98	3	3	16	16							
M11	0.97	9	9	8	8							
M13-B	0.33	1	3	6	18							
M14-B	0.56			2	4	1	2					
M15	1.39	3	2	2	1	1	1					

-- Indicates value of 0

* Includes all vegetated and unvegetated islands and bars

5.1.2 Middle Watershed Zone: Reaches M07 – M13

The middle watershed zone, found above the location of the historic diversion at Route 15, is affected by a different set of watershed stressors related largely to past agricultural land uses. With the exception of high gradient Reach M07, many of the reaches in this watershed zone are low gradient, sinuous channels flanked by hay fields and pasture. This zone is mostly unaffected by urbanization, except where residential neighborhoods have been developed close to the town center on Clover Road (Reach M08). Impacts from historic channel straightening are still observable today, however the lack of corridor encroachment and berming has allowed for recovery of channel planform in many reaches. Table 7 summarizes the direct impacts to the channel boundary conditions for reaches across the watershed. Note that four out of the seven reaches in this watershed zone currently have greater than 10% of their channel length straightened. Historic straightening has led to incision and increased sediment transport capacity in some reaches, which may also be contributing to fine sediment loading in downstream reaches. Many of the legacy impacts from straightening are found only in specific areas of reaches, and will be discussed in further detail in reach-scale descriptions and project identification in Section 5.2.

Table 7. Direct Channel Impacts											
Reach		Bridges -	Culverts		Ba	ank Armori	ng	Chan	Channel Straightening		
ID	Number	Length	Percent	Impact	Length	Percent	Impact	Length	Percent	Impact	
M01	1	107	6.5%	Low	171	5.2%	N.S.	247	15.0%	Low	
M02				N.S.	38	0.8%	N.S.				
M03	1	545	13.1%	Low	313	3.8%	N.S.	390	9.4%	Low	
M04				N.S.	193	3.8%	N.S.	267	10.6%	Low	
M05	1	255	9.6%	Low	325	6.1%	N.S.				
M06											
M07	2	135	7.1%	Low	365	9.5%	N.S.	657	34.3%	High	
M08	2	78	1.1%	Low	116	0.8%	N.S.	245	3.4%	Low	
M09				N.S.	253	2.8%	N.S.	711	16.0%	Low	
M10	1	21	0.4%	Low	78	0.8%	N.S.	892	17.2%	Low	
M11				N.S.	36	0.4%	N.S.				
M12											
M13	1	17	0.6%	Low	77	1.3%	N.S.	352	12.1%	Low	
M14	2	75	1.5%	Low	81	0.8%	N.S.	1483	30.3%	High	
M15	1	67	0.9%	Low	160	1.1%	N.S.	329	4.5%	Low	

-- Indicates value of 0

N.S. not significant

5.1.3 Upper Watershed Zone: Reaches M14 & M15

The headwaters zone of the Alder Brook watershed is also impacted by agricultural land uses and straightening, but has seen vast recovery of forest since the mid 1900's. This recovery of forest, both in the larger watershed and the stream corridor, has allowed for recovery of many features important to headwaters channels, such as shading and leaf litter inputs (Allan, 1995). Nevertheless, legacy impacts to the channel boundary conditions continue to affect reach M14. Note in Table 7 that approximately 30% of the channel length of this reach is straightened. Indeed, the lower segment of this reach is deeply incised and through pastureland and continues to generate and transport sediment to downstream Reach M13. Detailed discussions of the channel conditions and possible restoration strategies are discussed below in Section 5.2.

5.2 Reach Scale Stressors

The following is a technical summary of the Phase I and II observations used to document key geomorphic processes and adjustments occurring in the Alder Brook watershed at the reach scale. Within this summary is a discussion of reaches in the context of potential projects that could protect, sustain, or restore fluvial geomorphic equilibrium conditions, through the implementation of either passive or active stream corridor management strategies. Reach scale data referenced throughout the discussion are summarized in Appendices 3, 4, 5 and 6.

5.2.1 Reach M01

Reach Description:

This reach is located from the mouth at the Winooski River up to a change in buffer vegetation from open to forested cover. It is found in the historic floodplain of the Winooski River, which has been used heavily for agriculture for centuries. The reach has a length of 1651 feet and an overall channel slope of 0.6%. Observations of natural valley and slope characteristics suggest that the reference channel conditions are C-type with riffle-pool bedform; this channel form was observed during the field assessment. Channel cross sectional geometry suggests that this reach has already gone through a channel evolution process of incision and widening, from which it is currently recovering. Observations of abandoned terraces on the west side of the middle of the reach (where historic straightening had occurred) confirm a classification of stage IV of channel evolution. As the channel continues to adjust laterally to accommodate the excess sediment generated from Stage II and III of channel evolution (see Figure 14), additional erosion, deposition and debris jams will likely persist for years to come; this may adversely affect the habitat conditions and the biotic community it supports. Current geomorphic stability (RGA) and habitat (RHA) scores reflect a reach in fair condition that is still undergoing adjustments due to historic straightening, the historic water diversion, and current impacts from encroachment of the adjacent Circ Highway.



Figure 14. Channel Cross Section for Reach M01

Project Identification:

Although this reach has undergone recent encroachment form the Circ Highway, the equilibrium conditions appear to be recovering from the severe adjustments associated with the diversion of 1830. Due to the berming associated with the encroachment along the Circ Highway on-ramp (see map in Appendix 1), and the River Road crossing immediately below, there is little opportunity for restoration of greater floodplain connectivity in the lower section of this reach. There may be, however, opportunity to reestablish natural buffer vegetation along the middle portion of the reach (east bank) where recovery potential (due to Stage IV of channel evolution) is much higher. This would need to involve cooperation from the adjacent landowner whose farm fields abut the stream bank. Given the current stage of channel evolution in this reach, any restoration strategies should seek to avoid active management approaches in favor of cost-effective strategies to restore shading and input of organic materials for improvement of biotic habitat.

5.2.2 Reach M02

Reach Description:

This reach extends from the start of the softwood vegetation up to the downstream end of the first culvert crossing under the Circ Highway. At this break in slope Alder Brook leaves the historic floodplain of the Winooski River and enters a confined valley setting with steep, sandy side slopes that are characteristic of the lower zone of the watershed. The reach has an overall length of 2304 feet, with an average channel slope of 0.7%. Natural stream corridor characteristics indicate that this reach would be dominated by C-type geometry and riffle-pool bedform with a mix of planebed features in the more confined areas. RGA and RHA scores reflect the good stability and habitat conditions that dominate the reach, however certain areas of the reach are undergoing significant lateral adjustments due to severe aggradation.



Figure 15. Severe Aggradation in Reach M02

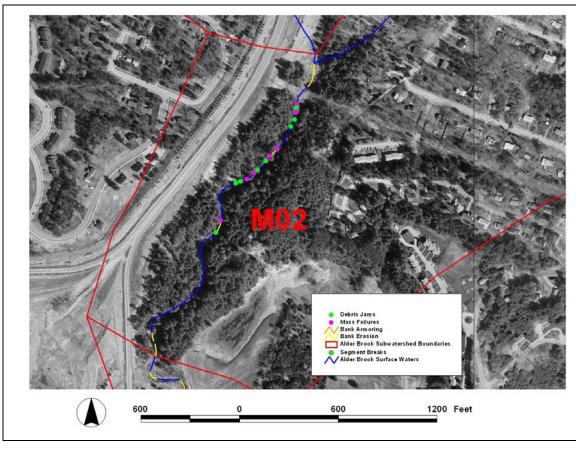


Figure 16. Spatial Scale of Sedimentation Features in Reach M02

This aggradation is leading to an abundance of bar features, debris jams, and mass failures (see Figures 15 and 16). Two cross sectional measurements were taken in this reach (see Appendix 6), and one had a much larger than expected bankfull width (55 feet); reflecting the resulting widening in this upstream section. The reach has therefore been assessed at Stage IIb of channel evolution. Compared with all other reaches in the watershed, the frequency of sedimentation indicators for M02 was among the highest (see Table 7). This aggradation is likely due to more recent impacts associated with the construction of the Circ Highway. At the downstream end of the first Circ Highway culvert crossing (reach break with M03) there are multiple threads to the channel and large bar features, indicating that large amounts of sediment were likely generated during the road construction and installation of the box culvert.

Project Identification:

There are no significant restoration project opportunities in this reach, due to the confined valley setting and the need for these adjustment processes to continue to occur and be resolved naturally over time. However, the tributary entering the upper reach from the northeast should be explored (and ideally assessed) in the future, as some gullying was noted during the field assessments. This impact, occurring independently of the culvert and road installation impacts, could also be contributing to aggradation and channel adjustments downstream.

5.2.3 Reach M03

Reach Description:

This reach extends from the upstream end of the first Circ Highway culvert up to the M04 reach break where a tributary enters from the northeast. The reach length is 4171 feet and the overall channel slope is 1.0%. M03 has been broken into 2 segments because of a change in channel dimensions and bedform. The lowermost segment, M03-A, has a slightly higher channel slope than Segment B, resulting in a B-type stream dominated by plane bedform. This reach has been assessed as having good geomorphic stability and habitat conditions. Although it likely went though a long period of instability after the diversion of 1830, it has reestablished a new equilibrium condition and has thus been classified in Stage I of channel evolution. The high number of depositional features noted for this segment in Table 7 are largely found in the upper section, where a "slug" of sediment associated with the Circ Highway construction and berming is migrating downstream (see Figure 17).

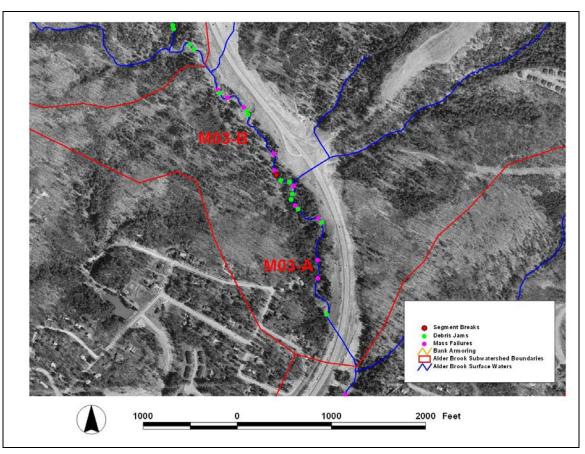


Figure 17. Spatial Scale of Channel Features in Reach M03

Segment B is found from the berm encroachment for the Circ "jughandle" up to the M04 reach break. This segment has a lesser channel slope, resulting in a C-type channel with riffle-pool bedform. This segment has been significantly impacted by direct sedimentation from road construction and berm encroachment. There are 2 sections of channel that have been straightened, representing approximately 10% of the entire reach length. The area with the greatest amount of aggradation and lateral adjustment in M03-B is the upper section closest to the reach break. Here the impacts to channel bed stability and planform can be easily observed in the field (can be seen from the Circ above; see Figure 18). Due to the degree of aggradation and widening observed in this segment, channel evolution has been assessed at Stage IIb, and fair geomorphic stability and habitat conditions have been noted.



Figure 18. Reach M03 as observed from the Circ Highway

Project Identification:

Similar to reach M02, there are no significant restoration project opportunities in this reach due to the confined valley setting and the fact that the adjustment processes associated with the sediment slugs will continue unabated over time with or without active restoration strategies. However, there are a number of depositional features concentrated around the tributary mouth entering the middle reach from the northeast which suggest that this tributary deserves investigation. In the future this tributary should be assessed to determine whether it is having a significant effect on the aggradation observed in the upper part of Segment A.

5.2.4 Reach M04

Reach Description:

This reach begins immediately upstream of a section of the channel straightened during the Circ Highway construction, and extends up to the downstream end of the second culvert at the reach break with M05. The channel length of this reach is 2507 feet with an overall slope of 0.9%, resulting in a C-type stream with riffle-pool bedform. As in downstream Reaches M02 and M03, a slug of sediment associated with the road construction is currently migrating downstream through the middle section of the reach. This is seen in Figure 19 where the abundance of debris jams and mass failures are causing lateral adjustments and widening. This was likely caused by the Circ road construction and the channel straightening that followed, which changed the sediment processes of the upper section of the reach from a depositional zone to a transport zone. The channel cross section measurements indicate an increase in width of over 10 feet from expected width derived from regional regressions (see Appendix 5). This aggradation and widening resulted in the reach being assessed as Stage IIb of channel evolution with fair geomorphic stability and habitat conditions. There is currently some beaver activity in the middle section of the reach.

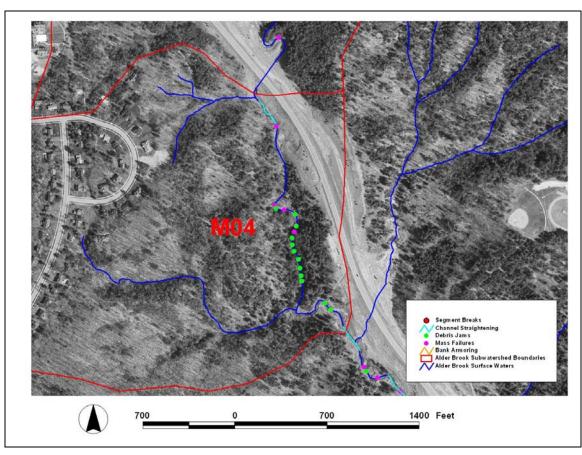


Figure 19. Spatial Scale of Channel Features in Reach M04

Project Identification:

The aggradation and widening in the middle and lower portion of the reach, caused by the Circ Highway construction and channel straightening, will likely continue to affect the lower section of the reach, and eventually Reach M03, for years to come. However, due to the narrow confinement of the valley, few if any floodplain restoration opportunities exist in the vicinity of the berming and road encroachment in the upper reach. There are some failing slopes along the berming that should be monitored over time (see Figure 20), as these slopes are continuing to contribute large amounts of sediment to the channel and causing widening downstream. If the bank failures continue, an active approach to stabilizing them may be necessary in the future.



Figure 20. Bank Failure Along Circ Berm in Reach M04

Figure 21. Gully in Reach M06

5.2.5 Reaches M05 and M06

Reach Description:

These two reaches have been grouped together for description because of their similarity in channel form and adjustment processes. They are found from the upper Circ culvert up to the Route 15 crossing in an area with little to no disturbance in the stream corridor. Both reaches are found within semi-confined to narrow valley settings with slopes ranging between 0.7 and 0.8%. C-type channel geometry with riffle-pool bedform dominates, and both reaches have been assessed in Stage IIb of channel evolution because of the observed aggradation and widening. Ratings of fair were assigned to the geomorphic stability and habitat conditions due mainly to impacts from aggradation and widening.

Figure 22 depicts the number and location of sedimentation features along the channel network. Note that (as described for downstream reaches) there is a pattern of oscillation between areas of high aggradation and lateral adjustment and areas of little lateral adjustment. There are a number of gullies (Figure 21) that

were observed in both reaches that are deeply incised and are delivering significant amounts of sediment to the main channel, causing severe lateral adjustment below *and* immediately above the gully confluence. Although the incision in the lower potions of these gullies may be relics of rejuvenated tributaries from the historic incision associated with the diversion of 1830, many are being heavily impacted and aggravated by urban runoff today. The Fern Hollow Road gully is one such example, and the effect of the sediment delivered to the main channel (quantified in Table 5) can be observed in the mainstem as the sediment slug continues to migrate downstream, as seen in Figure 22.

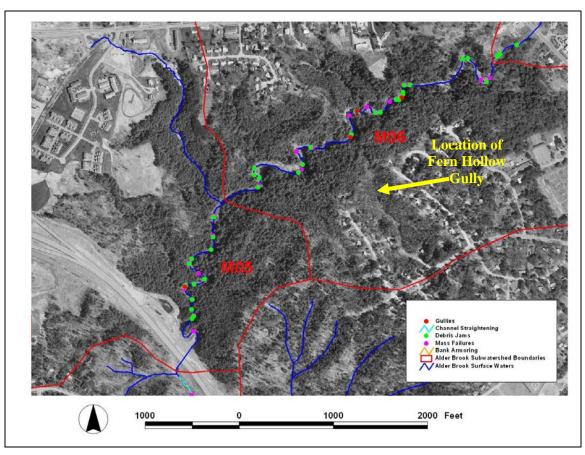


Figure 22. Spatial Scale of Sedimentation Features in Reaches M05 and M06

Project Identification:

Reaches M05 and M06 may present the greatest opportunity for active restoration of any of the reaches in the watershed; although these opportunities are found outside of the stream corridor and would need to be addressed using a watershed management and hydrologic approach. Currently, the deeply incised gully at the Fern Hollow Road outfall is being addressed by ANR and VYCC using manual labor and a NRCS/SCS check dam approach (Riley, 1998). A similar approach is recommended in an additional three gullies as depicted by the red dots (representing gully confluence with main channel) in Figure 22. Restabilization of these four gullies will reduce loading of coarse sand to the channel in the short term,

however long-term resolution of the problem will require a stormwater management approach to control the runoff entering the head of each gully. Given the soil characteristics found in this part of the watershed (abundance of sand), there are likely many opportunities to control stormwater runoff using infiltration designs on the flat sand terraces where the residential and commercial development exists. Only by addressing the source of the gullying (discharge points) will the sediment delivery from these sources be controlled in the long term, as the check dams currently being used are not designed to withstand less frequent rainfall events of higher magnitude and energy. They will likely fail without upslope runoff control.

In addition to the above described restoration projects, future assessment of the tributary entering M05 from the northwest is recommended. The sediment delivered to the main channel from this tributary warrants investigation as a large degree of lateral adjustment was observed below the confluence.

5.2.6 Reach M07

Reach Description:

This reach is found from just below the Route 15 crossing to approximately 500 feet above Route 128. The confined valley setting is a result of historic straightening and berming that occurred along the channel after the 1830 flood and diversion. Greater than 30% of the reach has been straightened, which increased the channel slope (3.7%), making this a sediment transport reach in a quasi-equilibrium state (Stage V) of channel evolution (see Figure 23). Also noteworthy is a small amount of channel braiding found below the Route 15 culvert. This area of channel adjustment represents the most upstream extent of the severe channel incision and recovery from the 1830 diversion. Here the steep armored slope descending from the Route 15 culvert continues to control the grade of the historic downstream adjustments.

Due to the stream type departure noted for this reach (change from B to F) and the unnaturally confined setting, geomorphic stability has been assessed as poor, however fair habitat conditions were noted. The rating of poor for stability reflects the straightening and unnatural confinement that makes this reach susceptible to frequent bed movement due to limited floodplain access. Current conditions in Stage V are relatively stable and are supporting a biotic community in fair condition (see Appendix 8). No project identification discussion has been included for this reach, since its human caused confinement precludes significant restoration.



Figure 23. Cross Section for Reach M07

5.2.7 Reach M08

Reach Description:

Reach M08 begins approximately 500 feet upstream of the Route 128 crossing and extends upstream to the north along Chapin Road to the confluence of two small tributaries entering from the west and east. This reach has a length of 7187 feet with an overall slope of 0.1%, resulting in a very low gradient E-type channel with dune-ripple and plane bedform. A diverse substrate, including some gravel and many macrophytes were present throughout the reach (see Figure 24), however a stream type departure has been noted for Segments A and C where plane bedform dominated over the reference dune-ripple bedform. The reach was segmented in the field because of the abundance of beaver activity found just upstream from Clover Road up to the crossing at Chapin Road. Due to the low gradient nature of the channel, and the overall absence of significant woody vegetation in the buffer, few sedimentation features (bars, debris jams, and mass failures) were noted. Comparison of the 1937 and 1999 aerial photography indicates that the stream planform has changed little over this time period, and straightening was limited (3.4%) along the reach. Fair conditions for geomorphic stability and physical habitat were noted.



Figure 24. Cross Section for Reach M08

Project Identification:

Overall there is good floodplain connectivity within M08, however there may be some buffer revegetation opportunities in the lower section of the reach from the lower reach break up to Clover Road. In this stretch, there are residential encroachments that have precluded the reestablishment of woody vegetation on the west bank. Efforts to reduce the encroachment of lawns in this zone and reestablish woody vegetation would increase shading, helping to lower summer temperatures in the water as it moves into downstream Reach M07, where the biotic communities are likely more sensitive. In addition, no stormwater controls were observed in the large residential neighborhood to the northeast of the channel on Clover Road. There is evidence below the outfalls originating from this area that peak flows are causing instability in the channel (e.g., scour), and it is recommended that this area be monitored further in the future.

5.2.8 Reach M09

Reach Description:

Reach M09 has an overall length of 4435 feet, ending at Col. Page Road to the north. This reach has an overall slope of 0.2%, but the channel gradient is variable and was the basis for creating three segments. Segments A and B are both low gradient E-type streams with planebed features and a mix of gravel and sand substrate. RGA and RHA scores noted for segment A are identical to those calculated for downstream segment M08-C due to the similarity of these segments. Beaver dams were observed in

Segment B and therefore the reach was not assessed for RGA and RHA scores. Segment C has a slightly higher gradient than the overall reach gradient, and C-type geometry with riffle-pool bedform has been noted in the field summary sheets. Significant channel straightening and bank armoring were noted in the upper section of this segment, which is leading to some minor changes in planform. Since there is good floodplain connectivity and buffer integrity in this reach, it is not likely that efforts to restore natural channel sinuosity would improve sediment attenuation or habitat conditions. Therefore, no project areas have been identified.

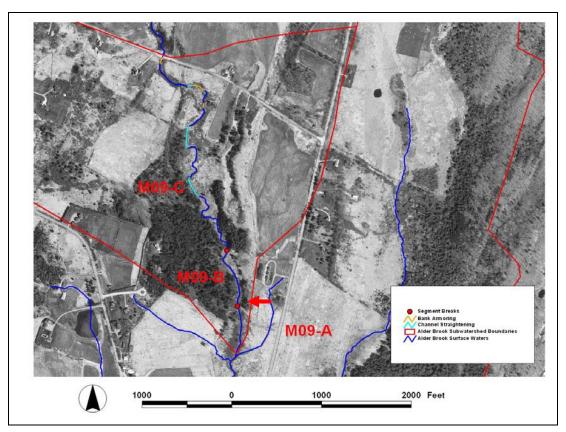


Figure 25. Direct Channel Impact Mapping for Reach M09

5.2.9 Reaches M10 and M11

Reach Description:

Reaches M10 and M11 have been grouped together for description because of their similarity of channel form and processes. Both reaches have very low gradient, sinuous channels with E-type channel geometry. Reach M10 begins at Col. Page road and extends 5172 feet to a break in the unvegetated buffer where softwoods are found in the corridor. Reach M11 extends 4999 feet from this buffer break up to the Earl Farm pasture. Due to the historic straightening and armoring in the lower section of Reach M10, a stream type departure has been noted where the bedform and substrate have changed from

reference sand conditions to cobble and gravel bottom with plane bedform. These areas of bedform change are found largely in the lower portion of the reach where armoring was present (see Figure 26). With the exception of this change from reference conditions, good physical stability and habitat conditions were noted for these reaches (reference RHA score for M11). A review of historic aerial photography, as well as the presence of abandoned terraces suggests there has been a process of channel change and restabilization over time. Channel Evolution Stage V has been noted for both reaches. Since there is good floodplain connectivity and buffer integrity in both reaches, it is not likely that restoration efforts would improve sediment attenuation or habitat conditions. Therefore, no project areas have been identified.

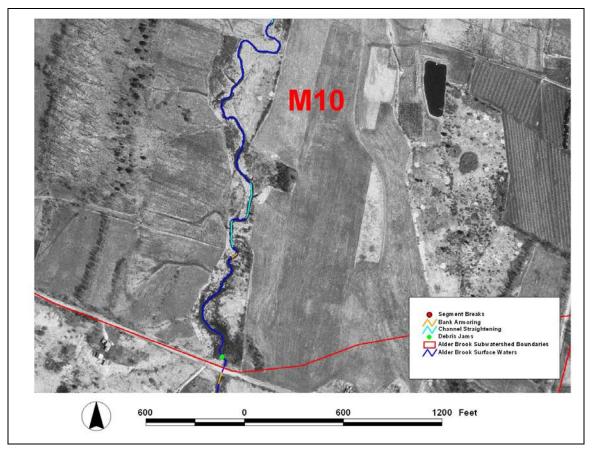


Figure 25. Direct Channel Impact Mapping in Lower Reach M10

5.2.10 Reach M13

Reach Description:

Reach M13 begins approximately 1000 feet above the Old Stage Road crossing and extends 2909 feet up to the confluence with a tributary entering from the west. This reach has a channel slope of 0.3%, resulting in a low gradient channel with E-type geometry. Within reach M13, only Segment B was

assessed due to limited property access. Observations from Segment B suggest that the historic straightening (see Figure 26) has resulted in a bedform and substrate departure from reference conditions, whereby the increase in energy gradient has caused a coarsening of the bed and a loss of channel undulation normally observed in sinuous channels in this setting. Nevertheless, the channel has recovered significantly from the historic impacts and is currently in Stage IV of channel evolution with good physical stability and habitat conditions. Due to the floodplain connectivity and buffer integrity found in this reach, it is not likely that restoration efforts would improve sediment attenuation or habitat conditions. Therefore, no project areas have been identified.

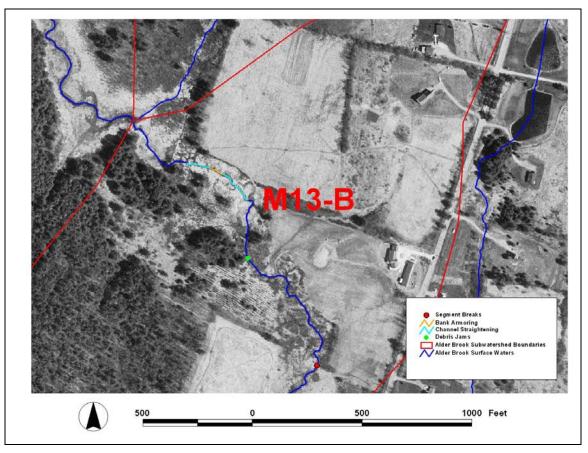


Figure 26. Direct Channel Impact Mapping in Segment M13-B

5.2.11 Reach M14

Reach Description:

Reach M14 begins at the confluence with the large tributary entering from the west and extends approximately 5000 feet up to the crossing at Rollin Irish Road. The reach has an overall channel slope of 2.9%, with a cobble-bottomed substrate and B-type channel geometry. Due to limited property access, the reach was broken into two segments and only the upper segment (B) was assessed. Significant

channel straightening was evident in both segments (observed from afar in segment A) and is depicted in Figure 27. This historic straightening has caused some incision in areas of the segment that was not noted in the channel cross-section measurements. The channel stability and habitat conditions of Segment B have been assessed as fair. In addition, active pastureland in Segment A and lower Segment B is causing significant instability in the channel.

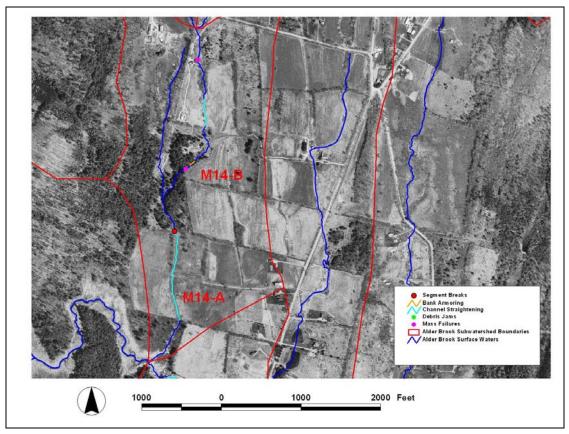


Figure 27. Direct Channel Impact Mapping in Reach M14

Project Identification:

The channel instability caused by grazing in Segments A and B is generating sediment that is transported and deposited in a lower gradient, buffered section of Segment A. This area presents an opportunity for fencing out the cattle to reduce channel instability and nutrient inputs. However, it should be recognized that the habitat conditions in this ephemeral channel (dry conditions were observed in August) may not be greatly improved given its small size and marginal capacity to support an aquatic community.

5.2.12 Reach M15

Reach Description:

Headwaters Reach M15 begins at the Rollin Irish Road crossing and extends approximately 7000 feet through a forested area before reaching the source of Alder Brook: a beaver pond at 900 feet elevation. The overall gradient of this reach is 3.8%, resulting in a cobble-bottomed channel with B-type geometry (see Figure 28). A small amount of historic straightening was observed in the lower part of the reach, but does not appear to have adversely affected the overall stability of the channel. Therefore, geomorphic stability and habitat conditions have been assessed as good with a Channel Evolution Stage of I. No project areas have been identified for this reach.



Figure 28. Channel Cross Section for Reach M15

6.0 Conclusions

The watershed and reach scale stressors described above indicate that the lower zone of the watershed is experiencing the greatest degree of channel adjustment and decline in physical habitat. While the historic diversion of 1830 is partly responsible for on-going adjustments observed today, the deleterious effects of recent residential and commercial development and floodplain encroachment in this zone of the watershed is clearly evident. Without steps to address the watershed level stressors affecting the channel corridor, habitat conditions will continue to decline and may not support the reference biotic community

in the near future. To summarize the reach-level project identifications provided in Section 5.2, the following steps are recommended to initiate restoration efforts and future monitoring in the lower watershed zone:

- 1. Assess and prioritize the impacts of gullies in Reaches M05 and M06 below Essex Center for future remediation efforts similar to those currently being implemented on Fern Hollow Road.
- 2. Address the need for stormwater runoff control for discharges to gullies in reaches M05 and M06 and develop a plan for long-term implementation of infiltration structures.
- 3. Develop a stream corridor protection strategy for reaches susceptible to future encroachment, whereby a belt width of six times the channel width is used as a basis for the corridor. Reaches M01, M03, M04, M05 and M06 are high priority reaches for corridor protection.
- 4. Assessment of tributaries that appear to be delivering large amounts of sediment to the main stem in reaches M02, M03, and M05.

In the middle and upper zones of the watershed, there are fewer opportunities for restoration. These watershed zones generally have good floodplain connectivity, and in many cases have forest vegetation that is regenerating within the corridor. Some small-scale, passive restoration strategies and monitoring have been addressed in the reach summaries in section 5.2 and are summarized below:

- Develop a stream corridor protection strategy for reaches susceptible to future encroachment, whereby a belt width of six times the channel width is used as a basis for the corridor. Reaches M08, M09 and M12 are high priority reaches for corridor protection.
- 2. Continued monitoring of the stormwater discharges from the Clover Road neighborhood where no runoff control structures were noted.
- 3. Restoration of natural, woody vegetation along specific areas of stream bank to lower summer stream temperatures and increase organic inputs to the channel (e.g., large woody debris).
- 4. Prioritize areas in reaches M12 and M14 for keeping grazing cattle away from stream channel with fencing.

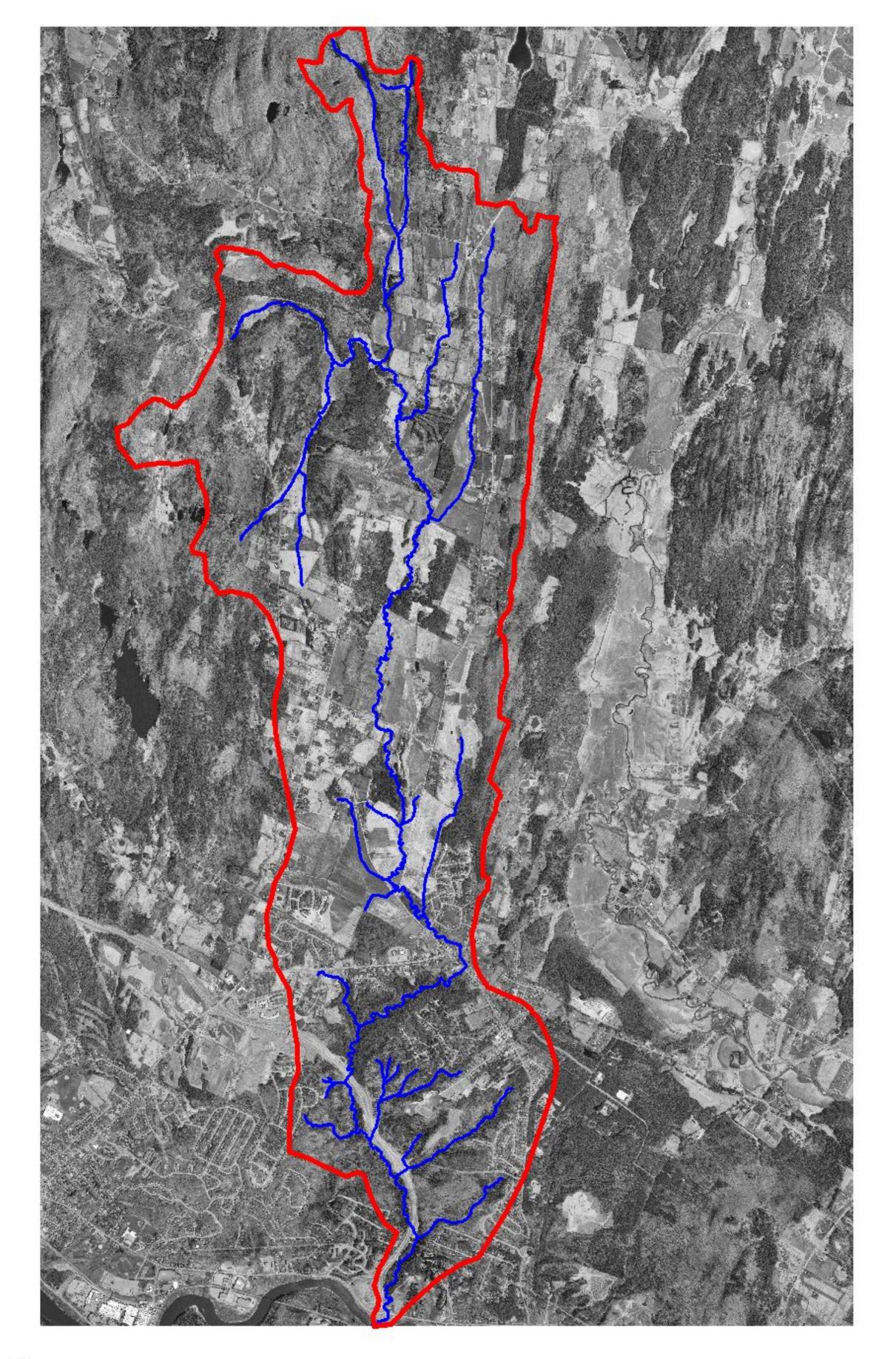
7.0 Literature Cited

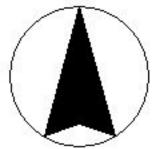
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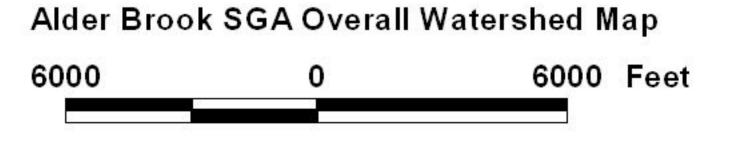
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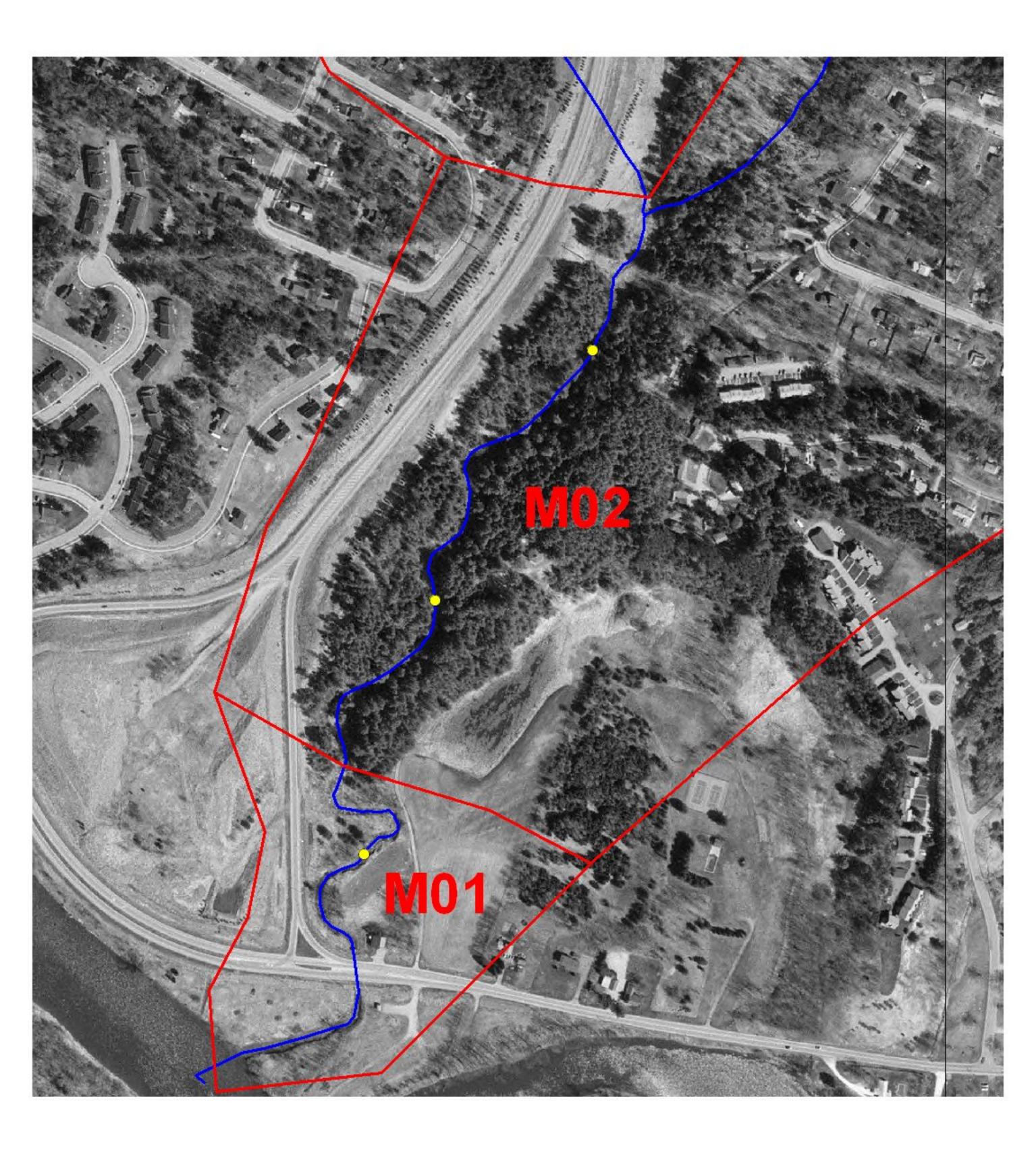
Appendix 1 – Subwatershed & Reach Maps



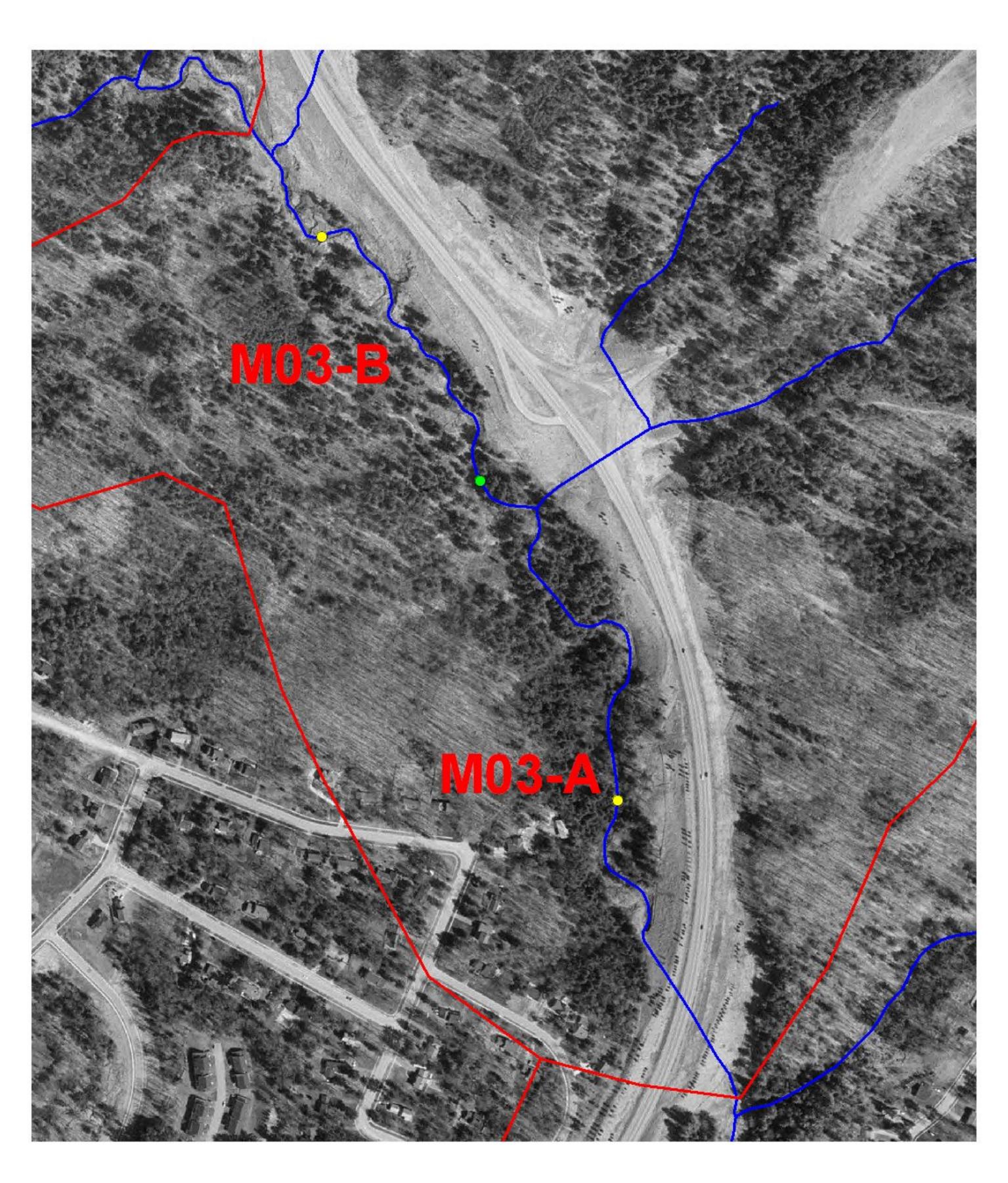


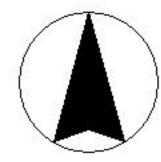


Alder Brook Watershed Boundary Alder Brook Surface Waters

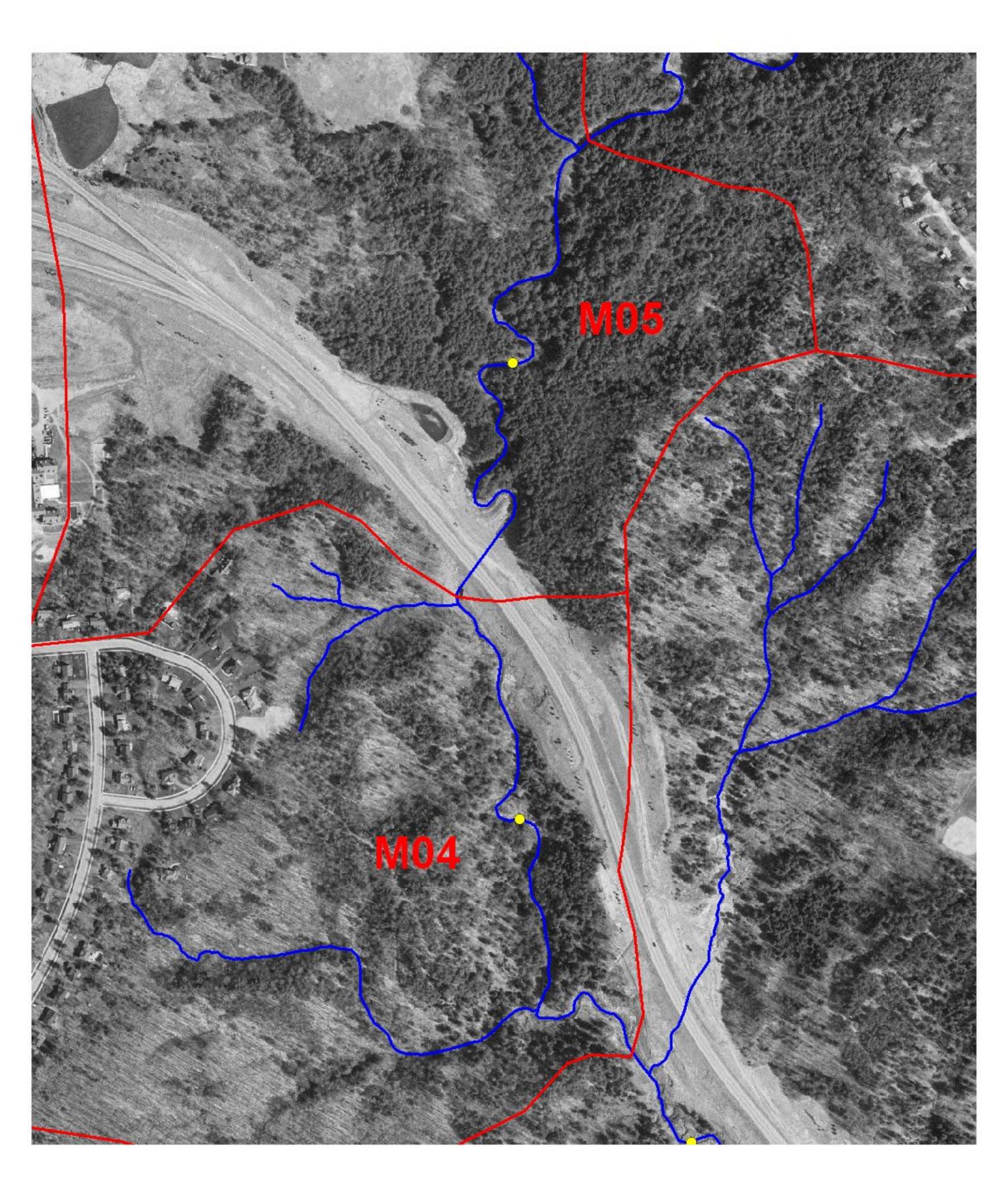


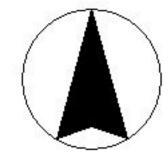


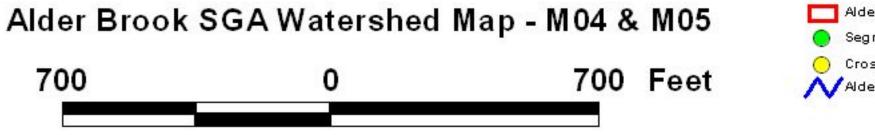


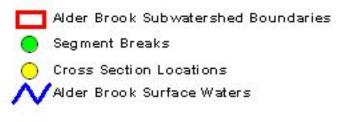


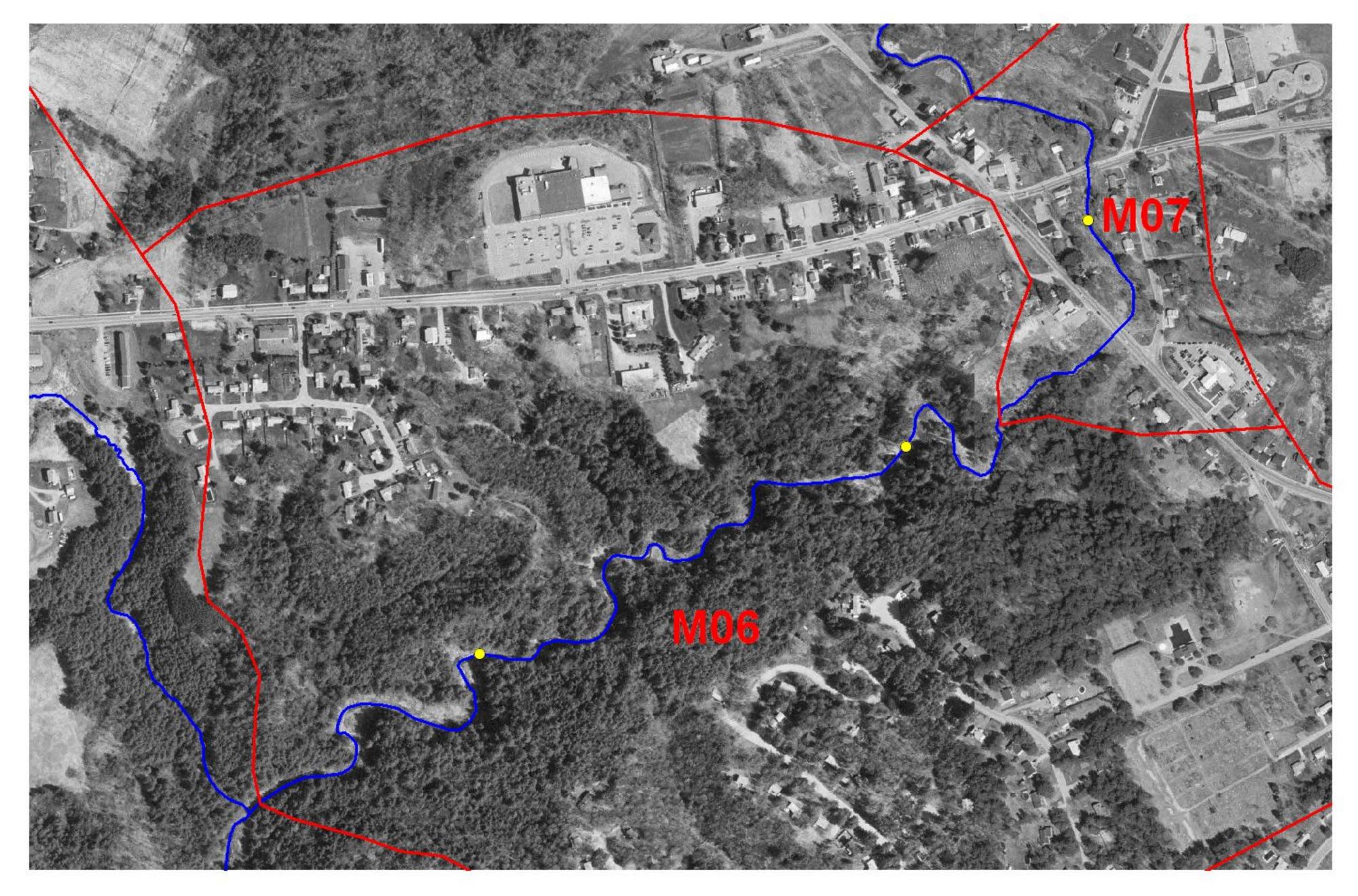
Alder Brook SG	A Watershed Ma	р - М03-А & М03-В	Alder Brook Subwatershed Boundaries .
600	0	600 Feet	 Cross Section Locations Alder Brook Surface Waters

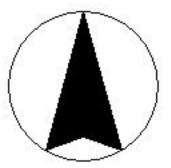












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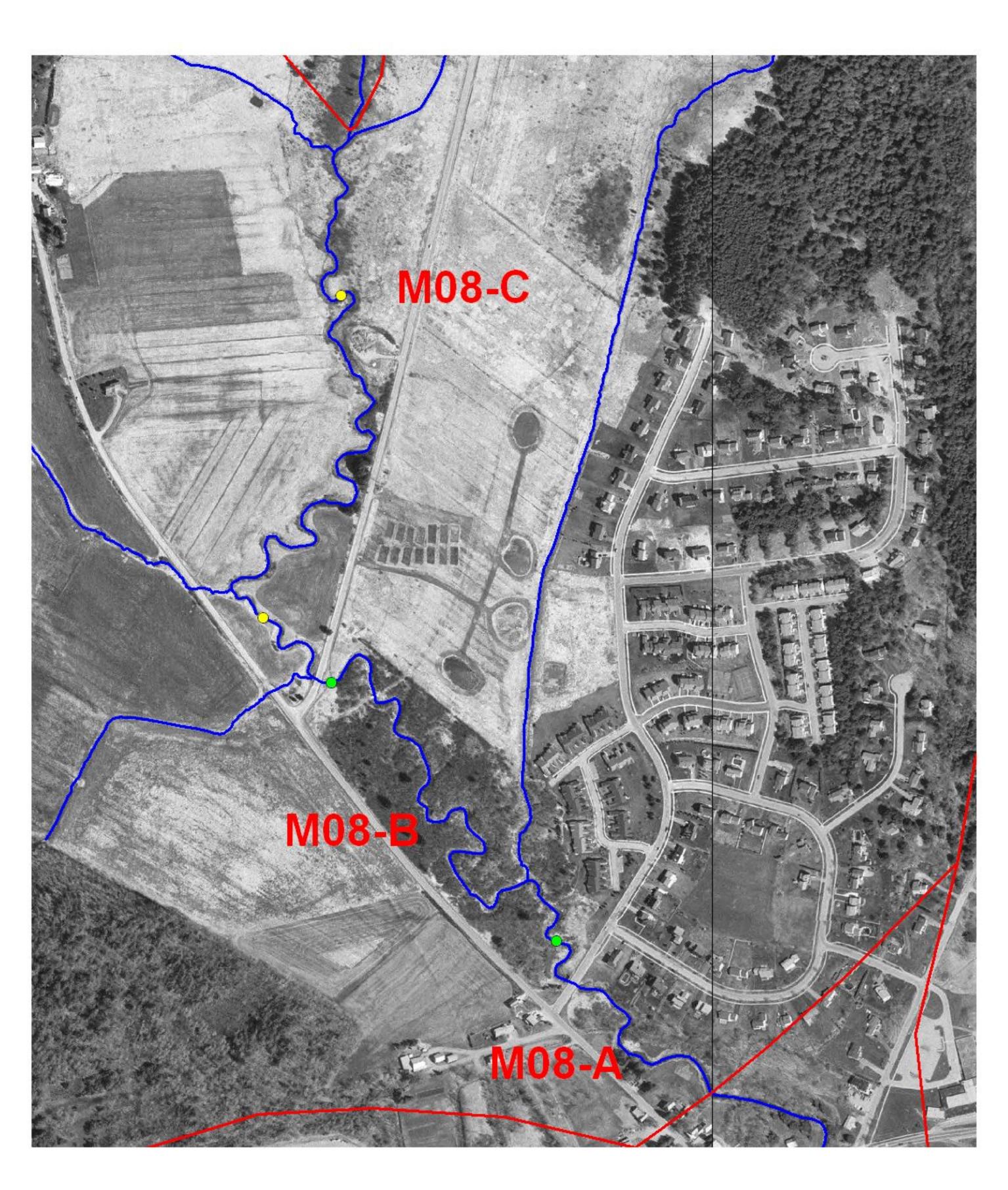
Alder Brook SGA Watershed Map - M06 & M07

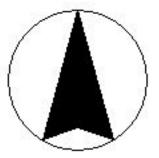
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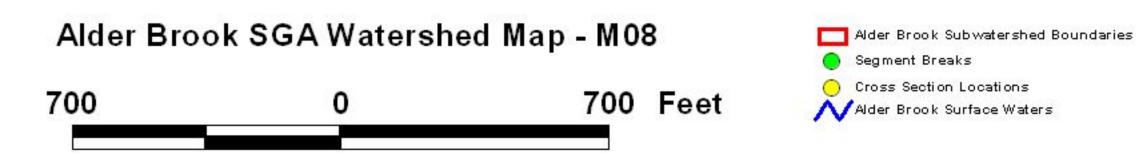
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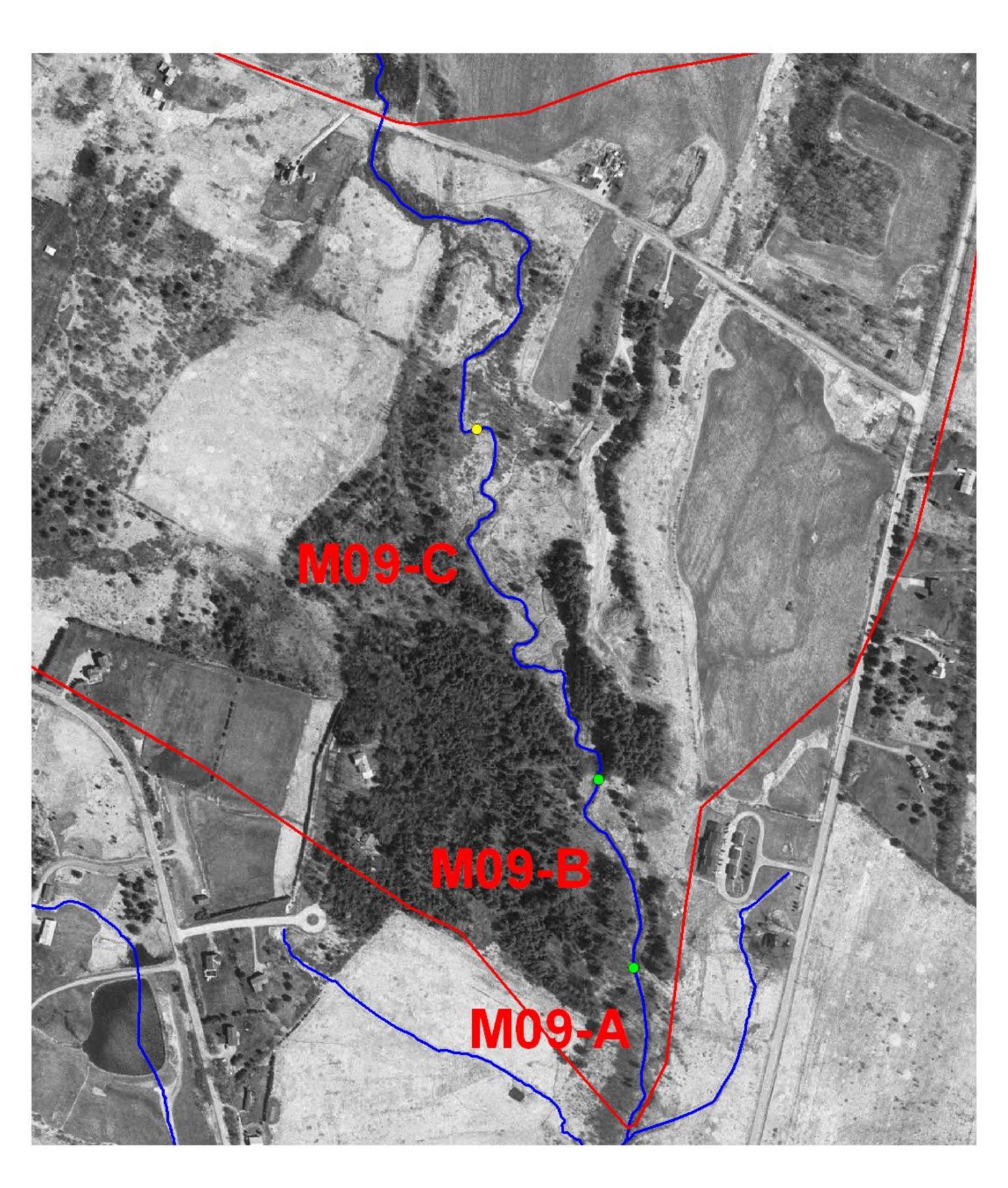
& M07 1600 Feet

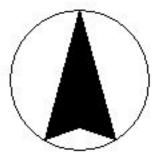
Alder Brook Subwatershed Boundaries Segment Breaks Cross Section Locations Alder Brook Surface Waters

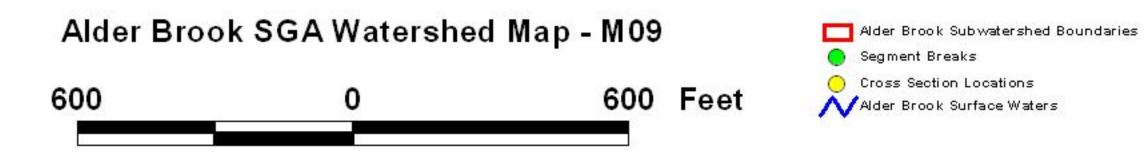


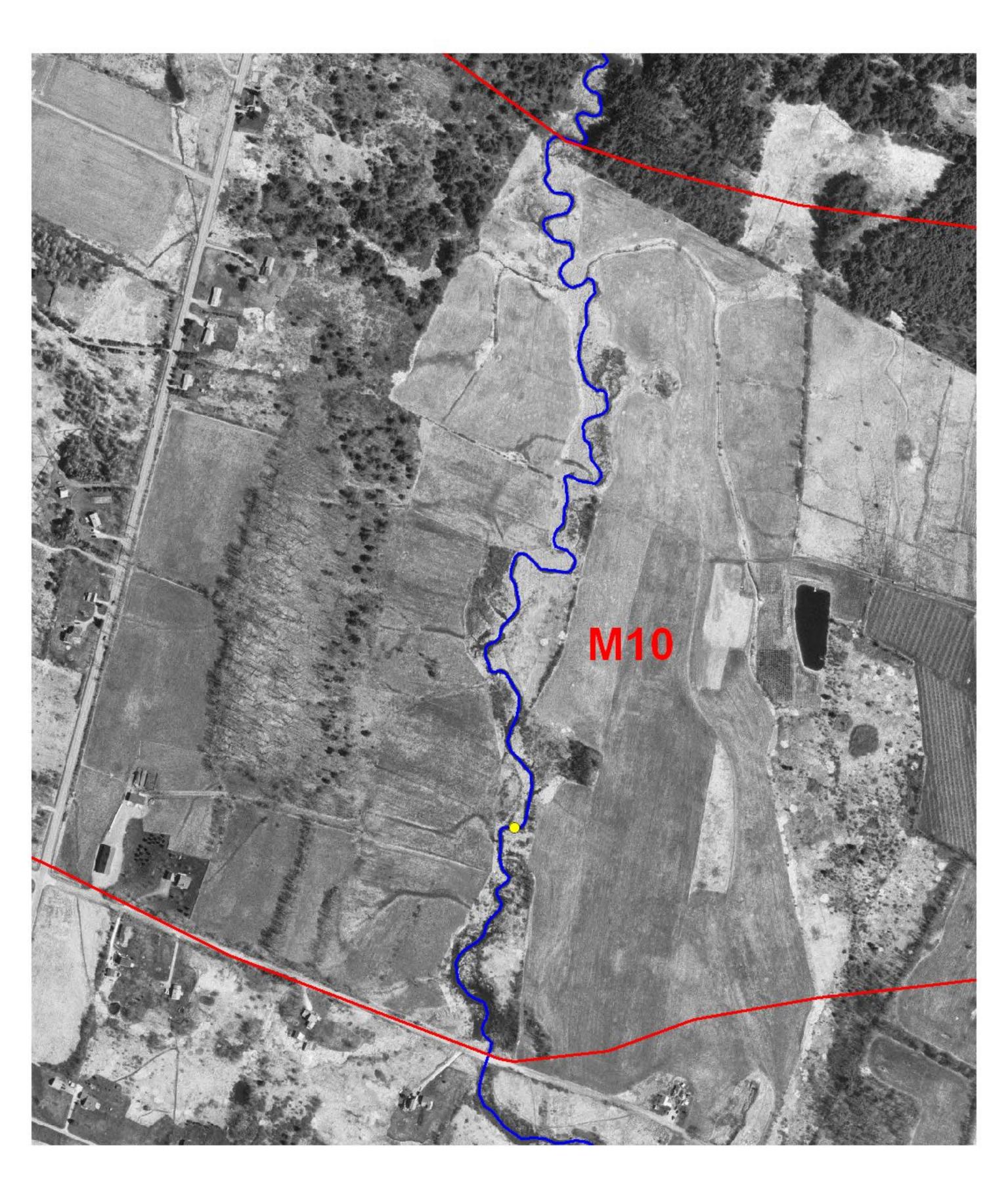


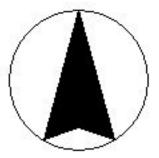


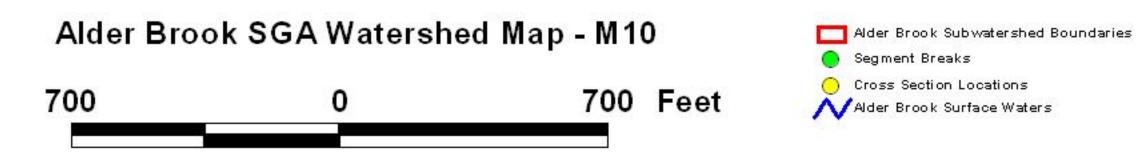


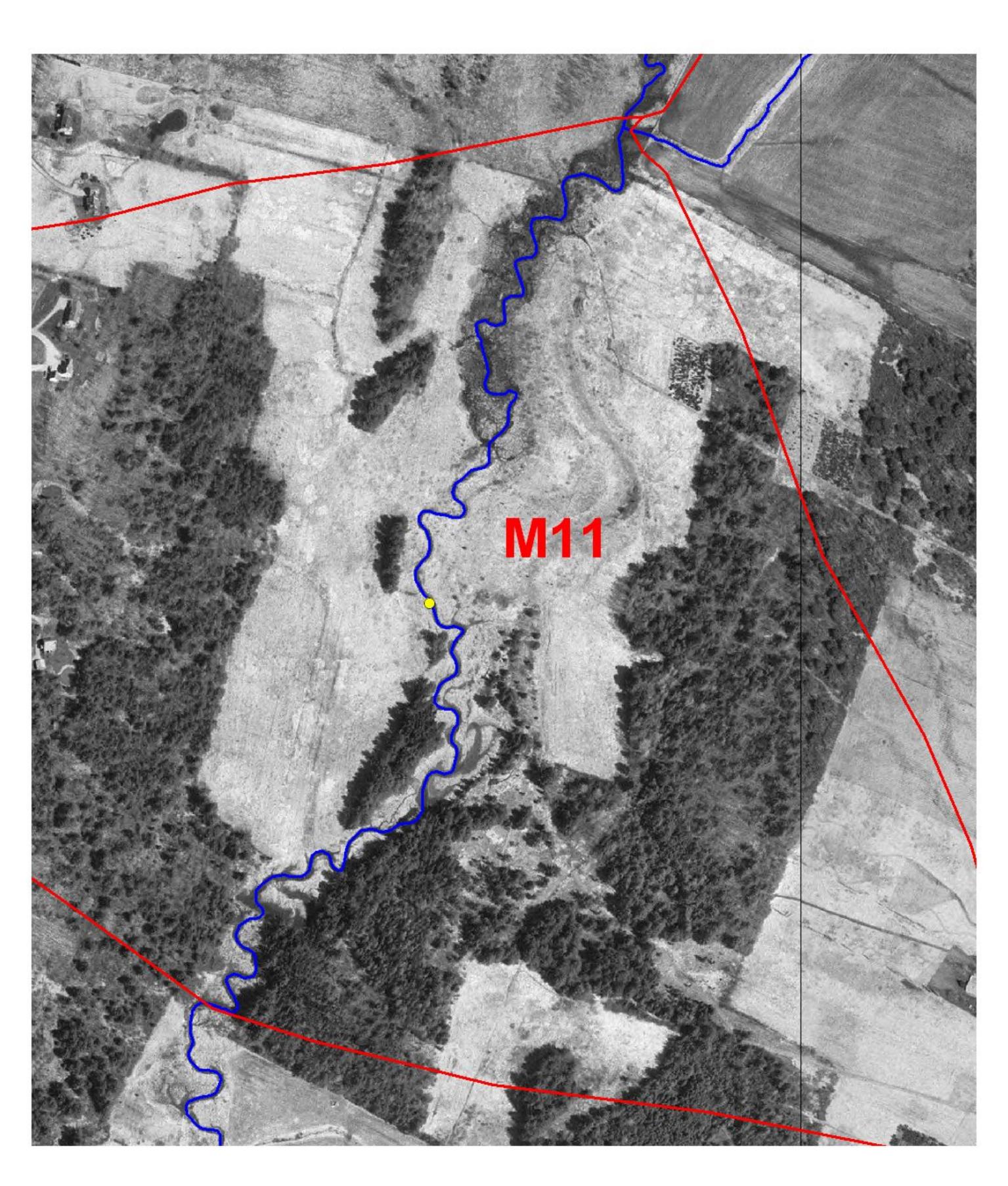


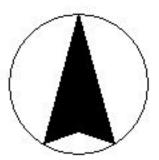


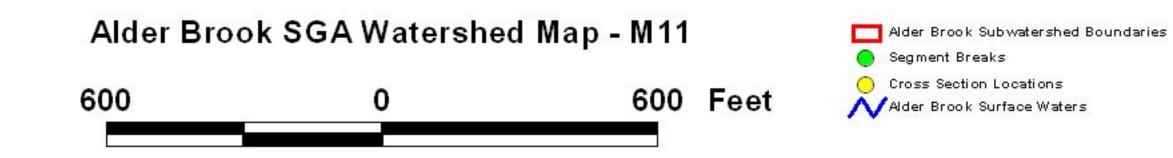


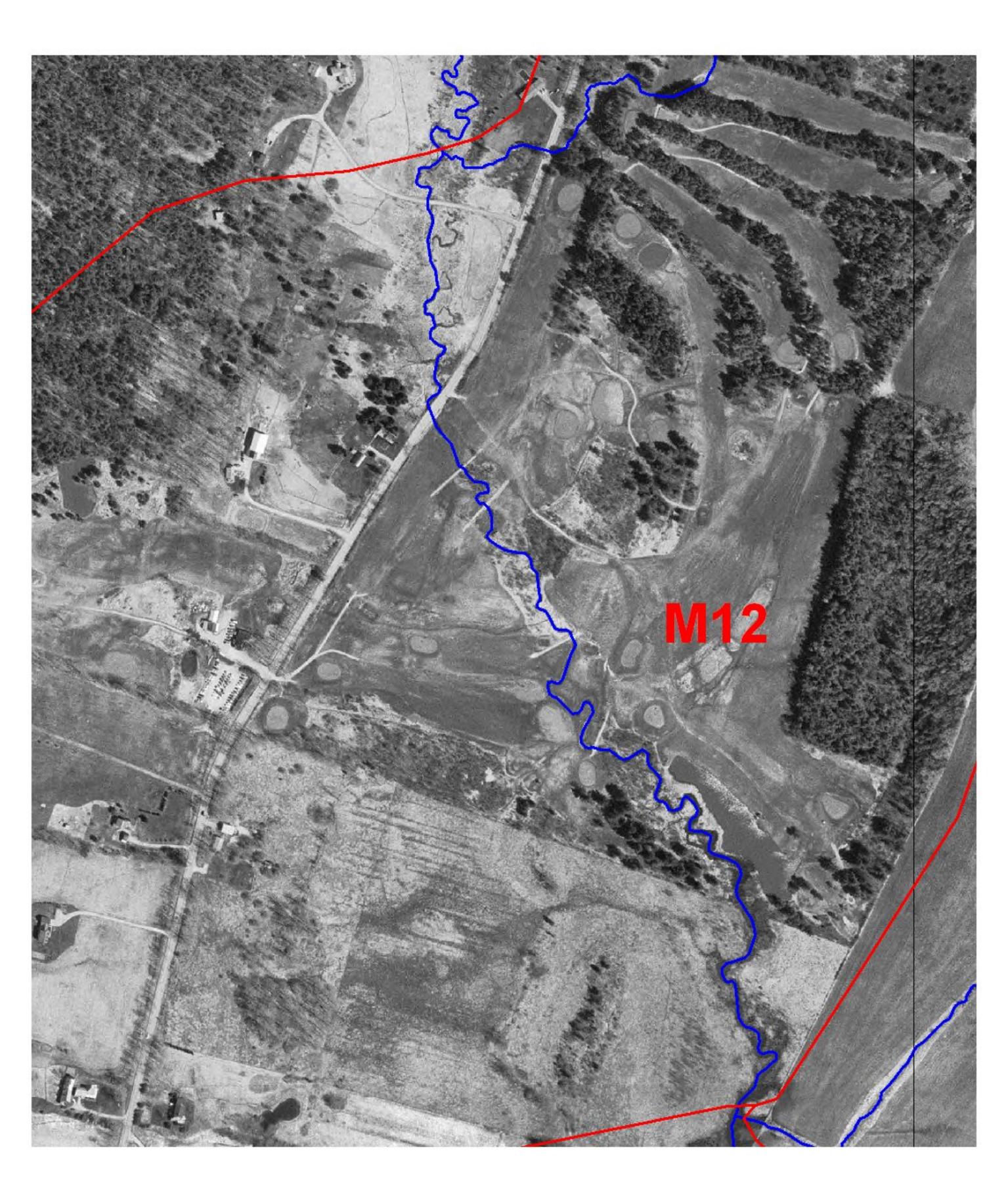


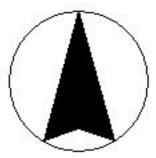


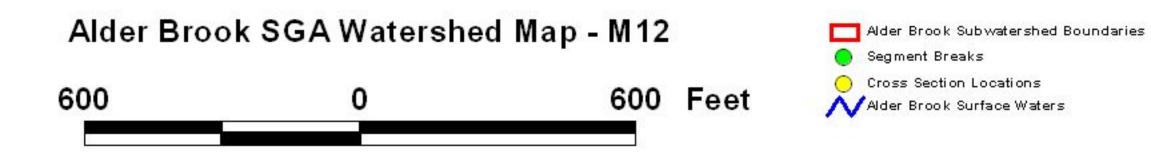


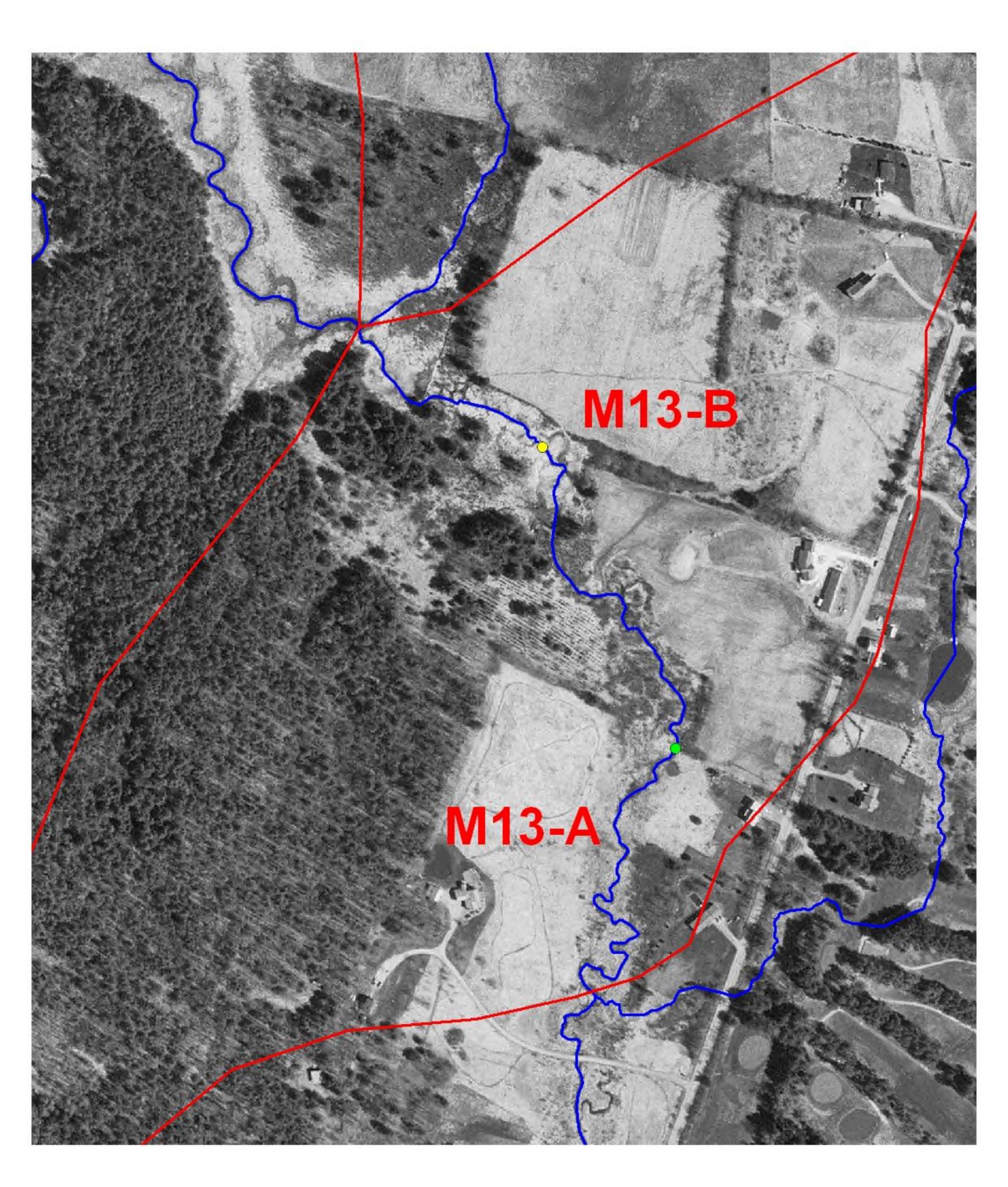


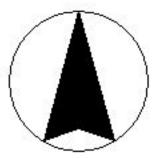




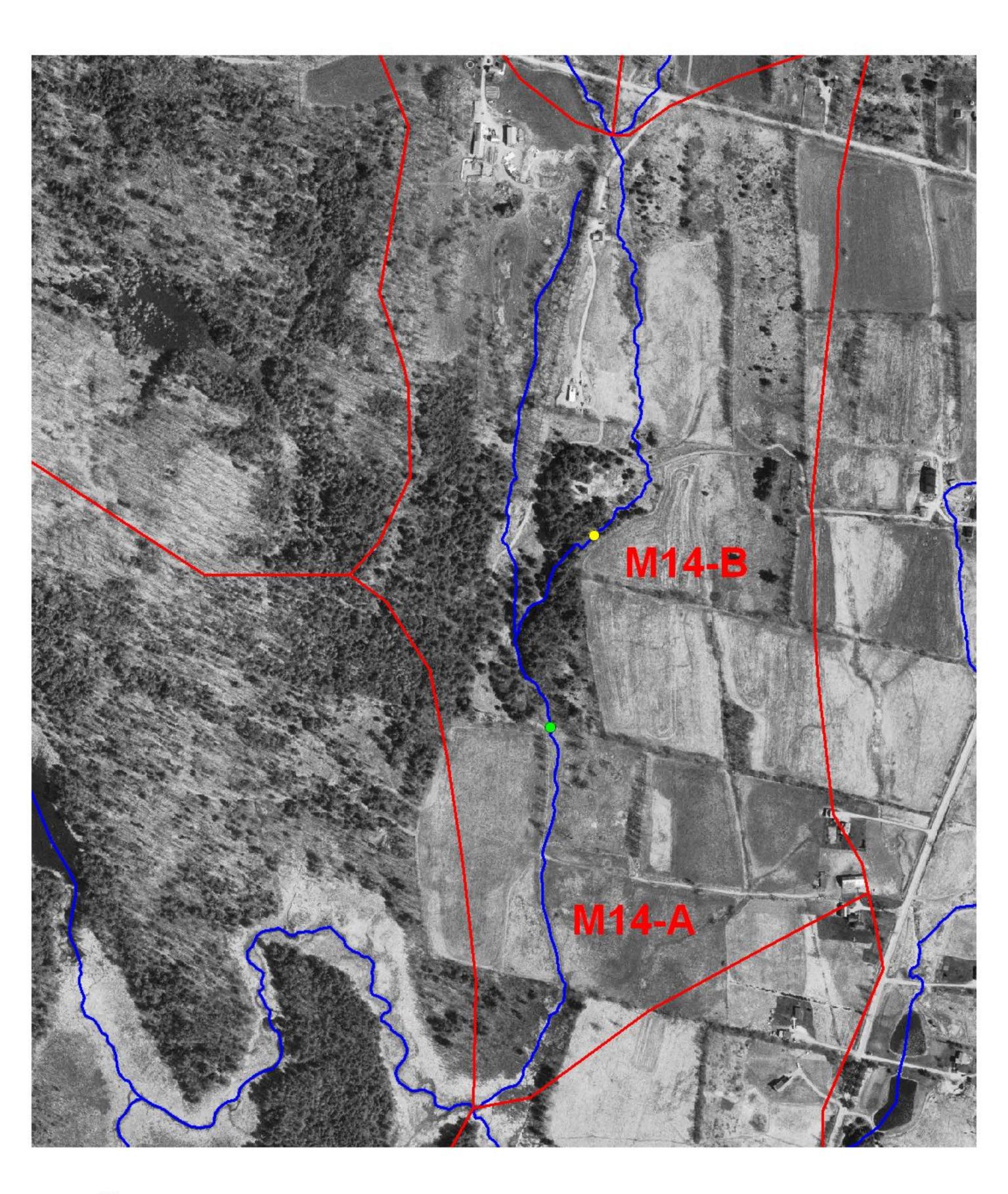




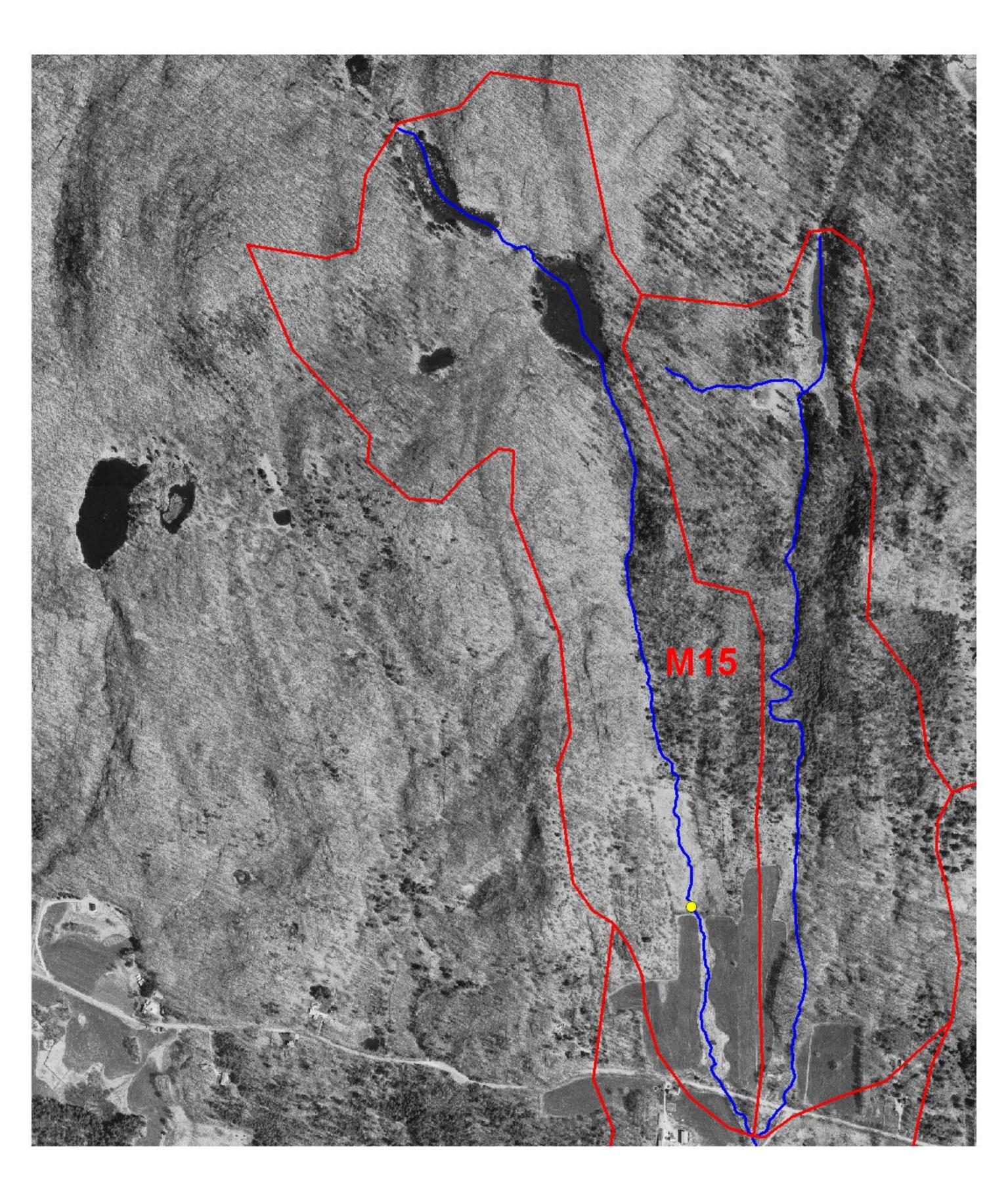


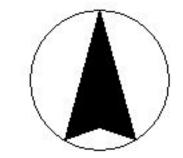


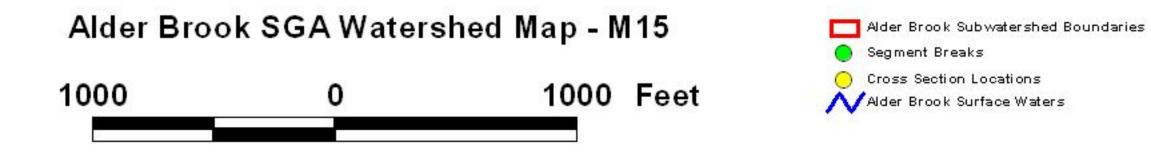












Appendix 2

Phase II Notes and Updates to Phase I Data:

General updates are reviewed below for each DMS Phase II step to which noteworthy revisions were made to the Alder Brook dataset, after the initial QA/QC from DEC staff. Common parameter themes across reaches are summarized with **reach names in bold text**. References to Phase I data are summarized and discussed in red text.

- Step 1 Valley and Floodplain Corridor:
 - o Adjacent Terrace or Hillside (1.4)
 - Phase II side-slopes have been reviewed and have been updated in the Phase I database.
 - o Valley Features (1.5)
 - Where better estimated or measured values were taken for valley width in Phase II surveys, Phase I data has been updated. Otherwise, Phase I valley width has been used and entered in Phase II database.
 - o Grade Controls (1.6)
 - Phase II grade controls have been reviewed and considered per the guidance in the most recent SGA protocols (2006) where culverts are not considered grade controls. All culverts and crossings have been removed from the Grade Control database.
 - Despite the abundance of beaver dams in some reaches and their ability to control stream grade on a short-term basis, these features have not been considered as grade controls in the database.
- Step 2 Stream Channel:
 - Stream Channel (2.1 2.9)

- Efforts were made to get 1 to 2 cross-sections per reach; 2 for the longer reaches. Sometimes representative cross-sections selected for DMS data entry disagrees with stream type or adjustment type, or suggests a higher/lower degradation adjustment than that observed.

- 1. Reaches with more than one cross-section that have average incision ratios **lower** than the one reported incision ratio include: **M06**
- 2. Reaches with more than one cross-section that have average incision ratios **higher** than the one reported incision ratio include: **M08-A and M08-C**
- o <u>Riffle Data (2.10 − 2.11)</u>
 - Riffle data has not been collected for "dune-ripple" or "plane" bedforms. All observed riffle/pool spacings have been included for "riffle-pool" and "step-pool" bedforms.
- o <u>Substrate Data (2.12 2.13)</u>
 - Percent Detritus has been estimated and tends to be higher on lower gradient reaches (E-types). Note that this data is more qualitative than quantitative.
 - For "Dune-Ripple" bedforms, average largest particles on both the bed and bar are sand, which often appear as "0" values in the DMS.
- o Stream Type (2.14)

- In heterogeneous reaches, dominant bedform has been selected even though reach may contain multiple bedforms throughout (e.g., B3 step-pool may also have significant portions of plane bedform). Those reaches with altered bedform from reference conditions are listed below:

- 1. Plane bed reaches that were likely riffle-pool include: M02
- 2. Plane bed reaches that were likely step-pool include: M07
- 3. Plane bed reaches that were likely dune-ripple include: M08-A, M08-C, M13-B

- Determination of stream type may be based on data from more than one cross-section measurement. - Please refer to all cross section data to confirm chosen stream type. Reference condition stream types have been updated in the Phase I database where a type different from Phase I estimate was observed in the field.

• Step 3 - Riparian Banks, Buffers, and Corridors: • <u>Stream Banks (3.1)</u>

- Observed bank erosion values in many cases represent best possible estimations of length for each bank. For reaches with higher percentages in particular, estimated values are likely more qualitative than quantitative.
- Phase II bank erosion data have been FIT'ed and are therefore included in the Phase I database.
- o Stream Buffer (3.2)
 - Phase II buffer width and vegetation data have been reviewed and have been updated in the Phase I database.
- o Stream Corridor (3.3)

- Phase II corridor land use data have been reviewed but have **NOT** been updated in the Phase I database. Therefore, database user should refer to Phase II for accurate data.

- Step 4 Flow and Flow Modifiers:
- o Springs, Seeps, & Tributaries (4.1)
 - In addition to seeps and springs, tributaries of any size were considered to provide water storage capacity at the reach scale during the Phase II assessments. GIS mapping using orthophotography and VHD layers were also used to determine the abundance of tributaries for each reach.
- o Adjacent Wetlands/GW Inputs; Impoundments/Flow Regs; Constrictions (4.2, 4.5, 4.7, 4.8)
 - Phase II inputs for above-described data have been reviewed and have been updated in the Phase I database.
- o Flow Regulating Impoundments (4.5 & 4.7)
 - In the Alder Brook watershed there are no on-stream impoundements.
- o Stormwater Inputs (4.6)
 - Stormwater inputs include those outfalls discharging directly to the channel, as well as those ditches and other features conveying concentrated runoff directly to channel. Man-made drainage mapping was used in field during Phase II assessments to locate potential stormwater inputs not found directly on the channel.
- Step 5 Channel Bed and Planform Changes:
 - 0 Bar Types (5.1)

- Phase II bar type and abundance data have been reviewed and have been updated in the Phase I database.

 \circ Planform Changes (5.2 – 5.3)

- Present-day alterations to the hydrologic and sediment regimes in the Alder Bk. watershed are caused primarily by: 1) urban runoff, and 2) beaver modifications to channel and floodplain. It is often difficult to tease apart the relative impacts of each of these factors during Phase II assessments when both are present in a reach or segment. Noteworthy planform changes relative to each impact are listed below:

- 1. Reaches where significant alterations to planform can be associated with **beaver activity** include the following reaches: **M04**, **M08-B**, **M09-C**
- Reaches where significant alterations to planform are resulting from urban runoff and/or floodplain encroachment include the following reaches: M01, M02, M03-B, M04, M05, M06 & M07
- o Channel Alterations (5.5)
 - Phase II channel alteration data have been FIT'ed and are therefore included in the Phase I database.
- *Step 6 RHA:*
 - o Bank Stability (6.8)

- Bank stability measurements reflect estimated bank erosion values entered in step 3.1. In some cases RHA scores for bank stability may appear slightly higher or lower than the expected ranges/values entered in step 3.1. Best judgment was used in these cases when evaluating bank stability from a habitat perspective.

- o Overall Rating (6.11)
 - Confidence in integrity of overall RHA scores is high for Alder Brook.

- Overall habitat assessment in E-type channels is difficult due to general lack of quality habitat associated with these sand-bottomed reaches. Another confounding variable which makes assessment of habitat in low-gradient E-type channels difficult is the influence of beaver activity. Reaches with lower RHA scores due to beaver influence included: **M04-A & M09-C**

• *Step* 7 – *RGA*:

o Channel Degradation (7.1)

- Incision values and entrenchment ratios were reviewed for ALL reach cross-section measurements in order to determine scores in 7.1 (row 2) and 7.3 (row 3). Certain reaches may appear to have RGA scores for these rows which do not agree with reported DMS cross section geometry, in which case database user should refer to additional cross-sections. Reaches where this is the case include: **M14-B**

o Channel Widening (7.3)

- As the channel evolution stage that follows aggradation, channel widening is an important adjustment process occurring in many of the impacted high-gradient (B & C type channels) reaches in the lower part of Alder Brook. Channel widths have been compared with hydraulic geometry curves developed for Chittenden County in order to make adjustments to scores in 7.3 (row 1). For this parameter, width to depth ratio is not always adequate at capturing the degree of widening. Also, certain reaches may appear to have RGA scores for these rows which do not agree with reported DMS cross section geometry, in which case the database user should refer to additional cross sections.

o Overall Rating (7.6)

- Confidence in integrity of overall RGA scores is high for Alder Brook.

- As discussed above in the RHA section, overall geomorphic stability is often difficult to assess in low-gradient, E-type channels affected by beaver activity.

Appendix 3 – Phase II Reach Data

	der Bro	ok erways Asso		each # ervers:	Phase M01 EPF, Cl	e 2 Segment S MB	Ś	page 1 of 2 Segment: 0 hy Not assessed:	Completion	er 19, 2006 Date:	FIT: Yes July 31, 2006 Rain: Yes	
Segment Length (ft):		1,651	Segment Lo	cation:	At Jct.	of Rt. 289 and F	River Rod (R	t. 117) park at gr	avel pull off o	n Winoos	ki River side of	
Step 1. Valley an 1.1 Segmentation None		odplain	Step 2. Strear 2.1 Bankfull Width	n Chanr	nel 33		Step 3. Riparian Features 3.1 Stream Banks			Step 4. Flow & Flow Modifiers 4.1 Springs / Seeps None		
-	, lo		2.2 Max Depth (ft)		4.75	Typical Bank S			4.2 Adjacent	-	Some	
1.3 Corridor Encroachm			2.3 Mean Depth (ft)		2.97	Bank Texture	Le	eft Right	4.3 Flow Stat		Moderate	
Length (ft)	One	Both	2.4 Floodprone Wic		325	Upper	<u></u>		4.4 # of Debri		1	
Berms	302	0	2.5 Aband. Floodpli		6.45	Material Type	Silt/Cla	y Silt/Clay	4.5 Impound		None	
Roads	0	0	2.6 Width/Depth Ra		11.11	Consistency	Cohesiv		•			
Railroads	0	0	2.7 Entrenchment F		9.85	Lower			4.6 # of Storn		ts 0	
Improved Paths	0	0	2.8 Incision Ratio		1.36	Material Type	М	ix Mix	4.7 Upstream	•	None	
Development	0	0	2.9 Sinuosity	М	oderate	Consistency	Non-cohesiv		•		0	
1.4 Adjacent Side	Left	Right	2.10 Riffles Type		mented	Bank Erosion	Le			_ength (ft)	0	
Hillside Slope	Flat	Flat	2.11 Riffle/Step Spa	acing (ft)	70	Erosion Length			Step 5, Chan	nel Bed ar	nd Planform Changes	
Continuous w/Som	etimes	Sometimes		•••		Erosion Height		0 2.50	5.1 Bar Types		<u></u>	
W/in 1 Bankfill Som	etimes	Sometimes	2.12 Substrate Con	nposition	1	Revetmt. Type	Rip-Ra	p None	Mid	2 Point	Side	
Texture No	t Evalua	Not Evalua	Bedrock	0	- %	Revetmt. Length	n (ft) 17	· /1 0	6	4	3	
1.5 Valley Features			Boulder	0	%	Near Bank Veg.	Type Le	eft Right	Diagonal	Delta	Island	
Valley Width (ft)	340		Cobble	5	%	Dominant	Herbaceou		1	0	0	
Width Determination	Estima	ated	Coarse Gravel	47	%	Sub-dominant	Shrubs/Sapl	in Shrubs/Saplin	5.2 Other Fea	atures		
Confinement Type	Broad	l	Fine Gravel	13	%	Bank Canopy	Le	eft Right	Flood Neck	Cutoff A	Avulsion Braiding	
Rock Gorge?	No		Sand	35	%	Canopy %	1-2	25 26-50	0 0) –	0 0	
Human-caused changed	d valley v	vidth? No				Mid-Channel C	anopy	Open	5.3 Steep Riff	les and He	ad Cuts	
						3.2 Riparian Buf	fer		Steep Riffles	Head Cu	ts Trib Rejuv.	
Notes:			Silt/Clay Present?	Y	es	Buffer Width	Le	eft Right	0	0	No	
Historic channel straigh	•		Detritus	5	%	Dominant	5-2	25 5-25	5.4 Stream Fo	ord or Anim	al No	
above the road crossing			# Large Woody		8	Sub-dominant	26-	50 26-50	5.5 Straighter	ning	Yes	
field. There is a signific as well as aggradation of			2.13 Average Large	est Partic	le on	Buffer Veg. Typ	e <u>Let</u>	t Right	5.5 Dredging		None	
the reach, suggesting st	•		Bed 6.0		inches	Dominant	Herbaceou	is Herbaceous				
A review of historic impa			Bar 3.0		inches	Sub-dominant	Shrubs/Sapl	in Shrubs/Saplin				
reveals historic and curr						3.3 Riparian Cor	ridor					
straightening, and redev sinuosity.	velopmer		2.14 Stream Type			Corridor Land	Le	eft Right				
en doory.			Stream Type:			Dominant	Cro	op Commercial				
Despite lower w:d ratio,			Bed Material:		l	Sub-dominant	Shrubs/Sapl	in Shrubs/Saplin				
	However, any further incision and			None			Amoun	t Mean Height	Note:			
entrnchment could lead	entrnchment could lead to a G-type channel.			Riffle-		Mass Failures						
Large amounts of armore at the outlet of the culve	-		2.15 Reference Str (if different from			Gullies	Nor	ne 0.00	Step 4.8 - C are on The s report - Step	second page	e of this	

· ·	EPF, CMB	nt: 0 Completion Data Rain	November 19, 2006 e: July 31, 2006 h: Yes
	At Jct. of Rt. 289 and River Rod (Rt. 11		
1.6 Grade Controls None		7. Rapid Geomorphic Assessment	Data
Total Height Desta Take	en GPSTaken		
Type Location Total Above Water (ft) Photo Tak		Score STI	D Historic
	7.1 Channel Degradation	11 Non	e Yes
	7.2 Channel Aggradation	9 Non	e No
	7.3 Widening Channel	12	No
	7.4 Change in Planform	10	Νο
		Total Score 42	
	Geon	norphic Rating 0.525	
	Channel Ev	volution Model F	
		volution Stage IV	
		phic Condition Fair	
		am Sensitivity Very High	
	Step 6. Rap	id Habitat Assessment Data	
4.8 Channel Constrictions	Stream Gradi	ent Type High	
Photo GPS Channel Floodprone		Score	
Type Width Taken? Taken? Constriction? Constriction	6.1 Epifaunal Substrate - Av	vailable Cover 13	
Instream 17.0 Yes No Yes Yes		mbeddedness 11	
Problem Deposition Below, Alignment	6.3 Velocity/D	epth Patterns 13	
Houldin Deposition Delow, agrinoite	6.4 Sedime	nt Deposition 8	
	6.5 Channe	I Flow Status 14	
	6.6 Chan	nel Alteration 7	
	6.7 Frequency of	Riffles/Steps 16	
	6.8	Bank Stability Left: 7 Rig	ht: 6
	6.9 Bank Vegetati		
	6.10 Riparian Vegetatio	•	
		Total Score 111	
	F	abitat Rating 0.555	
	Habitat S	tream Condition Fair	
Narrative:			

Aggradation and planform changes are evident, as well as some incision (see results for cross section). Observations of historic impacts and current conditions suggest stage IV to V of channel evolution for F model.

Organization: E	Alder Bro ssex Wat	terways Asso		Reach # Observers:	M02 EPF, C		Sec Why	ge 1 of 2 gment: 0 Not assessed:	November Completion	Date:	FIT: Yes July 31, 2006 Rain: Yes
Segment Length (ff Step 1. Valley 1.1 Segmentation No.	, and Flo	2,304 odplain		Stream Char		Step 3	reak in conifer buffer (and slope) along Rt. 2 Step 3. Riparian Features 3.1 Stream Banks				Flow Modifiers Abundant
1.2 Alluvial Fan	No		2.2 Max Dept		3.50	Typical Bank Slo	_		4.1 Springs / S 4.2 Adjacent V	•	Some
1.3 Corridor Encroach			2.3 Mean De		2.73	Bank Texture	Left	Right	4.3 Flow Statu		Low
Length (ft)	One	Both	2.4 Floodpror	()	85	Upper		<u></u>	4.4 # of Debris		8
Berms	64		2.5 Aband. F	、 ,	3.50	Material Type	Mix	Mix	4.5 Impoundm		None
Roads	301	-	2.6 Width/De	•	11.72	Consistency	Non-cohesive	Non-cohesive	-		
Railroads	0		2.7 Entrench		2.66	Lower			4.6 # of Storm		ts 1
Improved Paths	0	-	2.8 Incision F		1.00	Material Type	Gravel	Gravel	4.7 Upstream		None
Development	0	-	2.9 Sinuosity		Low	Consistency	Non-cohesive	Non-cohesive	•		0
1.4 Adjacent Side	Left	Right	2.10 Riffles T	vpe Sed	imented	Bank Erosion	Left	Right	Affected L		0
Hillside Slope V	ery Steep	· <u> </u>	2.11 Riffle/St		t) 150	Erosion Length ((ft) 228	144			d Planform Changes
Continuous w/S					,	Erosion Height (3.67	5.1 Bar Types		ia i lallioni onaligoo
W/in 1 Bankfill S	ometimes	Sometimes	2.12 Substrat	e Compositic	n	Revetmt. Type	, Rip-Rap	None	Mid	Point	Side
Texture	Silt/Clay	Silt/Clay	Bedrock	-	%	Revetmt. Length		0	3	4	9
1.5 Valley Features			Boulder	6	%	Near Bank Veg. 1		Right	Diagonal	Delta	Island
Valley Width (f	ft) 137		Cobble	21	%	Dominant	Coniferous	Coniferous	2	0	2
Width Determinatio	n Meas	ured	Coarse Grave	el 38	%	Sub-dominant	Herbaceous	Herbaceous	5.2 Other Feat	tures	-
Confinement Typ	e Narro	owly	Fine Gravel	22	%	Bank Canopy	Left	Right	Flood Neck C		vulsion Braiding
Rock Gorge	? No	-	Sand	13	%	Canopy %	76-100	76-100		<u> </u>	<u>0 1</u>
Human-caused chang	ged valley	width? No				Mid-Channel Ca	nopy C	losed	5.3 Steep Riffl	es and Hea	ad Cuts
						3.2 Riparian Buffe	er		Steep Riffles	Head Cut	
Notes:			Silt/Clay Pres	ent?	Yes	Buffer Width	Left	Right	2	0	No
Many planform chang			Detritus	3	%	Dominant	>100	>100	5.4 Stream Fo	rd or Anima	al No
aggradation and abu			# Large Woo	dy	27	Sub-dominant	None	51-100	5.5 Straighten		No
apparent straightenir	ng due to ti	ight valley and	2.13 Average	Largest Part	icle on	Buffer Veg. Type	e Left	Right	5.5 Dredging	5	None
steep side slopes.			Bed	20.0	inches	Dominant	Coniferous	Coniferous	<u>-</u> <u>-</u>		
Despite low entrench	ment valu	e and low w:d,	Bar	2.5	inches	Sub-dominant	Deciduous	Deciduous			
this reach is a C-type						3.3 Riparian Corr	idor				
reach where physica			2.14 Stream	Туре		Corridor Land	Left	Right			
severe, slope is sligh bedform dominates (Stream	Туре: С		Dominant	Forest	Forest				
reference bedform).				terial: Grave		Sub-dominant	Commercial	Commercial			
reach, slope is slightl	ly less and	l riffle-pool		Slope: None			Amount	Mean Height	Note:		
	edorm is likely reference. Segmentation vas not deeded necessary b/c of the overall				e Bed	Mass Failures Multiple 17.00 Step 1.6 - Grade Cont			ade Contro	ols and	
homogeneity of the e			2.15 Referen	-		Gullies Multiple 7.50 Step 4.8 - Channel Constrict			strictions		
nonlogeneity of the e			(if differer	t from Phase	e 1)		-		are on The se report - Steps		

Project: Stream: Organizatio Segment L	on: Es	lder Bro sex Wate		Association Seam	Reach # Observers:	EPF, CMB		page 2 of 2 Segment: 0 Fer (and slope) along Rt. 28		Rain:	
	ade Contro		_,					Step 7. Rapid Geomo	-		
110 010			т	otal Height				Confinement Type Confin	•		
Туре	Locat	ion	Total	bove Water (ft)	Photo Take	n GPSTaken			Score	STD	Historic
							7.1 Channe	el Degradation	14	None	No
							7.2 Channe	el Aggradation	13	None	Νο
							7.3 Wideni	ng Channel	13		Νο
							7.4 Change	e in Planform	14		Νο
								Total Score	54		
								Geomorphic Rating	0.675		
								Channel Evolution Model	D		
								Channel Evolution Stage	IIb		
								Geomorphic Condition	Good		
								Stream Sensitivity	Moderate		
								Step 6. Rapid Habitat Asse	ssment Data		
4.8 Cha	nnel Cons	trictions						·	High		
		Photo	GPS	Channel	Floodprone				9	Score	
Туре	Width	Taken?	Taken?	Constriction?	Constriction?		6.1 Epifaunal	Substrate - Available Cover		13	
Instrea	m 20.0	Yes	No	Yes	Yes			6.2 Embeddedness		8	
	roblem S			103	103			6.3 Velocity/Depth Patterns		14	
Bedrock			No	No	Yes			6.4 Sediment Deposition		8	
Р	roblem [Depositio	on Above	2				6.5 Channel Flow Status		9	
								6.6 Channel Alteration		15	
							6.	7 Frequency of Riffles/Steps		17	
								6.8 Bank Stability	Left: 7		
							6.9	Bank Vegetation Protection	Left: 9	Right	: 9
							6.10 Ripa	rian Vegetation Zone Width	Left: 10		t: 9
								Total Score		135	
								Habitat Rating	0	.675	
Narrative	0.							Habitat Stream Condition	า	Good	
		each stab	le w/ few	historic or curre	nt impacts. F	lowever, upper s	section of reac	h undergoing sign. aggrad. du	le to impacts	from re	cent Rt. 289

Lower section of reach stable w/ few historic or current impacts. However, upper section of reach undergoing sign. aggrad. due to impacts from recent Rt. 289 construction.

Project: Alder E Stream: A	Brook Alder Broo	ok	R	Phase each # M03	e 2 Segment S	, and the second s	ge 1 of 2 gment: A	November Completion	-	FIT: Yes ugust 1, 2006	
		erways Asso		ervers: EPF, S	NL	•	Not assessed:	Completion		Rain: Yes	
Segment Length (ft)		2,500		•	irst box culvert	,		round. Acces	s by parki		
Step 1. Valley	and Floo	dplain	Step 2. Stream	m Channel	Step	3. Riparian Feat	•	Step 4	. Flow & Flo	ow Modifiers	
1.1 Segmentation Ch		ensions			3.1 Stream Banks			4.1 Springs / Seeps Abundant			
1.2 Alluvial Fan	No		2.2 Max Depth (ft)	3.60	Typical Bank Sl	• •	D : 14	4.2 Adjacent V		Some	
1.3 Corridor Encroach			2.3 Mean Depth (ft)		Bank Texture	Left	Right	4.3 Flow Statu	-	Moderate	
Length (ft)	One	Both	2.4 Floodprone Wig		Upper			4.4 # of Debris		7	
Berms	434	0	2.5 Aband. Floodpl		Material Type	Silt/Clay	Silt/Clay	4.5 Impoundm		None	
Roads	237	0	2.6 Width/Depth Ra	atio 15.97	Consistency	Cohesive	Cohesive	Impoundmt.			
Railroads	0	0	2.7 Entrenchment I	Ratio 1.67	Lower			4.6 # of Storm	water Inputs	3	
Improved Paths	0	0	2.8 Incision Ratio	1.00	Material Type	Gravel	Gravel	4.7 Upstream	Flow	None	
Development	0	0	2.9 Sinuosity	Low	Consistency	Non-cohesive	Non-cohesive	4.9 # of Beave	er Dams	0	
1.4 Adjacent Side	Left	Right	2.10 Riffles Type	Not	Bank Erosion	Left	Right	Affected L	ength (ft)	0	
Hillside Slope Ve	ery Steep	Steep	2.11 Riffle/Step Sp	acing (ft) N/A	Erosion Length	(ft) 134	179	Step 5. Chanı	nel Bed and	Planform Change	
Continuous w/So	metimes	Sometimes			Erosion Height	(ft) 3.00	4.67	5.1 Bar Types			
W/in 1 Bankfill	Always	Always	2.12 Substrate Cor	nposition	Revetmt. Type	Rip-Rap	None	Mid	Point	Side	
Texture	Silt/Clay	Silt/Clay	Bedrock	0 %	Revetmt. Length	(ft) 259	0	6	10	6	
1.5 Valley Features			Boulder	15 %	Near Bank Veg.	Type Left	Right	Diagonal	Delta	Island	
Valley Width (ft) 157		Cobble	49 %	Dominant	Coniferous	Coniferous	2	1	0	
Width Determination		red	Coarse Gravel	10 %	Sub-dominant	Deciduous	Deciduous	5.2 Other Feat		Ū	
Confinement Type	e Semi-c	confined	Fine Gravel	17 %	Bank Canopy	Left	Right	Flood Neck C		ulsion Braiding	
Rock Gorge			Sand	9 %	Canopy %	76-100	76-100				
Human-caused chang		vidth? No		• /•	Mid-Channel Ca		losed	5.3 Steep Riffl	oo ood Uooo	•	
					3.2 Riparian Buff		looou	· · · ·			
Notes:			Silt/Clay Present?	Yes	Buffer Width	Left	Right	Steep Riffles	Head Cuts	<u>Trib Rejuv.</u> No	
There is a short section	on of the low	ver segment	Detritus	2 %	Dominant	>100	>100	0	0		
where straightening h		•						5.4 Stream Fo		No	
culvert installation.			# Large Woody	34	Sub-dominant	26-50	None	5.5 Straighten	ng	No	
			2.13 Average Large		Buffer Veg. Typ		Right	5.5 Dredging		None	
The areas where agg		-	Bed 12.0	inches	Dominant	Coniferous	Coniferous				
features were found a			Bar 4.0	inches	Sub-dominant	Herbaceous	Deciduous				
of debris jams in the u			2.14 Stream Type		3.3 Riparian Cor	ridor					
failures.	egment - which are also causing mass			_	Corridor Land	Left	Right				
				В	Dominant	Forest	Forest				
	ope of this segment is higher than segmen			Bed Material: Cobble		Commercial	None				
	This segment has not seen significant			None		Amount	Mean Height	Note:			
historic impacts and is	•	•		Plane Bed	Mass Failures						
	y Rt. 289 construction. It is a stable (stage plane bed reach, especially in the lower			eam Type	Gullies One 10.00			Step 4.8 - Channel Constrictions			
	plane bed reach, especially in the lower action approx. 500 feet above road crossing.			n Phase 1)				are on The second page of this report - Steps 6 through 7.			
			B 3 No	n Plane Bed				report - Steps	s o through 7	•	

Project: Stream: Organizatio Segment L	on: Es	lder Broo sex Wate	-	Association	Reach # Observers:	EPF, SNL	-	page 2 of 2 Segment: A r Rt. 289 up to the turna		Rain:	
	ade Contro		2,500	Segin				•			
1.0 014		<u>None</u>		Tatal IIaiaht				Step 7. Rapid Geomo onfinement Type Plane	•	ient Dat	<u>d</u>
Туре	Locat	ion	Tatal	Total Height Above Water (ft)	Photo Take	n GPSTaken		onimement rype Flane	Score	STD	Historic
							7.1 Channel	Degradation	14	None	Νο
							7.2 Channel /	Aggradation	13	None	No
							7.3 Widening	Channel	13		No
							7.4 Change i	n Planform	14		Νο
								Total Score	54		
								Geomorphic Rating	0.675		
								Channel Evolution Model Channel Evolution Stage Geomorphic Condition Stream Sensitivity	F I Good Moderate		
								Step 6. Rapid Habitat Asse	ssment Data		
4.8 Chai	nnel Const	trictions					9	Stream Gradient Type	High		
		Photo	GPS	Channel	Floodprone				S	core	
Туре	Width	Taken?	Taken?		Constriction?		6.1 Epifaunal S	ubstrate - Available Cover		14	
Instream	m 20.0	Yes	No	Yes	Yes			6.2 Embeddedness		12	
	roblem D				105		6.	3 Velocity/Depth Patterns		11	
								6.4 Sediment Deposition		10	
								6.5 Channel Flow Status		12	
								6.6 Channel Alteration		9	
							6.7 F	Frequency of Riffles/Steps		16	
								6.8 Bank Stability	Left: 8	0	
								ank Vegetation Protection	Left: 9	0	
							6.10 Riparia	an Vegetation Zone Width	Left: 7		9
								Total Score		34	
								Habitat Rating	0	.67	
Narrative	e:							Habitat Stream Condition	n (Good	

Stable plane bed reach with some aggradation noted around mass failures.

	Ider Bro	ook erways Asso		Phase each # M03 ervers: EPF, S	e 2 Segment S	Se	ge 1 of 2 gment: B Not assessed:	November 19, 200 Completion Date:	6 FIT: Yes August 1, 2006 Rain: Yes	
Segment Length (ft)		1,671						m aast Accass fra	m Rt. 289 tunraround	
Step 1. Valley a 1.1 Segmentation Cha	and Floo	odplain	Step 2. Streat 2.1 Bankfull Width		i.	3. Riparian Feat		Step 4. Flow & Flow Modifiers 4.1 Springs / Seeps Abundant		
	No		2.2 Max Depth (ft)	4.65		lope Undercut		4.2 Adjacent Wetland	s Abundant	
1.3 Corridor Encroach			2.3 Mean Depth (ft		Bank Texture	Left	Right	4.3 Flow Status	Moderate	
Length (ft)	One	Both	2.4 Floodprone Wid		Upper			4.4 # of Debris Jams	3	
Berms	656		2.5 Aband. Floodpl		Material Type	Mix	Mix	4.5 Impoundments	None	
Roads	0		2.6 Width/Depth Ra		Consistency	Non-cohesive	Non-cohesive	Impoundmt. Locatio	n	
Railroads	0	0	2.7 Entrenchment I		Lower			4.6 # of Stormwater Ir		
Improved Paths	0	0	2.8 Incision Ratio	1.00	Material Type	Mix	Mix	4.7 Upstream Flow	None	
Development	0	0	2.9 Sinuosity	Moderate	Consistency	Non-cohesive	Non-cohesive	4.9 # of Beaver Dam	s 0	
1.4 Adjacent Side	Left	Right	2.10 Riffles Type	Sedimented	Bank Erosion	Left	Right	Affected Length (f	ft) O	
Hillside Slope Ve	ry Steep	Steep	2.11 Riffle/Step Sp	acing (ft) 175	Erosion Length	(ft) 52	97	Step 5. Channel Bed	I and Planform Changes	
Continuous w/So	metimes	Sometimes			Erosion Height	(ft) 5.00	6.00	5.1 Bar Types	<u> </u>	
W/in 1 Bankfill So	metimes	Sometimes	2.12 Substrate Cor	nposition	Revetmt. Type	Rip-Rap	None	Mid Poir	nt Side	
Texture	Silt/Clay	Silt/Clay	Bedrock	0 %	Revetmt. Lengt	h (ft) 54	0	0 3	6	
1.5 Valley Features			Boulder	0 %	Near Bank Veg.	Type Left	Right	Diagonal Delt	a Island	
Valley Width (ft)) 157		Cobble	27 %	Dominant	Herbaceous	Shrubs/Saplin	1 0	0	
Width Determination	Meas	ured	Coarse Gravel	36 %	Sub-dominant	Shrubs/Saplin	Deciduous	5.2 Other Features		
Confinement Type	e Narro	w	Fine Gravel	16 %	Bank Canopy	Left	Right	Flood Neck Cutoff	Avulsion Braiding	
Rock Gorge?	No		Sand	21 %	Canopy %	1-25	26-50	0 0	0 0	
Human-caused change	ed valley	width? No			Mid-Channel C	anopy	Open	5.3 Steep Riffles and	Head Cuts	
					3.2 Riparian Buf	ffer		Steep Riffles Head	Cuts Trib Rejuv.	
Notes:			Silt/Clay Present?	Yes	Buffer Width	Left	Right	2 0	No	
Straightening along Rt			Detritus	4 %	Dominant	26-50	>100	5.4 Stream Ford or Ar	nimal Yes	
construction and berm			# Large Woody	10	Sub-dominant	5-25	None	5.5 Straightening	Yes	
the stream corridor. A stream ford and will be		•	2.13 Average Large	est Particle on	Buffer Veg. Typ	be <u>Left</u>	Right	5.5 Dredging	None	
			Bed 8.0	inches	Dominant	Shrubs/Saplin	Shrubs/Saplin			
This segment has a m			Bar 3.0	inches	Sub-dominant	Herbaceous	Mixed Trees			
and has been much m		•			3.3 Riparian Co	rridor				
construction and berm widening, as noted in			2.14 Stream Type		Corridor Land	Left	Right			
main adjustment proce			Stream Type:		Dominant	Shrubs/Saplin	Shrubs/Saplin			
bedorm is still pervais	ve througl	hout, however	Bed Material:		Sub-dominant	Commercial	Forest			
plane bedform is also		and will likely	Subclass Slope:			Amount	Mean Height	Note:		
replace the reference	eplace the reference bedform.			Riffle-Pool	Mass FailuresMultiple20.80Step 1.6 - Grade Controls a					
				ream Type	Gullies None 0.00 Step 4.8 - Channel Constriction are on The second page of the					
			(if different from	n Phase 1)				report - Steps 6 through		

Project: Stream: Organizatio	on: Essex	r Brook Waterwa	ys Association	Reach # Observers:	EPF, SNL	-	page 2 of 2 Segment: B	·	Rain:	
Segment Le	,	1,6	71 Segm	ent Location:	From Rt. 289	turnaround	up to tributary entering			
1.6 Gra	de Controls	None					Step 7. Rapid Geo		ment Da	ta
Туре	Location	Tota	Total Height Above Water (ft)	Photo Take	n GPSTaken		Confinement Type Con	fined Score	STD	Historic
						7.2 Channe 7.3 Wideni	el Degradation el Aggradation ng Channel e in Planform	12 10 11 9	None None	No No No No
							Total Sco Geomorphic Ratir	re 42		
							Channel Evolution Mod Channel Evolution Stag Geomorphic Conditio Stream Sensitivi	je IId on Fair		
							Step 6. Rapid Habitat As	sessment Data		
4.8 Char	nnel Constrict	ions None					Stream Gradient Type	High		
		oto GPS	Channel	Floodprone					Score	
Туре		ken? Take		Constriction?		6.1 Epifaunal	Substrate - Available Cove	r	8	
							6.2 Embeddednes		7	
							6.3 Velocity/Depth Pattern		6	
							6.4 Sediment Deposition		4	
							6.5 Channel Flow Statu		7	
							6.6 Channel Alteration		6	
						6.	7 Frequency of Riffles/Step		13	
						()	6.8 Bank Stability		B Right	
							Bank Vegetation Protection		Right	
							arian Vegetation Zone Widtl Total Score		Right	
							Habitat Rating).47	
Narrative			ac ocnocially along				Habitat Stream Condi	tion	Fair	

Aggradation and planform changes, especially along sections affected by Rt. 289 berming and construction.

-	aterways Asso	ciation Obse	each # M04 ervers: EPF, S		Sec Why	ge 1 of 2 gment: 0 Not assessed:		August 2, 2006 Rain: Yes	
Segment Length (ft): Step 1. Valley and Flc 1.1 Segmentation None	2,507 podplain	Segment Loo Step 2. Strean 2.1 Bankfull Width		1	3. Riparian Feat	1	289 up to 2nd box culvert crossing of Rt. Step 4. Flow & Flow Modifiers 4.1 Springs / Seeps Abundant		
1.2 Alluvial Fan No		2.2 Max Depth (ft)	4.25	Typical Bank S			4.2 Adjacent Wetland		
1.3 Corridor Encroachments		2.3 Mean Depth (ft)		Bank Texture	Left	Right	4.3 Flow Status	Moderate	
Length (ft) One	e Both	2.4 Floodprone Wid		Upper		<u>rugn</u>	4.4 # of Debris Jams	12	
Berms 53		2.5 Aband. Floodplr	. ,	Material Type	Silt/Clay	Silt/Clay	4.5 Impoundments	None	
Roads 32		2.6 Width/Depth Ra		Consistency	Cohesive	Cohesive	·		
	0 0	2.7 Entrenchment R		Lower	oonesive	Concente	4.6 # of Stormwater I		
	0 0	2.8 Incision Ratio	1.00	Material Type	Mix	Mix	4.7 Upstream Flow	None	
•	0 0	2.9 Sinuosity	Moderate	Consistency	Non-cohesive	Non-cohesive	•		
1.4 Adjacent Side Let		2.10 Riffles Type	Sedimented	Bank Erosion	Left	Right	Affected Length		
Hillside Slope Very Steel		2.11 Riffle/Step Spa		Erosion Length		<u>1 (ign</u>	C C	d and Planform Changes	
Continuous w/Sometime				Erosion Height		0.00	5.1 Bar Types	u anu Planorni Changes	
W/in 1 Bankfill Sometime		2.12 Substrate Corr	position	Revetmt. Type	Rip-Rap	Rip-Rap	Mid Poi	nt Side	
Texture Silt/Cla		Bedrock	0 %	Revetmt. Lengtl		74	<u>6 5</u>		
1.5 Valley Features	,	Boulder	0 %	Near Bank Veg.		Right		-	
Valley Width (ft) 158		Cobble	28 %	Dominant	Shrubs/Saplin \$	_	Diagonal Del		
	sured	Coarse Gravel	34 %	Sub-dominant	Coniferous	Coniferous	5.2 Other Features	U	
	ni-confined	Fine Gravel	13 %	Bank Canopy	Left	Right	Flood Neck Cutoff	Avulsion Braiding	
Rock Gorge? No		Sand	25 %	Canopy %	51-75	51-75			
Human-caused changed valley	/ width? No	Cana	10 /0	Mid-Channel C		losed	5.3 Steep Riffles and	•	
				3.2 Riparian Buf		10000	· · ·	I Cuts Trib Rejuv.	
Notes:		Silt/Clay Present?	Yes	Buffer Width	Left	Right	<u>3</u> 0	No	
Some straightening around Rt	. 289 at inlet to	Detritus	4 %	Dominant	>100	>100	5.4 Stream Ford or A		
box culvert. Many mass failure		# Large Woody	23	Sub-dominant	5-25	None	5.5 Straightening	Yes	
reach, especially in upper sect		2.13 Average Large		Buffer Veg. Typ		Right	5.5 Dredging	None	
where impacts from road/berm	n are most	Bed 6.0	inches	Dominant	Coniferous	Coniferous	5.5 Dredging	None	
obvious.		Bar 3.0	inches		Shrubs/Saplin	Mixed Trees			
Widening apparent in channel	dimensions	Dai 3.0	menes	3.3 Riparian Cor					
and in bar features in vicinity c		2.14 Stream Type		Corridor Land	Left	Right			
		Stream Type:	С	Dominant	Forest	Forest			
		Bed Material:		Sub-dominant	Commercial	None			
		Subclass Slope:			Amount	Mean Height	Noto		
		-	Riffle-Pool						
		2.15 Reference Stre		Gullies	One	20.00	Step 4.8 - Channel		
		(if different from		Guilles	One	20.00	are on The second report - Steps 6 thro	page of this	

Project: Stream: Organizatio	on: Essex	er Brook Waterv	vays	Association	Reach # Observers:	EPF, SNL	·	page 2 of 2 Segment: 0		Rain:	
Segment Le			2,507	Segm	ent Location:	From bend of	main stem i	nto conifer woods off Rt. 2	-		
1.6 Gra	de Controls	None						Step 7. Rapid Geom	•	nent Dat	ta
Tupo	Location	т	-+-1	Total Height	Dhoto Tako	n GPSTaken		Confinement Type Uncor			
Туре	LUCATION		Jiai	Above Water (ft)	PHOLO TAKE	I GPSTAKEII			Score	STD	Historic
								el Degradation	11	None	Νο
								el Aggradation	10	None	Νο
							7.3 Wideniı	ng Channel	11		Νο
							7.4 Change	e in Planform	8		Νο
								Total Score	40		
								Geomorphic Rating	0.5		
								Channel Evolution Model Channel Evolution Stage Geomorphic Condition Stream Sensitivity	IIc Fair		
								Step 6. Rapid Habitat Asse	essment Data		
4.8 Char	nnel Constric	tions						Stream Gradient Type	High		
	Ph	noto Gl	PS	Channel	Floodprone				5	core	
Туре	Width Ta	aken? Ta	aken?	Constriction?	Constriction?		6.1 Epifaunal	Substrate - Available Cover		9	
Instream	m 20.0 Ye	es N	lo	Yes	Yes			6.2 Embeddedness		7	
	roblem Dep							6.3 Velocity/Depth Patterns		7	
								6.4 Sediment Deposition		6	
								6.5 Channel Flow Status		6	
								6.6 Channel Alteration		9	
							6.	7 Frequency of Riffles/Steps		16	
								6.8 Bank Stability	Left: 6	0	
								Bank Vegetation Protection	Left: 5	-	
							6.10 Ripa	rian Vegetation Zone Width	Left: 3		: 6
								Total Score		95	
								Habitat Rating	0.	475	
Narrative	e:							Habitat Stream Conditio	n	Fair	

High degree of aggradation and changes in planform from gullies entering in reach and reaches above.

Project: Alder Br Stream: Al	rook der Bro	ok	F	leach #		2 Segment S	Summary	-	ge 1 of 2 gment: 0	November Completion I		FIT: Yes August 2, 2006
Organization: Ess	ex Wate	erways Asso	ciation Obs	ervers:	EPF, SN	L		-	Not assessed:	·		Rain: Yes
Segment Length (ft):		2,658			-			-		entering from	north. Ac	ccess from end o
Step 1. Valley a		dplain	Step 2. Strea 2.1 Bankfull Width	m Chan	nel 34	Step 3.1 Stream Bank	3. Riparian	Featu	ires	Step 4 4.1 Springs / S		low Modifiers Abundant
1.2 Alluvial Fan	No		2.2 Max Depth (ft)		3.20	Typical Bank Sl	lope Under	cut		4.2 Adjacent V	Vetlands	Abundant
1.3 Corridor Encroachm	nents		2.3 Mean Depth (f	t)	2.30	Bank Texture		Left	Right	4.3 Flow Statu	s	Moderate
Length (ft)	One	Both	2.4 Floodprone W	dth (ft)	94	Upper				4.4 # of Debris	Jams	13
Berms	487	0	2.5 Aband. Floodp	In	3.20	Material Type	Silt/0	Clay	Silt/Clay	4.5 Impoundm	ents	None
Roads	162	0	2.6 Width/Depth R	atio	14.78	Consistency	Cohe	sive	Cohesive	Impoundmt.	Location	
Railroads	0	0	2.7 Entrenchment	Ratio	2.76	Lower				4.6 # of Storm	water Input	s 1
Improved Paths	0	0	2.8 Incision Ratio		1.00	Material Type		Mix	Mix	4.7 Upstream	Flow	None
Development	0	0	2.9 Sinuosity	м	oderate	Consistency	Non-cohe		Non-cohesive	4.9 # of Beave		0
.4 Adjacent Side	Left	Right	2.10 Riffles Type		imented	Bank Erosion		Left	Right	Affected L	ength (ft)	0
Hillside Slope	Steep	Steep	2.11 Riffle/Step St			Erosion Length		78	213		• • •	d Planform Change
Continuous w/ Sor	netimes	Sometimes		U V	, 	Erosion Height		3.00	2.25	5.1 Bar Types	<u></u>	
W/in 1 Bankfill Som	netimes	Sometimes	2.12 Substrate Co	mpositio	n	Revetmt. Type	Rip-	Rap	Rip-Rap	Mid	Point	Side
Texture	Silt/Clay	Silt/Clay	Bedrock	. 0	%	Revetmt. Length	-	148	176	3	8	4
.5 Valley Features			Boulder	11	%	Near Bank Veg.		Left	Right	Diagonal	Delta	Island
Valley Width (ft)	125		Cobble	47	%	Dominant	Conifer		Coniferous	2	0	0
Width Determination	Measu	ired	Coarse Gravel	21	%	Sub-dominant	Herbace	ous	Herbaceous	5.2 Other Feat	•	Ū
Confinement Type	Semi-o	confined	Fine Gravel	15	%	Bank Canopy		Left	Right	Flood Neck C		vulsion Braiding
Rock Gorge?	No		Sand	6	%	Canopy %	51	1-75	51-75		<u>/////////////////////////////////////</u>	0 1
luman-caused changed	d valley w	vidth? No				Mid-Channel Ca	anopy	с	losed	5.3 Steep Riffle	es and Hea	•
5						3.2 Riparian Buf				Steep Riffles	Head Cut	
Notes:			Silt/Clay Present?	Y	/es	Buffer Width		Left	Right	2	0	No
Berming and armoring	of channe	el in vicinity of	Detritus	2	%	Dominant		>100	>100	5.4 Stream Fo	•	
Rt. 289. Valley tightens	-	-	# Large Woody		42	Sub-dominant	N	lone	5-25	5.5 Straighteni		No
oad crossing. Aggrada		widening are	2.13 Average Larg	est Parti	cle on	Buffer Veg. Typ		_eft	Right	5.5 Dredging		None
dominant processes in	reach.		Bed 11.0	·	inches	Dominant	- Mixed T		Mixed Trees	0.0 Dredging		None
			Bar 4.0		inches	Sub-dominant	Herbace	ous	Herbaceous			
						3.3 Riparian Cor	ridor					
			2.14 Stream Type			Corridor Land		Left	Right			
			Stream Type			Dominant		rest	Forest			
			Bed Materia	: Cobb	le	Sub-dominant		lone	Commercial			
			Subclass Slope	None			Amo		Mean Height	Note:		
			Bed Form	: Riffle	-Pool	Mass Failures	-	tiple	20.25	Step 1.6 - Gra	ade Control	ls and
			2.15 Reference S	ream Ty	ре	Gullies		One	12.00	Step 4.8 - Ch	annel Cons	strictions
			(if different from	n Phase	1)					are on The se report - Steps		

Stream:Alder BrookReach #Organization:Essex Waterways AssociationObservers:	EPF, SNL Rain: Yes
	From 2nd box culvert under Rt. 289 up to tributary entering from north. Access from
1.6 Grade Controls None	Step 7. Rapid Geomorphic Assessment Data
Type Location Total Height Above Water (ft) Photo Taker	n GPSTaken Confinement Type Confined Score STD Historic
	7.1 Channel Degradation12NoneNo7.2 Channel Aggradation9NoneNo7.3 Widening Channel10No7.4 Change in Planform9No
	Total Score 40 Geomorphic Rating 0.5
	Channel Evolution Model D Channel Evolution Stage IIb Geomorphic Condition Fair Stream Sensitivity Very High
	Step 6. Rapid Habitat Assessment Data
4.8 Channel Constrictions	Stream Gradient Type High
Photo GPS Channel Floodprone	Score
Type Width Taken? Taken? Constriction? Constriction?	
Instream 20.0 Yes No Yes Yes	6.2 Embeddedness 10
Problem Deposition Above	6.3 Velocity/Depth Patterns 10
	6.4 Sediment Deposition86.5 Channel Flow Status10
	6.6 Channel Alteration 13
	6.7 Frequency of Riffles/Steps 16
	6.8 Bank Stability Left: 4 Right: 5
	6.9 Bank Vegetation Protection Left: 9 Right: 9
	6.10 Riparian Vegetation Zone Width Left: 8 Right: 8
	Total Score 122
	Habitat Rating 0.61
Narrative:	Habitat Stream Condition Fair

Areas of significant aggradation, widening and changes in planform.

	er Brook	k ways Asso	ciation		ach # I vers: I	M06	e 2 Segment Su NL	Se	ige 1 of 2 gment: 0 Not assessed:	Novembe Completion	r 19, 2006 Date:	FIT: Yes August 3, 2006 Rain: Yes
Segment Length (ft):		4,609		nent Loca	ation:	From v	where small trib er	nters from no	orth at M05/M0	6 reach break	up to sha	arp bend and mass
Step 1. Valley and 1.1 Segmentation None	l Flood	plain	Step 2 2.1 Bankfu	2. Stream	Channe	<u>el</u> 48	Step 3. 3.1 Stream Banks	Riparian Feat	ures	4.1 Springs / 3		Flow Modifiers Abundant
1.2 Alluvial Fan No			2.2 Max De	epth (ft)		3.50	Typical Bank Slop	e Undercut		4.2 Adjacent V	Vetlands	Abundant
1.3 Corridor Encroachment	nts		2.3 Mean D	Depth (ft)		2.34	Bank Texture	Left	Right	4.3 Flow Statu	IS	Low
Length (ft)	One	Both	2.4 Floodp	rone Width	า (ft)	135	Upper			4.4 # of Debris	s Jams	20
Berms	0	0	2.5 Aband.	Floodpln		3.70	Material Type	Silt/Clay	Silt/Clay	4.5 Impoundm	nents	None
Roads	0	0	2.6 Width/	Depth Rati	0	20.51	Consistency	Cohesive	Cohesive	Impoundmt.	Location	
Railroads	0	0	2.7 Entrend	chment Ra	atio	2.81	Lower			4.6 # of Storm	water Inpu	ts 0
Improved Paths	0	0	2.8 Incisior	n Ratio		1.06	Material Type	Silt/Clay	Silt/Clay	4.7 Upstream	Flow	None
Development	0	0	2.9 Sinuosi	ity		High	Consistency	Cohesive	Cohesive	4.9 # of Beav	er Dams	1
1.4 Adjacent Side	Left	Right	2.10 Riffles	Туре	Sedim	-	Bank Erosion	Left	Right	Affected L	ength (ft).	500
Hillside Slope S	Steep V	Very Steep	2.11 Riffle/	Step Spac	cing (ft)	225	Erosion Length (ft) 57	192	Step 5. Chan	nel Bed ar	nd Planform Changes
Continuous w/Someti	times S	Sometimes					Erosion Height (ft)	3.00	4.00	5.1 Bar Types		
W/in 1 Bankfill Someti	times S	Sometimes	2.12 Subst	rate Comp	osition		Revetmt. Type	None	None	Mid	Point	Side
Texture Silt	t/Clay	Silt/Clay	Bedrock		0	%	Revetmt. Length (f	t) O	0	9	6	10
1.5 Valley Features			Boulder		0 9	%	Near Bank Veg. Ty	pe Left	Right	Diagonal	Delta	Island
Valley Width (ft) 1	192		Cobble		51 9	%	Dominant	Coniferous	Herbaceous	2	2	3
Width Determination	Measure	ed	Coarse Gra	avel	28 9	%	Sub-dominant	Coniferous	Herbaceous	5.2 Other Fea	tures	-
Confinement Type	Semi-co	onfined	Fine Grave		12 9	%	Bank Canopy	Left	Right	Flood Neck (Avulsion Braiding
Rock Gorge?	No		Sand		9 9	%	Canopy %	51-75	51-75			<u> </u>
Human-caused changed va	alley wid	th? No					Mid-Channel Can	ору С	losed	5.3 Steep Riff	les and He	ad Cuts
							3.2 Riparian Buffer			Steep Riffles	Head Cu	
Notes:			Silt/Clay Pr	esent?	Ye	s	Buffer Width	Left	Right	1	0	No
No significant straightening	ig observ	/ed, but	Detritus		3 9	%	Dominant	>100	>100	5.4 Stream Fo	ord or Anim	al Yes
multiple ATV crossings thr	-		# Large Wo	oody	5	7	Sub-dominant	None	None	5.5 Straighten		No
reach. These have been r	noted as	"fords" and	2.13 Avera	ge Larges	t Particle	e on	Buffer Veg. Type	Left	Right	5.5 Dredging		None
will be entered w/ FIT.			Bed	9.0	iı	nches	Dominant	Mixed Trees	Mixed Trees	0.0 2.0039		
Many mass failures, abund	dant bar	features	Bar	3.5		nches	Sub-dominant	None	None			
indicate aggradation and w	widening	l.					3.3 Riparian Corrid	or				
Numerous gullies enter rea			2.14 Stream	m Type			Corridor Land	Left	Right			
surrounding neighborhood them large sediment loads		•		m Type:	С		Dominant	Forest	Forest			
buffer conditions, reach is			Bed I	Material:	Cobble		Sub-dominant	None	None			
stage IIb of channel evolut				s Slope:				Amount	Mean Height	Note:		
			Be	d Form:	Riffle-P	ool	Mass Failures	Multiple	25.64	Step 1.6 - Gr	ade Contro	ols and
			2.15 Refer	ence Strea	am Type	2	Gullies	Multiple	8.67	Step 4.8 - Cł	nannel Con	strictions
			(if differ	rent from F	Phase 1))			'	are on The s report - Step		

Project:Alder BrookStream:Alder BrookReach #Organization:Essex Waterways AssociationObservers:	EPF, SNL	November 19, 2006 Completion Date: August 3, 2006 Rain: Yes
	From where small trib enters from north at M05/	
1.6 Grade Controls None		omorphic Assessment Data
Total Height Type Location Total Above Weter (ft) Photo Take	n GPSTaken	nfined
Type Location Total Above Water (ft) Photo Take		Score STD Historic
	7.1 Channel Degradation	12 None No
	7.2 Channel Aggradation	8 None No
	7.3 Widening Channel	9 No
	7.4 Change in Planform	10 No
	Total Sco	ore 39
	Geomorphic Rat	ng 0.4875
	Channel Evolution Mo	del D
	Channel Evolution Sta	
	Geomorphic Condit	-
	Stream Sensitiv	
	Step 6. Rapid Habitat A	ssessment Data
4.8 Channel Constrictions None	Stream Gradient Type	High
Photo GPS Channel Floodprone		Score
Type Width Taken? Taken? Constriction? Constriction?	6.1 Epifaunal Substrate - Available Cov	
	6.2 Embeddedne	
	6.3 Velocity/Depth Pattern	ns 9
	6.4 Sediment Deposition	
	6.5 Channel Flow State	JS 7
	6.6 Channel Alteration	on 16
	6.7 Frequency of Riffles/Ste	
	6.8 Bank Stabili	ty Left: 4 Right: 5
	6.9 Bank Vegetation Protection	on Left: 9 Right: 9
	6.10 Riparian Vegetation Zone Wid	
	Total Sco	
	Habitat Ratir	g 0.595
Narrative:	Habitat Stream Conc	ition Fair

As in many of the downstream reaches, significant aggradation and widening occurring throughout reach. This leads to many debris jams and changes in planform.

Stream:	Brook Alder Bro ssex Wat	ook terways Asso	ciation	Reach # Observers:	M07	e 2 Segment S NL	S	page 1 of 2 segment: 0 ny Not assessed:	November Completion	-	FIT: Yes J gust 3, 2006 Rain: Yes
Segment Length (f	t):	1,914	Segme	nt Location:	From a	approx. 800 feet l	below Rt. 15	crossing to jus	t above Rt. 128	B crossing.	Access from
Step 1. Valley		odplain	Step 2. 3 2.1 Bankfull V	Stream Chan Vidth	<u>nel</u> 35	Step 3 3.1 Stream Banks	<mark>3. Riparian Fe</mark> s	atures	Step 4 4.1 Springs / S	. Flow & Flo Seeps	w Modifiers Abundant
1.2 Alluvial Fan	No		2.2 Max Dept	h (ft)	4.05	Typical Bank Slo	_ ope Steep		4.2 Adjacent V		Abundant
1.3 Corridor Encroad	hments		2.3 Mean Dep		2.68	Bank Texture	Le	ft Right	4.3 Flow Statu	S	Moderate
Length (ft)	One	e Both	2.4 Floodpron	e Width (ft)	41	Upper			4.4 # of Debris	s Jams	3
Berms	0	551	2.5 Aband. Fl	oodpln	4.05	Material Type	Boulder/Cobb	l Boulder/Cobbl	4.5 Impoundm	ents	None
Roads	0	791	2.6 Width/Dep	oth Ratio	13.06	Consistency	Non-cohesiv	e Non-cohesive	Impoundmt.	Location	
Railroads	0	0	2.7 Entrenchr	nent Ratio	1.16	Lower			4.6 # of Storm	water Inputs	6
Improved Paths	0	0	2.8 Incision R	atio	1.00	Material Type	Mi	x Mix	4.7 Upstream	Flow	None
Development	512	863	2.9 Sinuosity		Low	Consistency	Non-cohesiv	e Non-cohesive	4.9 # of Beav	er Dams	0
1.4 Adjacent Side	Left	t Right	2.10 Riffles T	/pe	Not	Bank Erosion	Le	ft Right	Affected L	ength (ft)	0
Hillside Slope V	/ery Steep	Very Steep	2.11 Riffle/Ste	p Spacing (ft) 0	Erosion Length	(ft)	0 125	Step 5. Chan	nel Bed and	Planform Changes
Continuous w/S	ometimes	s Sometimes				Erosion Height ((ft) 0.0	0 8.00	5.1 Bar Types		
W/in 1 Bankfill	Always	s Always	2.12 Substrat	e Compositio	n	Revetmt. Type	Rip-Ra	p Rip-Rap	Mid	Point	Side
Texture	Mixed	l Mixed	Bedrock	1	%	Revetmt. Length	(ft) 18	0 185	1	0	1
1.5 Valley Features			Boulder	32	%	Near Bank Veg. 7	Type Le	ft Right	Diagonal	Delta	Island
Valley Width (ft) 60		Cobble	60	%	Dominant	Deciduou	s Deciduous	0	0	1
Width Determination	on Meas	sured	Coarse Grave	6	%	Sub-dominant	Shrubs/Sapli	n Shrubs/Saplin	5.2 Other Fea	tures	
Confinement Ty	pe Narro	owly	Fine Gravel	1	%	Bank Canopy	Le	ft Right	Flood Neck (Cutoff Avu	ulsion Braiding
Rock Gorge	e? No		Sand	0	%	Canopy %	76-10	0 76-100	1 0		0 1
Human-caused chan	ged valley	width? Yes				Mid-Channel Ca	nopy	Closed	5.3 Steep Riffl	es and Head	Cuts
						3.2 Riparian Buffe	er		Steep Riffles	Head Cuts	Trib Rejuv.
Notes:			Silt/Clay Pres	ent?	No	Buffer Width	Le	ft Right	1	0	No
Straightening in betw			Detritus	1	%	Dominant	5-2	5 5-25	5.4 Stream Fo	rd or Animal	No
road crossings. App			# Large Wood	ly	18	Sub-dominant	51-10	0 51-100	5.5 Straighten	ing	Yes
(historically) through relatively stable, with			2.13 Average	Largest Parti	cle on	Buffer Veg. Type	e <u>Left</u>	Right	5.5 Dredging	·	None
erosion, and has be	-		Bed 3	0.0	inches	Dominant	Non	e None	0.0		
channel evolution, w		•	Bar 1	4.0	inches	Sub-dominant	Mixed Tree	s Mixed Trees			
quasi-equilibrium.						3.3 Riparian Corr	idor				
Significant depositio	n haa haar	a noted where	2.14 Stream	Гуре		Corridor Land	Le	ft Right			
a significant break ir			Stream	Type: F		Dominant	Residentia	al Residential			
M07/M06 reach brea	•			terial: Cobb	le	Sub-dominant	Fores	st None			
potential to braid and		, ,	Subclass S	•			Amount	Mean Height	Note:		
mass failure is found	l just below	v this split		Form: Plane		Mass Failures	Non	e 0.00	Step 1.6 - Gr		
channel in M06.			2.15 Referen			Gullies	Non	e 0.00	Step 4.8 - Ch		
			(if differen	t from Phase	1)				are on The s report - Step		

Stream:Alder BrookReach # M07Organization:Essex Waterways AssociationObservers:EPF, SNL	Reach Summary page 2 of 2 November 19, 2006 Segment: 0 Completion Date: August 3, 2006 Rain: Yes prox. 800 feet below Rt. 15 crossing to just above Rt. 128 crossing. Access
1.6 Grade Controls None	Step 7. Rapid Geomorphic Assessment Data
Type Location Total Height Above Water (ft) Photo Taken GPSTak	Confinement Type Confined
	7.1 Channel Degradation5B to FYes7.2 Channel Aggradation11No7.3 Widening Channel7Yes7.4 Change in Planform6Yes
	Total Score29Geomorphic Rating0.3625Channel Evolution ModelFChannel Evolution StageVGeomorphic ConditionFairStream SensitivityVery High
4.8 Channel Constrictions Photo GPS Channel Floodprone	<u>Step 6. Rapid Habitat Assessment Data</u> Stream Gradient Type High Score
TypeWidthTaken?Taken?Constriction?Constriction?Instream12.0YesNoYesYesProblemScourAbove,ScourBelowInstream16.0YesNoYesYes	6.1 Epifaunal Substrate - Available Cover116.2 Embeddedness136.3 Velocity/Depth Patterns56.4 Sediment Deposition12
Problem Scour Below, Alignment	6.5 Channel Flow Status156.6 Channel Alteration36.7 Frequency of Riffles/Steps56.8 Bank StabilityLeft: 4 Right: 4
	6.9 Bank Vegetation ProtectionLeft: 5Right: 56.10 Riparian Vegetation Zone WidthLeft: 2Right: 2Total Score86Habitat Rating0.43
Narrative:	Habitat Stream Condition Fair

Channel is now relatively stable and in a state of quasi-equilibrium, however some failing slopes are noted along upper straightened section. Entrenched channel has therefore been assessed at stage V of CEM due to low probab. of further adjustment.

Project: Alc Stream: Organization:		ler Broc	ok rways Asso		Reach # servers:	M08	e 2 Segment S EP, KP	Se	age 1 of 2 gment: A v Not assessed:	Novembe Completion	r 19, 2006 Date:	FIT: Yes August 4, 2006 Rain: Yes
Segment Lengt	h (ft):		1,437	Segment L	ocation:	Segme	ent spilt below be	eaver ponding	ı in Segment B.	All data for	steps 2, 6	6 & 7 for this
Step 1. Va 1.1 Segmentation				Step 2. Stre 2.1 Bankfull Widt		<u>nel</u> 27	Step 3.1 Stream Bank	3. Riparian Fea ts	ures	4.1 Springs / S		Flow Modifiers Abundant
1.2 Alluvial Fan	N	D		2.2 Max Depth (ft	:)	5.90	Typical Bank Sl	ope Steep		4.2 Adjacent \	Vetlands	Abundant
1.3 Corridor Encr	oachme	ents		2.3 Mean Depth ((ft)	2.71	Bank Texture	Left	Right	4.3 Flow Statu	IS	Low
Length (ft)	One	Both	2.4 Floodprone W	/idth (ft)	250	Upper			4.4 # of Debris	s Jams	0
Bern	ns	256	0	2.5 Aband. Flood	pln	7.15	Material Type	Silt/Clay	Silt/Clay	4.5 Impoundm	nents	None
Road	ds	0	0	2.6 Width/Depth	Ratio	9.78	Consistency	Cohesive	Cohesive	Impoundmt.	Location	
Railroad	ds	0	0	2.7 Entrenchmen	t Ratio	9.43	Lower			4.6 # of Storm	water Inpu	its 2
Improved Path	าร	0	0	2.8 Incision Ratio		1.21	Material Type	Silt/Clay	Silt/Clay	4.7 Upstream	Flow	None
Developme	nt	300	0	2.9 Sinuosity		High	Consistency	Cohesive	Cohesive	4.9 # of Beav	er Dams	0
1.4 Adjacent Side)	Left	Right	2.10 Riffles Type		Not	Bank Erosion	Left	Right	Affected L	ength (ft).	0
Hillside Slop	be	Flat	Flat	2.11 Riffle/Step S	spacing (ft) 0	Erosion Length	(ft) 39	0	Step 5. Chan	nel Bed ar	nd Planform Cha
Continuous	w/	Never	Never				Erosion Height	(ft) 4.00	0.00	5.1 Bar Types		
W/in 1 Bank	fill	Never	Never	2.12 Substrate C	ompositio	<u>n</u>	Revetmt. Type	Rip-Rap	None	Mid	Point	Side
Textu	re Not	Evalua	Not Evalua	Bedrock	0	%	Revetmt. Length	1 (ft) 46	0	0	0	0
1.5 Valley Feature	es			Boulder	0	%	Near Bank Veg.	Type <u>Left</u>	Right	Diagonal	Delta	Island
Valley Wid	th (ft)	443		Cobble	0	%	Dominant	Herbaceous	Herbaceous	0	0	0
Width Determir	nation	Estima	ited	Coarse Gravel	2	%		Shrubs/Saplin	Shrubs/Saplin	5.2 Other Fea	tures	
Confinement	Туре	Very B	road	Fine Gravel	6	%	Bank Canopy	Left	Right	Flood Neck (Cutoff A	Avulsion Braid
Rock G	orge?	No		Sand	92	%	Canopy %	0	0	0 0		0 0
Human-caused cl	hanged	valley w	idth? No				Mid-Channel Ca	anopy	Open	5.3 Steep Riff	es and He	ad Cuts
							3.2 Riparian Buff	er		Steep Riffles	Head Cu	its Trib Rejuv
Notes:				Silt/Clay Present	? Y	′es	Buffer Width	Left	Right	0	0	No
Old, non-function	•		•	Detritus	10	%	Dominant	5-25	5-25	5.4 Stream Fo	ord or Anim	nal No
counted as strea	,			# Large Woody		75	Sub-dominant	51-100	51-100	5.5 Straighten	ing	No
intact in lower se channel and cause				2.13 Average Lar	gest Parti	cle on	Buffer Veg. Typ	e <u>Left</u>	Right	5.5 Dredging		None
	50 0000	1 00000		Bed N/A			Dominant	Herbaceous	Herbaceous			
Data entered in s	step 2 is	from cha	annel	Bar N/A			Sub-dominant	Shrubs/Saplin	Shrubs/Saplin			
geometry from se							3.3 Riparian Corr	ridor				
confirmed for this RGA scores have	0			2.14 Stream Type	e		Corridor Land	Left	Right			
be referenced for			eu, bui can	Stream Typ	e: E		Dominant	Residential	Residential			
	5			Bed Materia			Sub-dominant	Shrubs/Saplin	Shrubs/Saplin			
Little buffer throu				Subclass Slop				Amount	Mean Height	Note:		
numerous reside noted in FIT data		croachm	ents as		m: Plane		Mass Failures	None	0.00	Step 1.6 - Gi		
	l .			2.15 Reference S (if different fro			Gullies	None	0.00	Step 4.8 - Ch are on The s report - Step	econd pag	e of this

Project: Stream: Organizatic Segment L			Association		EPF, LEP, KP		page 2 of 2 Segment: A r ponding in Segment B.		Rain:	
	ade Controls None	1,437	Segm		Segment spin	below beave	Step 7. Rapid Geom		•	-
1.0 014		-				C	Confinement Type Uncor		ient Dat	.a
Туре	Location		Fotal Height Above Water (ft)	Photo Take	n GPSTaken		onnement rype Onco	Score	STD	Historic
						7.1 Channel	Degradation	11	None	Yes
						7.2 Channel	Aggradation	13	None	No
						7.3 Widening	g Channel	12		No
						7.4 Change	in Planform	10		Yes
							Total Score	46		
							Geomorphic Rating	0.575		
							Channel Evolution Model Channel Evolution Stage Geomorphic Condition Stream Sensitivity	V Fair		
							Step 6. Rapid Habitat Asse	essment Data		
4.8 Chai	nnel Constrictions						Stream Gradient Type	Low		
	Photo	GPS	Channel	Floodprone				S	core	
Туре	Width Taken?	Taken?	Constriction?	Constriction?		6.1 Epifaunal S	Substrate - Available Cover		10	
Instrear	m 18.0 Yes	No	Yes	Yes			6.2 Pool Substrate		14	
	roblem Scour Be						6.3 Pool Variability		14	
Bridge	8.00 Yes	No	Yes	Yes			6.4 Sediment Deposition		11	
Pi	roblem Scour Ab	ove,Sco	ur Below				6.5 Channel Flow Status		15	
							6.6 Channel Alteration		11	
							6.7 Channel Sinuosity		13	
							6.8 Bank Stability	Left: 5		
							Bank Vegetation Protection	Left: 6	0	
						6.10 Ripari	ian Vegetation Zone Width	Left: 5		: 5
							Total Score		23	
							Habitat Rating	0.	615	
Narrative	e:						Habitat Stream Conditic	n	Fair	

Project: Alder E Stream: A	Brook Alder Brook		Reach #	Phase M08	e 2 Segment Sumr	i i on i y	e 1 of 2 nent: B	November 19, 2006 FIT: Yes Completion Date: August 4, 2006
Organization: Es	sex Waterw	vays Asso	ciation Observers:	EPF, LI	EP, KP	Why N	lot assessed:	Wetland/impounded Rain: Yes
Segment Length (ft)	:	2,156	Segment Location:	From (Clover Dr. up to Chap	in Rd.		
Step 1. Valley 1.1 Segmentation	and Floodp	olain	Step 2. Stream Chann 2.1 Bankfull Width	el 0	Step 3. Rip 3.1 Stream Banks	arian Featur	es	Step 4. Flow & Flow Modifiers 4.1 Springs / Seeps
1.2 Alluvial Fan			2.2 Max Depth (ft)	0.00	Typical Bank Slope			4.2 Adjacent Wetlands
1.3 Corridor Encroach	ments		2.3 Mean Depth (ft)	0.00	Bank Texture	Left	Right	4.3 Flow Status
Length (ft)	One	Both	2.4 Floodprone Width (ft)	0	Upper			4.4 # of Debris Jams 0
Berms	0	0	2.5 Aband. Floodpln	0.00	Material Type			4.5 Impoundments
Roads	0	0	2.6 Width/Depth Ratio	0.00	Consistency			Impoundmt. Location
Railroads	0	0	2.7 Entrenchment Ratio	0.00	Lower			4.6 # of Stormwater Inputs 1
Improved Paths	0	0	2.8 Incision Ratio	0.00	Material Type			4.7 Upstream Flow
Development	191	0	2.9 Sinuosity		Consistency			4.9 # of Beaver Dams 4
1.4 Adjacent Side	Left	Right	2.10 Riffles Type		Bank Erosion	Left	Right	Affected Length (ft) 0
Hillside Slope			2.11 Riffle/Step Spacing (ft)	0	Erosion Length (ft)	0	0	Step 5. Channel Bed and Planform Changes
Continuous w/					Erosion Height (ft)	0.00	0.00	5.1 Bar Types
W/in 1 Bankfill			2.12 Substrate Composition		Revetmt. Type	None	None	Mid Point Side
Texture					Revetmt. Length (ft)	0	0	0 0 0
1.5 Valley Features					Near Bank Veg. Type	Left	Right	Diagonal Delta Island
Valley Width (ft)) 0				Dominant			
Width Determination	ı				Sub-dominant			5.2 Other Features
Confinement Type	e				Bank Canopy	Left	Right	Flood Neck Cutoff Avulsion Braiding
Rock Gorge?	?				Canopy %			
Human-caused change	ed valley widt	th?			Mid-Channel Canopy			5.3 Steep Riffles and Head Cuts
	-				3.2 Riparian Buffer			Steep Riffles Head Cuts Trib Rejuv.
Notes:			Silt/Clay Present?		Buffer Width	Left	Right	
			Detritus 0	%	Dominant			5.4 Stream Ford or Animal Yes
			# Large Woody	0	Sub-dominant			5.5 Straightening No
			2.13 Average Largest Partic	le on	Buffer Veg. Type	Left	Right	5.5 Dredging None
			Bed 0.0		Dominant			
			Bar 0.0		Sub-dominant			
					3.3 Riparian Corridor			
			2.14 Stream Type		Corridor Land	Left	Right	
			Stream Type:		Dominant			
			Bed Material:		Sub-dominant			
			Subclass Slope:			Amount	Mean Height	Note:
			Bed Form:		Mass Failures	None	0.00	Step 1.6 - Grade Controls and
			2.15 Reference Stream Type	e	Gullies	None	0.00	Step 4.8 - Channel Constrictions
			(if different from Phase 1)				are on The second page of this report - Steps 6 through 7.

•	Brook Alder Bro	ook	Read	Phase th # M08	e 2 Segment S	Se	ge 1 of 2 gment: C	November Completion E		FIT: Yes ugust 4, 2006
Organization: E	ssex Wa	terways Asso	ciation Observe	ers: EPF, LI	EP, KP	Why	Not assessed:			Rain: Yes
Segment Length (f	t):	3,594	Segment Locat	ion: From (Chapin Road cro	ossing up to co	onfluence of 2 s	small tribs from	n east an	d west. Data for
Step 1. Valley			Step 2. Stream C 2.1 Bankfull Width	hannel 27	3.1 Stream Bank	3. Riparian Feat	ures	Step 4. 4.1 Springs / Se		ow Modifiers Abundant
1.2 Alluvial Fan	No		2.2 Max Depth (ft)	5.90	Typical Bank S	lope Undercut		4.2 Adjacent W	etlands	Abundant
1.3 Corridor Encroac	hments		2.3 Mean Depth (ft)	2.71	Bank Texture	Left	Right	4.3 Flow Status	6	Low
Length (ft)	One	e Both	2.4 Floodprone Width	(ft) 200	Upper			4.4 # of Debris	Jams	5
Berms	120	0	2.5 Aband. Floodpln	7.15	Material Type	Silt/Clay	Silt/Clay	4.5 Impoundme	ents	
Roads	117	· 0	2.6 Width/Depth Ratio	9.78	Consistency	Cohesive	Cohesive	Impoundmt. L	ocation	
Railroads	0	0	2.7 Entrenchment Rati	o 7.55	Lower			4.6 # of Stormv	vater Inputs	6 0
Improved Paths	0	0	2.8 Incision Ratio	1.21	Material Type	Silt/Clay	Silt/Clay	4.7 Upstream F	low	None
Development	0	0	2.9 Sinuosity	High	Consistency	Cohesive	Cohesive	4.9 # of Beave	r Dams	0
1.4 Adjacent Side	Left	t Right	2.10 Riffles Type	Not	Bank Erosion	Left	Right	Affected Le	ength (ft)	0
Hillside Slope	Flat	t Flat	2.11 Riffle/Step Spacir	ng (ft) 0	Erosion Length	(ft) 246	0	Step 5. Chann	el Bed and	d Planform Changes
Continuous w/	Never	Never			Erosion Height	(ft) 3.20	0.00	5.1 Bar Types		5
W/in 1 Bankfill	Never	Never	2.12 Substrate Compo	sition	Revetmt. Type	Rip-Rap	None	Mid	Point	Side
Texture	Not Evalua	Not Evalua	Bedrock	0 %	Revetmt. Length	n (ft) 70	0	1	2	4
1.5 Valley Features			Boulder	0 %	Near Bank Veg.	Type Left	Right	Diagonal	Delta	Island
Valley Width (ft) 443		Cobble	0 %	Dominant	Herbaceous	Herbaceous	0	0	1
Width Determination	on Estin	nated	Coarse Gravel	2 %	Sub-dominant	Shrubs/Saplin	Shrubs/Saplin	5.2 Other Featu	ures	
Confinement Typ	be Very	Broad	Fine Gravel	6 %	Bank Canopy	Left	Right	Flood Neck C		ulsion Braiding
Rock Gorge	e? No		Sand	92 %	Canopy %	0	0			0 0
Human-caused chan	ged valley	width? No			Mid-Channel C	anopy	Open	5.3 Steep Riffle	s and Hea	d Cuts
					3.2 Riparian Buf	fer		· · · ·	Head Cuts	
Notes:			Silt/Clay Present?	Yes	Buffer Width	 Left	Right	0	0	No
Historic straightening	g along Ch	apin Road	Detritus	10 %	Dominant	51-100	51-100	5.4 Stream For	d or Anima	l No
where channel paral			# Large Woody	75	Sub-dominant	5-25	5-25	5.5 Straightenir		Yes
segment. Other hist	•	•	2.13 Average Largest	Particle on	Buffer Veg. Typ		Right	5.5 Dredging	.9	None
present above road, impacts.	possibly if	om old lanning	Bed N/A		Dominant	Shrubs/Saplin		0.0 2.00.99		
impuoto.			Bar N/A		Sub-dominant	-	Herbaceous			
Due to historic agricu	ulture impa	acts, channel			3.3 Riparian Cor	ridor				
assessed at stage V	of channe	l evolution.	2.14 Stream Type		Corridor Land	Left	Right			
			Stream Type: E		Dominant	Shrubs/Saplin				
			Bed Material: S	and	Sub-dominant	Hay	Hay			
			Subclass Slope: N			Amount	Mean Height	Note:		
			Bed Form: P	lane Bed	Mass Failures	None	0.00	Step 1.6 - Gra	de Control	s and
			2.15 Reference Stream	n Type	Gullies	None	0.00	Step 4.8 - Cha	annel Cons	trictions
			(if different from Pr	nase 1)				are on The se report - Steps		

	EPF, LEP, KP Rain: Yes
	From Chapin Road crossing up to confluence of 2 small tribs from east and west. Data
1.6 Grade Controls None	Step 7. Rapid Geomorphic Assessment Data
Type Location Total Height Above Water (ft) Photo Taker	GPSTaken Confinement Type Unconfined GPSTaken Score STD Historic
	7.1 Channel Degradation11NoneYes7.2 Channel Aggradation13NoneYes7.3 Widening Channel12Yes7.4 Change in Planform10Yes
	Total Score 46 Geomorphic Rating 0.575
	Channel Evolution Model F Channel Evolution Stage V Geomorphic Condition Fair Stream Sensitivity Very High
	Step 6. Rapid Habitat Assessment Data
4.8 Channel Constrictions	Stream Gradient Type Low
Photo GPS Channel Floodprone	Score
Type Width Taken? Taken? Constriction? Constriction?	6.1 Epifaunal Substrate - Available Cover 10
Instream 13.0 Yes No Yes Yes	6.2 Pool Substrate 14
Problem Deposition Above	6.3 Pool Variability 14
	6.4 Sediment Deposition116.5 Channel Flow Status15
	6.6 Channel Alteration 11
	6.7 Channel Sinuosity 13
	6.8 Bank Stability Left: 5 Right: 7
	6.9 Bank Vegetation Protection Left: 6 Right: 7
	6.10 Riparian Vegetation Zone Width Left: 5 Right: 5
	Total Score 123
	Habitat Rating 0.615
	Habitat Stream Condition Fair

Somem widening around areas where historic impacts from straightening had occurred. Overall, channel relatively stable after historic adjustments.

•	Brook Alder Bro	ook	Reach #	Phase M09	2 Segment S	Parriary	ge 1 of 2 gment: A	Novembe Completion	er 19, 2006 Date: A	FIT: Yes ugust 9, 2006
Organization: E	ssex Wate	erways Asso	ciation Observers:	EPF, K	D, KP	Why	Not assessed:			Rain: Yes
Segment Length (f	t):	665	Segment Location:	Segme	nt spilt below b	eaver ponding	in Segment B.	. All data for s	steps 2, 6 8	& 7 for this
Step 1. Valley			Step 2. Stream Chani 2.1 Bankfull Width	nel 0	Step 3.1 Stream Banl	3. Riparian Feat	ures	Step 4.1 Springs /		ow Modifiers Some
1.2 Alluvial Fan	No		2.2 Max Depth (ft)	0.00	Typical Bank S	lope Undercut		4.2 Adjacent	Wetlands	Abundant
1.3 Corridor Encroac	hments		2.3 Mean Depth (ft)	0.00	Bank Texture	Left	Right	4.3 Flow Stat	us	Low
Length (ft)	One	Both	2.4 Floodprone Width (ft)	0	Upper			4.4 # of Debri	s Jams	2
Berms	0	0	2.5 Aband. Floodpln	0.00	Material Type	Mix	Mix	4.5 Impoundr	nents	None
Roads	0	0	2.6 Width/Depth Ratio	0.00	Consistency	Non-cohesive	Non-cohesive	Impoundmt	Location	
Railroads	0	0	2.7 Entrenchment Ratio	0.00	Lower			4.6 # of Storn	nwater Inputs	s O
Improved Paths	0	0	2.8 Incision Ratio	0.00	Material Type	Silt/Clay	Silt/Clay	4.7 Upstream	Flow	None
Development	0	0	2.9 Sinuosity		Consistency	Cohesive	Cohesive	4.9 # of Beav	ver Dams	0
1.4 Adjacent Side	Left	Right	2.10 Riffles Type		Bank Erosion	Left	Right	Affected I	_ength (ft)	0
Hillside Slope	Hilly	Hilly	2.11 Riffle/Step Spacing (ft)	0	Erosion Length		39	Sten 5 Char	nel Bed and	d Planform Change
Continuous w/	Never	Never	11 3()		Erosion Height	. ,	3.00	5.1 Bar Types		
W/in 1 Bankfill S	ometimes	Sometimes	2.12 Substrate Composition	n	Revetmt. Type	None	None	Mid	2 Point	Side
Texture	Not Evalua	Not Evalua		-	Revetmt. Lengt	h (ft) 0	0	0	0	4
1.5 Valley Features					Near Bank Veg.		Right	Diagonal	Delta	Island
Valley Width (ft) 306				Dominant	Shrubs/Saplin		0	0	2
Width Determination		ated			Sub-dominant	-	Herbaceous	5.2 Other Fea	•	2
Confinement Typ					Bank Canopy	Left	Right	Flood Neck		ulsion Braiding
Rock Gorge	-				Canopy %	26-50	26-50			0 0
Human-caused chan		width? No			Mid-Channel C		Open	5.3 Steep Riff		
	<u></u>				3.2 Riparian Buf	• •	-	Steep Riffles	Head Cuts	
Notes:			Silt/Clay Present?		Buffer Width	Left	Right	0	0	<u>No</u>
No evidence of histo	ric straighte	ening in this	-	%	Dominant	>100	>100	5.4 Stream F	-	
segment. Channel g	•	•	# Large Woody	0	Sub-dominant	None	None	5.5 Straighter		No
conditions are idention			2.13 Average Largest Partic	-	Buffer Veg. Typ		Right	5.5 Dredging	iing	None
M08-C (as confirmed within segment), and			Bed 0.0		Dominant	Shrubs/Saplin		5.5 Dredging		NOTE
segment.	r can be use		Bar 0.0		Sub-dominant	-	Mixed Trees			
ooginona					3.3 Riparian Co					
Data for RGA and R			2.14 Stream Type		Corridor Land	Left	Right			
should also reference			Stream Type:		Dominant	Shrubs/Saplin				
-C, as channel and b very similar.	outter condit	tions were	Bed Material:		Sub-dominant	Forest	Forest			
vory sirillar.			Subclass Slope:			Amount	Mean Height	Noto:		
			Bed Form:		Mass Failures	None	0.00	Note: Step 1.6 - G	rade Control	s and
			2.15 Reference Stream Typ	be	Gullies	None	0.00	Step 4.8 - C		
			(if different from Phase	1)	Guiles	NULLE	0.00	are on The s	second page	of this
			E 5 Non Dune-	Ripple				report - Step	s 6 through	7.

Project: Stream: Organizatio	on: Ess	lder Bro sex Wate	erways	Association		EPF, KD, KP	-	page 2 of 2 Segment: A			Rain:	
Segment Le			665	Segm	ent Location:	Segment spil	t below beave	r ponding in Segme				
1.6 Gra	de Contro	ls None						Step 7. Rapid		•	nent Dat	a
Туре	Locati	ion	Lotal	Total Height	Photo Take	n GPSTaken	C	Confinement Type	Unconf		OTD	Llisterie
турс	Locat	1011	Total	Above Water (ft)						Score	STD	Historic
							7.1 Channel	•		11	None	Yes
							7.2 Channel			13	None	No
							7.3 Widening			12		Νο
							7.4 Change i			10		Yes
									Score	46		
								Geomorphic F	Rating	0.575		
								Channel Evolution	Model	F		
								Channel Evolution		V		
								Geomorphic Con	-	Fair		
								Stream Sens	sitivity	Very High		
								Step 6. Rapid Habita	at Asses	sment Data		
4 8 Char	nnel Const	rictions	None					Stream Gradient Type	e L	ow		
		Photo	GPS	Channel	Floodprone					S	core	
Туре	Width	Taken?	Taken?		Constriction?		6.1 Epifaunal S	Substrate - Available C	Cover		10	
51		ranorm	ranonn		o on other notion in		•	6.2 Pool Subs			14	
								6.3 Pool Varia	ability		14	
								6.4 Sediment Depos	sition		11	
								6.5 Channel Flow S	Status		15	
								6.6 Channel Alter	ration		11	
								6.7 Channel Sinu	uosity		13	
								6.8 Bank Sta	ability	Left: 5	Right	: 7
							6.9 E	Bank Vegetation Prote	ection	Left: 6	Right	: 7
							6.10 Ripari	an Vegetation Zone V	Nidth	Left: 5	Right	: 5
								Total S	Score	1	23	
								Habitat Ra	ating	0.	615	
Narrative	e:							Habitat Stream Co	ondition		Fair	

Project: Alder B Stream: A	rook Ider Brook		Reach #		e 2 Segment Sumr	i i cai y	e 1 of 2 ment: B	November 19, 2006 Completion Date:	FIT: Yes August 9, 2006
Organization: Es	sex Waterwa	ays Asso			•			Wetland/impounded	Rain: Yes
Segment Length (ft):	:	887	Segment Location:	Beaver	r impacted area behir	nd condom	iniums off of	Chapin Rd. Access fr	om pull-off on wes
Step 1. Valley a 1.1 Segmentation	and Floodpl	ain	Step 2. Stream Chann 2.1 Bankfull Width	nel 0	Step 3. Rip 3.1 Stream Banks	arian Featu	res	Step 4. Flow & 4.1 Springs / Seeps	Flow Modifiers
1.2 Alluvial Fan			2.2 Max Depth (ft)	0.00	Typical Bank Slope			4.2 Adjacent Wetlands	
1.3 Corridor Encroachr	ments		2.3 Mean Depth (ft)	0.00	Bank Texture	Left	Right	4.3 Flow Status	
Length (ft)	One	Both	2.4 Floodprone Width (ft)	0	Upper			4.4 # of Debris Jams	0
Berms	0	0	2.5 Aband. Floodpln	0.00	Material Type			4.5 Impoundments	
Roads	0	0	2.6 Width/Depth Ratio	0.00	Consistency			Impoundmt. Location	
Railroads	0	0	2.7 Entrenchment Ratio	0.00	Lower			4.6 # of Stormwater Input	uts 0
Improved Paths	0	0	2.8 Incision Ratio	0.00	Material Type			4.7 Upstream Flow	
Development	0	0	2.9 Sinuosity		Consistency			4.9 # of Beaver Dams	4
1.4 Adjacent Side	Left	Right	2.10 Riffles Type		Bank Erosion	Left	Right	Affected Length (ft)	0
Hillside Slope			2.11 Riffle/Step Spacing (ft)	0	Erosion Length (ft)	34	0	Step 5. Channel Bed a	nd Planform Changes
Continuous w/					Erosion Height (ft)	3.00	0.00	5.1 Bar Types	Ŭ
W/in 1 Bankfill			2.12 Substrate Composition		Revetmt. Type	None	None	Mid Point	Side
Texture					Revetmt. Length (ft)	0	0	0 0	0
1.5 Valley Features					Near Bank Veg. Type	Left	Right	Diagonal Delta	Island
Valley Width (ft)	0				Dominant			0 0	0
Width Determination	l				Sub-dominant			5.2 Other Features	
Confinement Type	•				Bank Canopy	Left	Right		Avulsion Braiding
Rock Gorge?	,				Canopy %			0 0	0 0
Human-caused change	ed valley width	ו?			Mid-Channel Canopy			5.3 Steep Riffles and He	ad Cuts
					3.2 Riparian Buffer			Steep Riffles Head Cu	
Notes:			Silt/Clay Present?		Buffer Width	Left	Right	0 0	
			Detritus 0	%	Dominant			5.4 Stream Ford or Anim	nal No
			# Large Woody	0	Sub-dominant			5.5 Straightening	No
			2.13 Average Largest Partic	le on	Buffer Veg. Type	Left	Right	5.5 Dredging	None
			Bed 0.0		Dominant			0.0 <u>2</u> .0 dgg	
			Bar 0.0		Sub-dominant				
					3.3 Riparian Corridor				
			2.14 Stream Type		Corridor Land	Left	Right		
			Stream Type:		Dominant				
			Bed Material:		Sub-dominant				
			Subclass Slope:			Amount	Mean Height	Note:	
			Bed Form:		Mass Failures	One	6.00	Step 1.6 - Grade Contr	ols and
			2.15 Reference Stream Typ	e	Gullies	None	0.00	Step 4.8 - Channel Cor	nstrictions
			(if different from Phase 1	1)				are on The second pag report - Steps 6 throug	

	Ider Broo	k ways Asso	ciation 0	Reach # bservers:	M09	2 Segment S	Se	age 1 of 2 gment: C v Not assessed:	Novembe Completion	er 19, 2006 Date:	FIT: Yes August 9, 2006 Rain: Yes	
Segment Length (ft):		2,883			•	-			crossing at	Col Page	Rd. Access from	
Step 1. Valley a 1.1 Segmentation Oth	and Flood	plain	Step 2. Str 2.1 Bankfull Wic	eam Chanr		-	3. Riparian Feat			4. Flow &	Flow Modifiers Some	
	No		2.2 Max Depth (ft)	1.90	Typical Bank Sl	—		4.2 Adjacent	•	Abundant	
1.3 Corridor Encroachr	nents		2.3 Mean Depth	-	1.25	Bank Texture	Left	Right	4.3 Flow Stat		Low	
Length (ft)	One	Both	2.4 Floodprone	. ,	250	Upper			4.4 # of Debr	is Jams	7	
Berms	142	0	2.5 Aband. Floo	dpln	1.90	Material Type	Mix	Mix	4.5 Impoundr	nents	None	
Roads	0	0	2.6 Width/Depth	Ratio	22.00	Consistency	Non-cohesive	Non-cohesive	Impoundmt	. Location		
Railroads	0	0	2.7 Entrenchme	nt Ratio	9.09	Lower			4.6 # of Storn	nwater Inpu	uts 0	
Improved Paths	0	0	2.8 Incision Rati	0	1.00	Material Type	Silt/Clay	Silt/Clay	4.7 Upstream	Flow	None	
Development	0	0	2.9 Sinuosity	Мо	oderate	Consistency	Cohesive	Cohesive	4.9 # of Beav	/er Dams	2	
1.4 Adjacent Side	Left	Right	2.10 Riffles Type	e Sediı	mented	Bank Erosion	Left	Right	Affected I	Length (ft)	0	
Hillside Slope	Hilly	Hilly	2.11 Riffle/Step	Spacing (ft)	70	Erosion Length	(ft) 320	228	Step 5. Char	nnel Bed a	nd Planform Changes	
Continuous w/	Never	Never				Erosion Height	(ft) 2.50	2.75	5.1 Bar Type:		<u> </u>	
W/in 1 Bankfill So i	netimes	Never	2.12 Substrate 0	Composition	1	Revetmt. Type	Rip-Rap	Rip-Rap	Mid	– Point	Side	
Texture N	ot Evalua	Silt/Clay	Bedrock	0	%	Revetmt. Length	n (ft) 180	72	0	4	5	
1.5 Valley Features			Boulder	1	%	Near Bank Veg.	Type Left	Right	Diagonal	Delta	Island	
Valley Width (ft)	306		Cobble	27	%	Dominant	Shrubs/Saplin	Shrubs/Saplin	2	0	0	
Width Determination	Measure	ed	Coarse Gravel	38	%	Sub-dominant	Herbaceous	Herbaceous	5.2 Other Fea	atures		
Confinement Type	Very Br	oad	Fine Gravel	20	%	Bank Canopy	Left	Right	Flood Neck	Cutoff	Avulsion Braiding	
Rock Gorge?	No		Sand	14	%	Canopy %	1-25	1-25	1 0)	0 1	
Human-caused change	ed valley wid	dth? No				Mid-Channel Ca	anopy	Open	5.3 Steep Rif	fles and He	ead Cuts	
						3.2 Riparian Buf	fer		Steep Riffles	Head Cu	uts Trib Rejuv.	
Notes:			Silt/Clay Presen	t? Y	es	Buffer Width	Left	Right	0	0	No	
Many of the planform of	0	•	Detritus	10	%	Dominant	>100	>100	5.4 Stream F	ord or Anim	nal No	
riffles noted are due to Despite low gradient o			# Large Woody		60	Sub-dominant	26-50	26-50	5.5 Straighter	ning	Yes	
substrate dominated b			2.13 Average La	argest Partic	cle on	Buffer Veg. Typ	e <u>Left</u>	Right	5.5 Dredging		None	
	, grater and		Bed 3.5		inches	Dominant	Shrubs/Saplin	Shrubs/Saplin				
Some lower gradient s			Bar 1.8		inches	Sub-dominant	Mixed Trees	Mixed Trees				
had channel dimension						3.3 Riparian Cor	ridor					
geometry, however a r -type.	najority of re	each was C	2.14 Stream Ty			Corridor Land	Left	Right				
type.			Stream Ty			Dominant	Shrubs/Saplin	Shrubs/Saplin				
				ial: Grave	l	Sub-dominant	Forest	Forest				
				pe: None			Amount	Mean Height	Note:			
				rm: Riffle-I		Mass Failures	ass Failures None 0.00			· ·		
				Stream Typ om Phase		Gullies	None	0.00	Step 4.8 - C are on The s report - Step	second pag	e of this	

Project:Alder BrookPhase 2 RealStream:Alder BrookReach #M09Organization:Essex Waterways AssociationObservers:EPF, KD, KP	Segment: C	November 19, 2006 Completion Date: August 9, 2006 Rain: Yes
	east just above beaver meadow up to	
1.6 Grade Controls None		rphic Assessment Data
Total Height Type Location Total Above Water (ft) Photo Taken GPSTaken	Confinement Type Uncon	
Type Location Total Above Water (ft) Photo Taken GPSTaken		Score STD Historic
	7.1 Channel Degradation	13 None Yes
	7.2 Channel Aggradation	11 None No
	7.3 Widening Channel	14 No
	7.4 Change in Planform	11 No
	Total Score	49
	Geomorphic Rating	0.6125
	Channel Evolution Model	D
	Channel Evolution Stage	IIc
	Geomorphic Condition	Fair
	Stream Sensitivity	Very High
	Step 6. Rapid Habitat Asse	ssment Data
4.8 Channel Constrictions	Stream Gradient Type	Low
Photo GPS Channel Floodprone		Score
Type Width Taken? Taken? Constriction? Constriction?	6.1 Epifaunal Substrate - Available Cover	15
Instream 14.0 Yes No Yes Yes	6.2 Pool Substrate	14
Problem Scour Below, Alignment	6.3 Pool Variability	13
	6.4 Sediment Deposition	10
	6.5 Channel Flow Status	17
	6.6 Channel Alteration	10
	6.7 Channel Sinuosity	8
	6.8 Bank Stability	Left: 6 Right: 8
	6.9 Bank Vegetation Protection	Left: 8 Right: 8
	6.10 Riparian Vegetation Zone Width	Left: 8 Right: 8
	Total Score	133
	Habitat Rating	0.665
Narrative:	Habitat Stream Condition	n Good

Significant aggradation may be mostly due to beaver impacts, and resulting changes to the sediment regime. Aggradation and planform changes are most dominant processes throughout.

Stream: Organization:		erways Asso	ciation Obse	ach # M10 rvers: EPF	2 Segment S	Sec Why	ge 1 of 2 gment: 0 Not assessed:	November 19, Completion Dat	te: August 11, 2006 Rain: Yes
Segment Length (Step 1. Valle 1.1 Segmentation N 1.2 Alluvial Fan	y and Floo	5,172 dplain	Step 2. Stream 2.1 Bankfull Width 2.2 Max Depth (ft)			3. Riparian Featu			
<u>1.3 Corridor Encroad</u> Length (ft) Berms Roads Railroads	chments One 0 0 0	Both 0 0 0	2.3 Mean Depth (ft)2.4 Floodprone Widt2.5 Aband. Floodpln2.6 Width/Depth Rat2.7 Entrenchment R	1.90 h (ft) 210 2.85 io 9.47 atio 11.67	Bank Texture Upper Material Type Consistency Lower	Left Silt/Clay Cohesive	<u>Right</u> Silt/Clay Cohesive	 4.3 Flow Status 4.4 # of Debris Ja 4.5 Impoundment Impoundmt. Loc 4.6 # of Stormwat 	Low ms 3 s None cation ter Inputs 0
Improved Paths Development <u>1.4 Adjacent Side</u> Hillside Slope Continuous w/ W/in 1 Bankfill Texture <u>1.5 Valley Features</u> Valley Width Width Determinati Confinement Ty Rock Gorg Human-caused char Notes: Much of the reach is substrate, with only cobble and gravel (a However, channel g throughout, and is o bed feautes (mostly Straightening and s aong old hay fields, of channel evolution	(ft) 250 ion Measu pe Very B le? No nged valley w s dominated l about 30% d as seen in pe geometry was clearly an E-ty plane). ome armoring as noted in F	by clay/silt lominated by bble count). s uniform ype with little g present FIT. Stage V	2.8 Incision Ratio 2.9 Sinuosity 2.10 Riffles Type 2.11 Riffle/Step Spa 2.12 Substrate Com Bedrock Boulder Cobble Coarse Gravel Fine Gravel Sand Silt/Clay Present? Detritus # Large Woody 2.13 Average Larges Bed Bar 3.0 2.14 Stream Type Stream Type: Bed Material:	position 0 % 9 % 62 % 6 % 5 % 18 % Yes 15 % 29 St Particle on inches inches	Bank Canopy Canopy % Mid-Channel Ca <u>3.2 Riparian Buff</u> Buffer Width Dominant Sub-dominant Buffer Veg. Typ Dominant Sub-dominant <u>3.3 Riparian Cor</u> Corridor Land Dominant	(ft) 2.50 Rip-Rap a (ft) 39 Type Left Herbaceous Shrubs/Saplin S Left 0 anopy er Left 51-100 26-50 e Left Herbaceous Shrubs/Saplin S ridor Left Shrubs/Saplin S	Right 0 Open Right 51-100 26-50 Right Herbaceous Shrubs/Saplin Right Shrubs/Saplin	5.1 Bar Types Mid 9 Diagonal 0 5.2 Other Feature Flood Neck Cuto 0 5.3 Steep Riffles a Steep Riffles H	Dams 0 gth (ft) 0 Bed and Planform Changes Point Side 3 4 Delta Island 0 0 25 Avulsion 0 0 and Head Cuts ead Cuts Trib Rejuv. 0 No
			Subclass Slope: Bed Form: 2.15 Reference Stre (if different from	None Plane Bed am Type	Sub-dominant Mass Failures Gullies	Hay <u>Amount</u> None None	Hay <u>Mean Height</u> 0.00 0.00	Note: Step 1.6 - Grade Step 4.8 - Chanr are on The seco report - Steps 6	nel Constrictions nd page of this

Organization: Essex	[.] Brook Waterways <i>I</i>		Reach # Observers:	EPF	-	page 2 of 2 Segment: 0		Rain:	November 19, 2006 August 11, 2006 Yes
Segment Length (ft):	5,172	Segm	ent Location:	From Col Page	e Road crossi	ng up to break in hay,			
1.6 Grade Controls	one					Step 7. Rapid Ge			ata
Type Location	Totol	otal Height	Photo Take	n GPSTaken	C	Confinement Type Ur	nconfined	ore STD	Historic
	F	bove Water (ft)							
						Degradation		3 None	Yes
						Aggradation		4 None	Yes
					7.3 Widening	•	1	5	Yes
					7.4 Change	in Planform		1	Yes
						Total So	ore 5	53	
						Geomorphic Ra	ting 0.6	625	
						Channel Evolution Mo	odel F		
						Channel Evolution St			
						Geomorphic Condit	5	d	
						Stream Sensiti			
						Step 6. Rapid Habitat	Assessmer	nt Data	
4.8 Channel Constrict	ons					Stream Gradient Type	Low		
Pho	oto GPS	Channel	Floodprone					Score	
	en? Taken?	Constriction?	Constriction?		6.1 Epifaunal S	Substrate - Available Cov	/er	13	
Bridge 7.00 Ye	s No	Yes	Yes			6.2 Pool Substra	ate	12	
Problem Dep			103			6.3 Pool Variabil	ity	10	
						6.4 Sediment Depositi	on	13	
						6.5 Channel Flow Stat	tus	16	
						6.6 Channel Alterati	on	10	
						6.7 Channel Sinuos	sity	13	
						6.8 Bank Stabil	ity	Left: 7 Righ	t: 8
					6.9 E	Bank Vegetation Protecti		Left: 9 Righ	
						ian Vegetation Zone Wic		Left: 8 Righ	
						Total Sco		136	
						Habitat Rati		0.68	
Narrative:						Habitat Stream Con	dition	Good	

severe.

Project: Alder Brook Stream: Alder Brook Organization: Essex Waterways Asso Segment Length (ft): 5,127	Reach # M11 Ociation Observers: EPF	Page 1 of 2 November 19, 2006 FIT: Yes Segment: 0 Completion Date: August 11, 2006 Why Not assessed: Rain: Yes beaver dams to south up to barbed-wire fence at pasture break at Earle farm. Access
Step 1. Valley and Floodplain 1.1 Segmentation None	Step 2. Stream Channel 2.1 Bankfull Width 16	Step 3. Riparian Features Step 4. Flow & Flow Modifiers 3.1 Stream Banks 4.1 Springs / Seeps
1.2 Alluvial Fan No <u>1.3 Corridor Encroachments</u> Length (ft) One Both	2.2 Max Depth (ft) 2.85 2.3 Mean Depth (ft) 1.89 2.4 Floodprone Width (ft) 450	Typical Bank SlopeSteep4.2 Adjacent WetlandsAbundantBank TextureLeftRight4.3 Flow StatusLowUpper4.4 # of Debris Jams9
Longur (h)OndDoutBerms00Roads00Railroads00	2.1 Hostophone Writin (it)4002.5 Aband. Floodpln2.852.6 Width/Depth Ratio8.202.7 Entrenchment Ratio29.03	Material Type Silt/Clay Silt/Clay 4.5 Impoundments None Consistency Cohesive Cohesive Impoundmt. Location Lower 4.6 # of Stormwater Inputs 0
Improved Paths 0 0 Development 0 0 1.4 Adjacent Side Left Right	2.7 Entrement ratio2.002.8 Incision Ratio1.002.9 SinuosityHigh2.10 Riffles TypeNot	LowerSilt/ClaySilt/Clay4.7 Upstream FlowNoneMaterial TypeSilt/ClaySilt/Clay4.7 Upstream FlowNoneConsistencyCohesiveCohesive4.9 # of Beaver Dams1Bank ErosionLeftRightAffected Length (ft)600
Hillside SlopeHillyHillyContinuous w/NeverNeverW/in 1 BankfillNeverNever	2.11 Riffle/Step Spacing (ft) 0 2.12 Substrate Composition	Erosion Length (ft)77205Step 5. Channel Bed and Planform ChangesErosion Height (ft)2.002.755.1 Bar TypesRevetmt. TypeNoneRip-RapMidPointSide
TextureNot EvaluaNot Evalua1.5 Valley Features Valley Width (ft)462	Bedrock0%Boulder0%Cobble0%	Revetmt. Length (ft)036224Near Bank Veg. TypeLeftRightDiagonalDeltaIslandDominantHerbaceousHerbaceous000
Width Determination Measured Confinement Type Very Broad Rock Gorge? No	Coarse Gravel3%Fine Gravel8%Sand89%	Sub-dominant Bank CanopyShrubs/Saplin Shrubs/Saplin Left5.2 Other FeaturesCanopy %1-251-25100Braiding 0
Human-caused changed valley width? No Notes:	- Silt/Clay Present? Yes	Mid-Channel Canopy Open 5.3 Steep Riffles and Head Cuts 3.2 Riparian Buffer Steep Riffles Head Cuts Buffer Width Left Right 0 0 No
Overall physical condition of stream is good, with much diversity of habitat. Many fish observed along hetergenous clay substrate.	Detritus20 %# Large Woody182.13 Average Largest Particle on	Dominant>100>1005.4 Stream Ford or AnimalNoSub-dominantNone51-1005.5 StraighteningNoBuffer Veg. TypeLeftRight5.5 DredgingNone
Some evidence of old revetments in upper 1/3 of reach, but no clear evidence of historic straightening. Since no signs of impacts to channel boundary conditions can be observed in 1930's photos, channel evolution	Bed N/A Bar N/A <u>2.14 Stream Type</u> Stream Type: E	Dominant Shrubs/Saplin Shrubs/Saplin Sub-dominant Coniferous Coniferous Coniferous 3.3 Riparian Corridor Eft Corridor Land Left Dominant Shrubs/Saplin
assumed to be at stage I despite the historic watershed impacts associated with agriculture	Bed Material: Sand Subclass Slope: None Bed Form: Dune-Ripple <u>2.15 Reference Stream Type</u> (if different from Phase 1)	Dominant Shrubs/Saplin Shrubs/Saplin Sub-dominant Forest Amount Mean Height Mass Failures None Gullies None None 0.00 Step 4.8 - Channel Constrictions are on The second page of this report - Steps 6 through 7.

roject: tream:)rganizatio		Alder Bro		Association	Reach # Observers:		h Summary	page 2 of 2 Segment: 0		Completior	Date: Rain:	November 19, 2006 August 11, 2006 Yes
egment L			5,127		ent Location:	From beaver	dams to south	up to barbed-wir	e fence	at pasture l	oreak a	at Earle farm.
1.6 Gra	de Contro	ols None						Step 7. Rapio	d Geomo	rphic Assessm	nent Da	ta
_				Total Height			C	onfinement Type	Unconf	fined		
Туре	Locat	tion	Total	Above Water (ft)	Photo Take	n GPSTaken				Score	STD	Historic
							7.1 Channel	Degradation		16	None	Νο
							7.2 Channel	Aggradation		16	None	No
							7.3 Widening	g Channel		17		Νο
							7.4 Change i	n Planform		16		No
									I Score	65		
								Geomorphic	Rating	0.8125		
								Channel Evolutior Channel Evolution Geomorphic Cc Stream Ser	n Stage Indition	F I Good High		
								Step 6. Rapid Habi		ssment Data		
4.8 Chai	nnel Cons	trictions	None				:	Stream Gradient Typ	pe L	_ow		
		Photo	GPS	Channel	Floodprone						core	
Туре	Width	Taken?	Taken?	? Constriction?	Constriction?		6.1 Epifaunal S	Substrate - Available			18	
								6.2 Pool Sub			15	
								6.3 Pool Var	5		18	
								6.4 Sediment Dep 6.5 Channel Flow			16 18	
								6.6 Channel Alte			18	
								6.7 Channel Sir			18	
								6.8 Bank St	5	Left: 9		: 9
							6.9 B	ank Vegetation Prot	5	Left: 10	-	
								an Vegetation Zone		Left: 8		
									Score		76	
								Habitat	Rating	0	.88	
Narrative	e:							Habitat Stream (Condition	n R e	eferen	

Stream w/o significant human impacts, high sinuosity, and v. good floodplain connectivity. High scores for RGA and RHA reflect these conditions and the abundant fish observed throughout reach - suggesting high quality habitat.

Stream:	Brook Alder Broo Essex Wate	ok erways Asso	ciation (Reach # I Dbservers: I	M13	e 2 Segment S v	S	age 1 of 2 egment: B y Not assessed:	Novembe Completion	er 19, 2006 Date: A	FIT: Yes ugust 15, 2006 Rain: No
Segment Length (ft):	1,745	Segmen	t Location:	Upper	segment bound	lary is conflue	ence with signifi	icant trib from	n west. Be	st accessed
Step 1. Valle	y and Floo	dplain		tream Channe			3. Riparian Fea	tures			low Modifiers
1.1 Segmentation		cess	2.1 Bankfull Wi		9	3.1 Stream Bank			4.1 Springs /		Some
1.2 Alluvial Fan	No		2.2 Max Depth		2.60		lope Undercut		4.2 Adjacent		Abundant
1.3 Corridor Encroad			2.3 Mean Dept	. ,	1.70	Bank Texture	Lef	<u>Right</u>	4.3 Flow Stat		Low
Length (ft)	One	Both	2.4 Floodprone		155	Upper			4.4 # of Debr		1 Nama
Berms	0	0	2.5 Aband. Flo	•	2.90	Material Type	Mix		4.5 Impoundr		None
Roads	0	0	2.6 Width/Dept		5.47	Consistency	Non-cohesive	Non-cohesive			•
Railroads	0	0	2.7 Entrenchm		16.67	Lower			4.6 # of Storn	•	
Improved Paths	0	0	2.8 Incision Ra		1.12	Material Type	Silt/Clay	-	4.7 Upstream		None
Development	0	0	2.9 Sinuosity		derate	Consistency	Cohesive				0
1.4 Adjacent Side	Left	Right	2.10 Riffles Typ		Not	Bank Erosion	Lef		Affected	Length (ft)	0
Hillside Slope	Flat	Flat	2.11 Riffle/Step	o Spacing (ft)	0	Erosion Length		-	Step 5. Char	nnel Bed an	d Planform Changes
Continuous w/	Never	Never				Erosion Height	(ft) 0.00		5.1 Bar Type	S	
W/in 1 Bankfill	Never	Never	2.12 Substrate	Composition		Revetmt. Type	None	Rip-Rap	Mid	Point	Side
	Not Evalua	Not Evalua	Bedrock	0	%	Revetmt. Lengtl	n (ft) 🛛 🕻	77	0	1	4
1.5 Valley Features			Boulder	7 9	%	Near Bank Veg.	Type Lef	Right	Diagonal	Delta	Island
Valley Width	(ft) 391		Cobble	4 9	%	Dominant	Herbaceous	Herbaceous	0	0	1
Width Determinati	on Estima	ated	Coarse Gravel	39	%	Sub-dominant	Shrubs/Saplir	Shrubs/Saplin	5.2 Other Fea	atures	
Confinement Ty	pe Very B	Broad	Fine Gravel	31 9	%	Bank Canopy	Lef	Right	Flood Neck	Cutoff A	vulsion Braiding
Rock Gorg	e? No		Sand	19	%	Canopy %	1-25	1-25	0 0) —	0 0
Human-caused char	nged valley w	vidth? No				Mid-Channel C	anopy	Open	5.3 Steep Rif	fles and Hea	ad Cuts
						3.2 Riparian Buf	fer		Steep Riffles	Head Cut	s Trib Rejuv.
Notes:			Silt/Clay Prese	nt? Ye	S	Buffer Width	Lef	t Right	0	0	No
Historic straightenin	g and armori	ing in upper	Detritus	8	%	Dominant	51-10	>100	5.4 Stream F	ord or Anima	al Yes
section of segment	along large h	nay field to	# Large Woody	/ 1	2	Sub-dominant	26-5) None	5.5 Straighter	nina	Yes
the north.			2.13 Average L	argest Particl	e on	Buffer Veg. Typ	be Left	Right	5.5 Dredging	-	None
Old wooden bridge	(falling apart)) in lower	Bed N/	A		Dominant	Shrubs/Saplii	Shrubs/Saplin			
segment is not having			Bar N/	A		Sub-dominant	-	Herbaceous			
channel adjustment	, but is causi					3.3 Riparian Cor					
deposition and scou	ir, as noted.		2.14 Stream Ty	vpe		Corridor Land	 Lef	t Right			
Doopito low gradiop	t of operations	roughly 1/2	Stream T			Dominant		Shrubs/Saplin			
Despite low gradien of reach has gravel	•		Bed Mate	erial: Gravel		Sub-dominant	Hav	•			
Channel evolution a			Subclass Sl	ope: None			Amount	Mean Height	Note:		
to historic straighter	ning and impa	acts, and the	Bed Fo	orm: Plane E	Bed	Mass Failures	None		Step 1.6 - G	rade Contro	ls and
redevelopment of si			2.15 Reference	e Stream Type	<u>e</u>	Gullies None 0.00			0 Step 4.8 - Channel Constrictions		
channel. Reference be sand be with dur			(if different	from Phase 1)				are on The s report - Step		

Stream:Alder BrookReach #M13Organization:Essex Waterways AssociationObservers:EPF, AV	page 2 of 2 Segment: B Completion Date: August 15, 2006 Rain: No
	ment boundary is confluence with significant trib from west. Best accessed
1.6 Grade Controls None	Step 7. Rapid Geomorphic Assessment Data
Total Height Type Location Total Above Water (ft) Photo Taken GPSTaker	Confinement Type Unconfined
Type Location Total Above Water (ft) Photo Taken GPSTaker	Score STD Historic
	7.1 Channel Degradation 14 None Yes
	7.2 Channel Aggradation 15 None No
	7.3 Widening Channel16No
	7.4 Change in Planform13Yes
	Total Score 58
	Geomorphic Rating 0.725
	Channel Evolution Model F Channel Evolution Stage IV Geomorphic Condition Good Stream Sensitivity High
	Step 6. Rapid Habitat Assessment Data
4.8 Channel Constrictions	Stream Gradient Type Low
Photo GPS Channel Floodprone	Score
Type Width Taken? Taken? Constriction? Constriction?	6.1 Epifaunal Substrate - Available Cover 18
Bridge 11.5 Yes No No Yes	6.2 Pool Substrate 17
Problem Deposition Above, Scour Below	6.3 Pool Variability 17
	6.4 Sediment Deposition 15
	6.5 Channel Flow Status 18
	6.6 Channel Alteration 10
	6.7 Channel Sinuosity 10
	6.8 Bank Stability Left: 8 Right: 8
	6.9 Bank Vegetation Protection Left: 9 Right: 9
	6.10 Riparian Vegetation Zone Width Left: 7 Right: 9
	Total Score155Habitat Rating0.775
Narrative:	Habitat Stream Condition Good

Some historic straighenting and degradation in upper segment, but overall physical condition of segment is good. Many fish observed throughout.

Project: Alder Stream:	Brook Alder Bro	ook	Re	each #	Phase M14	2 Segment S	Summary		e 1 of 2 ment: B	Novembe Completion	,	FIT: Yes August 15, 200
Organization: E		erways Asso			EPF, A\	/	١	•	Not assessed:			Rain: No
Segment Length (2,940				reak in pasture		•		ssing under F	Rollin Iris	
Step 1. Valley 1.1 Segmentation P	y and Floo	odplain	Step 2. Strear 2.1 Bankfull Width		1		3. Riparian I				I. Flow & I	Flow Modifiers Some
1.2 Alluvial Fan	No	0000	2.2 Max Depth (ft)		1.90	Typical Bank S				4.2 Adjacent \	-	Some
1.3 Corridor Encroad			2.3 Mean Depth (ft)		1.24	Bank Texture		Left	Right	4.3 Flow Statu		Low
Length (ft)	One	Both	2.4 Floodprone Wic		37	Upper	-	Len	rtigitt	4.4 # of Debris		0
	<u>447</u>			. ,				Miv	Mix			None
Berms			2.5 Aband. Floodpli		1.90	Material Type		Mix	Mix	4.5 Impoundm		None
Roads	0	-	2.6 Width/Depth Ra		12.10	Consistency	Non-cohes	sive	Non-cohesive	Impoundmt.		
Railroads	0	-	2.7 Entrenchment F	Ratio	2.43	Lower				4.6 # of Storm	•	
Improved Paths	0	0	2.8 Incision Ratio		1.00	Material Type			oulder/Cobbl	4.7 Upstream		None
Development	0	0	2.9 Sinuosity		Low	Consistency	Non-cohes	sive	Non-cohesive	4.9 # of Beav		0
1.4 Adjacent Side	Left	Right	2.10 Riffles Type		Not	Bank Erosion	<u> </u>	Left	Right	Affected L	ength (ft).	0
Hillside Slope	Steep	Steep	2.11 Riffle/Step Spa	acing (ft)) 0	Erosion Length	(ft)	0	82	Step 5. Chan	nel Bed ai	nd Planform Cha
Continuous w/S	Sometimes	Sometimes				Erosion Height	(ft) 0	0.00	4.00	5.1 Bar Types		
W/in 1 Bankfill	Sometimes	Sometimes	2.12 Substrate Con	npositior	า	Revetmt. Type	Rip-F	Rap	None	Mid	Point	Side
Texture	Silt/Clay	Silt/Clay	Bedrock	0	%	Revetmt. Length	า (ft)	81	0	0	1	1
1.5 Valley Features			Boulder	11	%	Near Bank Veg.		Left	Right	Diagonal	Delta	Island
Valley Width	(ft) 60		Cobble		%	Dominant	Conifer		Coniferous	0	0	0
Width Determinati	. ,	ured	Coarse Gravel	24		Sub-dominant				5.2 Other Fea	•	U
Confinement Ty		-confined	Fine Gravel	12		Bank Canopy		Left	Right			
Rock Gorg	_	commed	Sand		%	Canopy %	-	-75	51-75	Flood Neck (Avulsion Braid
•		width? No	Gana	5	/0	Mid-Channel Ca			osed	1 0		0 0
Human-caused char	igeu valley								JSeu	5.3 Steep Riff		
Notes:						3.2 Riparian Buf				Steep Riffles	Head Cu	
			Silt/Clay Present?		es	Buffer Width	-	Left	Right	0	0	No
Much of lower segments most likely reflecting			Detritus	3	%	Dominant	51-	100	51-100	5.4 Stream Fo	ord or Anim	al Yes
valley/channel. Alth			# Large Woody		6	Sub-dominant	-	6-50	26-50	5.5 Straighten	ing	Yes
cross-section, down	-		2.13 Average Large	est Partic	cle on	Buffer Veg. Typ	e L	.eft	Right	5.5 Dredging		None
many sections of rea	•		Bed 11.0		inches	Dominant	Conifer	ous	Coniferous			
channel evolution w	as chosen.	Channel	Bar 4.0		inches	Sub-dominant	Shrubs/Sa	plin S	hrubs/Saplin			
wider than predicited						3.3 Riparian Cor	ridor					
headwaters, high-gr			2.14 Stream Type			Corridor Land	I	Left	Right			
HG regression is no	t well suited	<i>.</i> ,	Stream Type:	в		Dominant	-	rest	Forest			
Significant straighter	nina in uppe	er sectio of	Bed Material:	Cobbl	e	Sub-dominant	Past		Pasture			
segment along old fi			Subclass Slope:	None			Amou		Mean Height	Note:		
changes form signifi			Bed Form:		Bed	Mass Failures	Multi		6.00	Step 1.6 - Gi	ade Contr	ols and
bank vegetation. Ch			2.15 Reference Str					-		Step 1.0 - Gl		
-3 feet and flow is lin segmented further b			(if different from			Gullies	N	one	0.00	are on The s report - Step	econd pag	e of this

Stream:Alder BrookReach # M14Organization:Essex Waterways AssociationObservers:EPF, AV	ch Summary page 2 of 2 Segment: B	November 19, 2006 Completion Date: August 15, 2006 Rain: No
	in pasture at edge of conifers up to cros	
1.6 Grade Controls None	·	rphic Assessment Data
Total Height Type Location Total Above Motor (ft) Photo Taken GPSTaken	Confinement Type Confin	
Type Location Total Above Water (ft) Photo Taken GPSTaken		Score STD Historic
	7.1 Channel Degradation	11 None Yes
	7.2 Channel Aggradation	12 None No
	7.3 Widening Channel	14 No
	7.4 Change in Planform	10 Yes
	Total Score	47
	Geomorphic Rating	0.5875
	Channel Evolution Model Channel Evolution Stage Geomorphic Condition Stream Sensitivity	F II Fair High
	Step 6. Rapid Habitat Asse	
4.8 Channel Constrictions	Stream Gradient Type	High
Photo GPS Channel Floodprone		Score
Type Width Taken? Taken? Constriction? Constriction?	6.1 Epifaunal Substrate - Available Cover	15
Instream 6.00 Yes No Yes Yes	6.2 Embeddedness	13
Problem Deposition Above, Scour Above	6.3 Velocity/Depth Patterns 6.4 Sediment Deposition	10 13
Instream 4.00 Yes No Yes Yes Problem Scour Above	6.5 Channel Flow Status	13
Hublem Scoul Above	6.6 Channel Alteration	9
	6.7 Frequency of Riffles/Steps	12
	6.8 Bank Stability	Left: 7 Right: 7
	6.9 Bank Vegetation Protection	Left: 7 Right: 7
	6.10 Riparian Vegetation Zone Width	Left: 6 Right: 6
	Total Score	123
	Habitat Rating	0.615
Narrative:	Habitat Stream Condition	n Fair

Some incision in straightened section not picked up in cross-sectional data. Channel evolution assessed at stage II due to observed incision.

Stream:		er Broo				ich # M15		2 Segment S		Seg	ge 1 of 2 jment: 0	Novembe Completion	r 19, 2006 Date:		: Yes 18, 2006
Organization:		x Wate	erways Asso			vers: EPF	•			-	Not assessed:			Ra	in: No
Segment Lengt	th (ft):		7,341	Segr	ment Loca	tion: Hea	Idwa	iters reach acc	essed from	Rol	llin Irish Rd to	south.			
Step 1. Va 1.1 Segmentation			dplain	Step 2.1 Bankfu	2. Stream		10	Step 3.1 Stream Bank	3. Riparian F	eatu	ires	4.1 Springs / S	4. Flow & Seeps		odifiers bundant
1.2 Alluvial Fan	No	5		2.2 Max D	epth (ft)	0.6	65	Typical Bank S	lope Steep			4.2 Adjacent \	Netlands	Α	bundant
1.3 Corridor Encr	roachme	ents		2.3 Mean I	Depth (ft)	0.4	43	Bank Texture	L	.eft	Right	4.3 Flow Statu	JS	L	w
Length ((ft)	One	Both	2.4 Floodp	orone Width	ı (ft) 1	18	Upper	_			4.4 # of Debri	s Jams	;	3
Berr	ms	0	0	2.5 Aband	. Floodpln	0.6	65	Material Type	N	/lix	Mix	4.5 Impoundm	nents	Ν	one
Roa	ds	0	0	2.6 Width/	Depth Ratio	23. 2	26	Consistency	Non-cohesi	ive	Non-cohesive	Impoundmt.	Location		
Railroa	ds	0	0	2.7 Entren	chment Rat	tio 1. 7	75	Lower				4.6 # of Storm	water Inp	outs)
Improved Pat	:hs	0	0	2.8 Incisio	n Ratio	1.(00	Material Type	Boulder/Cob	obl B	oulder/Cobbl	4.7 Upstream	Flow	Ν	one
Developme	ent	0	0	2.9 Sinuos	ity	Lo	w	Consistency	Non-cohesi	ive	Non-cohesive	4.9 # of Beav	er Dams	0	
1.4 Adjacent Side	е	Left	Right	2.10 Riffle	s Type	N	ot	Bank Erosion	L	eft	Right	Affected L	ength (ft)	0	
Hillside Slo	_ pe	Steep	Steep	2.11 Riffle	/Step Spaci	ing (ft) 0)	Erosion Length	(ft)	0	0	Step 5. Chan	nel Bed a	and Plan	form Changes
Continuous	w/Some	etimes	Sometimes					Erosion Height	(ft) 0 .	.00	0.00	5.1 Bar Types			<u> </u>
W/in 1 Bank	fill Some	etimes	Sometimes	2.12 Subst	trate Comp	osition		Revetmt. Type	No	ne	Rip-Rap	Mid	- Point		Side
Textu	ure	Mixed	Mixed	Bedrock		0 %		Revetmt. Length	h (ft)	0	160	0	0		0
1.5 Valley Featur	res			Boulder		6 %		Near Bank Veg.	Type L	.eft	Right	Diagonal	Delta		Island
Valley Wid	dth (ft)	60		Cobble		42 %		Dominant			Shrubs/Saplin	0	0		2
Width Determi	nation	Measu	red	Coarse Gr	avel	25 %		Sub-dominant	Herbaceo	us	Herbaceous	5.2 Other Fea	tures		
Confinement	t Type	Narrov	vly	Fine Grave	el	15 %		Bank Canopy	L	.eft	Right	Flood Neck (Avulsior	Braiding
Rock G	iorge?	No		Sand		12 %		Canopy %	26-	·50	26-50	1 0		0	0
Human-caused c	hanged	valley w	vidth? No					Mid-Channel C	anopy		Open	5.3 Steep Riff	les and H	ead Cuts	-
	-							3.2 Riparian Buf	fer			Steep Riffles	Head C		Trib Rejuv.
Notes:				Silt/Clay P	resent?	Yes		Buffer Width	L	eft	Right	0	0		No
Channel domina				Detritus		15 %		Dominant		00	>100	5.4 Stream Fo	ord or Anii	mal	No
characteristics w				# Large W	oody	8		Sub-dominant	26-	-50	26-50	5.5 Straighten			Yes
Channel wider th				2.13 Average Largest Particle or				Buffer Veg. Typ	be Le	eft	Right	5.5 Dredging	5		None
headwaters, high HG regression is	-			Bed	6.0	inche	es	Dominant	Mixed Tre	es	Mixed Trees				
rie regreeelen ie		r ounou)	•	Bar	2.0	inche	es	Sub-dominant	Shrubs/Sap	olin S	Shrubs/Saplin				
Some straighten								3.3 Riparian Cor			-				
section along ad	ljacent ha	ay fields	, as noted in	2.14 Strea	im Type			Corridor Land	L	eft	Right				
FIT.				Strea	am Type: E	В		Dominant	For		Forest				
				Bed	Material: C	Gravel		Sub-dominant	Shrubs/Sap	olin S	Shrubs/Saplin				
					s Slope: N				Amou		Mean Height	Note:			
				Be	ed Form: F	Plane Bed		Mass Failures		ne	5.00	Step 1.6 - G	rade Cont	rols and	
				2.15 Refe	rence Strea	am Type		Gullies		one	0.00	Step 4.8 - Cl	nannel Co	onstriction	
				(if diffe	rent from P	hase 1)						are on The s report - Step			5

Project: Stream: Organizatic		er Brook	ys Association	Reach # Observers:		ch Summary	page 2 of 2 Segment: 0	Completion	n Date: Rain:	November 19, 2006 August 18, 2006 No
Segment L	ength (ft):	7,3	41 Segm	nent Location:	Headwaters	reach accesse	d from Rollin Irish Rd to s	outh.		
1.6 Gra	de Controls	None					Step 7. Rapid Geomo	orphic Assessm	nent Da	ta
-		·	Total Height			(Confinement Type Plane			
Туре	Location	n Tota	Above Water (ft)	Photo Take	n GPSTaken			Score	STD	Historic
						7.1 Channel	I Degradation	15	None	Νο
						7.2 Channel	I Aggradation	16	None	Νο
						7.3 Widenin	g Channel	17		Νο
						7.4 Change	in Planform	13		Yes
							Total Score	61		
							Geomorphic Rating	0.7625		
							Channel Evolution Model	F		
							Channel Evolution Stage			
							Geomorphic Condition			
							Stream Sensitivity	Moderate		
							Step 6. Rapid Habitat Asse	ssment Data		
4.8 Char	nnel Constric	tions Non	9				Stream Gradient Type	High		
	Pł	noto GPS	Channel	Floodprone				S	core	
Туре		aken? Tak		Constriction?		6.1 Epifaunal	Substrate - Available Cover		15	
							6.2 Embeddedness		13	
						6	6.3 Velocity/Depth Patterns		11	
							6.4 Sediment Deposition		15	
							6.5 Channel Flow Status		15	
							6.6 Channel Alteration		10	
						6.7	Frequency of Riffles/Steps		16	
							6.8 Bank Stability	Left: 10		
							Bank Vegetation Protection	Left: 10		
						6.10 Ripar	rian Vegetation Zone Width	Left: 8		:: 8
							Total Score		51	
							Habitat Rating	0.	755	
Narrative	2:						Habitat Stream Condition	n (Good	

Some historic changes in planform from straightening along adjacent hay fields in lower reach.

					A	ppendix 4. I	Phase II Reac	h Summary	Statistic	S					
Reach	Segment	Stream Type	Dominant Bed Material	Bedform	STD*	Reference Stream Type†	Reference Bed Material†	Reference Bedform†	RHA Score	RHA Condition	RGA Score	RGA Condition	Reach Sensitivity	CEM**	CEM** Stage
M01		С	Gravel	Riffle-Pool					0.56	Fair	0.53	Fair	Very High	F	IV
M02		С	Gravel	Plane Bed	Yes	С	Gravel	Riffle-Pool	0.68	Good	0.68	Good	Moderate	D	llb
M03	А	В	Cobble	Plane Bed					0.67	Good	0.68	Good	Moderate	F	I
M03	В	С	Gravel	Riffle-Pool					0.47	Fair	0.53	Fair	Very High	D	lld
M04		С	Gravel	Riffle-Pool					0.48	Fair	0.50	Fair	Very High	D	llc
M05		С	Cobble	Riffle-Pool					0.61	Fair	0.50	Fair	Very High	D	llb
M06		С	Cobble	Riffle-Pool					0.60	Fair	0.49	Fair	Very High	D	llb
M07		F	Cobble	Plane Bed	Yes	В	Cobble	Step-Pool	0.43	Fair	0.36	Fair	Very High	F	V
M08	А	E	Sand	Plane Bed	Yes	E	Sand	Dune-Ripple	0.62	Fair	0.58	Fair	Very High	F	V
M08	В	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
M08	С	E	Sand	Plane Bed	Yes	E	Sand	Dune-Ripple	0.62	Fair	0.58	Fair	Very High	F	V
M09	А	E	Sand	Plane Bed					0.62	Fair	0.58	Fair	Very High	F	V
M09	В	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
M09	С	С	Gravel	Riffle-Pool					0.67	Good	0.61	Fair	Very High	D	llc
M10		E	Cobble	Plane Bed	Yes	E	Sand	Dune-Ripple	0.68	Good	0.66	Good	High	F	V
M11		E	Sand	Dune-Ripple					0.88	Reference	0.81	Good	High	F	1
M12		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
M13	А	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
M13	В	E	Gravel	Plane Bed	Yes	E	Sand	Dune-Ripple	0.78	Good	0.73	Good	High	F	IV
M14	А	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
M14	В	В	Cobble	Plane Bed					0.62	Fair	0.59	Fair	High	F	11
M15		В	Gravel	Step-Pool					0.76	Good	0.76	Good	Moderate	F	I

* STD = Stream Type Departure	Mean:	0.63	0.60
** CEM = Channel Evolution Model	Max:	0.88	0.81
† = Assessed Reference Condition Prior to Stream Type Departure	Min:	0.43	0.36

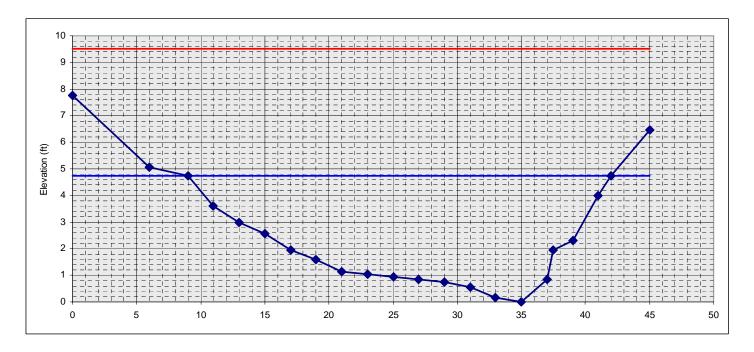
NE = Not Evaluated

Appendix 5. Alder Brook Reach Geometry Data

		÷	Phase 2 Stream Type				Phase	e 1 Data	Phase 2 Channel Data											
Reach	Seg- ment	Stream Type		Bedform	Subci. Slope		Slope	Channel e width	Bankfull width				r. Abandn FidPin		Entrench- ment				RGA I Cond.	RHA Cond.
M01	0	с	Gravel	Riffle-Pool	None	No	0.8	32.9	33.0	4.75	2.97	325.0	6.45	11.1	9.8	1.4	IV	F	Fair	Fair
M02	0	C	Gravel	Plane Bed	None	No	0.8	3 32.0	32.0	3.5	2.73	85.0	3.5	11.7	2.7	1.0	llb	D	Good	Good
M03	А	В	Cobble	Plane Bed	None	Yes	1.0	32.3	42.0	3.6	2.63	70.0	3.6	16.0	1.7	1.0	1	F	Good	Good
M03	B	с	Gravel	Riffle-Pool	None	No	1.0	32.3	50.0	4.65	2.5	150.0	4.65	20.0	3.0	1.0	lld	D	Fair	Fair
M04	0	с	Gravel	Riffle-Pool	None	No	1.1	30.5	43.5	4.25	2.49	170.0	4.25	17.5	3.9	1.0	llc	D	Fair	Fair
M05	0	с	Cobble	Riffle-Pool	None	No	1.1	30.1	34.0	3.2	2.3	94.0	3.2	14.8	2.8	1.0	llb	D	Fair	Fair
M06	0	с	Cobble	Riffle-Pool	None	No	0.9	29.4	48.0	3.5	2.34	135.0	3.7	20.5	2.8	1.1	llb	D	Fair	Fair
M07	0	F	Cobble	Plane Bed	b	No	3.9	28.6	35.0	4.05	2.68	40.5	4.05	13.1	1.2	1.0	٧	F	Fair	Fair
M08	A	E	Sand	Plane Bed	None	No	0.1	28.5	26.5	5.9	2.71	250.0	7.15	9.8	9.4	1.2	٧	F	Fair	Fair
M08	B					No	0.1	28.5												
M08	с	E	Sand	Plane Bed	None	No	0.1	28.5	26.5	5.9	2.71	200.0	7.15	9.8	7.5	1.2	٧	F	Fair	Fair
M09	A					Yes	0.2	2 25.8									٧	F	Fair	Fair
M09	В					No	0.2	2 25.8												
M09	c	с	Gravel	Riffle-Pool	None	No	0.2	2 25.8	27.5	1.9	1.25	250.0	1.9	22.0	9.1	1.0	llc	D	Fair	Good
M10	0	E	Cobble	Plane Bed	None	No	0.1	- 155.197 <u>-</u>	18.0		6 0416-5-	210.0	2.85	9.5	11.7	1.0	v	F	Good	Good
M11	0	E	Sand	Dune-Ripple	None	No	0.2	사내 (요구) 관	15.5	2.85	1.89	450.0	2.85	8.2	29.0	1.0	1	F	Good	Reference
M12	0	- Calenter				No	0.2	2 19.4								202.0				
M13	A					No	0.4	9.0												
M13	B	E	Gravel	Plane Bed	None	No	0.4		9.3	2.6	1.7	155.0	2.9	5.5	16.7	1.1	IV	F	Good	Good
M14	A					No	3.0) 15.0												
M14	B	В	Cobble	Plane Bed	None		3.0		15.0	1.9	1.24	36.5	1.9	12.1	2.4	1.0		F	Fair	Fair
M15	0	B			None		4.1		10.0				0.65	23.3	1.8	1.0	1	F	Good	Good

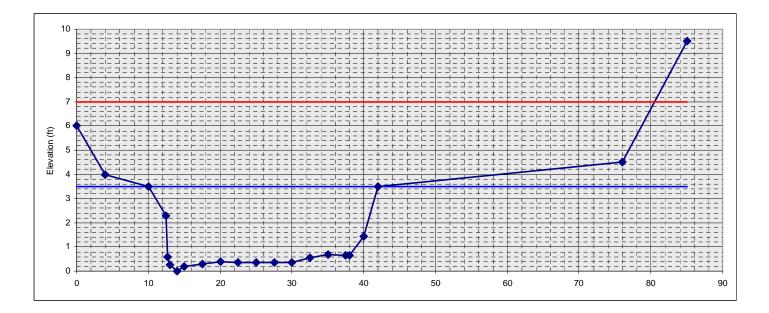
Appendix 6

Cross-sectional plots for Alder Brook reaches and segments are found below (all units in feet). The horizontal **blue line** represents the bankfull width and depth, and the **red line** represents the field-estimated floodprone depth and width (if visible on plot). Reaches/segments with multiple cross sections are denoted by X1, X2, etc.

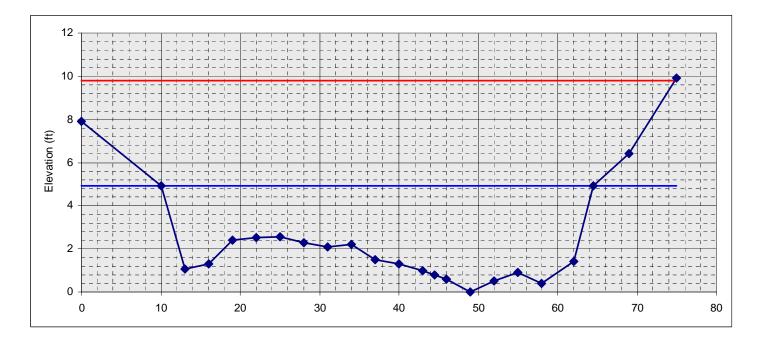


Reach M01

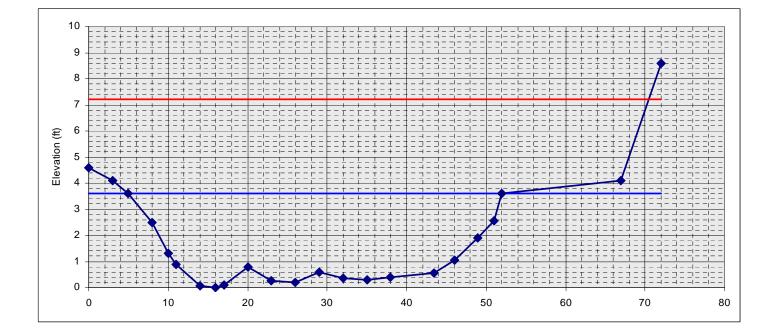
Reach M02 - X1



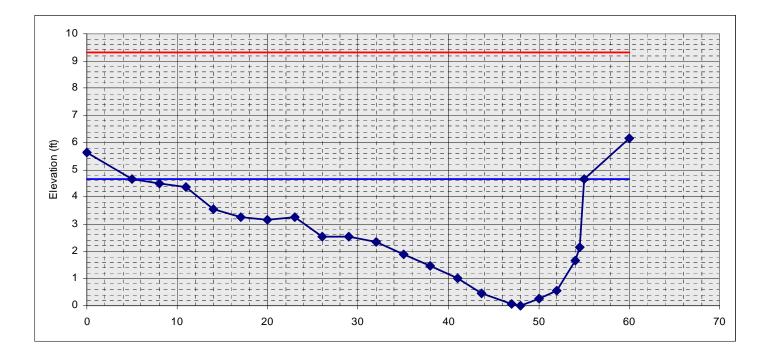
Reach M02 – X2



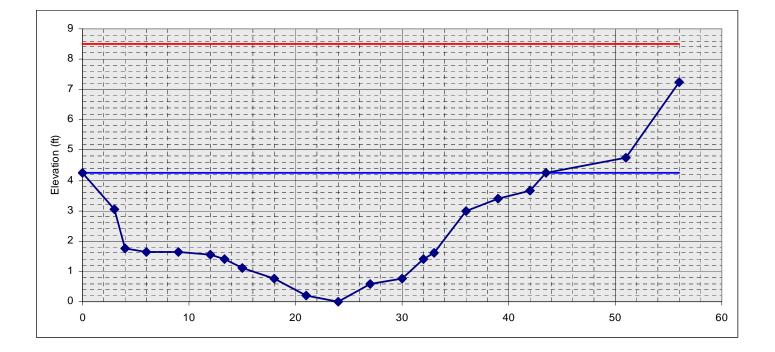
Segment M03-A



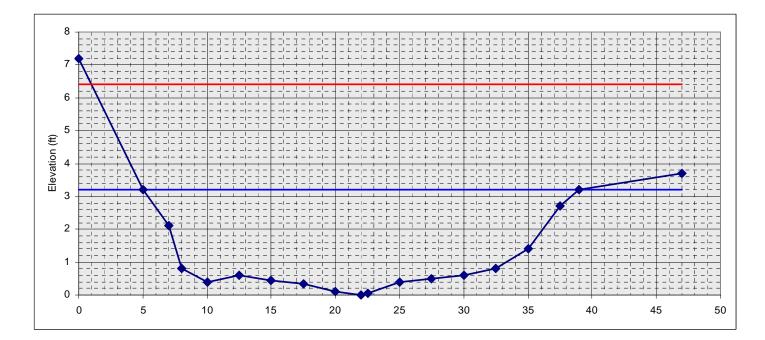
Segment M03-B



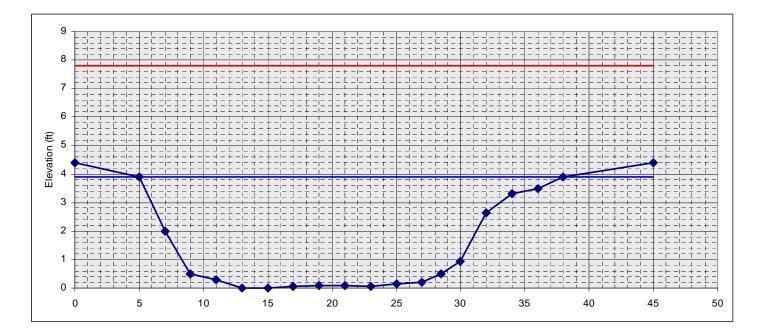
Reach M04



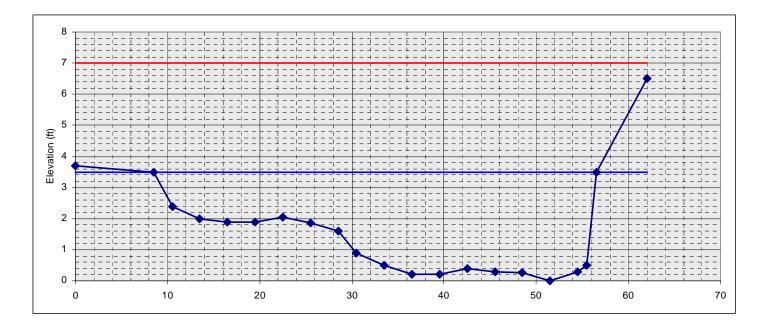
Reach M05



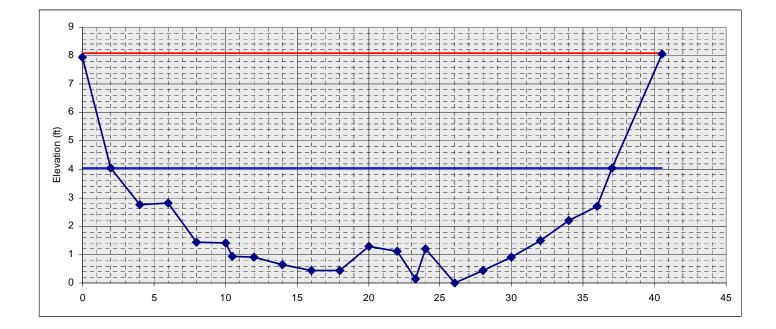
Reach M06 X1



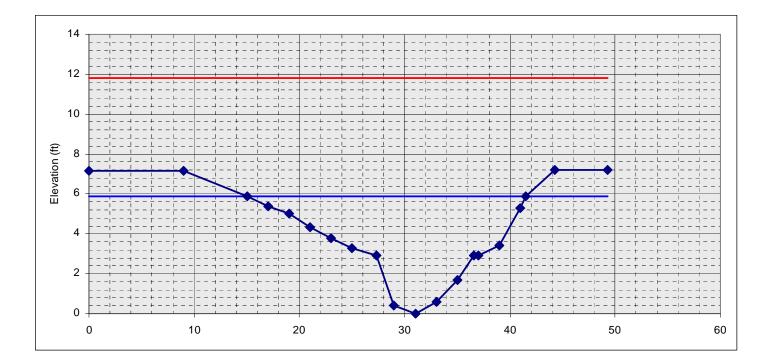
Reach M06 – X2



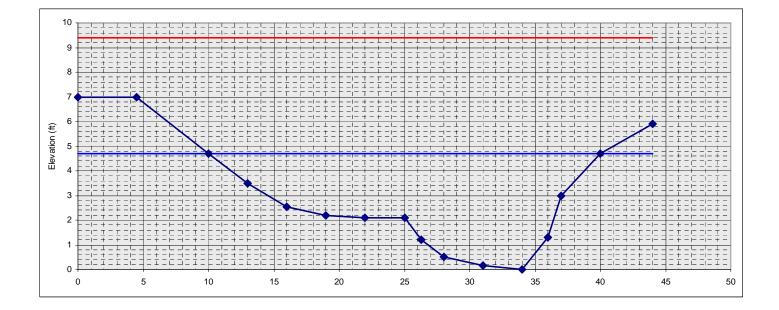
Reach M07



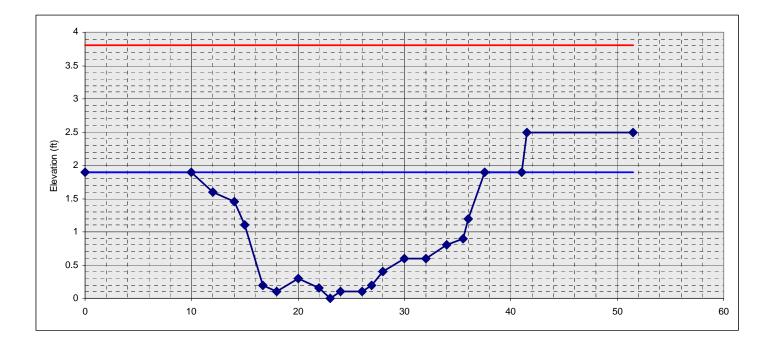
Segment M08-B - X1



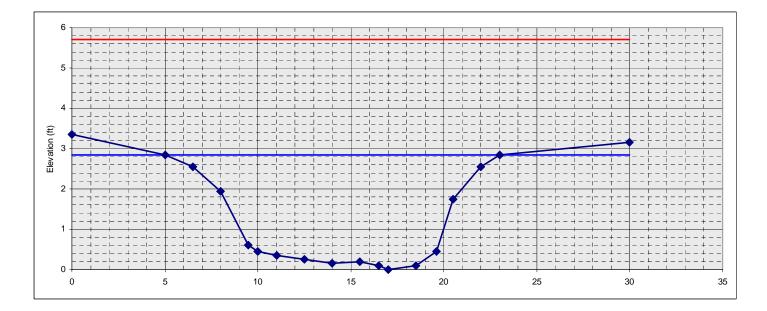
Segment M08-B - X2



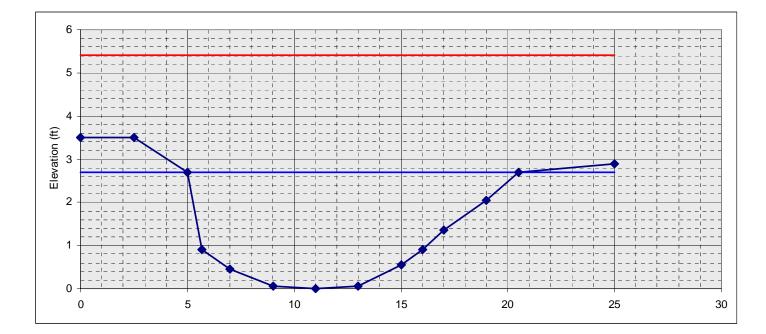
Segment M09-C



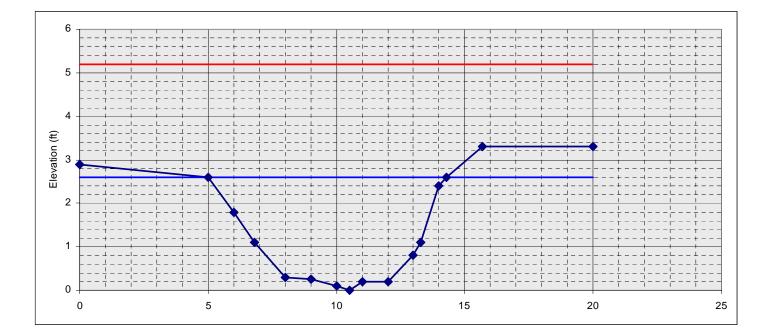
Reach M10



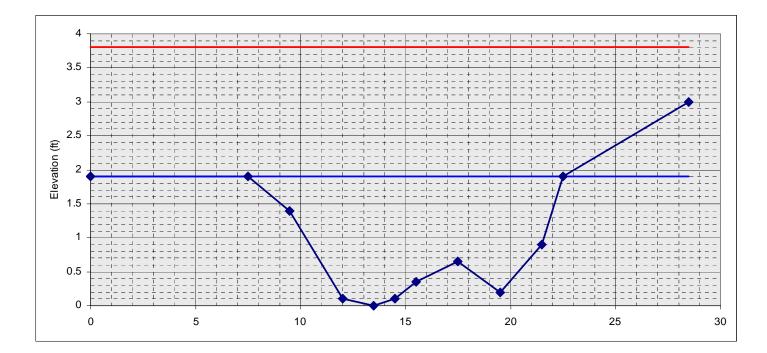
Reach M11



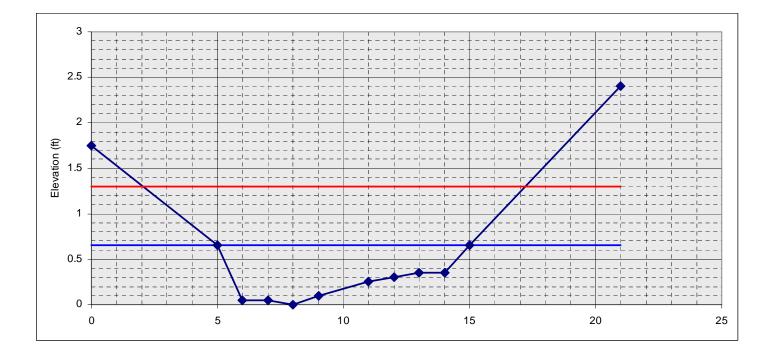
Segment M13-B



Segment M14-B



Reach M15

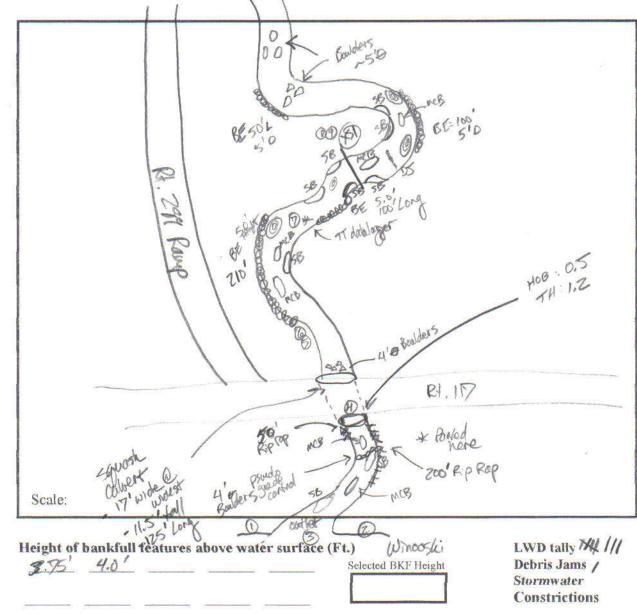


Appendix 7 – Reach Field Sketches

Sketch Fo	orm for Sites – Segments – Reach	es
Stream Name:	Aller Ble	S
Date:	7/31/06	T
Observers:	EPE A CMB	E
Organization //	Agency: FFA + FWA	

Segment or Site	ID:M	1
Town: Ess	en	
Elevation:	0	Ft.

Site Sketch - see reverse side for sketch codes and tally columns for left and right bank erosion, revetments, and corridor developments and calculating the total length of the segment affected by beaver flowages.



(culverts, bridges, old footings, bedrock)

D = Photo #

Sketch Form for Sites – Segments – Reaches

Stream Name	Alaber Bk	
Location:	West of 1289	15. ALC: N
Observers:	EPF to SNL	
Organization /	Agency: FEA & EWA	

Segment or S	Site ID: MA-	2-A
Date:	8/1/06	2 /
Town:	Esser	
Elevation:	- 300	Ft.
	bottom	

Site Sketch - see reverse side for sketch codes and tally columns for left and right bank erosion, revetments, and corridor developments and calculating the total length of the segment affected by beaver flowages.

Bor & 7.5" .45"
A MEIR' FR
20
mes recentle
WISS 00 HE
SE HITAHLINK THE LWD tally IIII Debris Jams Stormwater Constrictions

Sketch Form for Sites – Segments – Reaches

Stream Name:	Alder Bh	
Location:		
Ohamma		
Observers:		

Segment or Site ID: MC	03A1B
Date:	
Town:	
Elevation:	Ft.

Organization /Agency:

Site Sketch - see reverse side for sketch codes and tally columns for left and right bank erosion, revetments, and corridor developments and calculating the total length of the segment affected by beaver flowages.

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Scale: 56	a for the	No.	n dan perintah di kerakan Angkar bahar di kerakan
Scale: 59 V \ \	Weight .)	P AceBae	
	· (33)	12Cm	
Height of bankfull features above water surface (Ft.)	COR	gietch 1 Sech : 1	11/
and the reactives above water surface (Ft.)	Selected BKF Height	LWD taily Debris Jams	f.
	Science DKF Height	Stormwater	and here and the second distances and
		Constrictions	
5 A. C. 2000 C. COMPLET CO. A. L. A		(culverts, bridges, old fo	otings, bedrock

Sketch Form for Sites – Segments – Reach Stream Name: Adex Bk Date: Bk Observers: EFF & SNL Organization /Agency: FFA & EWA	es Segment or Site ID: <u>M04</u> Town: <u>Estern</u> Elevation: <u>SSD (bottom</u>) Ft.
Site Sketch - ee revensed in ketch codes and tally columns for l developments and calculating the physical length of the segment affected by	
Sperior Barberry Barb	Poly and Par
Change and	Road B OMEIO' NW Gred
Philled H = 4.5	State one of the seni-contined
Reader Daw	Dir De FF35×75'
Concention OS	Sb) and mes
A Contraction	trib Joseph Exciding
Scale: MFIL D PE	42
Height of bankfull features above water surface (Ft.)	LWD tally Belected BKF Height Debris Jams Stormwater Constrictions
	(culverts, bridges, old footings, bedrock)

Stream Name: Alder Bh	Segment or Site ID: MOS
ocation: Upper crossing of 289 to North	Date: 8/2/06
a contraction of the second se	Town: Essen, UT
Diservers: EPF & SNL Drganization /Agency: FEA & FWA	Elevation: Ft.
Site Sketch - see reverse side for sketch codes and tally columns for	
levelopments and calculating the total length of the segment affected b	by beaver flowages. LWO: HAHAH # THI
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1 Chix 30	
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Phase 2 Stream Geomorphic Assessment Murch, 2006

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Vermont Agency of Natural Resources

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Phase 2 Stream Geomorphic Assessment March, 2006

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Vermont Agency of Natural Resources

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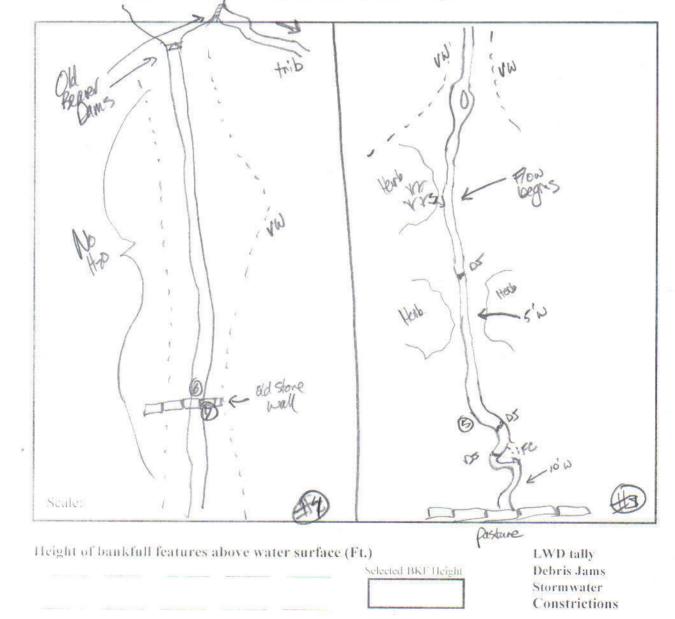
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(culverts, bridges, old footings, bedrock)

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Appendix 8. Alder Brook ANR Biomonitoring Results							
Date	ANR	Stream	SGA	Mean	Mean Species	Mean EPT	Community
Sampled	SiteID	Mile	Reach	Density	Richness	Richness	Assessment
10/17/1996	490700000003	0.3	M01	1368	37	17	Good
10/10/2001	49070000003	0.3	M01	1604	35	15	Good - Fair
10/2/2003	49070000003	0.3	M01	2220	44	18	Good - Very Good
8/24/2004	49070000003	0.3	M01	929	39	17	Good
9/30/1993	490700000028	2.8	M07	2210	27	14	Fair
10/13/2005	490700000041	4.1	M08-A	898	57	8	Good
10/14/1992	490700000048	4.8	M08-B	1004	44	15	Unrated

EPT: Sensitive Families of Ephemenoptera, Plecoptera, Trichoptera