APPENDIX K

HOUSATONIC RIVER AND RIPARIAN COMMUNITY CHARACTERIZATION: LYMAN STREET TO THE CONFLUENCE

Housatonic River and
Riparian Community Characterization:
Lyman Street to the Confluence

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Prepared for:
Roy F. Weston, Inc.
One Weston Way
West Chester, PA 19380-1499

Prepared by:
Woodlot Alternatives, Inc.
122 Main Street, Number 3
Topsham, ME 04086

Table of Contents

List of Figures

List of Tables

List of Appendices

1.0 INTRODUCTION

The United States Environmental Protection Agency (USEPA) is in the process of characterizing natural resources found in and adjacent to sections of the East Branch Housatonic River in Pittsfield, Massachusetts. The stretch of river described in this report is approximately 1.5 miles in length and extends from Lyman Street to the confluence with the West Branch of the Housatonic River (Figure 1). This stretch of the river is known as the EE/CA reach as defined in USEPA=s Combined Action Memorandum (26 May 1998). Portions of this area have been contaminated by Polychlorinated Biphenyls (PCBs), which originated from the General Electric (GE) facility in Pittsfield (Canonie Environmental, 1995). This report describes the methods and results of survey efforts to describe the physical and biotic resources of the study area.

1.1 PURPOSE OF REPORT

The purpose of the report is to describe existing conditions in the 1.5 mile section of the East Branch from Lyman Street to the confluence with the West Branch. Descriptions include both a stream and a riparian characterization. Data collected from field surveys may be used by the USEPA to reconstruct and/or enhance stream and riparian features if contaminated soils are removed from the site.

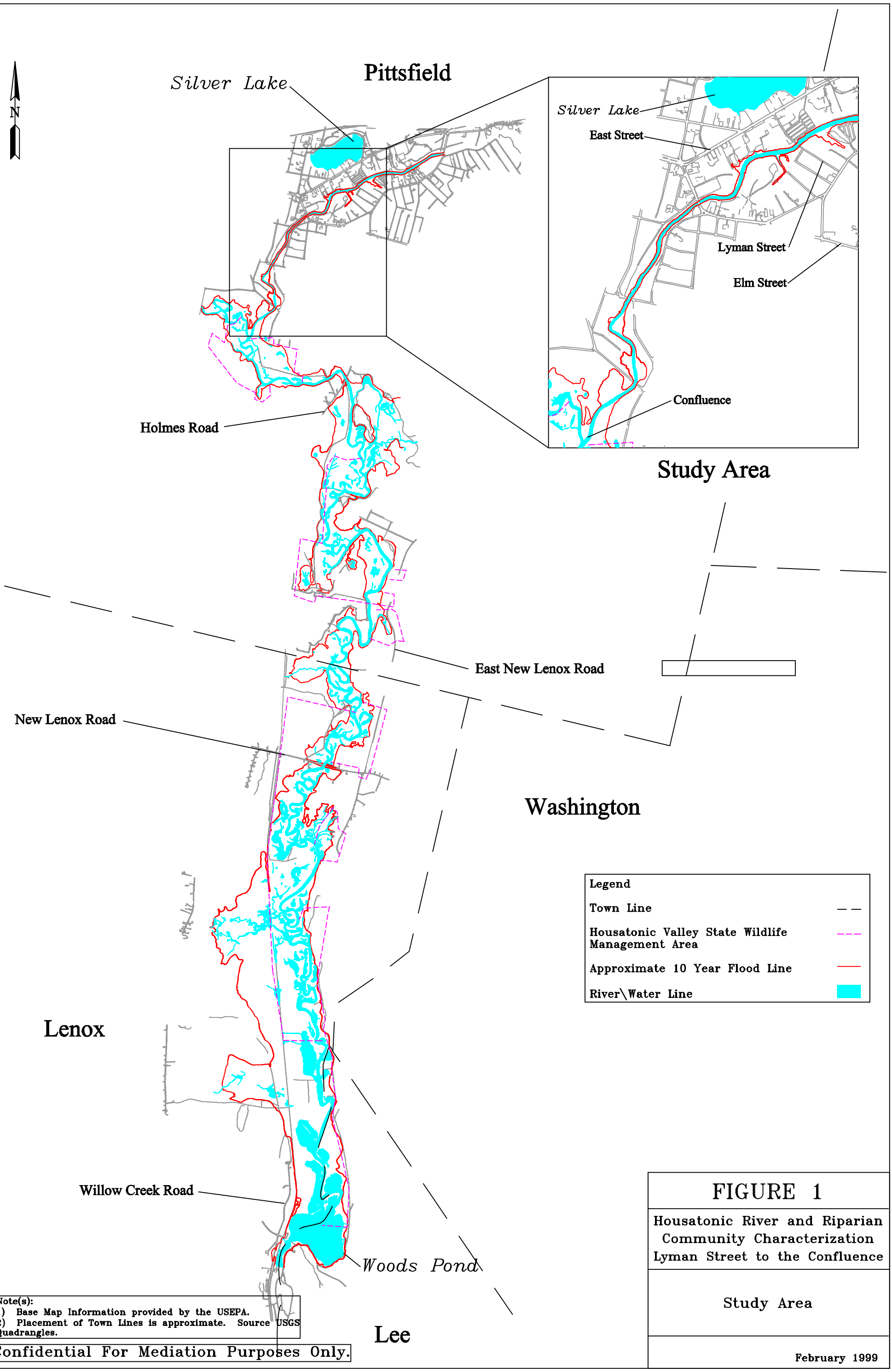
1.2 BACKGROUND

This section of the report briefly describes the study area and provides historical information on development and subsequent changes in natural communities.

1.2.1 SITE DESCRIPTION

The East Branch Housatonic River originates in the villages of Washington and Hinsdale, Berkshire County. It flows north for approximately seven miles to Dalton before turning west toward Pittsfield. The East Branch flows through urban Dalton and Pittsfield before reaching the confluence with the West Branch.

The study area is in an approximately 1.5 mile section of the East Branch Housatonic River in Pittsfield, Berkshire County, Massachusetts (Figure 1). Included in the study area is the river and riparian habitats within the ten-year flood zone from Lyman Street to the confluence with the West Branch. This section of the East Branch passes through urban Pittsfield where the river channel is well defined with abrupt, steep banks. Forested riparian areas bordering the river are typically narrow due to adjacent residential, commercial, and industrial land. Four bridges (Lyman Street, Elm Street, Dawes Avenue, and Pomeroy Avenue), artificial shoring, and channelization (Massachusetts Department of Environmental Protection 1995) have affected the channel size and shoreline zone of the East Branch. Several former oxbows and natural meanders were filled for the development of residential or commercial land (MADEP 1995).



Note(s):
1) Base Map Information provided by the USEPA.
2) Placement of Town Lines is approximate. Source USGS Quadrangles.

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FIGURE 1

Housatonic River and Riparian Community Characterization
Lyman Street to the Confluence

Study Area

February 1999

1.2.2 SITE HISTORY

Modifications to the East Branch of the Housatonic River and adjacent riparian communities, in the form of industrial and residential influences, have created observable differences in water and sediment quality, floodplain size and character, and river course location. The key influences on these differences are PCB discharge, waste water discharge, and land clearing.

From 1937 to 1977, GE used PCBs as insulating liquids for certain transformer applications (Blasland and Bouck Engineers, P.C. 1991). These materials came to be located in the sediments of the Housatonic River and associated floodplain by direct discharge from the facility, discharge from Silver Lake, erosion and runoff of contaminated soil, discharge of contaminated groundwater, and inadvertent discharge due to spills and other events (Roy F. Weston, Inc. 1998). Elevated levels of PCBs (≥1 ppm) appear to be largely confined to the ten year flood zone (Blasland and Bouck Engineers, P.C. 1991, 1992, 1993; Blasland, Bouck, and Lee, Inc. 1994). During the channelization of the Housatonic River, a number of oxbows were filled (MADEP 1995). Some of the fill material was contaminated by PCBs (Blasland, Bouck, and Lee, Inc. 1996). The total extent of PCBs in the sediments, riverbank soils, and floodplain is now under investigation, as is the potential affect of PCBs on organisms in the study area.

Industrial and municipal discharges to the Housatonic River contribute significantly to the flow quantities. An approximate total of 46 cubic feet per second (cfs) is added to the flow of the Housatonic River from several industrial facilities and seven municipal facilities in Massachusetts (Blasland, Bouck, and Lee, Inc. 1996).

Clearing of riparian areas has occurred throughout the study area and industrial and residential development dominate the upstream areas. This has limited the riparian zone to a narrow (often <60 feet wide), largely continuous, corridor that is broken by four bridges, two remediation sites with bank stabilization (at Lyman Street and Demming Street), and a short section of shoreline stabilization. Residential land use, particularly between Dawes and Pomeroy Avenue, is prevalent. This has both decreased the size of the high floodplain forest and brought a significant non-native plant component to the area.

2.0 METHODS

Stream and riparian characterization was performed using a modified methodology of Lortie *et al*. (1998).

2.1 STREAM CHARACTERIZATION – EXISTING CONDITIONS

An existing conditions survey was conducted to characterize the stream to create a template for potential restoration actions. In-stream and shoreline features were drawn onto 1:480 scale maps for the entire stretch of the study area. The resultant plan portrayed stream characteristics, depth, substrate type, and the location of physical features. This information was digitized using AutoCAD**7** to

create the final existing conditions maps. Photographs were taken throughout the study area to illuminate the existing features descriptions. Existing conditions maps with pertinent photographs are included in this report as Appendix B.

Stream characteristics included pools, riffles, runs, and eddies (Armantrout 1988): pools are aquatic habitats in streams with gradients less than one percent and are normally deeper and wider than the aquatic habitats above and below; riffles are shallow reaches with low subcritical flow (one to four percent gradient) in alluvial channels of finer particles that are unstable, characterized by small hydraulic jumps over rough bed material, causing small ripples, waves, and eddies, without braking the surface tension; runs are swiftly flowing stream reaches with a gradient greater than four percent, with little to no surface agitation, waves, or turbulence, and no major flow obstructions, with approximately uniform flow, substrates of variable particle size, and water surface slope roughly parallel to the overall stream gradient; eddies are circular currents of water, sometimes quite strong, diverging from and initially flowing against the main current, usually formed where water flows past some obstruction or on the inside of river bends.

In-stream features of significant size to produce stream morphology or to serve as wildlife habitat were depicted on the existing features map. Boulders, ledge outcrops, cobble or gravel bars, logs, and downed trees were common items encountered during the survey. Additionally, abrupt water course drops, such as over ledge or old structures, were also mapped.

Shoreline features such as gravel or cobble beaches, undercut banks, and artificial structures (*e.g.*, gabions, bridge abutments) were drawn onto the existing conditions map. These features were important for portraying impacts of a human origin, wildlife habitat, and substrate available for shoreline plants.

2.2 RIPARIAN CHARACTERIZATION

The riparian characterization focused mainly on the vegetation, though some topographic and surficial soil information was collected. No subsurface soil data was collected for this report. Procedures for information collection followed that of the Maine Natural Areas Program (1997)[1]. A copy of this protocol can be found in Appendix A. Plot size was modified to accommodate the riparian community dimensions. As width of the community varied, depending on urban encroachment, a variable width of up to 40 feet was utilized. Length of each plot was fixed at 50 feet.

Sampling was conducted every 1000 feet at survey stakes through the length of the study area. The distance between each plot varied only when property access or inappropriate plot location (*e.g.*, plot occurred at a bridge) dictated moving sampling location up- or down-stream. Photographs were taken at each plot.

[1] The Massachusetts Natural Heritage and Endangered Species Program does not have a detailed natural community sampling protocol. Therefore, that of the Maine Natural Areas Program was used instead.

Field surveys for the riparian vegetation were performed on 10 November to 13 November 1998. Though nearly all of the material found was identifiable, a number of vascular plant species would have already senesced by this time. For example, plant species that would be classified as spring ephemerals, such as trout lily (*Erythronium americanum*), would not be present during the field surveys. Therefore, the herb strata lists are biased for summer and fall flowering species. It was also difficult to accurately assign values for percent cover as many species had shed leaves or were in the process of leaf drop.

Basal area (ba) in feet was calculated for trees greater than 2 inches in diameter at 4.6 feet height (dbh) using the following formula: $d^2 \times 0.000078539816$, where d = dbh in inches. Trees for a given plot were summed and scaled, according to the plot size, to produce values with m^2/ha as units. Summary basal area figures are reported in both metric and English amounts for this report

3.0 RESULTS

Results of the field surveys are presented separately for stream and riparian characterization. Much of the collected information is summarized in figures and tables (identified in each section).

3.1 STREAM CHARACTERIZATION

Maps depicting the location and juxtaposition of stream features are located in Appendix B. In general, the study area can be morphologically described as a moderately entrenched stream system with moderate gradients of two to four percent, in a narrow, gently sloping valley. Entrenchment is defined as stream systems that have eroded into the substrate leaving the stream confined by walls resistant to erosion. Such stream systems typically contain relatively dense riparian vegetation that plays an important role in maintaining channel stability, and have a characteristically low sediment load (Rosgen and Silvey 1998). The study area largely fits this description, although several sections of the river that have been channelized or otherwise altered and depict slightly different characteristics. These alterations typically take the form of steeper than normal banks dominated by rip-rap of large rocks, boulders, granite and concrete slabs, and timber cribs.

Within the study area, three distinct sections were recognized and are based on the dominant in-stream habitats. Section 1 extends from Lyman Street to Elm Street (Appendix B, Sheets 1 and 2, Transect T070 to T110) and is largely one single run, flowing over fine sand substrates. Section 2 extends from Elm Street to just upstream of Pomeroy Avenue (Appendix B, Sheets 2 to 5, Transect T110 to T170) and consists of higher gradient riffle habitat over ledge, large rock substrate, and gravel bars. Section 3 extends from just upstream of Pomeroy Avenue to the confluence (Appendix B, Sheets 5 to 7, Transect T170 to T212) and consists of run habitat over sand substrates with occasional small riffles over gravel bars.

Section 1 consists mainly of a single, continuous stretch of run habitat. The channel varied from 50 to 65 feet in width and depth varied from 2.0 to 4.0 feet deep. The deeper areas generally occurred along the outer turns of the channel. Few sharp bends occurred in this section and, subsequently, few

point bars (deposits of sediment on the inside of a growing meander) were observed. Only one point bar occurred in this section, near Transect T082. A few small silt and sand bars were also noted in this section. These generally occurred just downstream of bends in the river, along the inside turn area of the channel. The only in-stream habitat features consistently observed in this section were downed trees and logs. These features were quite common within the channel and occasionally created turbulent water, but not riffle habitat.

Substrates within this section were predominantly sands and fine gravels. A smooth, featureless bottom was characteristic of much of the channel with small mounds of finer particles downstream of larger logs and trees. The banks in this section were steep and well armored with dense roots from stream-side trees. Several sections of bank also consisted of rip-rap. This included one new section of boulder rip-rap near Lyman Street and a sloping area of concrete slabs near Elm Street.

Section 2 occurred from Elm Street to just upstream of Pomeroy Avenue. This corresponded to Transect T110 to Transect T170. This section of the river was dominated by riffles with intermittent runs. Channel width varied from 30 to 55 ft and depths varied from 0.65 ft in riffles to 4.0 ft in runs and pools.

Riffles generally flowed over large rocks, boulders, and ledges in the upper three-fourths of this section (Transects T110 to T152), after which substrates became dominated by small rocks, cobble, and finally gravel at the downstream end of the section. The channel itself shifted back and forth in this stretch depending on the locations of flow restricting ledges and gravel bars. Runs were dominated by large rock and cobble substrates in the upper half of this section and by fine gravel and sand in the lower half of this section.

The bank, particularly the north bank, was highly altered in this section. From Transect T110 to T123, the north bank was a steep slope of large cobble and occasional concrete rubble overgrown by shrubs and trees. From Transect T132 to T142, cobble-filled rock gabions formed the dominant slope structure along the north bank. The south bank of the river generally consisted of a steep, well-armored slope of tree roots and fibrous forest duff.

Section 3 extended from just upstream of Pomeroy Avenue to the confluence, which corresponded with Transect T170 to T212. Channel width varied from 42 to 62 ft and depth from 0.65 ft to 4.0 ft. Runs were the most common in-stream habitat associated with this stretch of the river, although some gravel bars formed small riffle areas near the confluence. A single, continuous run 1.0 to 2.2 ft deep occurred from Transect T170 to T192. Below this, occasional riffles occurred at shallow gravel and sand bars that also diverted the river flow back and forth across the channel.

Substrates in this section of the river varied from course silt to gravel, with course sand as the most common particle size. At the lower end of the study area, near the confluence of the East Branch and West Branch (downstream of Transect T206), gravel becomes the predominant substrate. Many downed logs and trees were present in the stream, causing eddies on the downstream side. Shoreline bars were present, but infrequent, in Section 3 of the river. The riverbank was generally steep and apparently well armored, evidenced by the lack of erosion. In the lower portion of Section 3, the bank was sometimes mildly sloped.

3.2 RIPARIAN CHARACTERIZATION

The riparian communities of the study area (identified in the legend of the existing conditions maps in Appendix B) are best described as a narrow, largely continuous band of floodplain forest comprised of fast-growing trees. Only four bridges, two remediation sites (*i.e.*, Lyman and Demming), and a section of shoreline stabilization (gabions) break the forest corridor in this 1.5 mile stretch. Though no stumps were seen, the young age of most trees (mean = 33 years), and the minor amounts of both standing dead trees and downed woody material, suggest these forests have been cleared at some point in the recent past.

Due to the proximity of urban and residential sprawl, the vegetation of the riparian communities has a significant non-native component. Norway maple (*Acer platanoides*) was the most common non-native canopy tree. It occurred in 11 of the 29 community plots and was occasionally the dominant member of that stratum. The lianas and shrub strata possessed the highest ratio of non-native to native species in the study area. Frequently the entire layers were composed of introduced or escaped plants. Morrow=s honeysuckle (*Lonicera morrowii*), multiflora rose (*Rosa multiflora*), oriental bittersweet (*Celastrus orbiculata*), and common buckthorn (*Rhamnus cathartica*) were the dominant, non-native species. In one area downstream of Lyman Street, giant knotweed (*Fallopia sachilinensis*) and Japanese knotweed (*Fallopia japonica*) formed large, dense thickets. Other common woody non-natives included ninebark (*Physocarpus opulifolius*), wintercreeper euonymus (*Euonymus fortunei*), common privet (*Ligustrum vulgare*), and European spindle-tree (*Euonymus europaea*). The herbaceous layer varied in abundance with non-native species. Approximately twenty-five to fifty percent of the total cover of this stratum was non-native plants. Common herbaceous non-natives included wood bluegrass (*Poa nemoralis*), field-garlic (*Alliaria petiolata*), dame=s rocket (*Hesperis matronalis*), and celandine (*Chelidonium majus*).

3.2.1 NATURAL COMMUNITIES

FLOODPLAIN FOREST COMMUNITY

This was the dominant community in the study area and formed a largely continuous strip of forest from the Lyman Street bridge to the confluence of the East Branch and West Branch. Best described as a high floodplain, the forest typically grew on a flat or gently sloped terrace 4 to 12 ft above the normal flow level. Often, the edge of the community dropped precipitously into the river course with exposed soil and roots at the channel edge. The width of the community varied with location and side of the river. The floodplain forest on the north side of the river ranged in width from 6 to 174 ft, with most of the community less than 40 ft wide. This side of the river showed a higher level of industrial and residential encroachment on the riparian areas than the other shore. The floodplain forest on the south side of the river ranged in width from 23 to 226 ft, with much of the community exceeding 40 ft in width. The sizes of the riparian communities on this side of the river were largely affected by residential influences.

Dominant canopy trees included boxelder (*Acer negundo*), Norway maple, American elm (*Ulmus americana*), and cottonwood (*Populus deltoides*). Mean dbh for each species in the study area was 8.9 in, 7.72 in, 6.53 in, and 26 in, respectively. Silver maple (*Acer saccharinum*) and basswood

(*Tilia americana*) are infrequent associates. Canopy trees in this community averaged 16 ft in height, though trees as tall as 78 ft were recorded, and 30.5m^2 /ha (133 ft^2/acre) of basal area . Larger canopy trees ranged from 18 to 51 years old, with the mean age of 31 years.

Boxelder and Norway maple were the common sapling-size woody vegetation. Riverbank grape (*Vitis riparia*), and the introduced multiflora rose and oriental bittersweet were common lianas. These woody climbers often represented a significant amount of cover for the sapling stratum. Understory shrubs were represented almost entirely by non-native species. Morrow=s honeysuckle, Japanese barberry, common buckthorn, common privet, ninebark, European spindle-tree, and wintercreeper euonymus were the common shrub species. In a few places on the north shore, large thickets of giant knotweed (*Fallopia sachilinensis*) were observed. Native species, such as silky dogwood (*Cornus amomum*), red-osier dogwood (*Cornus sericea*), and black raspberry (*Rubus occidentalis*), were infrequent members of this stratum.

As with the other strata of this community, the herb layer was dominated by a mix of native and non-native species. Wood bluegrass, white snakeroot (*Ageratina altissima*), zig-zag goldenrod (*Solidago flexicaulis*), field-garlic, and stream bank wild rye (*Elymus riparius*) were the common species. Calico aster (*Symphyotrichum lateriflorum*), heart-leaved aster (*Symphyotrichum cordifolium*), smooth goldenrod (*Solidago gigantea*), a brome grass (*Bromus latigulumis*), dames rocket, and white avens (*Geum canadense*) were less common associates.

MEDIUM-GRADIENT STEAM COMMUNITY

The Housatonic River channel in the study area ranged from 30 to 60 ft wide and was generally 1.0 to 3.0 ft deep. Sections as deep as 4.0 ft were observed. The river drops a total of 10 feet over the 1.5 mile study area, equating to a 6.6 foot drop per mile. The substrate is typically sand and small cobbles, with little vegetation occurring in the river channel.

Vegetation occurring in this community was restricted to the few areas where upland sloped gradually into the river channel. In such areas, old sand bars and cobble shores were the common substrate that plants were found on. Reed canarygrass (*Phalaris arundinacea*) and creeping bentgrass (*Agrostis stolonifera*) were the most common herbs found on the shores of this community. Infrequent herbs included water scorpion-grass (*Myosotis scorpioides*), purple loosestrife (*Lythrum salicaria*), eastern willow-herb (*Epilobium coloratum*), coltsfoot (*Tussilago farfara*), and common water-purselane (*Ludwigia palustris*).

MESIC NORTHERN HARDWOOD FOREST COMMUNITY

This community, distinct from the riparian floodplain forest community, occurred at one site below Fred Garner Park, on each shore of the river. Both banks appeared to have been affected by past excavation. American beech (*Fagus grandifolia*) and sugar maple (*Acer saccharum*) were the dominant canopy trees. Mean dbh measurements for trees in this community were 8.4 and 7.7 inches, respectively. Canopy height was 49 ft with an average ba of 34.7 m^2 /ha (151 ft^2/acre). Additional tree species included eastern hemlock (*Tsuga canadensis*), white ash (*Fraxinus americanus*), and red oak (*Quercus rubra*).

Woody climbing vegetation was absent from the sapling layer, which was comprised exclusively of American beech. Silky dogwood, Morrow=s honeysuckle, winged burning bush (*Euonymus alatus*), and red-osier dogwood were common shrubs. On the north shore of the river, common scouring-rush (*Equisetum variegatum*) covered large portions of the steep bank. Herbs common to each shore were wood bluegrass and calico aster.

3.2.2 CANOPY DESCRIPTION

The canopy is described by plot in Table 1 and by species in Table 2.

3.2.3 WILDLIFE

Songbirds observed in this area included American robin (*Turdus migratorius*), American crow (*Corvus brachyrhynchos*), blue jay (*Cyanocitta cristata*), tufted titmouse (*Parus bicolor*), European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), northern cardinal (*Cardinalis cardinalis*), chimney swift (*Chaetura pelagica*), house finches (*Carpodacus mexicanus*), black-capped chickadees (*Parus atricapillus*), and goldfinches (*Carduelis tristis*). Both mallards (*Anas platyrhynchos*) and Herring Gulls (*Larus argentatus*) were observed during 1998 field surveys[2]. Their use of this section of the river is limited. Garter snakes (*Thamnophis sirtalis*) were the only herpetofauna observed in this section of the river. Striped skunks (*Mephitis mephitis*), woodchucks (*Marmota monax*), raccoons (*Procyon lotor*), beavers (*Castor canadensis*), muskrats (*Ondatra zibethica*), oppossums (*Didelphis marsupialis*), and eastern gray squirrels (*Sciurus carolinensis*) were observed in this section during the 1998 field surveys. No large mammals were observed.

4.0 DISCUSSION

The discussion of the field survey results is largely aimed at identifying low and high quality community features in reference to potential sediment removal action and remediation.

4.1 STREAM CHARACTERIZATION

In summary, Section 1 was morphologically the most uniform and provided little structure. The stream floor bottom tended to be featureless and composed of fine sands. In-stream structure was more diverse in Section 2. An abundance of riffle habitat, large rocks, ledges, and deeper pools were present. The majority of Section 3 was dominated by uniform run habitat with little in-stream structure, aside from the large amounts of downed trees and logs. Only the lower end of this portion of the study area contained structural diversity, such as gravel bars and small riffle sections. The general lack of in-stream structural diversity in major sections of the study area provides ample enhancement opportunity following potential remediation activities.

[2] Field surveys performed by Woodlot Alternatives, Inc. in preparation of a report for Techlaw, Inc. entitled AHousatonic River Ecological Characterization: Newell Street to Woods Pond@.

Table 1. Summary of Tree Data by Plot from Riparian Characterization.

Number of Stems in Plot

Plot Number	Plot Size (square meters)	American beech	American elm	*apple*	basswood	black willow	boxelder	cherry birch	cottonwood	eastern hemlock	*horsechestnut*	*Norway maple*	red oak	silver maple	sugar maple	white ash	white pine	standing dead
T070N	122		3				3							1				1
T080N	153						4											
T088N	135		2				2		2									
T110N	97						1					2		1				1
T120N	185		2	1								6						
T130N	134								1									
T140N	23																	
T148N	134		1						2									
T160N	185						8				1	8						
T170N	134						1					3						1
T180N	148						3					2		5				
T190N	148																	
T200N	134	5													2			1
T211N	185		1				4											
T070S	185		1			1	4		1									
T080S	185		1				12		5									
T088S	185		1				2											
T100S	162						6					3						
T110S	139		2				5				2	1						
T120S	185		4				7											
T130S	116		1				10											
T140S	185		1				4		1			2						
T148S	116		3				2					2						
T160S	185		1			1	3					2		2				
T170S	116						4										1	
T180S	116						1					5						
T190S	139	3						1		2			1		1	1		
T200S	185				5										1	1		
T211S	185				2		5											1

Basal Area (square meters/hectare)

Plot Number	Plot Size (square meters)	American beech	American elm	*apple*	basswood	black willow	boxelder	cherry birch	cottonwood	eastern hemlock	*horsechestnut*	*Norway maple*	red oak	silver maple	sugar maple	white ash	white pine	standing dead
T070N	122						15.5											
T080N	153		4.5				17.8							0.9				4.0
T088N	135		4.1				10.8		60.5									
T110N	97						7.3					4.6		1.8				5.1
T120N	185		2.0	0.7								8.3						
T130N	134								36.6									
T140N	23																	
T148N	134		1.0						19.9									
T160N	185						17.6				1.1	5.3						
T170N	134						16.5					2.0						2.3
T180N	148						3.9					3.3		23.8				
T190N	148																	
T200N	134	15.0													17.8			12.4
T211N	185		1.0				16.4											
T070S	185		1.8			2.7	22.1		1.7									
T080S	185		0.7				26.5		136									
T088S	185		0.7				6.5											
T100S	162						11.4					12.7						
T110S	139		6.0				11.6				4.0	1.0						
T120S	185		3.5				10.9											
T130S	116		1.5				42.6											
T140S	185		3.1				4.1		4.6			2.4				1.0		
T148S	116		7.4				8.5					36.6						
T160S	185		1.7			14.3	8.2					2.4		2.7				
T170S	116						22.3										4.2	
T180S	116						6.1					21.4						
T190S	139	8.2						3.5		13.3			1.3		1.0	7.3		
T200S	185				18.4										3.8	24.5		
T211S	185				12.6		5.8											0.7

Mean dbh (cm)

Plot Number	Plot Size (square meters)	American beech	American elm	*apple*	basswood	black willow	boxelder	cherry birch	cottonwood	eastern hemlock	*horsechestnut*	*Norway maple*	red oak	silver maple	sugar maple	white ash	white pine	standing dead
T070N	122						21											
T080N	153		16				28									13		26
T088N	135		18				27		68									
T110N	97						30									16		25
T120N	185		15	13												17		
T130N	134								79									
T140N	23																	
T148N	134		13						40									
T160N	185						22				18					13		
T170N	134						53									13		20
T180N	148						15									17		
T190N	148																29	
T200N	134	22																
T211N	185		15				31								25			46
T070S	185		14			25	35		20									
T080S	185		13				21		79									
T088S	185		13				27											
T100S	162						19									27		
T110S	139		23				18				18					13		
T120S	185		14				18											
T130S	116		15				24											
T140S	185		15				15		33							16		
T148S	116		33				23									44		
T160S	185		20			58	25									18		
T170S	116						26											
T180S	116						30									24		
T190S	139	19						25		30								
T200S	185				27								15		13	36		
T211S	185				36		16								30	76		
																		13

Percent of Total Basal Area for Plot

Plot Number	Plot Size (square meters)	American beech	American elm	*apple*	basswood	black willow	boxelder	cherry birch	cottonwood	eastern hemlock	*horsechestnut*	*Norway maple*	red oak	silver maple	sugar maple	white ash	white pine	standing dead
T070N	122						100											
T080N	153		16				65									3		14
T088N	135		5				14		80									
T110N	97						38									24		27
T120N	185		18	6												76		
T130N	134								100									
T140N	23																	
T148N	134		5						95									
T160N	185						74				4	22						
T170N	134						71					19						9
T180N	148						12					10				77		
T190N	148																	
T200N	134	42													21			35
T211N	185		6				94											
T070S	185		6			9	78		8									
T080S	185		1				16		83									
T088S	185		10				90											
T100S	162						48					52						
T110S	139		28				51				18	4						
T120S	185		24				76											
T130S	116		3				97											
T140S	185		21				27		31			16				6		
T148S	116		14				15					71						
T160S	185		5			48	28					8				9		
T170S	116						84										16	
T180S	116						22					78						
T190S	139	24						10		38					3	3		
T200S	185				39											8		
T211S	185				66		30											3

Italicized font indicates species is not native to Massachusetts

Table 2. Summary of Tree Data by Species from Riparian Characterization.						
Species	Percent Frequency Occurrence in Plots	Mean dbh (cm)	Mean dbh (inches)	Mean Basal Area (square m/ha)	Mean Basal Area (square ft/acre)	Mean age (years before present)
Amercan beech	6	21	8.3	11.6	50.5	103
American elm	48	16	6.3	2.7	11.8	26
apple	3	13	5.1	0.7	3.0	
basswood	6	30	11.8	15.5	67.5	52
black willow	6	41	16.1	8.5	37.0	
boxelder	72	22	8.7	14.3	62.3	32
cherry birch	3	25	9.8	3.5	15.2	
cottonwood	20	66	26.0	43.2	188.1	44
eastern hemlock	3	30	11.8	13.3	57.9	
horsechestnut	6	18	7.1	2.5	10.9	30
Norway maple	38	19	7.5	19.2	83.6	26
red oak	3	15	5.9	1.3	5.7	
silver maple	13	22	8.7	1.8	7.8	24
sugar maple	6	21	8.3	4.3	18.7	57
white ash	10	25	9.8	10.9	47.5	47
white pine	1	25	9.8	4.2	18.3	
standing dead	13	26	10.2	3.0	13.1	
Species Total	15	26	10.2	8.8	38.3	33

Italicized font indicates species is not native to Massachusetts

4.2 RIPARIAN CHARACTERIZATION

The abundance of non-native plants provides both challenges and possibilities for potential remediation actions. If contaminated soils are to be removed, the exposed mineral substrate will be a prime germination medium for many non-native plants. As well, the proximity of urban and residential areas provides a source for non-native propagules. However, restoration activities could promote the development of a native, natural community to the replace the existing one that contains many alien species. Remediation activities will certainly require extensive non-native species control for a number of growing seasons to insure that these species do not become well established.

4.2.1 NATURAL COMMUNITIES

The pristineness of the natural communities of the study area have been impacted by urban and residential influences. However, these areas provide important functions: shoreline stabilization and habitat for urban-tolerant species. The large trees and moderately dense herbaceous cover appear to function well in stabilizing stream-side sediments. Beyond the vertical banks, very few areas of extensive erosion were observed in the 1.5 mile stretch. This function of the natural community currently protects both commercial and residential properties, especially on the north shore.

The plant communities also provide a vegetated travel corridor for many species of wildlife moving to and from less developed habitats to the north and south. Maintaining and/or restoring and enhancing this function is an important management concern.

4.2.2 CANOPY DESCRIPTION

The most significant aspect of the riparian communities' canopy is the structural diversity it adds to the local landscape. Cottonwood trees up to 78 ft tall were not uncommon. These and other canopy trees provide nesting/denning habitat for small mammals, songbirds, and insects (which are utilized by fish in the stream when they fall). The trees also provide migratory bird feeding and roosting habitat and serve as a visual barrier between the river and riparian corridor and the adjacent urban development.

4.2.3 WILDLIFE

Finfish are likely to migrate into this section of river from upstream and downstream areas. The scarcity of vegetated wetland habitat and the previous impacts of channelization reduce the overall value of the system for fish and shellfish. In addition, water quality in this reach may be compromised by urban runoff, and possibly by discharges of toxins (as evidenced by the presence of containment booms in the river at one location immediately upstream of Lyman Street). None of the records reviewed indicate the persistence of shellfish populations in this section of river. Additionally, no live freshwater mussels were observed in this section during the 1998 field surveys.

The river and its associated riparian forest provide habitat for wildlife species that tolerate or utilize urban areas. Most of the songbird species are well known for their use of urban areas and/or backyard feeders. As well, many of the mammals observed in the study area are species that utilize residential areas as sources of food and/or shelter. There is very little habitat for amphibians in the area.

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APPENDIX A: Maine Natural Areas Program Community Sampling Protocol

INSTRUCTIONS
NATURAL COMMUNITY SURVEY FORM

Maine Natural Areas Program

3 June 1997 draft

For the past several years the Maine Natural Areas Program has been trying to improve the quality and quantity of data on natural community occurrences in Maine. This form is the latest iteration in our attempts to standardize data collection for unusual occurrences of natural communities and move towards quantitative documentation.

When to use this form: Fill out at least the first part of the natural community survey ("Reconnaissance") any time you're surveying an area with any natural attributes. (The natural community survey supplements but does not replace the Site Survey Summary. For every site you visit, even ones with no unusual natural features, you fill out a Site Survey Summary.) For example, if you were checking an area which turned out to have been clearcut a few months ago, you would just fill out the Site Survey Summary. But if you were checking an area which had 50-year old pine forest, a red maple swamp, and an oak-pine woodland, you'd fill out the community reconnaissance form to generally describe each community type. The reconnaissance is useful to keep track of the different vegetation types you encounter in an area, even if none of them turn out to be particularly unusual.

How this form is structured: The Natural Community Survey has three parts.
Part I is the Reconnaissance, which serves as an overview of all of the natural communities or vegetation types in your survey area. What communities are present, and where are they in relation to changes in topography? What are the community boundaries? Even if this is the only part of the community form that you complete (e.g. if the area has nothing unusual), it will serve as a record of the visit and provide some community information, but probably will not be mapped or entered into the database.
Part II is the Description of a particular natural community. This is to be completed for all unusual natural community occurrences. An unusual natural community can either be an occurrence of a highly-ranked type (S1, S2, or S3, see the MNAP's natural community classification) or an outstanding example of a more common community type. Part II contains all the basic information fields needed for minimum documentation of community occurrences. It combines environmental descriptors for the community with vegetation data collected from nested plots arrayed on one or more transects through the community. Note that if your reconnaissance of an area turns up three unusual natural communities (say a pristine red maple swamp [!], a pitch pine - scrub oak barren, and a high-quality sedge meadow), you will fill out three Part IIs-- one for each community occurrence in that area. If your reconnaissance turns up only marginal red maple swamp and typical 80-year-old mixed forest, you won't fill out any Part IIs (unless you have lots of time on your hands and want to help us supplement our data on lower-quality occurrences...).
Part III is the Summary Notes. This can apply to one or more of the communities you've described, at your discretion. You can fill out one Part III to apply to all of the natural communities in the area, or fill out separate ones for each community type; whichever seems to make the most sense for that particular site. Like Part II, fill this out only if you encounter unusual natural communities.

After you've filled out the various forms for an area, staple them all together along with a copy of the topo map showing the area you surveyed, the location of your observation points (from the reconnaissance page), and the approximate boundaries of any unusual natural communities, as well as the location of any rare species.

Part 1: Reconnaissance

Note: This form has boxes separating each data item. It's designed to cue you to put something in each of the boxes, except those with their names in parentheses (these are to be filled in by MNAP staff when logging in the data). If a box does not apply, note that; to us in the office, blank boxes can mean "don't know", "didn't pay attention to this", or "not applicable here", all of which have very different meanings.

IDENTIFIERS/LOCATION:

Survey Area - provisional name assigned by field worker; should represent an identifiable feature on topographic map. If you're dealing with a specific portion of a larger identifiable area, note both: "Pemetic Mountain, Acadia National Park."

Date - date of the fieldwork.

(Site Name) - "Official" name; field workers ignore.

Surveyors - your name(s).

Town and County

USGS Quad - the name of survey map used. Assumed to be 7.5' (1:24000) unless you note otherwise.

(Quadcode:) Field workers ignore.

Airphoto: - type, scale, date, and source of imagery used (e.g. airphoto, 1:20K, 1980, MGS).

Directions - precise directions in words; or if the topo or Maine Atlas shows directions clearly, attach copy with route of access marked. Access notes can be extremely important and are often not apparent simply from a topographic map.

VEGETATION/HABITAT:

Community type - appropriate name from the MNAP natural community classification; or assign provisional name of your own. (Also O.K. to leave this blank– MNAP staff can fill in later– as long as your other information is sufficient!)

Soil - describe texture, moisture regime, and origin, as appropriate. Give soil series, if known.

Slope, aspect, topography - describe.

Strata (Dominant Species & Total Cover) - Enter the total coverage (estimated %) of a particular layer (stratum), and 1 or 2 dominant species (i.e. those with greatest coverage or abundance). Strata are defined by a combination of dominant plant type and height; for example, the herb layer includes all vascular plants less than 1 m tall, as well as any herbs more than 1 m tall.
The strata are defined as follows:

TREE = canopy (if emergents present, note as "E");
SAPLING / TALL SHRUB = > 2 m: woody plants not forming tree canopy but > 2 m tall;
SHRUB = 1 - 2 m: woody plants 1 - 2 m tall;
HERB = < 1 m: all herbaceous vascular plants plus any woody plants < 1 m tall;
BRYOID = all ground-layer non-vascular plants.

Condition - How much human impact is apparent? Is there evidence of natural disturbance that's notable? This is a very important bit of information for us as we interpret your reconnaissance forays.

Additional data - indicate if plots were sampled for this community or if reconnaissance only.

Part II: Description

Note: Again, this form has boxes separating each data item. It's designed to cue you to put something in each of the boxes, except those with their names in parentheses (these are to be filled in by MNAP staff when logging in the data).

IDENTIFIERS/LOCATION

Area - same as on Reconnaissance part.

Date - date of the fieldwork.

Observation Pt. # - Essential cross reference to your reconnaissance page.

Adjacent communities - list communities bordering this one (helps understand community transitions on the landscape.)

Community type - from your reconnaissance page.

(Lat.) - field workers ignore.
(Long.) - field workers ignore.

CLASSIFICATION HIERARCHY

This is used to cross-reference to TNC's national vegetation classification, ordered by physiognomy, phenology, and leaf type. This can be left blank IF it's obvious from the accompanying data.

Physiognomy

forest (trees forming 60-100% cover, generally > 5 m tall)
woodland (open stands of trees, 25-60% canopy cover; generally > 5 m tall)
shrubland (shrubs or small trees, usually 1-5 m tall, with > 25% cover; trees at < 10% cover
dwarf shrubland (shrubs and dwarf trees < 1 m tall, usually < 0.5 m tall, with > 25% cover; any taller strata have < 10% cover)
herbaceous (graminoids &/or forbs forming > 10% cover; any taller strata have < 10% cover)

sparse vascular / non-vascular (each vascular layer is < 10%; non-vascular vegetation anywhere from absent to continuous).

Phenology– what best describes the leaf form of the uppermost stratum (ignoring those with < 10% cover):

evergreen (> 75% of the total woody cover)
deciduous (>75% of the total woody cover)
mixed (evergreen and deciduous species each contribute 25% - 70% of the total woody cover)
perennial (herbaceous vegetation with > 50% cover of perennial spp.)
annual (herbaceous vegetation with > 50% cover of annuals).

Leaf type– applies to the uppermost stratum, as above:

broad-leaf woody
needle-leaf woody
graminoid
forb
pteridophyte
non-vascular

Alliance - field workers ignore.

ADDITIONAL DATA FOR FORESTS

Tree canopy height - measure with a clinometer.

Supercanopy trees? - indicate species, if present, e.g. "few, white pine 80-100 cm dbh"

Core data - list cores with an identifier so that person who later counts the rings can enter data here.

Deadwood - characterize, especially downed wood (standing dead will be counted in plots).

HISTORY

Fire, e.g. "charcoal bbs common in soil, no fire scars above ground"
Wind, e.g. "some pine with broken tops"
Cutting, e.g. "few stumps, mostly rotted"
Agriculture, e.g. "stone fences present"
Impoundment, e.g. "water level maintained by dam at bridge"

This information is really important to interpreting the field data. If a box does not apply, please mark it out or put n/a– do not leave it blank.

ADDITIONAL SPECIES LIST

List additional plant species - Species recorded in the plot data should capture the overall character of the community, but there will always be plant species that don't occur in your quadrats: these should be listed here. This will give us a more-or-less complete species list, another useful interpretive and comparative tool.

Species list sketchy? - Note whether your species list covers just the dominants or is basically complete. This will be important in interpreting your data. Note if particular groups are missing

because of season or your level of expertise (e.g., "most composites not yet identifiable" or "not confident of grass i.d.s").

VEGETATION PLOT DATA

Once you have a sense of the area, decide on a transect direction and put in 5 - 10 plots spread through the community. Heterogeneous communities will require more plots than uniform ones. [Add sampling specification details here, duplicating field sheet.]

TOPOGRAPHY & SOILS

Elevation - note whether in feet or in meters.

Aspect - Please record as 0-360°; give range if appropriate. Note magnetic or true reading.

Slope - Notice this is in percent. A 45° slope = 100% slope.

Microtopography - hummocks and hollows, etc.

Habitat patchiness - describe pattern or patches. Are they substrate related?

Topographic Position - circle most appropriate descriptor.

pH - record substrate pH and note how it was obtained.

Soil Profile Description - sketch the soil profile representative of the community. If you don't have a complete soil profile, describe as deep as you dug or probed. For mineral soils, give depth, color, presence of mottling, etc. of each horizon as appropriate. For organic soils, indicate peat depth if it is less than 1 m, or just check off the "> 1 m" blank if appropriate. Indicate degree of decomposition using the Von Post scale (see Appendix 2). Note depth to water table and depth to obstruction, if those can be determined. If possible, take a soil temperature reading at about 10 cm depth.

Surficial deposit - circle the appropriate descriptor, or more than one if surficial geology is unknown/unclear.

Surface - percentage of surface covered by each category. What would you see if you took all of the vegetation away (a geologist's dream!)?

Average texture - These are general soil texture classes. The attached "Simplified Key to Soil Texture" (Appendix 1) may be helpful.

Bedrock type - name, if known; or check off the closest type of those listed. Indicate whether you confirmed the type in the field, or if this was taken off of the bedrock map.

Igneous Rocks
- Granitic (Granite, Schyolite, Syenite, Trachyte)
- Dioritic (Diorite, Dacite, Andesite)
- Gabbroic (Gabbro, Basalt, Pyroxenite, Peridotite)

Sedimentary Rocks	Metamorphic Rocks
Limestone (and Dolomite)	Gneiss
Sandstone	Schist
Siltstone	Slate / Phyllite
Shale	Marble
Marl	Serpentine

Soil stoniness - average stoniness of soil or deposit up to 1 m in depth.

Drainage & moisture regime - These classes indicate the amount of moisture available to plants, and are defined in terms of (1) actual moisture content (in excess of field capacity), (2) the extent of the period during which excess water is present in the plant-root zone, and (3) soil structure/texture. Permeability, level of groundwater, and seepage are factors affecting moisture status, but because these may not be directly observed or measured in the field, they are limited as criteria of moisture status. Soil profile morphology, for example mottling, normally reflects soil moisture status (indirectly), but because it does not always do so, it should not be the overriding criterion. Topographic position and vegetation as well as mottling or other morphological characteristics are useful field criteria for assessing soil moisture status. The key provided is from the Maine Association of Professional Soil Scientists.
If soils are strongly influenced by seepage waters, please note.

Hydrologic regime - circle appropriate descriptor.

PART III. Summary Notes

This should be self-explanatory.

APPENDIX 1. MINERAL SOIL TEXTURE KEY

Simplified Key to Texture

A1 Soil does not remain in a ball when squeezed ..... **sand**

A2 Soil remains in a ball when squeezed ..... B

B1 Squeeze the ball between your thumb and forefinger, attempting to make a ribbon that you push up over your finger.
Soil makes no ribbon ..... **loamy sand**

B2 Soil makes a ribbon; may be very short C

C1 Ribbon extends less than 1 inch before breaking ..... D

C2 Ribbon extends 1 inch or more before breaking ..... E

D1 Add excess water to small amount of soil; soil feels at least slightly gritty ..... **loam or sandy loam**

D2 Soil feels smooth ..... **silt loam**

E1 Soil makes a ribbon that breaks when 1-2 inches long; cracks if bent into a ring ..... F

E2 Soil makes a ribbon 2+ inches long; doesn't crack when bent into a ring ..... G

F1 Add excess water to small amount of soil; soil feels at least slightly gritty ..... **sandy clay loam or clay loam**

F2 Soil feels smooth ..... **silty clay loam or silt**

G1 Add excess water to a small amount of soil; soil feels at least slightly gritty ..... **sandy clay or clay**

G2 Soil feels smooth ..... **silty clay**

APPENDIX 2. VON POST SCALE OF PEAT DECOMPOSITION

H1: Completely undecomposed peat; only clear water can be squeezed out.

H2: Almost undecomposed and mud-free peat; water that is squeezed out is almost clear and colorless.

H3: Very little decomposed and very slightly muddy peat; when squeezed water is obviously muddy but no peat passes through fingers. Residue retains structure of peat.

H4: Poorly decomposed and somewhat muddy peat; when squeezed, water is muddy. Residue muddy but it clearly shows growth structure of peat.

H5: Somewhat decomposed, rather muddy peat; growth structure visible but somewhat indistinct; when squeezed some peat passes through fingers but mostly very muddy water. Press residue muddy.

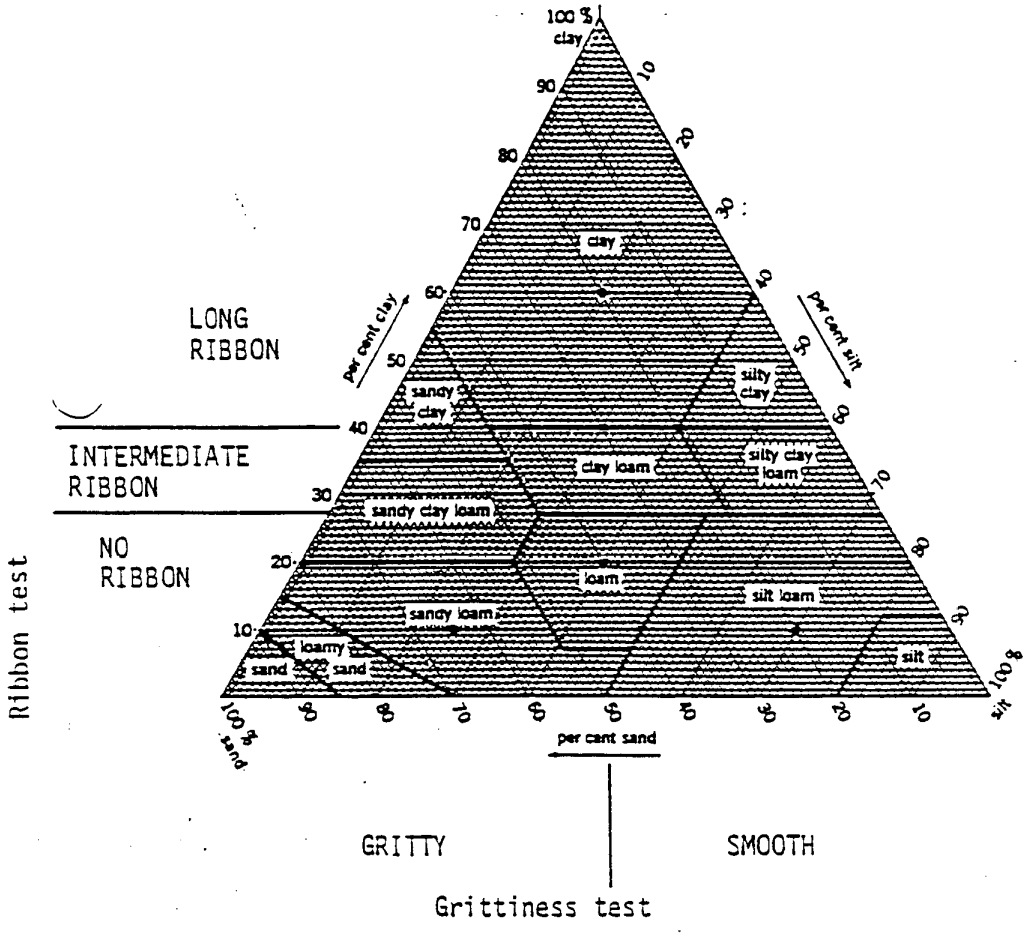
H6: Somewhat decomposed, rather muddy peat; growth structure indistinct; less than 1/2 of peat passes through fingers when squeezed. Residue very muddy, but growth structure more obvious than in unpressed peat.

H7: Rather well-decomposed, very muddy peat; growth structure visible, about 1/2 of peat squeezed through fingers. If water is squeezed out, it is porridge-like.

H8: Well-decomposed peat; growth structure very indistinct; about 2/3 of peat passes through fingers when pressed, and sometimes a somewhat porridge-like liquid. Residue consist mainly of roots and resistant fibers.

H9: Almost completely decomposed and mud-like peat; almost no growth structure visible. Almost all peat passes through fingers as a homogeneous porridge if pressed.

H10: Completely decomposed and muddy peat; no growth structure visible; entire peat mass can be squeezed through fingers.



Dots shown represent (by percent):

Sand	Silt	Clay
20	70	10
20	20	60
65	25	10
40	40	20

Figure 25. Soil texture classification (after Donahue et al. 1971). Interpretation for any point in the graph is read as follows: % Clay, move horizontally to the left; % Silt, move parallel to the Clay Axis, up and to the right; % Sand, move parallel to the Silt Axis, down and to the right.

NATURAL COMMUNITY SURVEY PART I: RECONNAISSANCE

Maine Natural Areas Prog

IDENTIFIERS / LOCATION

Survey area:			Date:
(Site name:)		(Quadcode:)	Airphoto (#, scale, date):
Surveyors:	Town: County: (Biophysical Region:)	USGS 7.5' Quad:	

Mark all observation points on a copy of the topo. Add any comments or sketches here if necessary to clarify the topo.	Directions (if not obvious from topo or Maine Atlas):

VEGETATION / HABITAT

Observation Point 1	Observation Point 2	Observation Point 3
Community type:	Community type:	Community type:
Soil:	Soil:	Soil:
Slope, aspect, topography	Slope, aspect, topography:	Slope, aspect, topography:
STRATA: cover & 1-2 dominant spp. for each	STRATA: cover & 1-2 dominant spp. for each	STRATA: cover & 1-2 dominant spp. for ea
Tree layer: Total cover (%):_____	Tree layer: Total cover (%):_____	Tree layer: Total cover (%):___
Sapling / tall shrub layer: Total cover (%)_____	Sapling / tall shrub layer: Total cover (%)_____	Sapling / tall shrub layer: Total cover (%)___
Shrub (1-2 m) layer: Total cover (%)_____	Shrub (1-2 m) layer: Total cover (%)_____	Shrub (1-2 m) layer: Total cover (%)___
Herb layer: Total cover (%)_____	Herb layer: Total cover (%)_____	Herb layer: Total cover (%)___
Bryoid layer: Total cover (%)_____	Bryoid layer: Total cover (%)_____	Bryoid layer: Total cover (%)___
Other diagnostic or notable species:	Other diagnostic or notable species:	Other diagnostic or notable species:
Condition / evidence of human use:	Condition / evidence of human use:	Condition / evidence of human use:
Additional data collected / COMMENTS plots (size)? tree cores? photos?	Additional data collected / COMMENTS plots (size)? tree cores? photos?	Additional data collected / COMMENTS plots (size)? tree cores? photos?

Observation Point 4	Observation Point 5	Observation Point 6
Community. type:	Community type:	Community type:
Soil:	Soil:	Soil:
Slope, aspect, topography:	Slope, aspect, topography:	Slope, aspect, topography:
STRATA*: cover & 1-2 dominant spp. for each	STRATA*: cover & 1-2 dominant spp. for each	STRATA*: cover & 1-2 dominant spp. for each
Tree layer: Total cover (%):_____	Tree layer: Total cover (%):_____	Tree layer: Total cover (%):_____
Sapling / tall shrub layer: Total cover (%)_____	Sapling / tall shrub layer: Total cover (%)_____	Sapling / tall shrub layer: Total cover (%)_____
Shrub (1-2 m) layer: Total cover (%)_____	Shrub (1-2 m) layer: Total cover (%)_____	Shrub (1-2 m) layer: Total cover (%)_____
Herb layer: Total cover (%)_____	Herb layer: Total cover (%)_____	Herb layer: Total cover (%)_____
Bryoid layer: Total cover (%)_____	Bryoid layer: Total cover (%)_____	Bryoid layer: Total cover (%)_____
Other diagnostic or notable species:	Other diagnostic or notable species:	Other diagnostic or notable species:
Condition / evidence of human use:	Condition / evidence of human use:	Condition / evidence of human use:
Additional data collected / COMMENTS plots (size)? tree cores? photos?	Additional data collected / COMMENTS plots (size)? tree cores? photos?	Additional data collected / COMMENTS plots (size)? tree cores? photos?

* STRATA are defined as:

TREE = canopy (if emergents present, note as "E");
SAPLING / TALL SHRUB = > 2 m tall and < 5 cm dbh: woody plants not forming tree canopy but > 2 m tall;
SHRUB = 1 - 2 m: woody plants 1 - 2 m tall;
HERB = < 1 m: all herbaceous vascular plants plus any woody plants < 1 m tall;
BRYOID = all ground-layer non-vascular plants.

NATURAL COMMUNITY SURVEY PART II: DESCRIPTION

-> complete separate description forms for each notable natural community on reconnaissance page.

IDENTIFIERS / LOCATION

Area (specific/general):			Obs. Pt. #
Community type:			Adjacent communities:
Quad:	(Lat.:)	Size (acres) of community EO (not site):	BE SURE TO MAP EXTENT OF COMMUNITY ON TOPO. Distinguish between portions ground-truthed vs. portions presumed to be part of community based solely on photo/map interpretation, where applicable.
(Quadcode:)	(Long:)		

CLASSIFICATION HIERARCHY

Physiognomy (Class)	Phenology (Subclass)	Leaf type (Group)
forest	evergreen woody	broad-leaf woody
woodland	deciduous woody	needle-leaf woody
shrubland	mixed woody	graminoid
dwarf shrubland	perennial	forb
herbaceous	annual	pteridophyte
sparse vascular/nonvascular		non-vascular

(ALLIANCE:)

ADDITIONAL DATA FOR FORESTS

Tree canopy height	Core data: ring counts (~ 5 cores) of larger trees (give sp. & dbh)	Deadwood (describe distribution, abundance, degree of decay):	
supercanopy trees?			

HISTORY (describe evidence or lack thereof; please do not leave boxes blank. Indicate approximately how recent where possible.)

Fire:	Wind:	Cutting:	Agriculture:	Impoundment

comment

ADDITIONAL SPECIES LIST

List additional plant species in community not included in the plot data that follows.	Species list sketchy or basically complete? Comment

NATURAL COMMUNITY SURVEY PART II: DESCRIPTION

-> complete separate description forms for **each** notable natural community on reconnaissance page.

IDENTIFIERS / LOCATION

Area (specific/general):			Obs. Pt. #
Community type:			Adjacent communities:
Quad:	(Lat.:)	Size (acres) of community EO (not site):	BE SURE TO MAP EXTENT OF COMMUNITY ON TOPO. Distinguish between portions ground-truthed vs. portions presumed to be part of community based solely on photo/map interpretation, where applicable.
(Quadcode:)	(Long:)		

CLASSIFICATION HIERARCHY

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dwarf shrubland	perennial	fern
herbaceous	annual	pteridophyte
sparse vascular/nonvascular		non-vascular

(ALLIANCE:)

ADDITIONAL DATA FOR FORESTS

Tree canopy height:	Core data: ring counts (~ 5 cores) of larger trees (give sp. & dbh)	Deadwood (describe distribution, abundance, degree of decay):	
supercanopy trees?			

HISTORY (describe evidence or lack thereof; please do not leave boxes blank. Indicate approximately how recent where possible.)

Fire:	Wind:	Cutting:	Agriculture:	Impoundment:

comment:

ADDITIONAL SPECIES LIST

List additional plant species in community not included in the plot data that follows.	Species list sketchy or basically complete? Comment:

VEGETATION PLOT DATA

Area:	Obs. pt. #:
Community type:	(Regional alliance/community:)

LAYER	plot #			
TREE list species and dbh for all trees >= 5 cm dbh; count standing dead as 1 species. note units: QUAD SIZE: note which size used 5.64 m radius for 1/100th ha 7.98 m radius for 2/100th ha use same size throughout!				
SAPLING / TALL SHRUB cover class by species of: trees > 2 m tall but < 5 cm dbh; and shrubs > 2 m tall QUAD SIZE: 2.8 m radius or 25 m^2				
SHRUB cover class* by species of shrubs/trees 1 - 2 m tall. QUAD SIZE: 2.8 m radius or 25 m^2				
HERB cover class* by species for all herbaceous plants plus any woodies < 1 m tall QUAD SIZE: 1 m^2, 2-4 herb quads per tree plot. Enter individual values in left-hand column and average in right-hand column. Remember the zeros for spp present in some but not all herb quads when figuring averages!				
BRYOID ground-layer mosses, liverwort, lichens in herb quads. resolution (check one): __"moss"/"liverwort"/"lichen" only; __identified to major group; __identified to genus; __identified to species.				
REMARKS				

In box on previous page, list plant spp. present in the community but not in the sample plots so we have a complete species list.

* cover classes (record midpoint): < 2 1 2-5% 3 6-12% 9 13-24% 19 25-49% 37 50-74% 63 75-100% 87

date: initials: p. ____ of ____

TOPOGRAPHY / SOILS

Area: | Obs. pt. #:

Community type: | (Regional alliance/community:)

Elevation:	Aspect: magnetic or true?	Slope: measured or estimated?	Microtopography:

pH (note kit or meter type)	Topographic position:			Habitat patchiness (describe zones or patches if present):
	P low plain, level T toe of slope LS lower slope MS middle slope	TB hillside terrace/bench US upper slope E cliff/ledge	C crest M high plateau N narrow valley D drainage channel	

Mineral Soil Profile:

horizon depth (cm) color mottling other

O _____

A _____

E _____

B _____

C _____

Organic Soil Profile:

peat depth:_____cm OR > 1 m_____

vonPost decomposition:_____

ALL SOILS:

DEPTH TO WATER TABLE:_____

DEPTH to OBSTRUCTION:_____

Soil temperature reading _____ F/C at _____ (depth)

Surficial deposit:

- bedrock
- talus slope
- glacial till
- moraine
- esker/outwash
- glacial delta
- lacustrine/fluvial
- marine
- aeolian
- other:

Surface:

- _____% Bedrock
- _____% Boulders (>60 cm)
- _____% Cobbles/Gravel
- _____% Bare mineral soil
- _____% Organic soil
- _____% Litter (note type)
- _____% Water
- _____% Total vegetation
- _____ Other:

Average Texture:

- gravel
- sand
- loamy sand / sandy loam
- loam
- silt loam
- clay loams
- sandy clay / clay
- peat
- muck

Bedrock type:

Igneous
- granite
- dioritic
- gabbroic
- other igneous _____

Metamorphic
- slate/phyllite
- schist/gneiss
- other metamorphic _____

Sedimentary
- limestone
- other sedimentary _____

details?

Soil stoniness:

- v. little (< 1%)
- moderate (2-25%)
- very (25-100%)

Drainage & moisture regime (see MAPPSS key):

- very poorly drained
- poorly drained
- somewhat poorly drained
- moderately well drained
- well drained
- somewhat excessively drained
- excessively drained

Hydrologic regime:

- upland
- nontidal wetland:
  - permanently flooded
  - semiperm'ly flooded
  - seasonally flooded
  - saturated
- tidal - irregularly
- tidal - regularly
  - saltwater
  - brackish
  - freshwater
- unknown

APPENDIX B: Housatonic River Existing Conditions Maps

LEGEND

R1 RIFFLE – 1 FOOT DEEP
RU 2 RUN – 2 FEET DEEP
P1 POOL – 1 FOOT DEEP

COBBLE BAR
GABIAN WALL
GRAVEL BAR
LEDGE OR BEDROCK
RIP-RAP
SAND BAR
SILT BAR
VEGETATED GRAVEL
LOGS OR FALLEN TREES
HIGH FLOODPLAIN FOREST
MESIC NORTHERN HARDWOOD FOREST
LOCATION AND DIRECTION OF NUMBERED PHOTO
BOULDERS OR LARGE ROCKS
LOCATION OF NUMBERED TRANSECT

PHOTO 8
LOOKING DOWNSTREAM

PHOTO 7
LOOKING UPSTREAM

PHOTO 11
LOOKING DOWNSTREAM

PHOTO 10
LOOKING UPSTREAM

PHOTO 12
LOOKING UPSTREAM

LYMAN STREET
CULVERT
WOODCHUCK HOLE
NEW BOULDER/ COBBLE RIP-RAP
T070
T088
RU 2-3'
RU 3-4'
R
7

1"=100'
100' 0 100' 200'

NOTES:
1) Base map information including road locations, lot lines, contour data, and treeline provided by R.F. Weston.
2) River and Riparian data collected in November 1998.
3) Riparian characterization plots were located on each shore and extend 15.2 meters downstream and up to 12.1 meters upslope from stream edge (depending on width of riparian zone) from approximate plot location.

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APPENDIX B

STREAM CHARACTERIZATION EXISTING CONDITIONS

SCALE: 1"=100' FEBRUARY 8,1999
SHEET 1 of 7

LEGEND

R1 RIFFLE – 1 FOOT DEEP
RU 2 RUN – 2 FEET DEEP
P1 POOL – 1 FOOT DEEP

COBBLE BAR
CABIAN WALL
GRAVEL BAR
LEDGE OR BEDROCK
RIP-RAP
SAND BAR
SILT BAR
VEGETATED GRAVEL
LOGS OR FALLEN TREES
HIGH FLOODPLAIN FOREST
MESIC NORTHERN HARDWOOD FOREST
LOCATION AND DIRECTION OF NUMBERED PHOTO
BOULDERS OR LARGE ROCKS
LOCATION OF NUMBERED TRANSECT

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PHOTO 16
LOOKING UPSTREAM


PHOTO 13
LOOKING UPSTREAM


PHOTO 18
LOOKING DOWNSTREAM


PHOTO 19
LOOKING UPSTREAM


PHOTO 14
LOOKING UPSTREAM


PHOTO 20
LOOKING UPSTREAM


PHOTO 15
LOOKING UPSTREAM


PHOTO 21
LOOKING DOWNSTREAM


PHOTO 22
LOOKING UPSTREAM

ELM STREET
BAFFLED STORMWATER OUTFALL
CULVERT
OLD PIPE CROSSING
BOULDER/COBBLE
TIMBER CRIB & ROCK RIP-RAP
RIP-RAP OF LG. ROCKS & CONCRETE SLABS
RU 1
RU 2-1
RU 2-3
RU 3-4
RU 3-5
R 1-1
R 1-2
R 5-1

1"=100'
100' 0 100' 200'

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APPENDIX B

STREAM CHARACTERIZATION EXISTING CONDITIONS

SCALE: 1"=100' FEBRUARY 8,1999

SHEET 2 of 7

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LEGEND

R1 RIFFLE – 1 FOOT DEEP
RU 2 RUN – 2 FEET DEEP
P1 POOL – 1 FOOT DEEP

- COBBLE BAR
- RIP-RAP
- HIGH FLOODPLAIN FOREST
- GABIAN WALL
- SAND BAR
- MESIC NORTHERN HARDWOOD FOREST
- GRAVEL BAR
- SILT BAR
- LOCATION AND DIRECTION OF NUMBERED PHOTO
- LEDGE OR BEDROCK
- VEGETATED GRAVEL
- BOULDERS OR LARGE ROCKS
- LOGS OR FALLEN TREES
- LOCATION OF NUMBERED TRANSECT

1"=100'

100' 0 100' 200'


PHOTO 5
LOOKING DOWNSTREAM


PHOTO 3
LOOKING UPSTREAM


PHOTO 1
LOOKING DOWNSTREAM


PHOTO 5
LOOKING UPSTREAM


PHOTO 4
LOOKING DOWNSTREAM


PHOTO 1
LOOKING UPSTREAM


PHOTO 3
LOOKING UPSTREAM


PHOTO 2
LOOKING DOWNSTREAM


PHOTO 2
LOOKING UPSTREAM

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APPENDIX B

STREAM CHARACTERIZATION EXISTING CONDITIONS

SCALE: 1"=100' FEBRUARY 8,1999
SHEET 3 of 7

LEGEND

R1 RIFFLE – 1 FOOT DEEP
RU 2 RUN – 2 FEET DEEP
P1 POOL – 1 FOOT DEEP

COBBLE BAR
GABIAN WALL
GRAVEL BAR
LEDGE OR BEDROCK
RIP-RAP
SAND BAR
SILT BAR
VEGETATED GRAVEL
HIGH FLOODPLAIN FOREST
MESIC NORTHERN HARDWOOD FOREST
LOCATION AND DIRECTION OF NUMBERED PHOTO
BOULDERS OR LARGE ROCKS
LOGS OR FALLEN TREES
LOCATION OF NUMBERED TRANSECT

PHOTO 6
LOOKING DOWNSTREAM

PHOTO 8
LOOKING DOWNSTREAM

PHOTO 9
LOOKING DOWNSTREAM

PHOTO 7
LOOKING UPSTREAM

DAWES AVENUE

PHOTO 10
LOOKING DOWNSTREAM

PHOTO 12
LOOKING UPSTREAM

PHOTO 15
LOOKING UPSTREAM

PHOTO 13
LOOKING DOWNSTREAM

PHOTO 11
LOOKING UPSTREAM

1"=100'

100' 0 100' 200'

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APPENDIX B

STREAM CHARACTERIZATION EXISTING CONDITIONS

SCALE: 1"=100' FEBRUARY 8,1999

LEGEND

R1 RIFFLE – 1 FOOT DEEP
RU 2 RUN – 2 FEET DEEP
P1 POOL – 1 FOOT DEEP

- COBBLE BAR
- GABIAN WALL
- GRAVEL BAR
- LEDGE OR BEDROCK
- RIP-RAP
- SAND BAR
- SILT BAR
- VEGETATED GRAVEL
- HIGH FLOODPLAIN FOREST
- MESIC NORTHERN HARDWOOD FOREST
- LOCATION AND DIRECTION OF NUMBERED PHOTO
- BOULDERS OR LARGE ROCKS
- LOGS OR FALLEN TREES
- LOCATION OF NUMBERED TRANSECT

PHOTO 16
LOOKING DOWNSTREAM

PHOTO 17
LOOKING UPSTREAM

PHOTO 18
LOOKING ACROSS

PHOTO 19
LOOKING UPSTREAM

PHOTO 20
LOOKING DOWNSTREAM

PHOTO 21
LOOKING DOWNSTREAM

PHOTO 22
LOOKING UPSTREAM

PHOTO 23
LOOKING DOWNSTREAM

PHOTO 24
LOOKING UPSTREAM

POMEROY AVENUE

T170
T180
LG. BOULDER RIP-RAP
SUMP
SAND
COARSE SAND/ FINE GRAVEL
RU 1'-2.5' FINE GRAVEL
R 1'-1.5' GRAVEL
R 0.5-1.5
R 1'-1.5' SAND/SILT
RU 2'-3' SAND & SILT
RU 2'-3' SAND/SILT
RU 1.5'-2.5' SAND/SILT
RU 5-15'
C SAND/ FINE GRAVEL
C AMP
WOODCHUCK HOLE

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1"=100'
100' 0 100' 200'

APPENDIX B

STREAM CHARACTERIZATION EXISTING CONDITIONS

SCALE: 1"=100' FEBRUARY 8,1999
SHEET 5 of 7

LEGEND

R1 RIFFLE – 1 FOOT DEEP
RU 2 RUN – 2 FEET DEEP
P1 POOL – 1 FOOT DEEP

- COBBLE BAR
- GABIAN WALL
- GRAVEL BAR
- LEDGE OR BEDROCK
- RIP-RAP
- SAND BAR
- SILT BAR
- VEGETATED GRAVEL
- HIGH FLOODPLAIN FOREST
- MESIC NORTHERN HARDWOOD FOREST
- LOCATION AND DIRECTION OF NUMBERED PHOTO
- BOULDERS OR LARGE ROCKS
- LOGS OR FALLEN TREES
- LOCATION OF NUMBERED TRANSECT


PHOTO 1
LOOKING UPSTREAM


PHOTO 2
LOOKING DOWNSTREAM


PHOTO 6
LOOKING DOWNSTREAM


PHOTO 26
LOOKING UPSTREAM


PHOTO 27
LOOKING UPSTREAM


PHOTO 3
LOOKING DOWNSTREAM


PHOTO 4
LOOKING DOWNSTREAM


PHOTO 5
LOOKING DOWNSTREAM


PHOTO 7
LOOKING DOWNSTREAM


PHOTO 8
LOOKING DOWNSTREAM


PHOTO 9
LOOKING DOWNSTREAM


PHOTO 10
LOOKING DOWNSTREAM


PHOTO 11
LOOKING UPSTREAM


PHOTO 12
LOOKING DOWNSTREAM


PHOTO 13
LOOKING DOWNSTREAM


PHOTO 14
LOOKING UPSTREAM

1"=100'

100' 0 100' 200'

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APPENDIX B

STREAM CHARACTERIZATION EXISTING CONDITIONS

SCALE: 1"=100' FEBRUARY 8,1999

SHEET 6 of 7